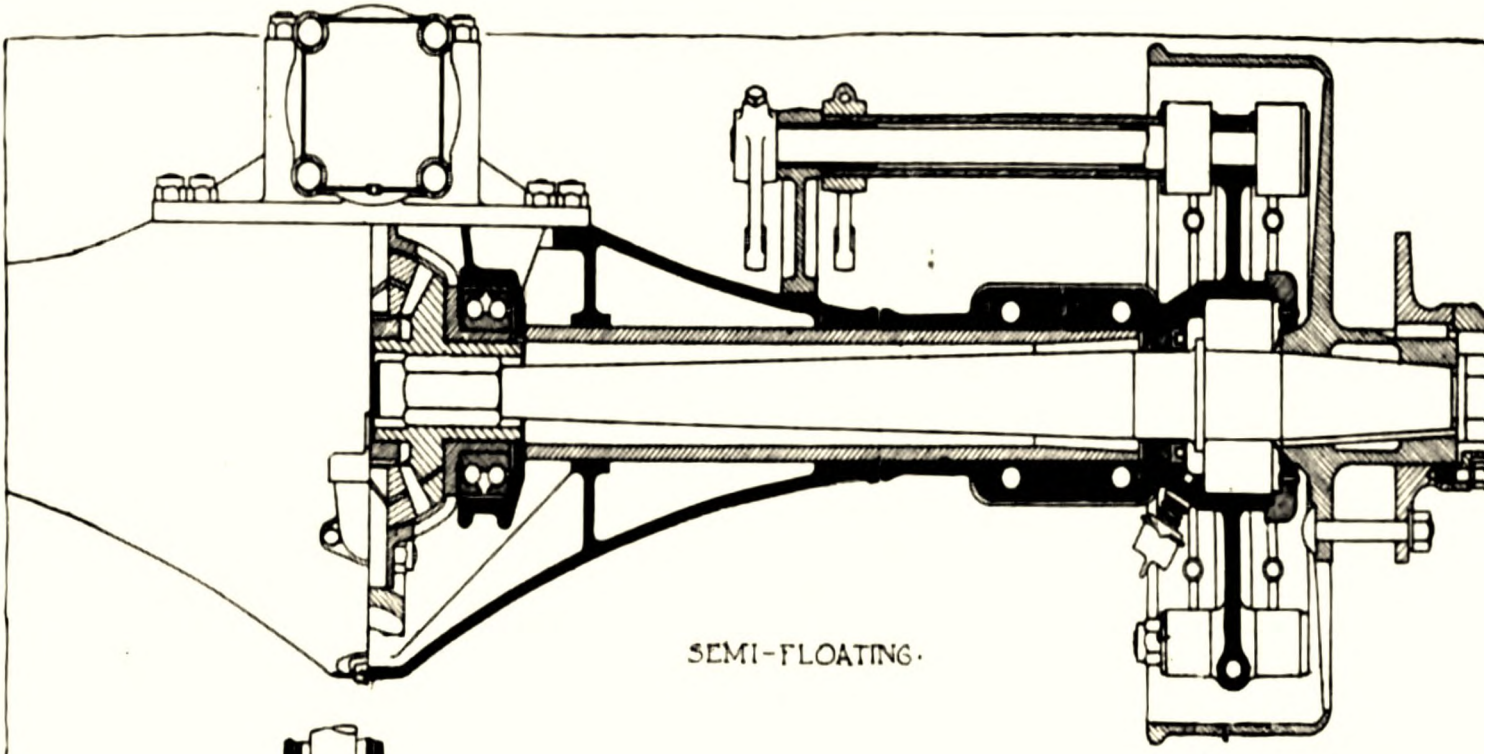

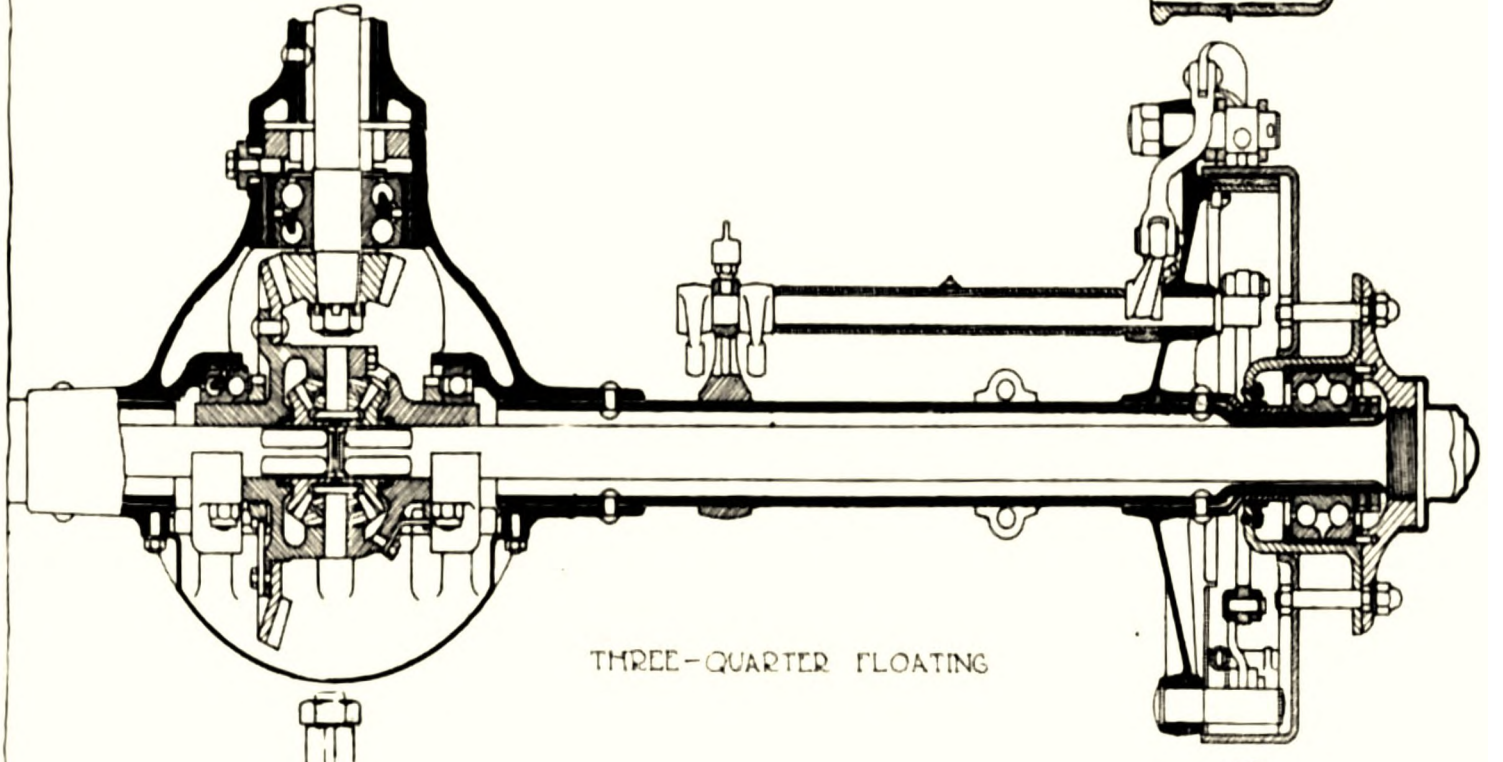

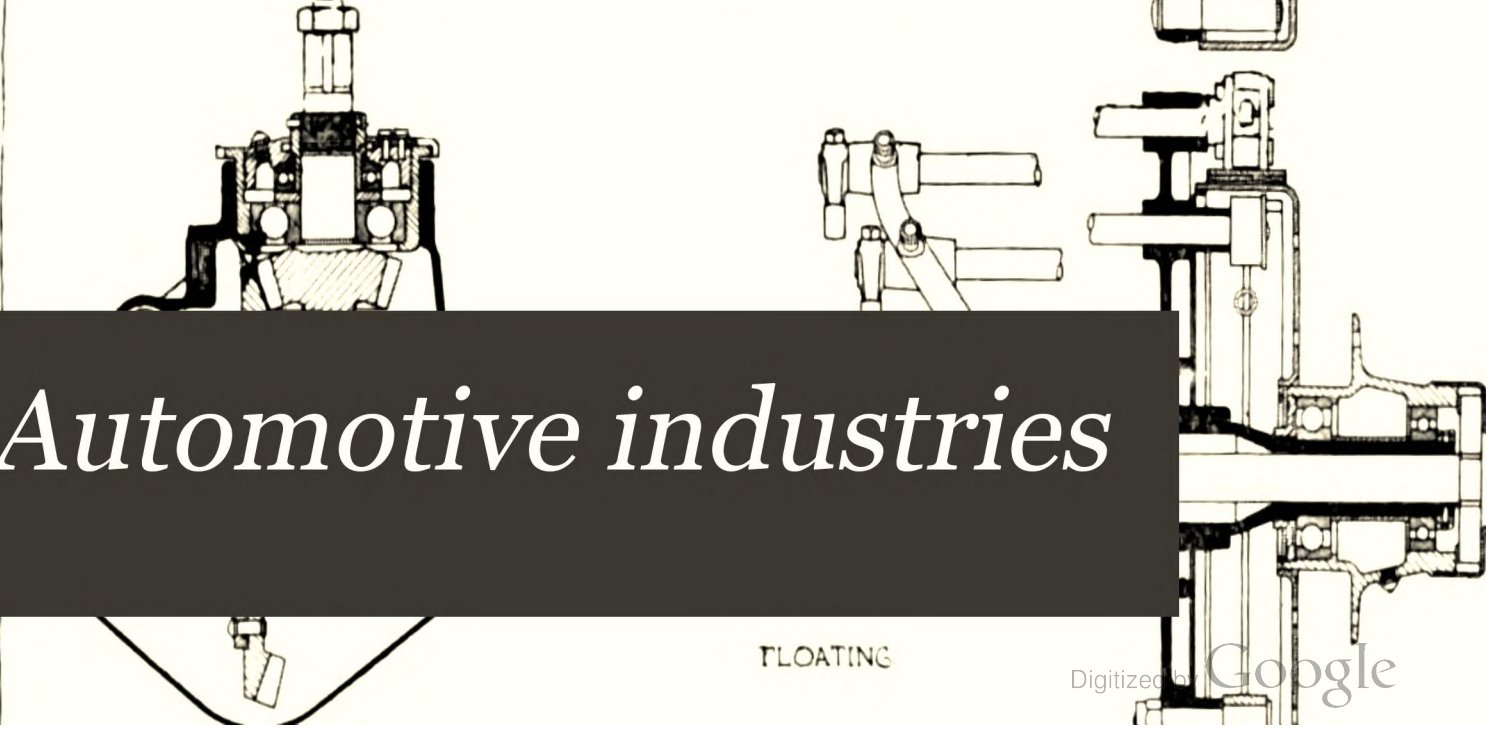

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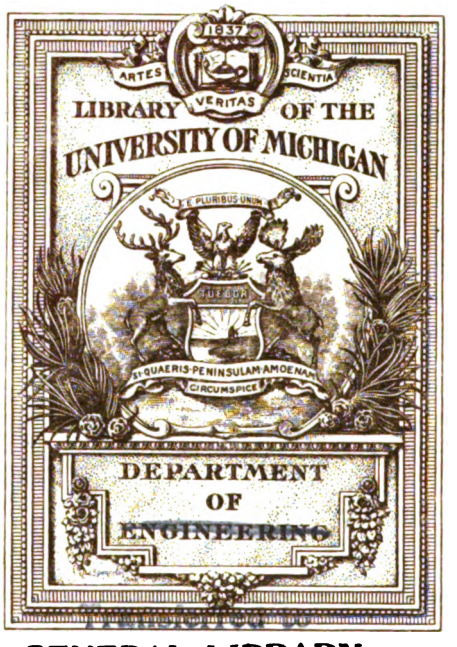


The Automobile

Vol. XXXIII New York—July 1, 1915, to December 30, 1915—Chicago Nos. 1 to 27

Index to Volume XXXIII

ACCESSORIES

ASSOCIATIONS AND CLUBS

S. A. E.

CAR DESCRIPTIONS

COMMERCIAL VEHICLES

CONTESTS

EDITORIAL

—

GOOD ROADS

—

LEGAL AND LEGISLATIVE

—

MISCELLANEOUS

—

REGISTRATION

—

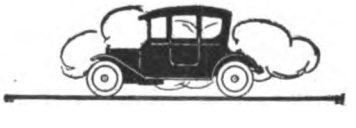
ROSTRUM

SHOWS

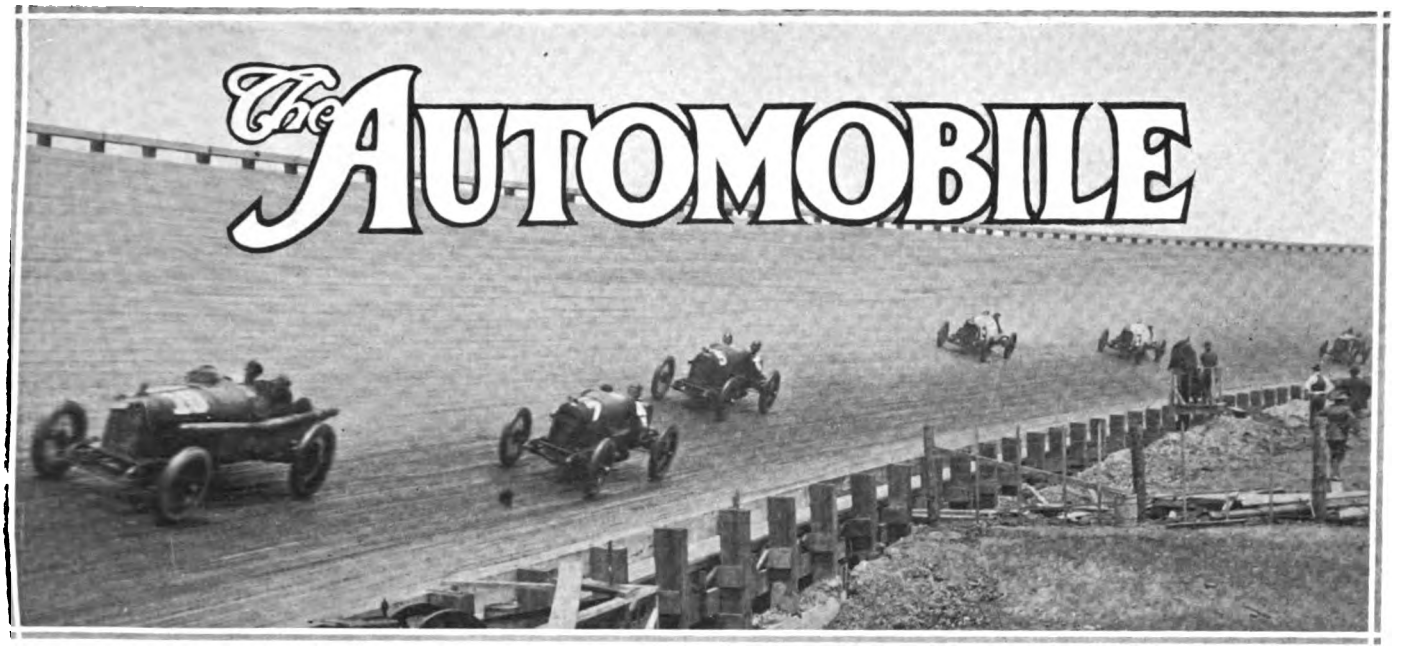
TECHNICAL

Engineer's Forum

TRADE NEWS



VOL. XXXIII NEW YORK—THURSDAY, JULY 1, 1915—CHICAGO No. 1



Turning the banked curves at 100 miles an hour; a group of contestants at high speed

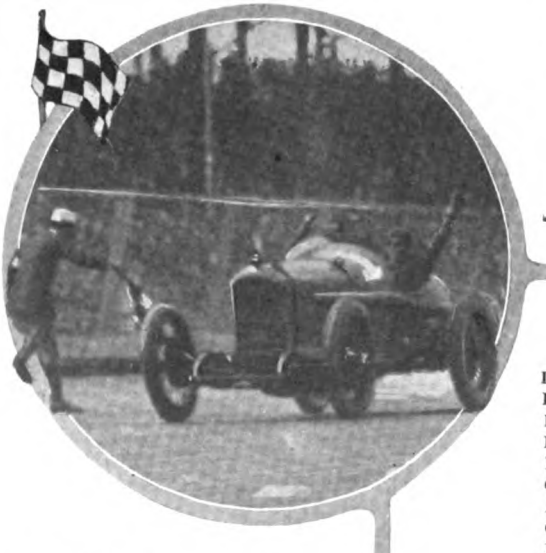
Resta in Peugeot Victorious

Averages 97.58 Miles Per Hour Over 500-Mile Course on Chicago's Board Saucer—First Ten Higher than 90 Miles Per Hour

CHICAGO SPEEDWAY, June 26—Lacking but 7½ min. of averaging 100 m.p.h. for 500 miles, on the new 2-mile board speedway here to-day, Dario Resta in the Peugeot car in which he finished second at Indianapolis, carried off $23,000 in cash prizes, and set a world's record for this distance on any speedway. This average might have been higher had he been forced to extend the Peugeot, in fact during three of the centuries out of the five hundred, the average was over 98 m.p.h., the highest average being on the second hundred mile where Resta put the mark at 99.4 m.p.h.

Believed 97 M.P.H. Would Win

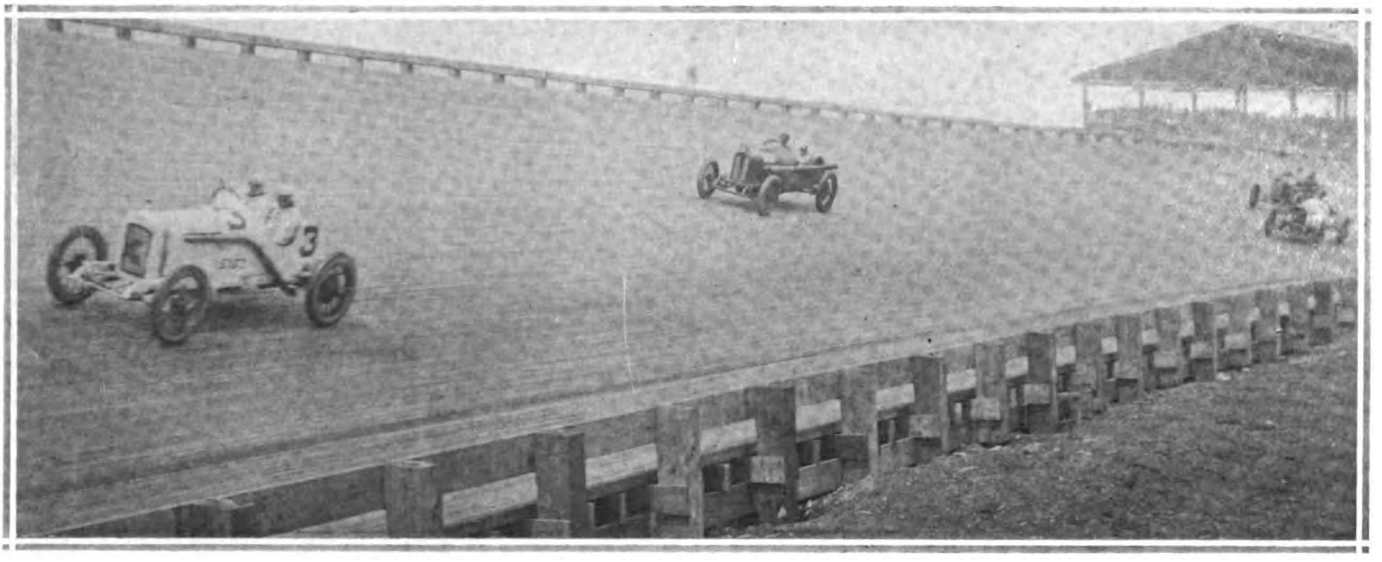
A speed of 97.58 m.p.h. was not dreamed of previous to the start of the race. Resta himself believing that a pace of 97 m.p.h. would easily win. With this object in view he set out not to hurry himself during the first hour, when his average was 96.8 m.p.h. This proved too slow and he found himself in third position and 1½ min. behind Porporato in a Sunbeam who was setting the pace. This brought Resta to the realization of the fact that to win meant a higher speed than 97 m.p.h. and he started his second century with 100 m.p.h. as his objective. How close he came to this is shown by the timer tape which gives his average for the second hundred at 99.4 m.p.h. at which position he was leading with a little over a minute on the rest of the field. He slackened slightly on the third hundred placing his average at 98.3, but finishing this century with a lead of over 3 min. His fourth century was made at 98.4 m.p.h. at the end of which he had a lead of over 3½ min. He slackened off very considerably during the last hundred miles, when he had the race well in hand, his pace aver-



Resta in Peugeot Winner of the Chicago 500-mile Board Speedway Competition

RESULTS

Driver	Car	M.P.H.
Resta	Peugeot	97.58
Porporato	Sunbeam	96.5
Rickenbacher	Maxwell	96.1
E. Cooper	Stutz	94.9
Grant	Sunbeam	94.3
Anderson	Stutz	93.7
Chevrolet	Delage	92.8
Burman	Peugeot	92.2
Alley	Duesenburg	91.3
J. Cooper	Sebring	90.3



Anderson's Stutz leading Van Raalte's Sunbeam, showing the latter's tendency to go high on the bank

aging but 95 m.p.h. which was enough to let him win with a margin of 3 min. and 24 sec. over Porporato who was in second position with a Sunbeam.

Board Surface Makes Good

The average pace of 97.58 m.p.h. as compared with 89.84 average by DePalma at the Indianapolis speedway, gives some indication of what may be expected in the future on board tracks. Chicago's new board surface has made good to-day in a manner not anticipated by the most sanguine. Cord tires have also made good to-day in a manner that exceeds the expectations of those who saw them perform so remarkably at Indianapolis. Up to 100 m.p.h. these tires gave a good account of themselves but at speeds of over 100 m.p.h. the wear was such as to make changes necessary on the right rear every 15 or 20 min.

Battle from the Start

Resta had to battle with his rivals from the drop of the starter's flag until the race was half over before he was certain of a walk-over, and from that distance to the finish it was largely a procession on his part. The greatest speed of the race was during the first hundred miles when the 3 Stutz cars and Porporato's Sunbeam were setting a pace intended to eliminate Resta's fast Peugeot. An average lap by lap of 105 to 108 m.p.h. was being maintained by these leaders, and if it had not been for tire troubles during the first century a phenomenally high pace would have been maintained. Instead of drawing Resta out, as they had hoped, the wiley Italian stuck to his objective, 97 m.p.h. and watched his competitors one by one stop for tire troubles. Porporato led the field at the end of the first century gaining the distinction of being the first driver to win the $1,000 for leadership at this point. Cooper in the Stutz was second, and Wilcox in another Stutz was eliminated with a broken piston.

It was at this point that Resta's real race started, namely that of overtaking Porporato and Cooper and establishing a safe lead for himself, which he had accomplished before 120 miles were covered. At this point he leading Porporato by 6 sec. At 140 miles his lead was 25 sec. At 150 miles he had a lead of 49 sec. At 160 miles he had nearly 2 min. to his credit, and from this time to the finish he never lost the leadership, while the fight for second place was being steadily waged among Porporato in his Sunbeam, Rickenbacher in a Maxwell, and Earl Cooper with the Stutz at a speed which often went up to as much as 100 m.p.h.

Porporato Forces Pace

Porporato who finished in second position with an average of 96.5 m.p.h. was one of the drivers to greatly improve his chances after the Indianapolis race, where he failed to make a showing. He was but 3 min. and 24 sec. behind the leader at the finish, and his phenomenal performance during the first hundred miles constituted one of the most interesting phases of the race. It was his battle with the Stutzes during this opening century which was responsible for the high average of 99.2 m.p.h. irrespective of many stops for tire troubles as well as the disadvantage of starting with relatively cold motors, which could not be expected to show up as well in the opening century as in subsequent ones. Although leading at the first hundred, Porporato was in second place at 200 miles being more than 3 min. back of the leader; at 300 miles he was back in fourth place, Rickenbacher's Maxwell and Cooper's Stutz leading him by approximately a minute. He ran in fourth position to 350 miles when he got back in third place and was able to get in second position at 400 miles which position he maintained to the finish of the race with the narrow margin of 15 sec. From the time Porporato safely landed in second place at 400 miles, it was a neck-and-neck fight with Rickenbacher who was rapidly gaining on him at the finish. Porporato had a lead of less than a minute on Rickenbacher's Maxwell at 400 miles. He increased this to nearly 2 min. at 440 miles and at 460 miles he had a lead of nearly 3 min. This was cut to less than a minute at 480 and to 15 sec. at the finish.

Prize Winners

No.	Driver	Car	Prizes
1	Resta	Peugeot	$23,000
11	Porporato	Sunbeam	11,000
7	Rickenbacher	Maxwell	5,000
4	E. Cooper	Stutz	3,500
17	Grant	Sunbeam	3,000
3	Anderson	Stutz	2,000
12	Chevrolet	Delage	1,800
9	Burman	Peugeot	1,700
19	Alley	Deusenberg	1,600
23	J. Cooper	Sebring	1,400
	Total		$54,000

Stutz Set Fast Pace

Before the start the Stutz entry of 3 cars was looked upon to be a determining factor in the race and wide regret was expressed by Stutz followers when the first to finish was Cooper's in fourth place and the next Anderson's in sixth position. Wilcox

The last row passes the pits as Resta leads off the first lap

driving the third Stutz was eliminated on the ninetieth mile. From the start the three Stutzes set out to maintain a terrific pace, Wilcox being the pace setter as at Indianapolis. Tire troubles soon set in. The race started at 10.30 and exactly 17 min. later Cooper stopped to change a right rear on his Stutz; a minute later Anderson stopped his Stutz to change a right rear, leaving Wilcox and Resta averaging 104 m.p.h. to the lap. At 32 miles or exactly 19 min. after starting Resta stopped to change a right rear, allowing Wilcox to gain three-quarters of a lap, but his leadership was shortlived as he to had to stop to change a right rear after the race was running but 22 min. He took 30 sec. for the change but which was enough to restore the leadership to Resta.

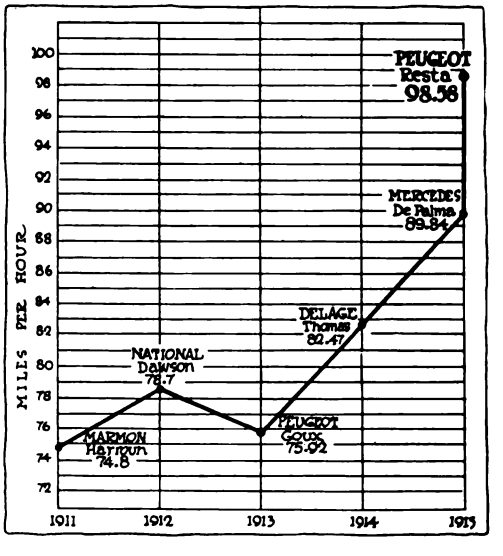
Resta's leadership was again surrendered when at 74 miles he stopped for another right rear, with Wilcox but a lap behind him, and Anderson closely following. At this point it looked as if three or four stood even chances for the $1,000 prize for leadership at the end of the first hundred miles, but stops for tires entirely changed the aspect of affairs, and Porporato carried off the wished for gold.

Rickenbacher's performance in bringing the Maxwell into third position with an average speed of 96.1 m.p.h. was unexpected. He was not a serious contender during the first hundred miles running in eleventh place at 60 miles. He cut this to ninth position at 100 miles. It was in the second century that he established himself by cutting to eighth place at 120, to sixth place at 140, to fifth place at 160, to fourth place at 180, and to third at 220. He dropped back to fourth place for a short time only to later regain third which he held for the last hundred miles.

Earl Cooper brought his Stutz into fourth position finishing with an average of 94.4 m.p.h. Cooper drove a remarkably consistent race from start to finish only for one period during the entire race did he get further back than fourth place, this being between 220 and 280 miles when he was running in fifth and seventh positions. He was soon in third place, but at 350 miles was in fifth which he held until near the finish.

Harry Grant finished in fifth position. To bring his six-cylinder Sunbeam home in that place was considered impossible both by Grant and the others and to bring it home as he did without making a stop was wonderful indeed. The car is old and has been raced many seasons, its speed quite high, but its stamina for a long grind always questioned. Grant turned the 2-mile track in 1 min. 15 sec. to 1 min. 16 sec. as steadily as if some mechanical device were in control. When Grant crossed the tape on his last lap his 7-gallon oil tank was empty, his gasoline was exhausted for he coasted over the line, and many parts of his car were about to give way. The exhaust pipe was broken and the rear half almost dropping off and many other unimportant parts were in equally bad shape. But Grant has been having hard luck with this car for two seasons and in each race started, some minor trouble would develop and put him out of the running. The single set of tires Grant used were Silvertown cords and the front set showed practically no wear, while the rears had only a small portion of the tread ground off. Grant was the only driver to finish the 500 miles without making a stop, but he was not alone in bringing home a car without making a tire change. Five others share this honor with him, Alley, J. Cooper in a Sebring, Orr in a Maxwell, and Mulford and Babcock both of whom finished but not in the first ten.

The five other cars to finish were: Anderson's Stutz, at 93.7 m.p.h.; Chevrolet, Delage at 92.8 m.p.h.; Burman, Peugeot at 92.2 m.p.h.; Alley, Duesenberg at 91.3 m.p.h., and J. Cooper, Sebring at 90.3 m.p.h.



Speed chart showing big gain in miles per hour above previous events

Burman Changes a Piston

Of those finishing in the money there is another whom we must acknowledge as displaying gameness of an unusual sort, this being Burman. Thirty minute before the official time for starting Burman discovered a piston had seized momentarily during his last trial lap and this meant he was out of the race unless Referee Vissering would grant him time practically to dismantle his motor. The drivers and officials expressed their willingness to have the start delayed until 10.30 to allow Burman to replace the burned piston and clean the scored cylinder. With a trio of

Tabulation of Times at Important Intervals in the 500-Mile Race at Chicago

No.	Car	Driver	Position	Miles: 40	Position	100	Position	200	Position	300	Position	400	Position	400	Position	480	Position	500	M.P.H.
1	Peugeot	Resta	1	23:59:85	3	1:01:58	3	2:02:17	1	3:03:19	1	4:04:49	1	4:41:12	1	4:53:28	1	5:07:26	97.58
11	Sunbeam	Porporato	7	23:21:65	1	1:00:28	1	2:05:23	3	3:08:25	4	4:08:29	2	4:44:33	2	4:58:43	2	5:10:50:45	96.5
7	Maxwell	Rickenbacher	5	24:23:80	6	1:04:55	9	2:05:30	4	3:07:51	2	4:09:18	3	4:47:22	3	4:59:32	3	5:11:65:23	96.1
4	Stutz	Cooper	4	24:19:15	4	1:01:06	2	2:03:34	2	3:08:19	3	4:14:45	5	4:52:04	5	5:03:53	4	5:15:59:15	94.9
17	Sunbeam	Grant	12	24:44:00	10	1:04:56	10	2:06:44	6	3:09:38	5	4:12:02	4	4:51:22	4	5:04:04	5	5:18:11:58	94.3
3	Stutz	Anderson	3	24:32:77	8	1:02:53	6	2:08:51	9	3:12:38	7	4:16:24	6	4:54:20	6	5:06:29	6	5:20:09:86	93.7
12	Delage	Chevrolet	11	24:43:08	9	1:03:19	7	2:08:02	5	3:11:08	6	4:16:27	7	4:57:08	7	5:09:44	7	5:23:05:67	92.8
9	Peugeot	Burman	9	24:23:23	5	1:02:37	5	2:13:27	11	3:20:29	10	4:21:51	8	4:58:26	8	5:12:52	8	5:25:12:61	92.2
19	Duesenberg	Alley	21	33:27:84	19	1:12:12	17	2:18:16	15	3:20:39	10	4:24:19	9	5:03:08	9	5:15:35	9	5:28:33:88	91.3
23	Sebring	J. Cooper	15	25:57:04	14	1:06:04	12	2:14:33	13	3:21:13	11	4:27:08	10	5:05:58	10	5:18:51	10	5:32:10:42	90.3
22	Peugeot	Babcock	17	26:43:05	15	1:08:52	15	2:16:15	14	3:26:14	12	4:33:22	12	5:12:51	11	5:26:08	11	5:39:19:28	88.4
10	Sunbeam	Van Raalte	6	23:22:43	2	1:02:29	4	2:06:55	7	3:19:01	8	4:32:01	11	5:21:30	12	5:36:09	12	5:59:59:85	83.4
5	Maxwell	Carlsen	10	28:35:43	18	1:08:21	14	2:12:03	10	3:53:25	15	5:01:36	14	5:41:29	13	5:55:58		Flagged.	
27	Maxwell	Orr	14	25:18:83	13	1:05:53	11	2:20:59	16	3:38:47	13	4:56:39	13	5:43:28	14	5:59:12		Flagged.	
30	Mulford	Mulford	18	27:57:62	17	1:12:00	16	2:25:18	17	3:39:40	14	4:59:39	15	5:47:18		Flagged.			
21	Duesenberg	Haupt	13	24:49:09	11	1:25:00	18	3:51:38	18	Out 294th mile, clutch trouble.									
15	Duesenberg	O'Donnell	8	24:28:58	7	1:04:48	8	2:07:16	8	Out 289th mile, connecting rod bearing failed.									
31	Sunbeam	Limberg	16	26:48:45	16	1:07:39	13	2:13:39	Out	220th mile, connecting rod bearing failed.									
2	Stutz	Wilcox	2	25:05:48	12	Out 90th mile, broken piston.													
20	Mercer	Henning	19	34:11:20	Out	42nd mile, oil on plugs.													
24	Ogren	Chandler	Out	24th mile,		broken bevel pinion housing.													

mechanics Burman set to work and with lightning speed dismantled the motor, cleaned the cylinder by lapping in a dummy piston with coarse emery, replaced the injured piston and was ready on the starting line at 10.30. It was remarkably fast work and efficient too, as it proved when Burman finished in eighth place.

Porporato Breathed Smoke

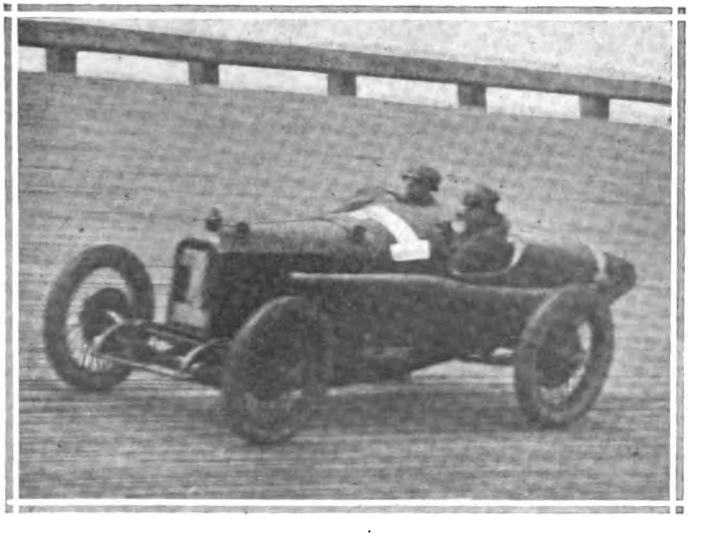
Those knowing the drivers intimately, realize the astonishing results. While it was not unexpected that Resta would win, for he had the fastest car in the race, it was unlooked for to see Porporato, and Rickenbacker finish as they did, since these contestants were expected to be displaced by the Stutzes. Porporato was a happy place winner, for before the race he expressed himself as believing his car would not finish. "It cannot stand the terrible grind which I expect will be over 95 m.p.h." But Porporato gained hope when he was told he was running two laps behind Resta for about 50 miles. And atop of it all Porporato drove through the entire 500 miles in an atmosphere of smoke. This was caused by discharges from the breather pipe and leaks about the exhaust pipe, the smoke being forced through the driver's compartment by an air draught. When asked how he possibly finished after breathing smoke for 5 hours he answered through his interpreter, "Periodically I would stick my head to one side and get a breath of fresh air and this would be enough for one-quarter of a lap."

Other astonishing results were made. It was thought by everyone, that there would be an unusually large number of failures in the early part of the race because of the fast pace anticipated. Many predicted the number of cars to finish would be insufficient to take all the prize money. The first 100 miles showed three cars withdrawn. These were the Ogren driven by Chandler which went out after 20 miles with a broken driving pinion housing, the Mercer special driven by Hanning went out with ignition trouble caused by too loose pistons and the Stutz driven by Wilcox withdrawing with a broken piston. This car mortality was very low compared with Indianapolis where five cars went out early in the race. Between 100 and 200 miles the remaining twenty-one cars all remained in the race, but between 200 and 300 two more fell by the wayside, these being the Sunbeam driven by Limberg which had burned out a bearing and the Duesenberg with Haupt up which went out because the clutch could not be operated.

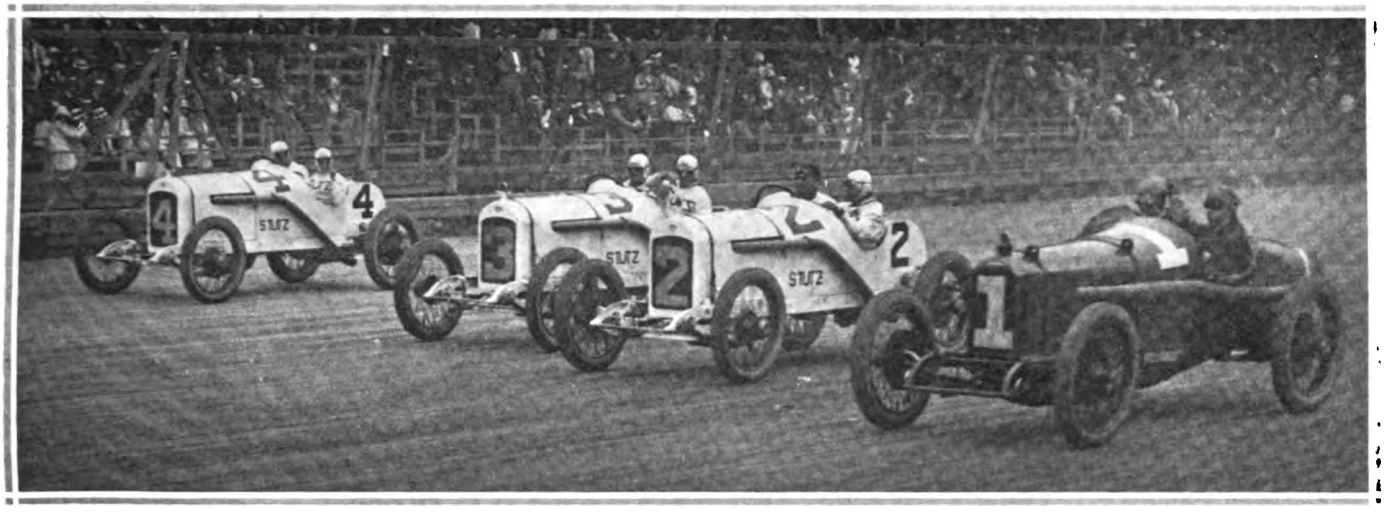
Six failures in twenty-one starters is a very good record and on a percentage basis equals about 29 per cent, whereas at Indianapolis half the field, or eleven cars, were withdrawn before the race was finished.

Track Design Helped Speed

That few cars dropped out and that the time of the first ten was better than DePalma's Indianapolis record was possible only because of the design of the track. Had the cars and drivers been capable of withstanding a speed of 110 m.p.h. the track would have permitted it, for its turns are



Resta traveling at high speed around the course



Front row favorites. Resta's Peugeot and the three Stutz who were expected to make the pace

so shaped as to make steering an act requiring little effort and, if properly negotiated, reduce tire wear to a minimum. Most of the drivers found that high riding, about 8 ft. from the top rail was the tire saving zone while others who traveled low and scraped their wheels across the wood surface made the greater number of tire changes. After 100 miles of running a black band about 10 ft. wide formed from exhaust smoke, oil, water and other drippings from the cars encircled the track and it was at a point just outside this band that tires seemed to ride with least wear. Grant found this out early in the race and while Porporato had an idea that high riding would do the trick, he rode too high and entered and left the turns with too much of a swing. Grant attributed his tire record to three things, the tires, the method of driving and the weight distribution of his car which he redesigned in this respect.

There were many conditions present at Chicago's race which parallel as many at Indianapolis. In the first place the race to-day should have been run last Saturday but rain caused a postponement. One hour before the start, black clouds hovered overhead and it looked as if a storm was approaching, as also at Indianapolis. Even at the start a heavy mist dropped over the track so that grandstand spectators could not see the bleachers opposite, which is possible in fair weather. It was an hour after the start that Old Sol poked his head from behind a cloud and beat down with all his calorific value on the wood saucer. He showed out just in time to brighten Porporato when he crossed the tape a leader at 100 miles at 99.8 m.p.h. and a winner of the $1,000 prize offered for the performance.

Cars Went Through Mist

The twenty-one cars starting plowed through the heavy mist with Resta leading a 100-mile pace. He had to lead for it was expected of him and he was being hounded by the Stutzes. But Resta drove beautifully and suffered no trouble like he did at Indianapolis. He made five stops, three for a right rear tire and two for supplies of fuel and oil. His last stop was made while he was leading Porporato by three laps and evidently Resta remembered the fate of others who lost a race because the car needed fuel on the last lap. Resta has pitmen of par excellence; men who practiced for weeks before, in changing tires, filling the tanks, etc. Resta stood calmly by each time he stopped and even on his last halt he waited patiently for assistance instead of getting excited. Resta did not have to fear Porporato for to gain three laps was impossible at this time and the next nearest man was Rickenbacher who was too far behind even to be considered

General view of the activities at the track during the 500-mile race at the Chicago speedway

Table Giving Equipment of Cars Participating in 500-Mile Race on the Chicago Board Track

Car	No.	Driver	Mechanician	Cylinders	Bore	Stroke	Displacement	Spark Plug	Carbureter	Mag neto	Tires	SIZE		Wheels	Metemeter	Wheelbase	Weight
												Rear	Front				
Peugeot	1	Resta	McCarty	4	3.62	6.67	276.0	K.L.G.	Zenith	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	109	2400
Stutz	2	Wilcox	Scott	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2404
Stutz	3	Andersen	Rooney	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2340
Stutz	4	Cooper	Dutton	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2385
Maxwell	5	Carlson	Franzen	4	3.75	6.75	298.2	Bosch	Master	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2282
Maxwell	7	Rickenbacher	Schroder	4	3.75	6.75	298.2	Bosch	Zenith	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2267
Peugeot	9	Burman	Gable	4	3.65	7.10	296.0	Bosch	Master	Bosch	Silvertown	34x4½	33x4½	R.W.	Boyce	105	2350
Sunbeam	10	Van Raalte	Copple	4	3.70	6.30	274.0	K.L.G.	Zenith	Bosch	Silv. (R) Palmer (F)	880x120 mm.	820x120 mm.	R.W.	Boyce	112	2244
Sunbeam	11	Porporato	Romeo	4	3.70	6.30	274.0	K.L.G.	Zenith	Bosch	Silv. (R) Palmer (F)	880x120 mm.	820x120 mm.	R.W.	Boyce	112	2300
Delage	12	Chevrolet	Phellips	4	3.662	7.09	298.68	Bosch	Claudel	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	110	2350
Duesenberg	15	O'Donnell	P. Hendersen	4	3.98	6.00	299.0	Bosch	Schebler	Bosch	Silvertown	33x5	33x4½	R.W.	Boyce	106	2170
Sunbeam	17	Grant	Moore	6	3.26	5.89	274.9	K.L.G.	Master	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	110	2400
Duesenberg	19	Alley	J. Hendersen	4	3.98	6.00	299.0	Rajah	Master	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	106	2120
Mercer	20	Henning	Davis	4	4.75	6.75	298.2	Bosch	Rayfield	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	110	2400
Duesenberg	21	Haupt	Jehnsen	4	3.98	6.00	299.0	Bosch	Schebler	Bosch	Silvertown	33x5	33x4½	R.W.	Boyce	106	2100
Peugeot	22	Babcock	Palleth	4	3.07	6.141	186.0	K.L.G.	Claudel	Bosch	Silvertown	34x4½	33x4½	R.W.	Boyce	104	2100
Sebring	23	J. Cooper	Pelo	4	3.98	6.00	299.0	Bosch & Rajah	Master	Bosch	Silvertown	33x5	32x4½	R.W.	Boyce	102	2499
Ogren	24	Chandler	Liphardt	4	3.98	6.00	299.0	Rajah	Rayfield	Bosch	Silvertown	33x4½	32x4	Houk	Boyce	108	2499
Maxwell	27	Orr	Stafford	4	3.75	6.75	298.2	Rajah	Master	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2200
Mulford	30	Mulford	Stevens	4	3.687	7.00	299.0	Rajah	Zenith	Bosch	Silvertown	33x4½	32x4	R.W.	Boyce	102	2496
Sunbeam	31	Limberg	Lorgebamp	6	3.26	5.89	274.9	K.L.G.	Master	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	116	2407

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From 100 miles onward Resta had his own way. He had from two to ten laps on the majority of the field and only two Stutzes and Porporato to contend with as the others did not care to break up in an effort to get further in front. These in the ruck relied upon the failure of the leaders to set them ahead. It was Resta, Porporato, Rickenbacher and Cooper who were doing the fast work in front. Porporato did not know what position he held because the scoring was not up to standard, but he was so enthusiastic because the car was still on the course that he was content to keep going and merely finish. At 200 miles Resta was traveling slightly under 98 miles per hour, taking the turns rather high and coming around so often that spectators started to lose track of the number of laps he was ahead of the others. Strange as it may seem, it looked as if Porporato was traveling faster than Resta, probably because the former was driving close to the wall on the straightaway and offered better comparison with a fixed object. However, Porporato was running in third place about 3 min. behind Resta and following him was Cooper, only one lap behind, and Rickenbacher, almost on even terms with Porporato.

Four Drivers Furnish Thrills

These four drivers were furnishing the spectators with a demonstration of the speed capabilities of the track and at 300 miles the order was changed with Rickenbacher in second place 5 min., or nearly 4 laps, behind Resta. Cooper was third and Porporato was fourth. It was after the 300 mile mark that Porporato began to wake up and at 400 he was in second place. These four men ran the last 100 miles in practically the same order they showed at 400, but each worked hard to gain a little, all succeeding, as the times show.

When the first ten men had finished there still were five cars on the track and each one wanted to finish.

In point of attendance the speedway officials were satisfied and an official count showed 80,000 people had paid for watching the first 500-mile race in Chicago. Many of the spectators did not arrive until a few minutes before the start owing to the fact that the Illinois Central Railroad was blocked for more than three miles because of a wreck. This was the only steam road running special trains to the speedway and its service was paralized completely for more than two hours. The roads leading to the track were frightfully crowded with pedestrians and automobiles, not a few cars being forced into the ditch and pulled out by teams.

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Of the cars which finished well up in the list the first eight had nothing done to their motors throughout the race. Burman, the ninth man, changed a couple of spark plugs on two occasions and the tenth man never touched the motor at all. Thus out of ten cars all running 500 miles at a speed in excess of 90 miles an hour, a total distance of 5,000 car-miles, all that was done to the ten engines was the changing of four spark plugs.

Let us look at the total of reliability which this represents.

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One hundred and forty valves and valve springs stood up.

Ten magnetos supplied at least 18,000,000 sparks.

Not more than sixty spark plugs took this discharge and stood up (probably those which Burman changed were missing because of oil).

Eleven carbureters gave a steady supply of proper gas.

Oil in proper quantities reached the 1,000 moving parts of the ten motors.

And, this is the main point of the whole demonstration:

Only two modern design cars suffered broken parts, despite such a thrashing as a bunch of racing machines has never before received.

Lessons of Indianapolis

Now, it is not very long since the Indianapolis 500-mile race showed a very different state of affairs, so there can be no question that the lessons learned in the Hoosier classic have been taken to heart, and that the time interval has been sufficient to enable the owners of the competing vehicles to make good use of their experiences.

At Indianapolis two things stood out prominently as troubles, spark plugs and materials. Both these in turn reflect to lubrication for the spark plugs which failed to spark mostly did so because of too much oil, while the materials which, in the forms of pistons or connecting rods, could not stand the stress mostly failed because absence of oil at the right place produced too much friction and so too much heat.

This was not always so for some of the mechanical breakdowns at Indianapolis were caused by too weak a design, such as the use of too fine a fillet between the head and the wall of an aluminum-alloy piston. Such things as this have been changed, the oil pressures have been adjusted, the piston clearances have been modified so as to give the best compromise of freedom and oil tightness, in one or two cases compressions have been altered and valve spring strengths have been increased a little on some of the cars, but nothing radical has been done.

Racers Are Improved

One might sum up the whole situation by saying that Indianapolis showed us a bunch of fine cars either altogether new or partly new. Cars prepared with the utmost care but not tried out under the only really severe test, that of a long race.

At Chicago we have now seen the same cars freed from their minor faults, with the bugs removed. They are to the cars of 4 weeks ago as the stock product of a good manufacturer is to his last experimental model and this record-breaking race in Chicago is the finest testimony that the world of motoring has ever had to the importance of little things. One thing and one thing only made the motors' task a little easier and this was a general use of slightly higher gear ratios, but this was offset or even more than nullified by the greater speed and the much higher air temperature.

(*Continued on page* 46)

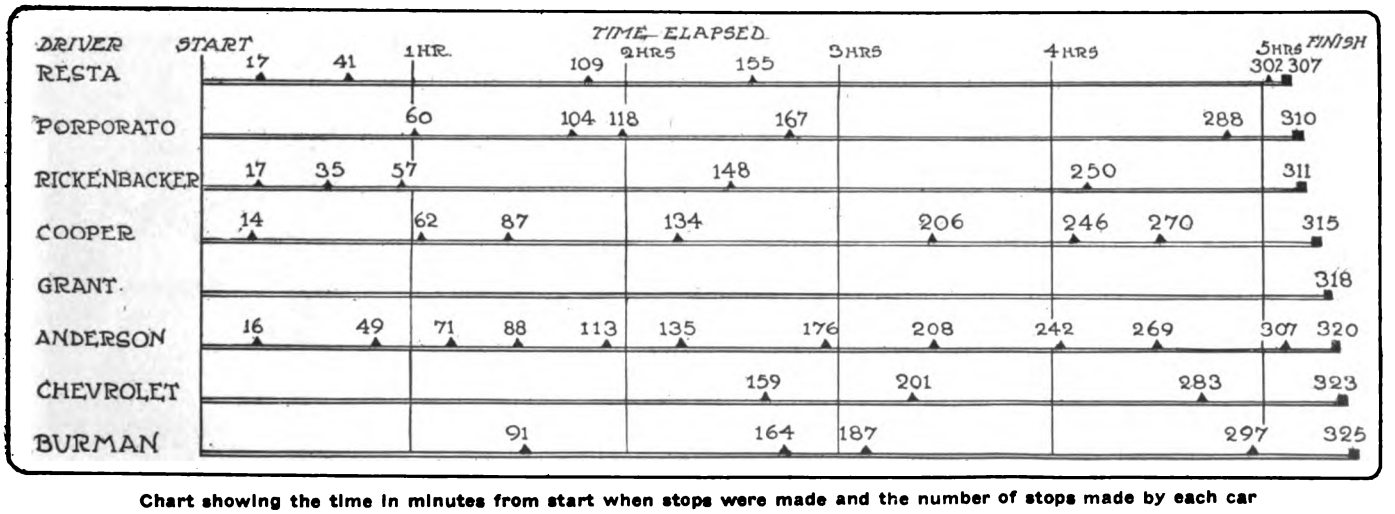

Chart showing the time in minutes from start when stops were made and the number of stops made by each car

Table Giving Equipment of Cars Participating in 500-Mile Race on the Chicago Board Track

Car	No.	Driver	Mechanician	Cylinders	Bore	Stroke	Displacement	Spark Plug	Carbureter	Mag neto	Tires	SIZE		Wheels	Motometer	Wheelbase	Weight
												Rear	Front				
Peugeot	1	Resta	McCarty	4	3.62	6.67	276.0	K.L.G.	Zenith	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	109	2400
Stutz	2	Wilcox	Scott	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2404
Stutz	3	Andersen	Rooney	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2340
Stutz	4	Cooper	Dutton	4	3.812	6.50	296.8	Bosch	Stromberg	Bosch	Silvertown	33x5	33x4½	Houk	Boyce	102	2385
Maxwell	5	Carlson	Franzen	4	3.75	6.75	298.2	Bosch	Master	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2282
Maxwell	7	Rickenbacher	Schroder	4	3.75	6.75	298.2	Bosch	Zenith	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2267
Peugeot	9	Burman	Gable	4	3.65	7.10	296.0	Bosch	Master	Bosch	Silvertown	34x4½	33x4½	R.W.	Boyce	105	2350
Sunbeam	10	Van Raalte	Cepple	4	3.70	6.30	274.0	K.L.G.	Zenith	Bosch	Silv. (R) Palmer (F)	880x120 mm.	820x120 mm.	R.W.	Boyce	112	2244
Sunbeam	11	Porporato	Remco	4	3.70	6.30	274.0	K.L.G.	Zenith	Bosch	Silv. (R) Palmer (F)	880x120 mm.	820x120 mm.	R.W.	Boyce	112	2300
Delage	12	Chevrolet	Phellips	4	3.662	7.89	298.68	Bosch	Claudel	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	110	2350
Duesenberg	15	O'Donnell	P. Hendersen	4	3.98	6.00	299.0	Bosch	Schebler	Bosch	Silvertown	33x5	33x4½	R.W.	Boyce	106	2170
Sunbeam	17	Grant	Moore	6	3.26	5.89	274.9	K.L.G.	Master	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	110	2480
Duesenberg	19	Alley	J. Hendersen	4	3.98	6.00	299.0	Rajah	Master	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	100	2120
Mercer	20	Henning	Davis	4	4.75	6.75	298.2	Bosch	Rayfield	Bosch	Silvertown	33x4½	33x4½	R.W.	Boyce	110	2400
Duesenberg	21	Haupt	Johnson	4	3.98	6.00	299.0	Bosch	Schebler	Bosch	Silvertown	33x5	33x4½	R.W.	Boyce	106	2100
Peugeot	22	Babcock	Palloth	4	3.07	6.141	186.0	K.L.G.	Claudel	Bosch	Silvertown	34x4½	33x4½	R.W.	Boyce	104	2100
Sebring	23	J. Cooper	Pelo	4	3.98	6.00	299.0	Bosch & Rajah	Master	Bosch	Silvertown	33x5	32x4½	R.W.	Boyce	102	2499
Ogren	24	Chandler	Liphardt	4	3.98	6.00	299.0	Rajah	Rayfield	Bosch	Silvertown	33x4½	32x4	Houk	Boyce	108	2499
Maxwell	27	Orr	Stafford	4	3.75	6.75	298.2	Rajah	Master	Bosch	Silvertown	35x5	34x4½	Houk	Boyce	105	2200
Mulford	30	Mulford	Stevens	4	3.687	7.00	299.0	Rajah	Zenith	Bosch	Silvertown	33x4½	32x4	R.W.	Boyce	102	2496
Sunbeam	31	Limberg	Lorgehamp	6	3.26	5.89	274.9	K.L.G.	Master	Bosch	Silvertown	35x5	34x4½	R.W.	Boyce	116	2497

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Four Drivers Fu

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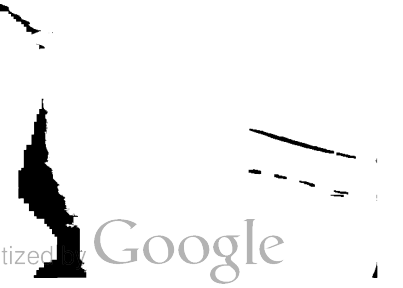

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Above—Belgian armored car which has received its colors prior to leaving for the front

Below—Rear view of Belgian armored car. Note cannon and quick-firer above it; also tool chest at rear with axe and spade fastened at the side

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[illegible] possible, with a sloping [illegible]reen within this roof being capable of being placed at any angle so as to give a more or less clear view of the road. When closed down entirely, the driver has a view ahead through an eye hole only. There is a small shuttered opening on the two sides of the car, level with the heads of the driver and his assistant, and on the outside of these a mirror enabling a view to be obtained of what is happening immediately to the rear. Although there is but one steering wheel and one set of controls, there are two sets of clutch and brake pedals, the auxiliary set being in front of the reserve driver. As the switch is also centrally located, it is possible for the relief man to stop the car if the man at the wheel should be shot.

Protection of the motor comprises a fixed steel plate in front of and around the sides of the radiator, and steel plates received in grooves, on each side of the hood. The top of the hood is not protected. The steel guard in front of the

A corps of Belgian armored cars going into action in an attack on a village in northern France

Belgian Armored Cars Most Efficient

Organized into Corps of Two Sections Each—Observation, Ammunition and Supply Cars, Cyclists and Motorcyclists in Each Unit

By W. F. Bradley
Special Representative of THE AUTOMOBILE, *with the Allied Armies in France*

IT is a somewhat curious fact that when the European war broke out the application of the automobile to warfare was decidedly inferior to the industrial and commercial organization of the self-propelled vehicle. Because staff officers made use of cars in place of horses, and because the aeroplane industry had been absorbed by the military authorities, it was popularly supposed that everything worth knowing about military motoring was possessed by the army authorities. As a matter of fact, military officers in all countries are the most conservative of beings. During the 8 months the war has been in progress more prejudices have been scattered to the winds, more practical knowledge has been gained and more progress has been made in the application of the automobile to military operations than in the 8 years preceding August 1, 1914.

Before the War

Germany, with her wonderfully efficient war machine, had not foreseen the full scope of the automobile in a great war. France had enough imagination to see that gasoline must replace oats in the task of carrying food and ammunition to the men in the front line. England possessed the finest fleet of commercial vehicles the world has ever seen and a war office which did not actually own more than a score of trucks when it was decided to send an army across the Channel. Belgium was snug and smug in her neutrality and had not even taken the trouble to consider in what way her motor industry could be of use to her army.

It is thus all the more to the credit of the plucky little nation that she should at the present time have the most carefully developed and the most efficient fighting automobile corps to be found in Europe. Even to the non-military mind it is obvious that the best use of the armored automobile is not as an individual machine attached to an infantry battalion or a cavalry regiment. To carry out really important work the armored automobiles must form a homogeneous and self-contained corps capable of operations on a really important scale. Such a corps, as it exists at the present time in the Belgian army, comprises ten cars fitted with cannon and machine gun and protected by armor plating, three officers' armor plated observation cars, one automobile workshop, two ammunition cars, three supply cars with gasoline, tires, oil

One of the Belgian armored cars as it appears on the road

and mechanical spares, and one automobile ambulance. In addition the corps has attached to it 100 cyclists and twelve motorcyclists.

A corps of this nature is divided into two sections, each comprising five armored cars, one officers' observation car, one ammunition car, two supply cars, fifty cyclists and six motorcyclists. The third observation car is used by the corps commander whether the two sections are working together or separately, while the repair car and the ambulance are common to the two sections. There is also an ordinary touring car used for despatch carrying and general work. The twenty-one cars forming the armored corps carry about 100 men, thus with the cyclists and motorcyclists making a total of more than 200 officers and men.

Each Man a Specialist

The staffs are picked with special care, every man being a specialist in his particular task. Every driver has had long experience on the road; the gunners are the best the army can provide; the men on the repair car can be relied on to make good anything short of a complete smash; there is an expert electrician for the electric lighting equipments; every motorcyclist can do running repairs and the cyclists comprise many professional road racers.

The corps has been organized and the cars designed and produced by Belgian automobilists of long experience, in collaboration with army officers. In this work the automobile engineer played a much more important rôle than the military expert, although it is obvious that the best results could only be obtained by a reasonable co-operation between an army man convinced of the utility of the automobile and an expert automobile engineer knowing what features to emphasize and what mistakes to avoid in order to get the most efficient service. To give complete credit, it should be mentioned that the artillery officer had to find a place on the expert committee, his task being to design the mounting of the guns and the armor plating on the cars.

Two makes of cars are used, the majority being 20 horsepower Mors, with Knight motor, and the others 18 horsepower Peugeots with four-cylinder, poppet-valve motors. The Peugeot cylinder dimensions are 3.7 by 6.3 inches, and the Mors bore and stroke are 3.9 by 5.5 inches. The two makes of cars are practically equal in speed and weight carrying capacity. They are all fitted with wire wheels carrying tires of 880 by 120 millimeters, the armored cars having twin wheels at the rear, and all the others have singles back and front. By this arrangement only one size wheel and one size tire is made use of in the entire corps, thus simplifying the carrying of supplies.

Every Detail Complete

No detail in the design and fitting up of the cars has been overlooked. The Mors armored cars have a single compartment built of 5 millimeter steel plate capable of resisting a rifle bullet fired at comparatively short range. A partial roof is fitted over the head of the driver, but is capable of being hinged forward so as to give easier movement within the body. There is no door, the men climbing in over the sides. The gun is mounted on a steel platform at the rear, its base swinging round on the platform, so that it is possible to fire ahead, astern, to left, or to right. One of the distinctive features of these cars is the use of the ordinary machine gun taking the rifle cartridge, and also of a cannon of practically 40 millimeter bore. The quick firer is mounted immediately above the cannon, in such a way that the gunner can use either one or the other at will, but in addition the rapid firing gun can be unshipped, fastened in supports on the side of the car and used in one direction while the bigger gun is firing in another direction.

The driver is placed as low as possible, with a sloping roof over his head, the hinged screen within this roof being

Above—Belgian armored car which has received its colors prior to leaving for the front

Below—Rear view of Belgian armored car. Note cannon and quick-firer above it; also tool chest at rear with axe and spade fastened at the side

capable of being placed at any angle so as to give a more or less clear view of the road. When closed down entirely, the driver has a view ahead through an eye hole only. There is a small shuttered opening on the two sides of the car, level with the heads of the driver and his assistant, and on the outside of these a mirror enabling a view to be obtained of what is happening immediately to the rear. Although there is but one steering wheel and one set of controls, there are two sets of clutch and brake pedals, the auxiliary set being in front of the reserve driver. As the switch is also centrally located, it is possible for the relief man to stop the car if the man at the wheel should be shot.

Protection of the motor comprises a fixed steel plate in front of and around the sides of the radiator, and steel plates received in grooves, on each side of the hood. The top of the hood is not protected. The steel guard in front of the

radiator has six rectangular openings cut in it, with a steel plate carried in front of the opening, there being a gap of about an inch and a half between this plate and the main surface. In addition there is a wind scoop at the top and bottom of the radiator guard. Two ventilator cowls are fitted on the top of the hood to help carry away the hot air from the motor. It has been found that this design gives adequate cooling, while protecting the motor without interfering with accessibility. Naturally a pump and ventilator fan are carried. In order to attend to magneto, carbureter or valves it is only necessary to lift out the sliding side plates and raise the hood in the usual way. Gasoline and oil are carried in the cowl, and thus fully protected against shot. The body stops short just a little ahead of the rear axle, leaving a space at the rear for a locker divided into six compartments for tools and spares. Other spares are strapped to the top of this locker, while on the sides are an axe, spade, saw and hammer, and on one side of the frame member, partly hidden under the body overhang, there is a pick and big shovel. On the right-hand side of the body there is a spare wheel carrier.

Lighting System Complete

Lighting equipment comprises a dynamo under the floorboards, supplying current to lamps within the car, to the headlights, and to the side lamps. The headlights are, however, also fitted up for acetylene, the generator being mounted on the left hand side of the body, just to the rear of the hood. The side lamps have gasoline burners in addition to the electric bulbs. It is practically impossible for the cars to be held up for lack of light. If the electric headlights fail the bulbs are taken out and the acetylene generator put into action. If there is no electric current, the gasoline side lamps can be used. It is because gasoline is always carried on the car that it has been preferred to kerosene or oil. Each car carries four men—two gunners, a driver and a reserve driver.

The Observation Car

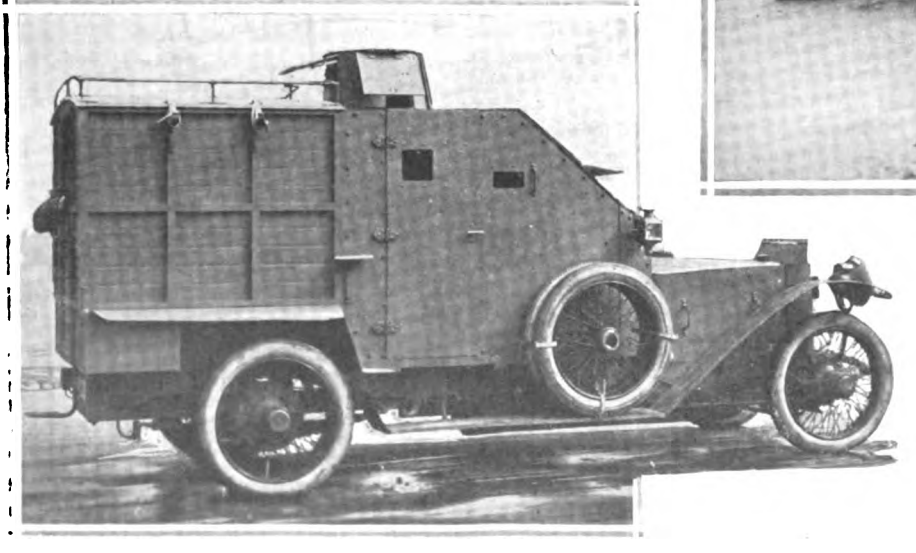
One of the most interesting units of the section is the observation car. This is an armor-plated car with the body divided into three compartments. In the first compartment are the driver and his assistant, their protection against fire being practically the same as that of the men in the fighting cars. Back of the driver's cab is a small armor-plated compartment just big enough for two men. It has a conning tower in the roof, the sides of the tower being hinged in five or six sections so that one section only can be used if necessary. It is from this car that the commanding officer and his lieutenant command the operations. He makes use of a periscope in the conning tower, and has at hand maps, compass and other instruments. His compartment is fitted up with a seat for two, a folding table, and a series of lockers under the seat. The rear portion of the car is made to carry four men, but is more often used for transporting officers' kit. The entrance is at the rear; this portion of the body is not armor plated.

A Motor Workshop

Although the motor workshop is not as complete as the traveling shops attached to the big motor convoys, it is a really excellent example of a repair department capable of keeping pace on the road with comparatively fast machines. Unlike the convoy workshops, the possibility of overhauling a gearbox or a rear axle has not to be considered. The automobile has a van type body, fully opening at the rear. The equipment comprises a pedal-operated drilling machine, a forge, a heavy vise, anvil, complete sets of taps and dies and a very complete selection of hand tools. On one side of the car is a stout workbench, folding up against the body when not in use, and the tool chests are stout wood lockers fitting all around the car when the vehicle is in motion, but capable of being taken out and placed on the ground so that the top forms a convenient workbench.

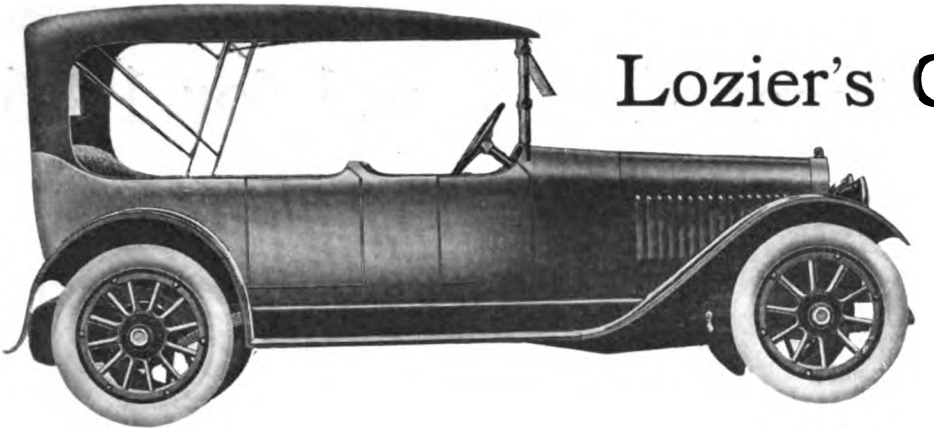
There are no special features about the ammunition vans. The supply cars are distinctive, for the van type bodies are divided internally into sections to receive the 6-gallon circular

(*Continued on page* 21)



Above—One of a corps of Belgian armored cars reconnoitering on a road in the north of France. Note underslung rear springs and dual tires

Below — Officers' observation with periscope tower attached to a Belgian armored car corps. Note that only the forward portion is armor plated



Lozier's Car a Twelve

Former Manufacturer Breaks Retirement with Announcement of H.A.L. Car—Cylinders in Blocks of Six at 60 Degrees

Harry Lozier's new car to be known as H. A. L.

DETROIT, MICH., June 26—Harry A. Lozier's new car is to be a twelve-cylinder machine, selling at $1,750 either as a two-passenger roadster or seven-passenger touring car. The name selected temporarily is H. A. L., and this may or may not be adopted permanently. Details as to the personnel of the company, which has been organized by Mr. Lozier to market the new twelve in Cleveland, are still withheld.

Since his retirement as the head of the former Lozier Motor Co. in 1912, Mr. Lozier has been carefully studying conditions in the industry, and has reflected some of his ideas of latest construction and present development in the H. A. L.

The motor is 3 by 4½ in., giving it a rating of about 43.2 hp. S. A. E., and piston displacement of 381.6 cu. in.

The motor is a Cleveland product and of a design that has previously been brought out in types of a less number of cylinders. The cylinders are arranged in V fashion, at 60 deg., with all six of each side cast in a block. The valves are overhead and seated in the removable head which comes off as a unit for each block. The valve rods run up to the rockers in the V, which, due to the overhead-valve construction, permitting of the exhaust manifolds running on the outer side of the cylinder blocks, is free of all apparatus with the exception of the carbureter, intake manifolds, water connections and ignition distributer. This makes a very accessible design, particularly as there is a special means at the top of the cylinders for the adjustment of the valve tappets. The valve parts are inclosed completely.

Cylinders Are Offset

In the connection of the rods to the crankshaft, the cylinders are offset enough so that each two rods are placed side by side on the bearing, a form of construction used in several V motors. The crankshaft has three main bearings, and the single camshaft in the center has a separate cam for each valve, making twenty-four in all. The camshaft is driven by silent chain from the crankshaft. Pistons are very light and made of a special aluminum alloy.

In the lubrication system the oil is forced through the drilled crankshaft and is delivered to the bearings in proportion to the power developed.

Setting the cylinder blocks at 60 degrees leaves room on the sides for the location of the starting and lighting units. A satisfactory turning radius is therefore made possible. The position of the exhaust manifolds on the outer side of the cylinder blocks does not interfere with the accessibility of the electric units.

Details of the chassis are meager at this time, although it is definitely stated that a dry-disk clutch is used, and that the wheelbase is 130 in. Left drive with a hard rubber, corrugated steering wheel; center control of a three-speed gearset; and the use of 34 by 4 tires are features that are also known. In the spring suspension, the cantilever construction is employed at the rear, with the front springs of usual half-elliptic type. The gasoline tank is hung at the rear.

In the general outward make-up of the car, the services of a well-known eastern body maker have been had, and the body design is what might be termed a semi-torpedo, with hood and cowl following the same nearly flat slope. The seats are low, with body sides comparatively high. Upholstery does not come over the sides, which are rounded in latest fashion. The new curve that is much in vogue at the back of the front seat is well worked out.

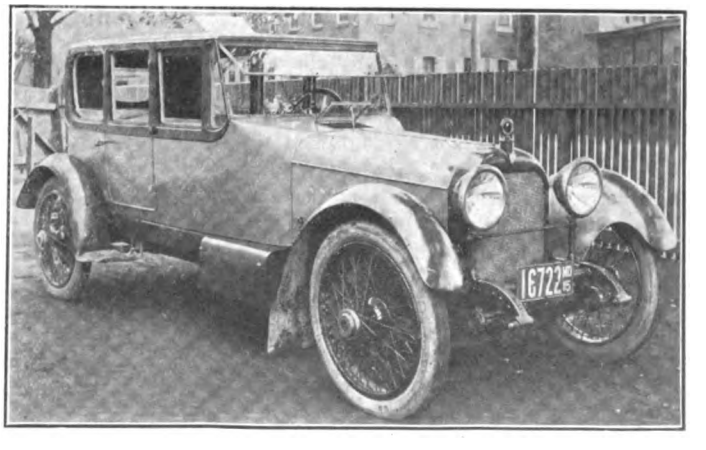
Unique Body on Mercer Chassis

BALTIMORE, MD., June 28.—R. W. Gill of Baltimore is the owner of what is perhaps the most unique closed car ever seen in the Maryland metropolis. It is a specially built Sedan on a 22-70 Mercer Sporting chassis, and embodies many ideas which are decidedly original.

A fair idea of the height of the car can be obtained when it is realized that a man of average height can stand on the ground and look over the top of the car. The seats are exceptionally low, the six-inch cushions resting directly on the floorboards. The front seats are of the individual type, one of them folding up to allow the driver easy access to the front compartment. The interior is decorated in gray whipcord.

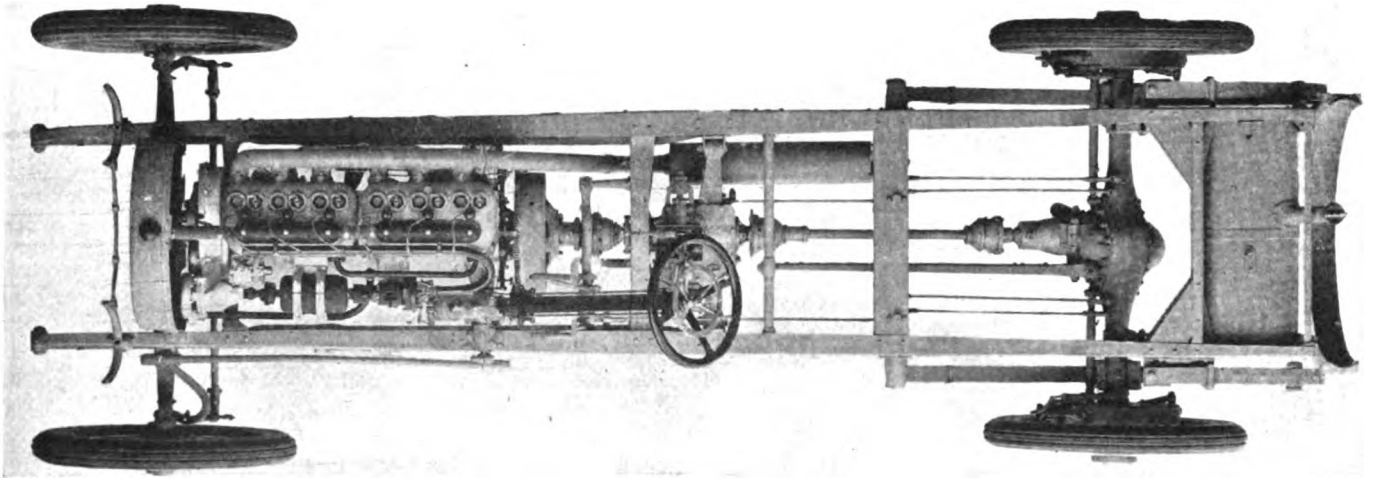
The cowl and roof are fitted with ventilators in the form of small skylight windows. They can be raised or lowered conveniently. On the forward part of the hood Mr. Gill has fitted a small opera light.

The running boards have been omitted, a wide step, suspended from the frame, being used instead. The absence of running boards gives the car a very foreign air, and the various points of individuality, particularly the lowness of the body, are worked out in a way to be especially pleasing.



Unique low sedan body mounted on Mercer chassis

Marmon Features Continued for 1916



Marmon chassis with independent gearset showing method of supporting both motor and gearbox on three points

A Study of the Engineering Principles in the Big Six

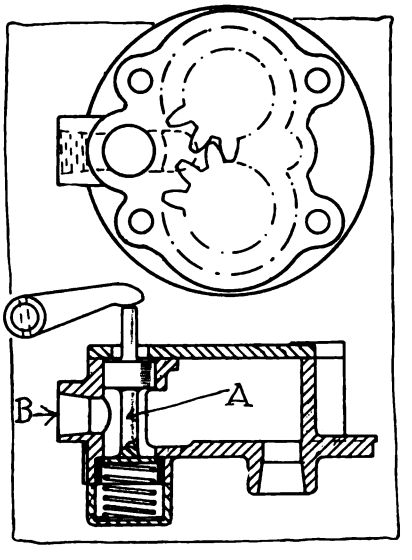
AS already announced in our news columns, the 1916 Marmon six differs but little from the 1915 model, but an examination of the design of the chassis is instructive because there are several Marmon features which have proved good and yet are highly unusual. The chassis as a whole is one of the most original in thought that America is producing to-day.

It is accepted that the running of a six depends upon the rigidity of the crankshaft support to a very great extent and the fact that the Marmon is noticeably free from vibration is traceable to the form of crankcase employed. First, there are seven main bearings on the crankshaft so that each throw has individual support, but this is hardly so important a feature as the way in which these bearings are fitted to the crankcase. In order to provide the maximum of rigidity to the aluminum casting it is made in barrel form. Thus the crankcase is almost the equivalent of a tube, in itself a very strong form to resist bending or distortion. Each of the seven crankshaft bearings is contained in the center of a circular, split-aluminum casting of diameter slightly in excess of that of the crank circle and these seven castings are first fitted to the crankshaft. This makes for a most excellent bearing finish, for the crankshaft can be held in any convenient manner while each bearing in its aluminum carrier is scraped and tested for proper contact. Also the degree of tightness of adjustment of each bearing separately can be tried, which is practically impossible with any other method of crankshaft mounting.

Tubular Crankcase

When all the bearings are in place and fitted properly the whole shaft as a complete unit is put into the crankcase, whereupon the aluminum bearing carriers are bolted in place and add enormously to the stiffness of the whole motor. The crankcase has then become a tube with a series of stiff partitions, a tube reinforced at seven places. It is claimed that the construction is lighter than any other which gives equal rigidity and this is easy to believe since the metal is so well disposed that very little of it can be dead weight; almost every particle of aluminum is doing its share of the work.

In the oiling system there is a novelty which has long been considered by many engineers as being a feature which will ultimately find a place on every chassis. This is an oil throttle which is opened or closed in conjunction with the carbureter throttle so that the pressure of the lubricant varies with the internal pressures in the motor which means that the more heavily a bearing is loaded the more oil is fed to it. Actually the pressure ranges from 12 to 60 pounds per square inch and the way in which this is accomplished is extremely simple. In the drawing on this page is shown the oil pump in section and plan. The little plunger *A* can be depressed by the small lever, and the latter is joined to the carbureter throttle by a straight link rod. As the plunger is depressed the upper piston portion closes the orifice *B* so restricting the oil supply. The spring under the lower part of the plunger is used to return it to the open position and the dumbell shape of piston, of course, equalizes the pressure so that the oil neither tends to open the throttle nor to close it.

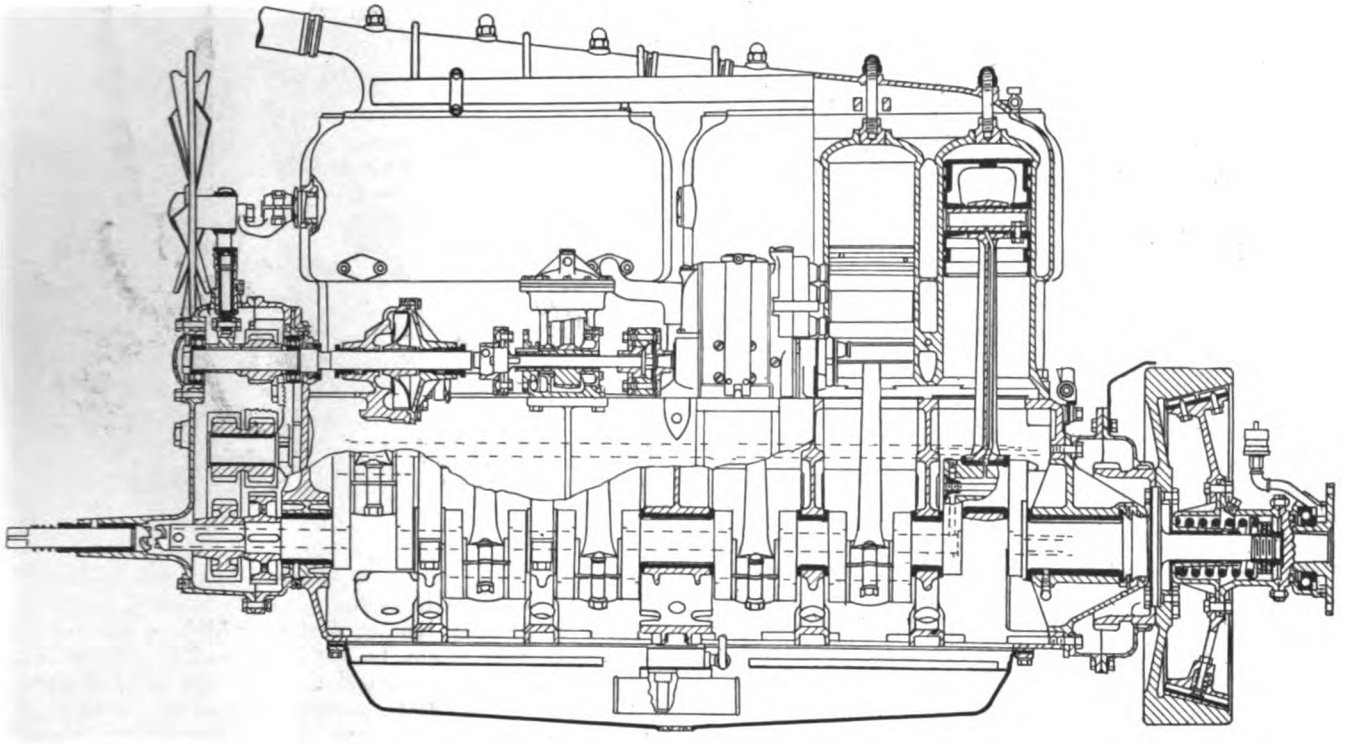


Marmon oil pump with throttle which adjusts pressure of oil in accordance with carbureter opening

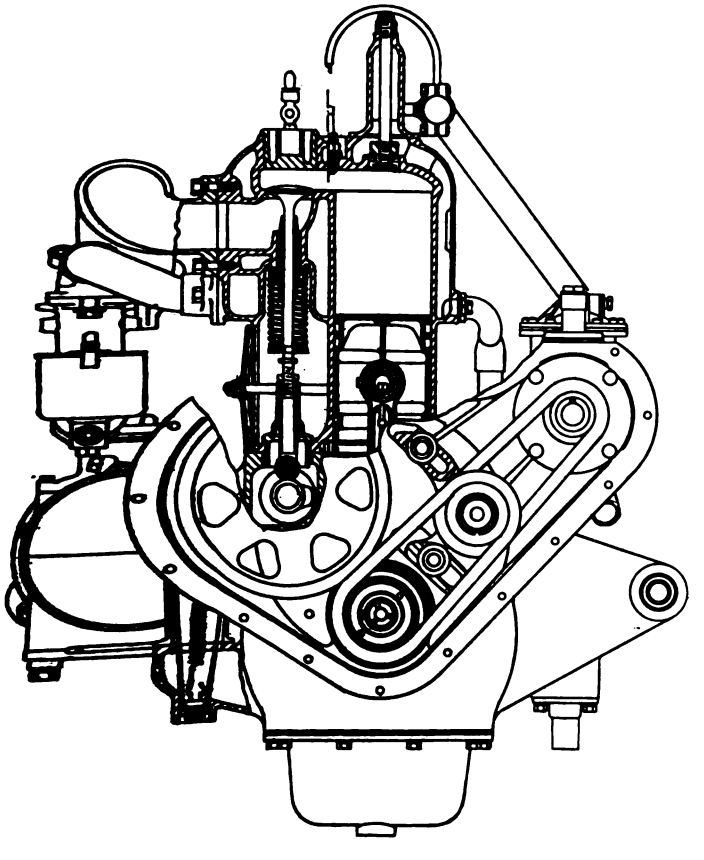
Oil to Main Bearings

The oil is forced to each main bearing and so gains entry to the hollow crankshaft whence it is conducted to the connecting rod bearings, the piston pins and the cylinders. In addition the camshaft, with its eight bearings, is separately inclosed in an aluminum tunnel which is kept filled with oil under pump pressure, and a tiny hole is drilled through each

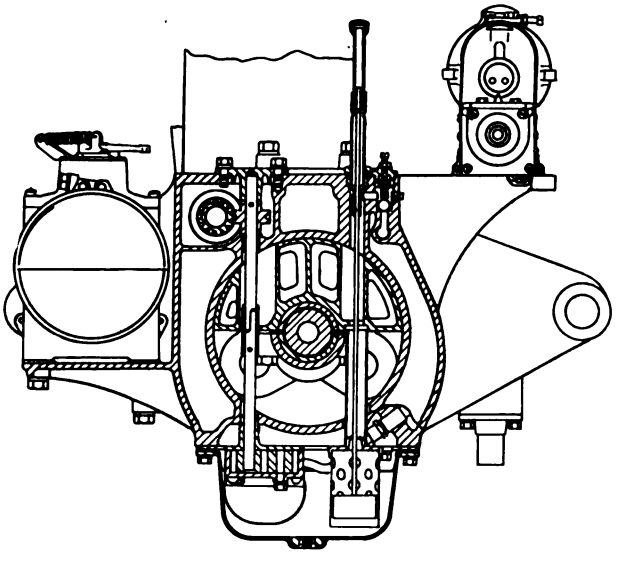
Sections Through Units of the Marmon 1916 Product

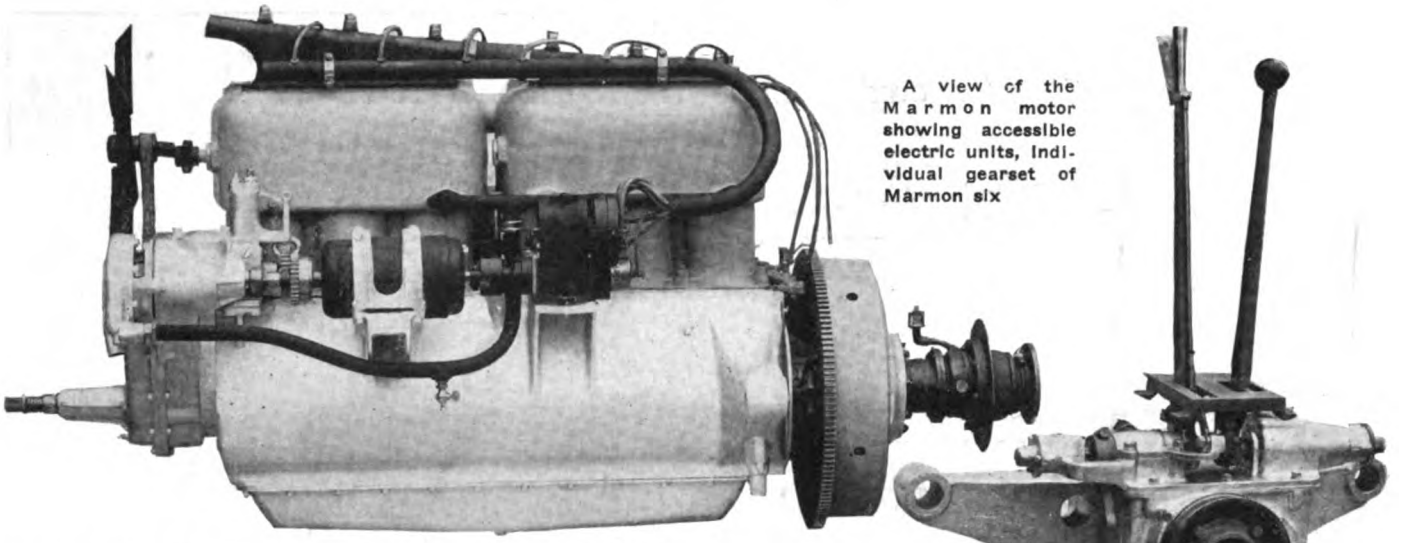


Longitudinal part section through the Marmon six motor showing crankshaft suspension and clutch detail, etc.



Transverse section through motor and section through crankcase showing oil level gauge and pump with auxiliary mountings





A view of the Marmon motor showing accessible electric units, individual gearset of Marmon six

Gearset and housing with control members used on the Marmon Six for 1916

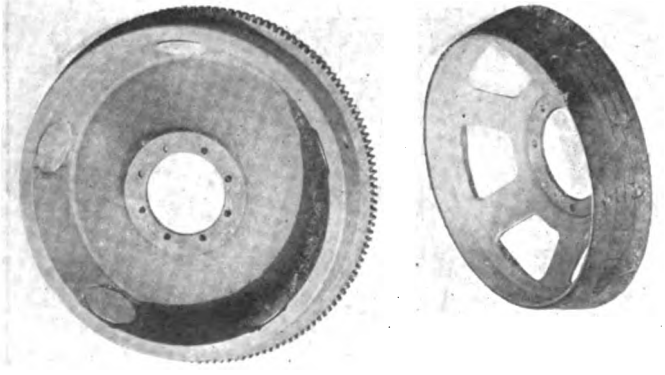
tappet rod. This allows the oil to escape over the head of the tappet immediately beneath the end of the valve stem so lubricating every part of the valve gear, and, it is claimed, the presence of oil at this point quiets the valve action. This is no new feature for the Marmon having been used by the makers for many years, but it is not always that things of this kind are remembered as they should be. It necessitates a tight valve inclosing plate, of course, but there is a large return passage for the oil which lies around the tappets after doing its work, so the cover plates can be removed without any lubricant loss.

Gear-and-Chain Drives

Another somewhat unusual feature is the use of both gear and chain front end drives, the camshaft being driven by a spur gear and the pump or magneto shaft by means of a pair of short chains which run over an intermediate idler for adjusting purposes. This layout is shown in the end view drawing of the motor and it should be observed that it calls for only a small inclosure. Everything is very compact and there is no waste space.

Independent Gearbox

Last year the Marmon company introduced a new clutch with the peculiarity that the cushion springs were located in the flywheel instead of beneath the asbestos cone facing. This feature is continued but it might be well to point out the fundamental advantage. Woven asbestos and wire fabric is heavier than leather and also stiffer, so, to prevent centrifugal force causing it to lift from the cone it is well to secure it as tightly as may be with many rivets. If the clutch cone and facing are thus made as much like one piece as they can be the facing cannot fly out and drag on the flywheel when the clutch is withdrawn. Again, it is easy to fit to the flywheel large area contact springs which give an easier engagement that might be obtained readily from smaller ones beneath the facing material. Of course, the drawback is that it costs a good deal more to machine the flywheel with the necessary recesses for the springs than it would to fit them to the cone.



Marmon clutch with cushion springs set in flywheel instead of beneath fabric facing of cone

Apart from manufacturing considerations there is much to be said for the use of an independent gearbox and there are many who adhere to the belief that it is quieter than any gearset that is in unit with the motor. In the Marmon instance the use of a unit powerplant would be rendered a little difficult on account of the crankcase design so the manufacturers have no regrets in choosing what they consider the better practice of separate parts.

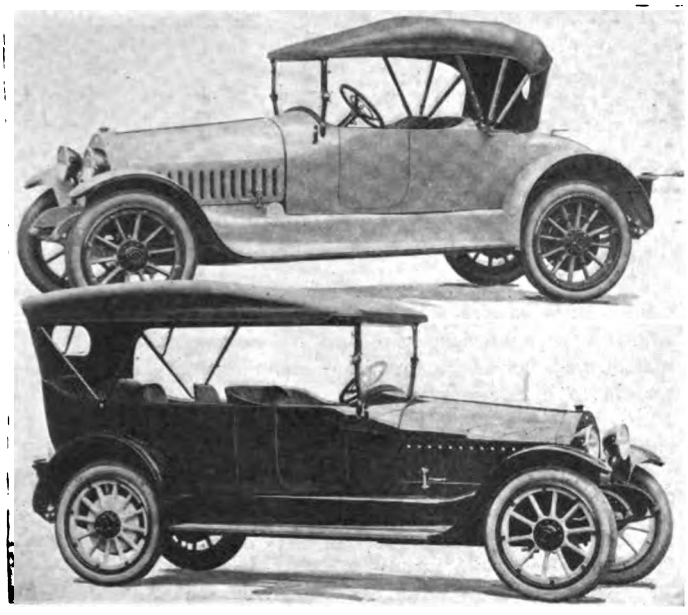
Like the motor the gearbox is attached at three points, two at the rear and one in front. Between gearbox and motor is a universal coupling that allows for any small disalignment that may arise through frame weave, and the splined shaft that carries the sliding gears is very large and stiff.

As can be seen in the chassis view the clutch and brake pedals are carried on a shaft secured to the same cross frame member that supports the front end of the gearbox, while the gear shift and emergency brake levers are mounted centrally upon the gearset. Very particular care is taken in supporting the gear lever as can be seen, the long bearing on either end of the cross shaft insuring that the lever shall always move across the strikers without the least hint of sticking. In practice it is to be doubted whether there are any cars which have an easier handling gearshift and certainly very few indeed have one that is even nearly as good.

Drives Through Springs

Drive from the spiral bevel rear axle is taken through the springs, but the torque is supported by a substantial pressed steel member. It should be noticed that the intermediate brake gear is carried on a cross rail of the frame located at the place where the front end rear spring hangers are attached, this serving greatly to strengthen the rigidity of the drive.

As said before the above dissertation on points of design only touches upon a few new things. The dimensions of the motor remain 4.25 by 5.5 in. bore and stroke, 468 cubic in.,



Above—Marmon 41—Three passenger club roadster. Below—Marmon 41—Seven passenger touring model

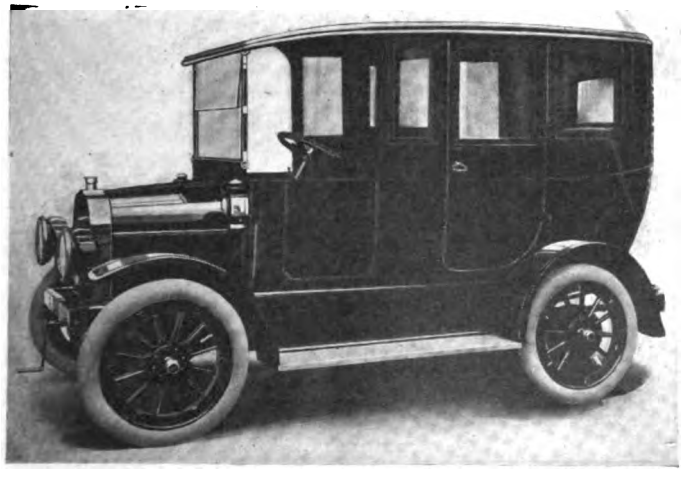
the wheelbase is still 132.5 in. As last year the starting and lighting system is all Bosch with a Willard storage battery and a Bosch magneto is used for ignition. Tires are Goodrich Silvertown 36 by 4.5 all round with one spare rim in the equipment and the price is $3250 for all models except the seven passenger touring car, which costs $3350. There are five models in all, speedster, roadster, four, five and seven-passenger touring cars.

Gear ratios are proportioned to the work the car is expected to do being 3.06 to 1 for the speedster, 3.5 to 1 for the roadster and four-passenger and 3.77 to 1 for the two larger touring cars.

Body Styles

This year a few special three-seated bodies will be made of the clover-leaf pattern where the middle passenger sits between and slightly behind the driver and his companion; one of these was nearing completion on the occasion of a recent visit to the plant and is a smart looking and most comfortable type.

As to the touring bodies these are now aluminum instead of steel so being a little less in weight, and much care has been given to their detail finish. The upholstery ends flush with the body sides and are secured by an internal bead so that the leather is invisible externally, giving a sharp outline to the body. Really the easiest way to describe the body changes is to say that the upholstery and fittings have been gone over with a microscope and every little thing which marred appearance has been removed or altered. There is the same space, the same comfort, the same quality of material, but the new body looks pleasing from every aspect instead of better some ways than others.



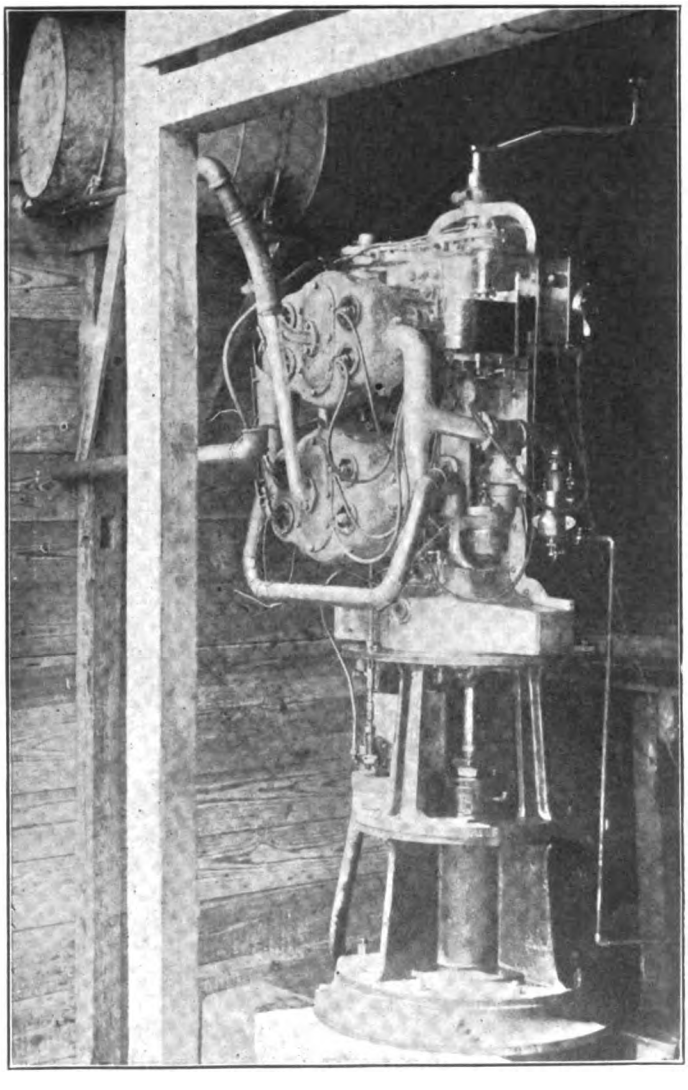
Taxicab recently brought out by Touraine Co., Philadelphia

Wisconsin Motor Operates on End

An interesting example of what can be done with an automobile engine is illustrated herewith. This is a stock model A 4.75 by 5.5 Wisconsin motor, model U, mounted so that the crankshaft is vertical instead of horizontal. The shaft is directly connected to a centrifugal pump and is delivering 750 gallons of water per minute for 10 hours a day.

The biggest difficulty, of course, to overcome in this installation was the proper oiling. In its natural position, the motor has its oil reservoir in the bottom of the crankcase, but in this instance a separate oil tank is placed under the engine and the oil pump connected to the bottom end of the reservoir. From here the oil is pumped directly to the main bearings and then forced through a hollow crankshaft to the connecting-rod bearings. The oil is forced out of the connecting-rod bearings and thrown to the cylinders and other motor parts, then draining back to the reservoir through a strainer.

A feature is the arrangement which has been made to crank the motor. It will be noted there is a platform erected behind it and a long cranking handle placed within reach. The cooling water is in the tank shown above the engine.



Vertical automobile motor made horizontal for stationary work

Bostonian Argues for Resiliency as the Measure of Tire Efficiency

Introduction and Commentary by M. C. K.

NOBODY doubts that resiliency has so far been found to be one of the properties in a tire which is intimately associated with the possibility for getting satisfactory work from the vehicle to which the tire is fitted, and this intimate association with desirable ends has tricked many persons into accepting the measure of resiliency in a tire as the measure of its efficiency, to the effect of encouraging the idea that increased efficiency can surely be obtained if tire makers succeed in increasing the resiliency. A premium is thereby offered for a stronger rebounding capacity in tires, and the search for improved tire materials is artificially limited to those in which resiliency and pliancy go together in the same close union as in rubber and air, the close union of the properties in these materials being in fact the main prop for the fallacious and restrictive axiom by which one of these properties is selected as a measure of tire virtue.

Theory's Practical Sting

Considerable trade importance is connected with the axiom when it is introduced in the specifications for tire supplies in the form of a demand that the tires shall measure as high as possible by a resilio-meter test, thereby placing those tires under a trade ban whose makers aim for improvement through efforts going in a different direction and offering perhaps better chances for ultimate perfection of tires and for a better adjustment of tires to the spring suspension and to loads and speeds. When it is said that resiliency is becoming accepted among electric truck builders as a measure of tire quality, it may be worth noting that a portion of the weight of electric motors is usually suspended upon the wheel axle and that therefore a spring action from the tires may be more needed for this class of vehicles than for trucks and omnibuses in which the unsprung weight is smaller or more robust, and also that the springs of electric trucks are usually made according to the formula which reduces the first cost of the springs to a minimum, namely short, stiff and of small range. While it is not certain that the most resilient tires must necessarily serve best to offset the shortcomings of such springing—for which a great deal can be said at the present stage of spring suspension practice—it is probably true that auxiliary spring qualities are at present most readily found in tires in which the resiliency is as pronounced as possible. It is when the alleged axiom is accepted as having a universal validity governing for all efforts for tire improvement that the need of a sharp distinction makes itself felt.

One Conclusive Exception

Railroads prove conclusively that tire improvement does not tend in the direction of increased resilience when roads are radically improved, and it is almost equally obvious that the shortest road to tire efficiency (in the case of solid tires which notoriously do not allow the road inequalities to sink into them in any degree at all comparable to the action of air tires in this respect) may not be found through an increase of either their pliancy or their resiliency, but very probably through increasing their durability while at the same time enlarging and improving the action of the spring suspension with which the tire co-operates. The universal validity of the alleged axiom is thus disproved in advance by a cursory and untechnical examination of the facts. The hold it has gained in wide circles is so much more remarkable, and the following communication offers an argument in its favor which may be of general interest, although the writer is unable to discover any points or chain of reasoning in it which have not already been met in previous articles on the subject.

Editor THE AUTOMOBILE:—After reading with considerable interest M. C. K.'s comments in the June 10 number of THE AUTOMOBILE on Mr. Duryea's letter of May 21, 1915, I am wondering if many other readers of your popular magazine are not asking, like myself, "Which man is right?"

I would, therefore, like to present a somewhat different analysis of the factors affecting the power efficiency of tires, hoping that it may serve to "clear the air," so to speak, and perhaps bring about a solution of the problem which will be satisfactory to both parties.

In the first place, it may be taken for granted that the maximum power efficiency will be obtained when the sum total of the losses, of whatever nature, are a minimum; and it only remains for us to determine what combination of qualities tend to produce this result without sacrificing any of the the necessary functions which it is intended that good tires should possess.

I agree with M. C. K., when it comes to formulating these rules from the results of certain road tests, that it is not sufficient to take one set of conditions and assume that your conclusions will apply equally well to all other conditions. Nevertheless, I maintain that there are certain underlying principles which will always govern the results and cannot be disregarded by those who seek to explain through "logic" such every-day phenomena as riding qualities, efficiency, etc.

It seems advisable at this point to define the terms commonly used to describe the properties of elastic bodies,—namely, flexibility and resiliency—so as to avoid any possible confusion in the reader's mind, due to his having a different conception of these terms from that of the writer's.

FLEXIBILITY

Briefly stated, flexibility signifies the degree of pliancy, and should only be used to denote the ratio between the amount of deflection or compression and the force producing it, subject to the following conditions: That the elastic limit is not exceeded. That the forces acting are at rest. That the spring-action of the body is undamped either by external or internal friction.

We may represent this property by the following equation:

$$f = \frac{D}{L};$$

where f = the flexibility,
D = the deflection,
and L = the load applied.

In measuring the flexibility of a tire we should be very careful to eliminate the effect of molecular friction; otherwise the results of different observations will not check. We should also specify the load applied, because f varies with the load and is not constant as in the case of a metallic spring.

To get a true idea of the comparative flexibility of different tires we should plot a curve, using for abscissae the load applied, and for ordinates the deflection. In the pneumatic tire we should remember that there is a marked distinction between the flexibility of the tire wall and the flexibility of the tire as a whole when inflated; and we should always make clear which is meant.

We should also distinguish the difference between "flexibility," and "resistance to flexion," because friction affects the latter but not the former, and consequently may produce a marked difference in the behavior of the tire.

RESILIENCY

Resiliency expresses ordinarily the "liveliness" of an elastic body, and is represented by the ratio of the *energy* recovered

in the rebound to the *energy* in the blow. It depends entirely upon the extent to which the action of compression and the subsequent expansion is damped by friction. It is in itself an expression of efficiency, or "output-over-input"; and should not be confused with "flexibility" which is based on the action of a *frictionless* spring or other elastic body.

If one tire is more resilient than another it does not mean necessarily that it is less flexible as a whole, but it may be due to superior construction which reduces the internal molecular friction, notwithstanding the fact that the same tire may be made more resilient as a whole by using a higher degree of inflation, which at the same time, of course, reduces its flexibility.

EFFECT OF RESILIENCY ON EFFICIENCY

In determining the effect which resiliency has upon efficiency it is quite possible to answer the question without going into a lengthy explanation of the reaction of the tire upon the road surface, which is more or less involved and seems to have led some thinkers away from the solution of the problem rather than toward it.

In view of the fact that the tire is an elastic body it must be flexed to a certain degree by the load which it is obliged to carry. Furthermore, since it *is* elastic, it must recover its original shape when the load is removed, otherwise the tire would grow thinner and thinner with each revolution of the wheel like a batch of dough under the action of the much abused rolling-pin. During each cycle of compression and expansion a certain amount of energy is consumed in overcoming the molecular friction in the wall or other solid elastic parts of the tire. This energy is entirely wasted and appears only in the form of heat, which under certain conditions may become very intense. Obviously the energy so consumed detracts just that much from the propulsion of the vehicle; and, in the proportion this loss is reduced, the efficiency will be increased. There can be no other result.

As far as the bouncing of the wheels on the road is concerned, we have to consider other factors besides the resiliency of the tires, because that is only one among the many involved, and I doubt if it can be proved that bouncing in itself retards the vehicle excepting as it allows the driving wheels to slip on the road if they are thrown upward with sufficient force.

Fortunately there are other ways of preventing the wheels from bouncing than by reducing the resiliency of the tires, which it has been demonstrated greatly reduces their efficiency. Increasing their flexibility as a whole is one way, and for the others we may turn to the designers of the springs, running-gear, and shock-absorbers to provide.

CONCLUSION

The task of the tire builder, as I see it, is to build a tire which will properly relieve the unsprung portions of the car from the shocks due to small irregularities in the road surface; and at the same time, if the tire is to have the maximum efficiency, which means that the internal losses shall be a minimum, it must be resilient whatever its flexibility.

Boston, June 21, 1915. RUSSELL HASTINGS.

P. S.—If I have not made myself quite clear on any points, I should appreciate having the privilege of explaining them before you publish the letter (if you see fit to do so) rather than afterwards.—R. H.

Single Criterion Usually False

In view of the postscript the writer refrains from all detailed comment upon Mr. Hastings' presentation of the subject, so much more willingly as he knows of no single property which can be accepted as a criterion of tire efficiency in the place of resiliency but inclines to the belief that tire improvement must go hand in hand with the improvement of springs, wheels and roads, must vary in its means with the vehicle speed and maximum load and, on the whole, is as closely interwoven and organically connected with other motor vehicle improvements as, for example, the type of the motor. The greatest fuel efficiency is no doubt obtained from a motor of very high piston speed, yet no one could contemplate establishing motor speed as a measure of motor merit. It would be an industrial calamity if anybody succeeded in doing so.

When the subject in hand is narrowed down to a question of the desirable properties in solid tires, the writer would formulate the task of the tire maker along lines somewhat different from those followed by Mr. Hastings. With no restricting theories to work for, traction qualities, noiselessness and durability become the leading requisites, with economy in cost of production closely following and with reform efforts directed mostly toward inducing vehicle manufacturers to adopt such wheel and tire dimensions and such spring systems that the effect of tire material upon power efficiency of the vehicle will be reduced to a minimum.

By working for large dimensions, the demand for power efficiency can be met in a rational manner to a considerable degree and whatever may be further done for the same purpose through improvement of the tire material may then be undertaken under small stress. The most prominent considerations which arise in this connection seem to the writer to be the following.

Requisites for Power Efficiency

Power efficiency is determined mainly on smooth roads, in so far as a tire which is not efficient on smooth roads will have a low total efficiency—the smooth-road action of a tire being the fundamental one to which all other action is only spasmodically added—and it is known that the smoother the road the more rigid the tire should be to have power efficiency. Neither pliancy nor resilience is here wanted. Pliancy is wanted however for absorbing shocks and giving vehicle springs time to start their action, as well as for noiselessness. Resilience, though a prime requisite in stationary (not rotating) vehicle springs, is wanted in tires only to restore the deformed tire to its round shape and only in the degree required for that purpose. All other usefulness of resilience in tires, to increase power efficiency, is fictitious. The power wasted in flexions is not restored for use in propulsion by a resiliency which restores a tire to its shape with such promptness as to cause a rebounding of the vehicle. Resilience in tires only keeps the pliancy of the tires operative.

In accordance herewith, the requisites for producing power efficiency are rigidity on smooth roads and pliancy for shocks plus a modicum of resilience to maintain the shape of the tire. These requisites are plainly contradictory and have to be reconciled by compromise, but resilience plays a subordinate part among them and cannot be the leading aim.

A Question of Materials

Necessity is something else. It may be a necessity to use highly resilient materials in order to obtain the pliancy and flexibility that are wanted. The use of compressed air in air tires is an important example. It is wonderfully pliant but also so resilient that it reacts at once with full force against any deformation. For its use in tires its resilience in this degree is unfortunate, as it takes effect in bouncing the wheel back from the very same obstacle which causes a deformation, unless the vehicle speed is high. Now, the question for the maker of solid tires may be said to be just this—where power efficiency to be obtained through the choice of materials is concerned—of finding a material which will act at all speeds as an air tire acts at vehicle speeds so high that the excessive resiliency of air does no harm, getting no chance for rebound against the ground.

It is certain that a highly resilient material is not what is intrinsically wanted, as it has the drawback of causing immediate rebound. But whether the high resilience can be sidetracked in practice is another question. To solve it by assuming that maximum resilience is a virtue is to make a virtue out of something which has not even been proved to be a necessity.

Dimensions Reconcile Conflict

On the other hand it is easily demonstrated that large dimensions offer one safe method for reconciling the conflicting demands in some degree, giving comparative rigidity for smooth roads in conjunction with an acceptable degree

of flexibility for absorbing shocks resulting from impacts with relatively small objects.

Specific Pressures Most Important

The larger the wheel and tire, the smaller the flexion which will produce a considerable contact area for the support of the load and therefore the greater the flexibility which can be allowed in the material to help in absorbing the road obstacle and in tempering the shock.

It may perhaps be objected that the work involved in the flexion is always determined by the load and should be the same whether the flexion is large or small, but, as the work done also depends on the distance through which the load must act in accomplishing the flexion, it is susceptible of proof that a flexion which may be considered as dropping the load level one-quarter inch (in the case of the large wheel and tire) consumes less power than a flexion caused by the same load but involving a drop of the load level amounting to one full inch. This is perhaps generally admitted and the demonstration need therefore not be made explicit.

Road Dust in Cylinders and Bearings—Effects and Remedy

CARBON deposits, it is widely admitted, are more troublesome the higher the piston speed of the motor. Clogging of carbureter nozzles, it has been whispered from abroad, occurs with some frequency in those excellent carbureters in which a little air is admitted to the interior of the jet. Chemical analysis of the carbon deposit in any motor, it has been established in Germany, reveals a proportion of silica varying from 2 to 8 per cent, besides some other impurities which can scarcely be traced to any other origin than road dust. These observations singly and jointly call attention to a feature in construction and operation which seems to have been neglected and which may yet have a considerable influence on the adjustment and durability of motor bearings, on compression, on knocking, on premature ignition and on backfiring. The feature referred to relates to the lack of provisions for keeping road dust out of the fuel charge and thereby out of the cylinders.

Assuming that a certain amount of dust is in suspension in the air under the motor hood but is in the act of settling by gravitation owing to the slowing up of the air current which takes place after it has passed through the fan, it stands to reason that more of this dust will be drawn through the carbureter if the suction is strong than if it is mild, and that the motor with high piston speed therefore will inhale more dust per cubic inch of air than the slower motor. As its combustion chamber is also smaller and more compact, having a relatively smaller wall area, and as flame propagation is more rapid in this type of motor, it is not difficult to believe that the necessity for frequent removal of the carbon deposit from such motors has something to do with the amount of dust inhaled and is not merely an expression for the related fact that any coating interferes more with operation in a high-speed motor than in a slower one on account of the greater need of good cooling and of keeping the volume of the combustion chamber from being reduced. In the majority of informal statements on the subject it is claimed that the carbon deposit is thicker as well as more troublesome in the high-speed motor, and this would be almost conclusive with regard to the source of the deposits if the obtainable data were explicit in giving dates and mileage. If everybody who has kept records bearing on the subject, including records of his motor repairs, would contribute a copy of them to the fund of public information, the question could probably be decisively answered even if each contribution were not very complete.

Why Air Is Not Filtered

The principal objection to filtering the air which enters the carbureter is perhaps the same which militates against the use of backfiring screens, namely that any arrangement of this nature tends to obstruct the flow of air and thereby reduces the volumetric efficiency, counteracting the good effects of large channels and valves, unless the whole air conduit is considerably increased in area—and this would mean an increase of some of the carbureter dimensions. While the points in carbureter design which are involved are not the same for filters as for backfiring screens, which are above the jet, they are practically the same as for the use of screens in aviation motors to prevent a carbureter fire from spreading to other parts. It is perhaps worth while inquiring if something may not be done to reduce the dust intake without interference with carbureter design and dimensions.

Strong Hint from Radiator Practice

A discussion at one of the S. A. E. meetings throws some light on this possibility, which consists in filtering the air before it enters the hood. A paper on radiators by Howard Greer, Jr., of the McCord company, gave occasion for the remarks which bear on the subject, and while these did not refer to the dust question at all but solely to cooling, especially fan and radiator efficiency, they seemed to establish the desirability of diffusing the air current passing through the radiator as much as possible—by whatever suitable means this may be accomplished—and thereby suggested that some kind of an air filter might be used for this purpose, not only serving to exclude the dust but also regulating the cooling effects of fan, radiator and vehicle speed.

Some of these remarks are herewith quoted. "After you drive the air fan beyond a certain speed you get air at anywhere from 950 to 1150 ft. per min.; if you get it at a higher rate than that you shoot a core of cold air right through the center of the air passage [meaning each of the many air passages in a radiator]; the skin air is not disturbed and you do not take the heat out [of the adjacent water tube] in proportion to the speed at which you are driving air through."

With regard to the factors which make dust tend to settle, like the impurities of river water in a settling basin, the following is of interest: "Air is pulled through the radiator and jammed against the motor, starter, water manifold, exhaust manifold, wires and all kinds of things." And, speaking about blowing some sparks—which may be considered incandescent specks of dust—and seeing what happens to them: "I have seen a spark put in from the front of the car go over and actually circle around the manifold and then dive down to the bottom and then come out. . . . The space is not only restricted but baffled; these restricted corners cause all kinds of swirls, and the velocity of the air going out is much less than of that coming in, because it creeps out the sides and front and all kinds of places instead of going out some definite passage." Also: "In the conventional construction you take a highly refined piece of mech-

(*Continued on page* 29)

Splitdorf Announces Twelve-Cylinder Magneto

Dixie Models Now Include Eights and Twelves—Eight Operates at Engine Speed

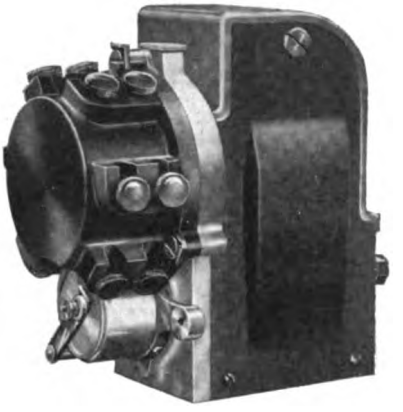


Fig. 1—The latest Dixie magneto has its twelve terminals arranged on a compound distributer

BY adding a 12-cylinder model to its line of Dixie magnetos the Splitdorf Co. is able to furnish ignition for any automobile engine on the market. This new magneto operates on the same principle as the other Dixie models, having stationary windings and no armature in the ordinary sense.

The Mason principle on which the Dixie magnetos operate is a radical departure from ordinary magneto practice, and possesses many features of great interest. In the first place the rotating shaft passes through the magnet poles instead of between them and instead of carrying an armature on which the windings are placed this shaft carries two solid polar extensions separated by a non-magnetic distance piece. Surrounding these revolving pole pieces is a light laminated field structure consisting of two pole pieces *F* and *G*, Fig. 2, and a straight core on top. This core carries both primary and secondary windings. The principle of operation is that of sending magnetic lines alternately in opposite directions through the field structure. It will be seen that the pole extensions *S* and *N* are simply a means of carrying the magnetic lines from the main magnet to the laminated field structure and that they do not change their polarity. In the four- and six-cylinder models each polar extension embraces about 90 degrees of the tunnel.

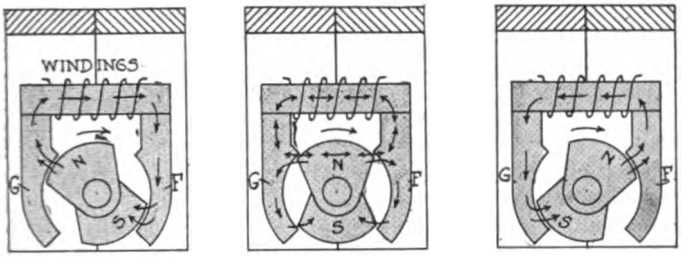


Fig. 2—Principle of operation of the Dixie magneto showing the stationary windings and magnetic field

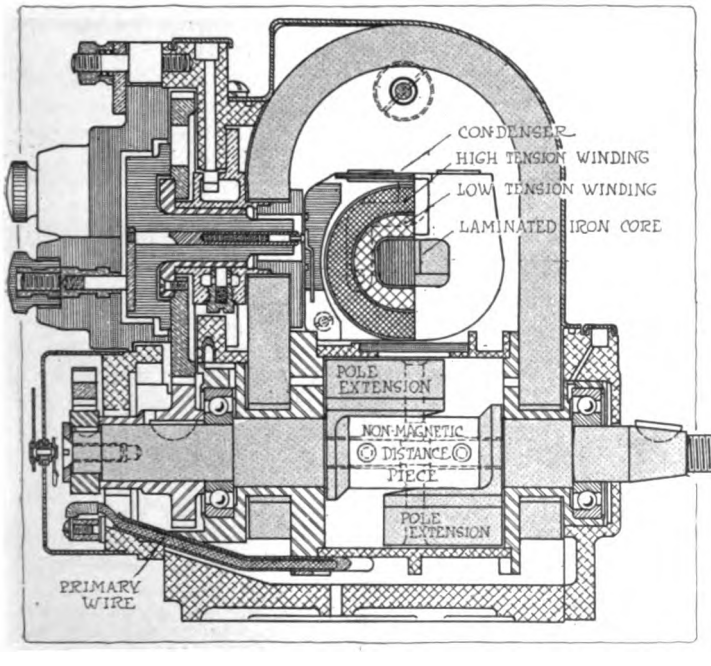


Fig. 3—Half-size section to scale of the 4-cylinder Dixie showing location of stationary windings and rotating pole extensions

Path of the Flux

When the pole *N* is adjacent to *G*, Fig. 2, left, the magnetic flux flows in the direction of the arrows through the core of the windings from left to right. Continuing the rotation of the poles until they occupy a vertical position it will be seen that the field of the magnet is shorted through the pole pieces, cutting out the magnetic flux entirely from the core. Passing this point in rotation the pole extension *N* then comes into a position adjacent to *F*, causing the magnetic lines to flow once more through the core, but this time in the opposite direction, that is, from right to left. This reversal of direction of the magnetic flux is of course a necessary feature in any magneto and is the means of inducing the current in the windings.

In order to render this reversal easy and complete the path for the magnetic lines is made up of thin iron laminations such as are used also in the construction of the armature in the ordinary magneto. The Splitdorf Co., however, make the claim for the Dixie construction that a point of great efficiency is obtained since the bulk of iron in the stationary field structure is so small, its size being governed entirely by magnetic requirements.

The windings are remarkably small, being wound on a core of only 0.75 by 0.5 in., Fig. 3. The core is held in place by two screws passing through slots in the projecting ends. One end of each of the two windings is earthed. The open end of the high tension winding terminates in a contact plate *P*, Fig. 6, embedded in a rubber block at the side of the windings. The open end of the primary winding passes through a brass tube which leads to the base of the magneto and so to the contact breaker, Fig. 3. In dismantling, this wire is the only electrical connection to be loosened.

The Rocking Field

One of the most important features of the magneto is that the whole of the laminated pole structure including the windings can be rocked through several degrees. This rocking is accomplished by turning the timer arm of the circuit breaker in the ordinary way to advance or retard the spark. By means of this positive connection between the field and the circuit breaker it is possible to arrange the instrument to produce the sparks either advanced or retarded at the critical moment when the most magnetic lines are being cut. Hence the magneto has no one point in its spark position when the intensity of the spark is maximum or minimum; it is uniform all the time.

The distributer on the four- and six-cylinder models, Fig. 6, consists of an insulating block with a short spindle at one

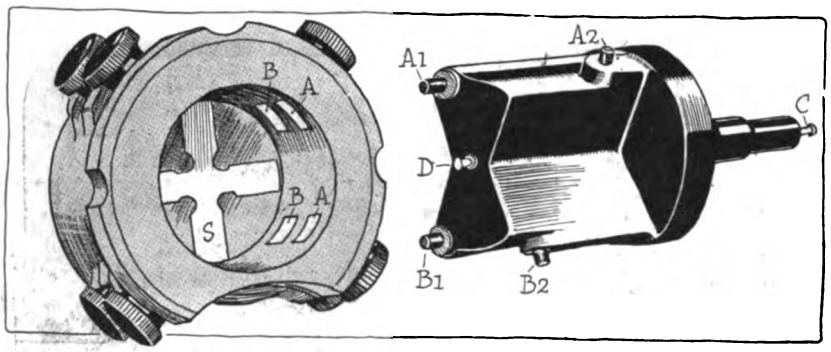


Fig. 4—Compound distributer box and block on the eight-cylinder Dixie magneto. The distributer on the twelve is the same except that the contact piece S which transfers the high tension current to the terminal plates through the brushes in the block is six-pointed to supply the twelve terminals

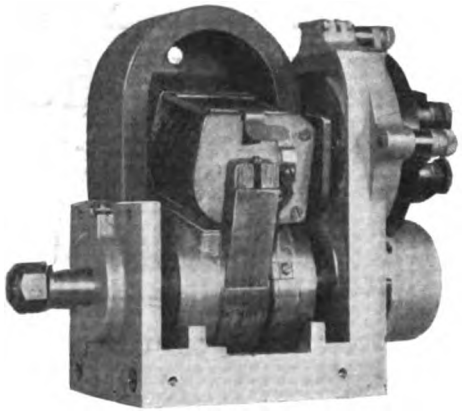


Fig. 5—Interior view of four-cylinder Dixie with cover and one of the magnets removed to show the windings and rocking field

end of which is a spring brush bearing on the contact quadrant *P* on the windings. The high-tension current passes from this point to a radial arm on the distributer face and so to the outer terminals of the instrument. A good feature is the shortness of the path for the current from the windings to the terminals. A safety spark gap is included in the high-tension circuit at the base of the windings, and the condenser is located on top.

In the circuit breaker, Fig. 6, it will be seen that nothing revolves except the cam attached to the shaft. By this construction it is possible to adjust the contact points while running as the contact bases are stationary. The grounding terminal is insulated on the end of the spring clip which holds the breaker cover in position and as it bears on the center of the cover the ground wire is also stationary while moving the timer arm.

The four- and six-cylinder instruments are identical in every respect except the distributer and timing gears. In the eight- and twelve-cylinder models the shape of the rocking field and also the polar extensions are changed so that four sparks can be produced in each revolution. Fig. 6, right, shows the shape of the laminated pole pieces which embrace only 50 deg. each of the upper half of the tunnel, instead of 90 deg. In order to obtain the requisite number of magnetic reversals with these pole faces the main polar extensions are in the form of a cross, two ends being of *N* polarity and two of *S*.

The New Compound Distributer

As it is practically impossible to obtain more than six contacts in a flat distributer disk of ordinary construction without a great risk of short-circuits caused by dangerously small electrical hazard distances a particularly ingenious compound distributer, Fig. 4, has been designed for the eights and twelves in which the terminals are not arranged in one plane as in the four- and six-cylinder models but in two parallel planes. In the compound distributer block on the eight-cylinder instrument the high-tension current is led through the center of the block from the brush *C* in contact with the windings to the brush *D* which bears on the center of the cruciform contact plate *S* embedded in the distributer box. This plate has no connections with any terminals but is a means of conducting the current in turn to the eight terminals as follows: In operation the plate *S* becomes "live" by contact with the brush *D* as before explained. Rotating over the ends of *S* are the two brushes *A1* and *B1* connected respectively to two similar brushes *A2* and *B2* in the side of the block. The path of the latter brush *B2* includes the four contact pieces *B* connected to the four of the terminals while the other brush *A2* rotates in the path of the terminal plates *A* connected to the remaining four terminals. Now, since the two brushes *A1* and *B1* are arranged 135 deg. apart it follows that eight sparks will be distributed to their respective terminals in one revolution of the distributer block in equal divisions of time. The timer gear is in the ratio of 2 to 1 so that this magneto runs at engine speed, an unusual feature of an eight-cylinder magneto. On the twelve the distributer gear ratio is 3 to 1 requiring a speed one-and-one-half times the engine speed.

12 Distributer Similar to 8

The distributer for the twelves is identical in every respect except that the contact star at the base of the box is six-pointed instead of four to supply the twelve terminals which are arranged in two layers as shown in the external view, Fig. 1. By the use of the compound distributer block on the eights and twelves as many as 285 sparks of high intensity can be obtained per second. Owing to this high speed of spark production a double contact breaker having two breaker arms and contact points is used on the twelves.

Constructionally the Dixie magnetos are up to the present high standard of practice. The shaft runs on ball bearings, tightly fitting brass side covers inclose the magnets and the

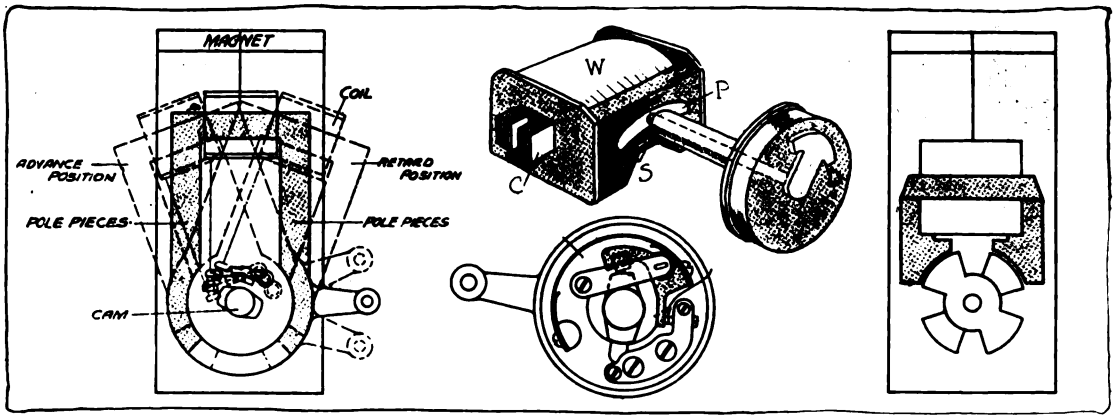


Fig. 6—Left, showing how the laminated field with its windings rocks inside the magnets simultaneously with the circuit breaker. Center, the windings and distributer block of the four-cylinder model, and below, the distributer with stationary contact points. Right, the laminated field on the eight and twelve-cylinder magnetos in relation to the rotating pole extensions

whole instrument can be dismantled with no other tool than a screwdriver. The magnet itself is in two parts and fits into place without bolting, having semi-circular notches which embrace the shaft bearing. Great accuracy has been used in the manufacture of the rotating pole extensions, the clearance between the ends and the stationary poles being brought down to the workable minimum. An interesting point in connection with the operation of these pole extensions is that end thrust is neutralized by the equal magnetic pull on both ends of the rotor. The compactness of the magnets can be realized from the dimensions which except in the height are practically identical in all models. The common width is 4.125 inches and the total length 8.375 inches. On the twelve the height of the magnet is 7.5 inches being one inch more than the others so as to provide a stronger magnetic field.

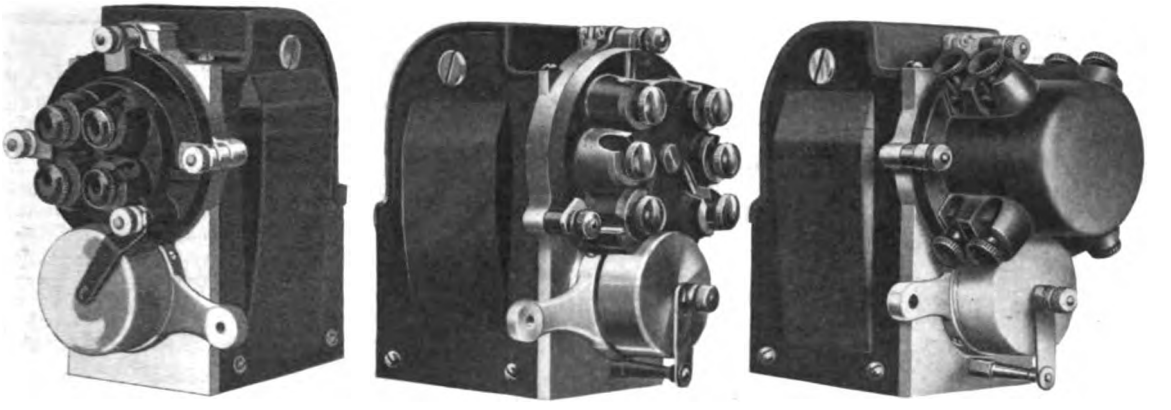


Fig. 7—Models 40, 60 and 80 Dixie magnetos for four- six- and eight-cylinder engines

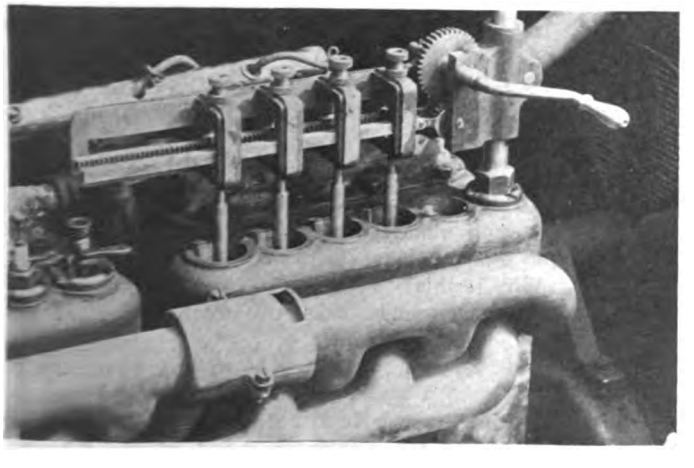
The four automobile models are designated 40, 60, 80 and 120 for four-, six-, eight- and twelve-cylinder engines.

Multiple Valve Grinder

A simple valve grinder by which four valves can be ground at one time and which device can be rigidly attached to any motor in a car, has been brought out by Knepper and Wright, Detroit, Mich. Turning the handle at the right is all that has to be done in grinding the valves. This imparts a back-and-forward movement to the horizontal rack, which in turn gives a short back-and-forward movement to the four screw drivers which engage in the slots in the valves. Additional pressure on any valve can be had by the knurled adjusting screw on the top. As shown the device is attached to a spark plug hole but this is not the only method, for special devices are made to suit different types of engines and those with detachable cylinder heads can be dealt with just as readily as the type illustrated.

Naturally this tool is intended more for use in garages and repair shops than by the private car owner, but its wide range of adjustability and the consequent ease of attachment to almost any engine ought to enable valve grinding to be performed at a slightly cheaper rate; a distinct advantage to the owner in these days of many valves.

One of the great advantages of a tool of this kind is that it can be relied upon to give an even pressure at all times. Sometimes with the hand method the pressure upon the bearing seat will be much greater than at others and an even seat for the valve is not gained as quickly as with the mechanical method.



Knepper multiple valve grinder ready for action

Belgian Armored Cars Most Efficient

(*Continued from page* 10)

section cans in which reserve gasoline is carried, also the special lubricating oil cans, and has special grooves to receive tires. Along the lower portion of the two sides are a series of lockers—six on each side—with a door on the outside. These lockers contain various small parts, stowed away systematically, and as readily accessible as the stock in an automobile store. Each compartment has its own lock, and in addition a catch to prevent the door flying open if the attendant fails to lock it. The store keeper maintains a complete list of the parts in his possession; as each part is given out he records the fact in his storebook and arranges for replacement to be sent to him when a certain minimum has been reached. He thus knows at all times, without going through his lockers, what material he has in stock.

The Armored Cars in Action

An armored car corps in action is a thrilling sight. Suppose, for instance, a village held by the enemy has to be attacked. The cyclists are first sent forward to reconnoiter, draw the enemy's fire, ascertain his strength and the condition of the roads. During this time the cars are concealed in the rear, and the motorcyclists are used for carrying dispatches from the advancing cyclists to the corps commander at the rear. When the attack is decided upon, the corps may be divided into two sections, each one of which has instructions to dash through the village by a different route. On such a dash it is probable that the quick firing guns will have to be employed, although the cannon can be brought into operation immediately if it is needed for attacking a stronghold. A charge through a village is usually made in staggered formation, one car being on the right hand side of the road, the next one 50 yards to the rear on the left hand side, and the third again on the right. Unless the village is scientifically fortified, it is practically impossible for an infantry force to stand before a raid of this nature. Comparatively little use can be made of armored cars in trench warfare, but in an advance or in covering a retreat they are invaluable. In the case of a retreat, for instance, their extreme mobility enables them to hold a position until overwhelming forces are brought up and to get away at the last moment with very little fear of capture. On the other hand, retreating forces of the enemy are most seriously harassed by cars which can dash in, attack and retreat at 40 miles an hour.

The Rostrum

Communications

¶ The editor of the Rostrum is anxious to secure from car users and others, communications dealing with the overcoming of difficulties in making repairs and in the numberless other phases of every-day automobiling. This department is mutual and is a common ground upon which an interchange of ideas and opinions can be made as freely as in the clubroom.

Inquiries

¶ The purpose of the Rostrum department is primarily to aid in the solving of motorists' problems. Readers of THE AUTOMOBILE *are requested to allow our editorial staff aid in the solution of difficulties as they arise and perhaps through this assistance reduce the cost of upkeep of their cars and gain a useful knowledge in the economical phases of the vehicles.*

Carbureter Is Probably Too Small

EDITOR THE AUTOMOBILE:—I have a model 16 Buick equipped with a model L Schebler 1 1-2-in. carbureter which is causing me considerable trouble. When the engine is running slowly, it works fairly well. I can open the throttle quickly and the engine immediately picks up and does not skip, but as soon as I start up a hill it begins to skip even with a half throttle and when it reaches the speed of 38 miles per hour, it will skip, spit back through the carbureter and fire in the muffler. I have had the dials set at all points, sometimes adjusting it so it will work good for 10 or twenty miles, but it will be almost impossible to do anything with it. I think the float has been moved, as it is 7-8 in. from the top of the bowl. What suggestions can you offer on this? C. A. B.

New York City.

—It would seem that you have changed the carbureter on your model 16 Buick from the original Schebler D, which was used for standard equipment, and put on a 1 1-2-in. size model L. If this is the case, you have too large a carbureter on your car. The proper size for you to use on model 16 Buick would be 1 1-4 in., that is, the 1 1-4-in. model L.

The carbureter being too large would require a large amount of heat to keep it from loading up when the motor is running slowly. This, as stated, is due to the large size of the carbureter. The correct level of the cork float should be 1 1-16 in. from the top of the bowl when the float valve is closed.

Relative to the motor missing at a speed of 38 miles per hour, it would be very likely that this is due to ignition trouble. The breaker is not working properly perhaps at that speed.

Chains Probably Not at Fault

Editor THE AUTOMOBILE:—Please tell me if the slack can be taken out of the chains which run the cam and magneto shaft on the Paige 1914 model 36.

2. What remedy can you suggest for a rattle which occurs when the clutch is disengaged? It is of the multiple-disk type with cork inserts. K. M.

Eunice, La.

—While the drive chains used on the model 36 Paige motor will stretch to some extent, they will not do so sufficiently to cause any trouble while the motor is running smoothly, as there would be a steady pull on the chain and hence no possibility of their causing a slap.

If trouble develops with the pump drive chain, it would be more apt to be caused by the pumpshaft bushing becoming worn, which would allow extra slack in this chain, and the remedy therefore would be in the installation of a new bushing. If the trouble is in the generator drive chain there is no way by which this can be adjusted other than by removing the bolts which fasten the generator to its supporting bracket, elongating the hole and moving the generator out slightly. If this were done care must be used in resetting the generator so as to get same so that the chain will be properly aligned.

The chain driving the camshaft is a shorter and much heavier chain than the other two and, in fact, is much heavier than is necessary for the work which it has to do and should not ever cause any trouble.

2. The clutch rattle may possibly be caused by the prongs on the shifting bar not being of equal distance away from the thrust bearing. This can be determined by inserting a feeler gauge between the prongs and the bearing and if one is found to be closer than the other, the distance should be equalized by bending back the one which is closer.

There is a tendency for a rattle to occur in this type of clutch when it is disengaged, especially when coasting on a down-grade or when driving over a rough spot, but this can be overcome by bringing the shifting lever into neutral position and allowing the clutch to remain engaged, especially while coasting down a grade.

Water Boils at Higher Speeds

Editor THE AUTOMOBILE:—The following question has puzzled every one whom I have asked, and I will appreciate a word from you relative to this question.

I have a Buick roadster, model 30, which travels well up to a speed of 20 miles per hour, but when the speed is increased, the water boils so fast that the radiator is soon emptied and consequently I have the usual trouble which accompanies a heated engine. The pump is in good shape, new heavy hoses all around. The radiator was opened up and all the tubes were free and also the tanks are in good shape. Circulation seems to be good. The cylinders have recently been burned out with oxygen and I am at a loss to know what is causing the trouble. H. B. TREVOR.

Buffalo, N. Y.

—It would seem that your trouble must result from one of two causes: First, an improper setting of the spark, which can be corrected by advancing the magneto, or second, by a collapsing hose connection between the radiator and the water pump, which, at 20 miles per hour or over becomes closed due to the suction of the pump. This latter cause seems to be the most probable and it can be remedied by winding a piece of wire into the shape of a coil spring and inserting it tightly into the tube, thus holding the wall against collapsing under the suction of the pump.

When a Motor Stops Quickly

Editor THE AUTOMOBILE:—Some engines such as the Pierce-Arrow, stop almost immediately after the switch is cut off, while other engines seem to lose their momentum gradually. Why is this?

2—What American-made cars use carbureters of the Claudel type?

3—Would this type of carbureter be of any advantage in connection with such a motor as the Packard 48, Pierce 48, Stevens-Duryea, or Stearns-Knight six?

4—What would be the maximum speed of the following cars geared up and in running trim: Packard 48, Pierce 48,

Stearns-Knight six, Stevens-Duryea and Peerless 48?

5—What is the maximum speed of the Rolls-Royce, Packard 48, Pierce 48, Stearns-Knight six, Peerless 48, Stevens and Simplex 75?

6—Please give specifications of the Packard Twin Six. Also, speed, fuel consumption and weight?

New Haven, Conn. T. B. S. D.

—When the switch is cut off on an engine, it is merely a matter of bringing to rest the moving parts which are no longer propelled by the explosion of the gases in the combustion chamber. Only one influence is probably great enough to be considered as the opposing factor to the movement of the motor, and this is the internal friction. When this has exerted its influence to such an extent that the motor is unable to turn itself over against the compression of the cylinders, it will come to rest. The compression is not an opposing factor unless the momentum is insufficient to carry the motor over top center, because when it is carried over top center the expansion of the compressed air gives up practically all the power which was utilized in compressing it. If the compression is exceptionally heavy, then the speed does not have to be reduced as far as it would if only a light compression were used, before the engine will be unable to turn itself over the dead point. With these considerations, it will be easily seen that a motor with tight bearings, tight piston rings and high compression will come to rest much quicker than one which has the opposite conditions. Of course, a gas-tight motor is more efficient under running conditions than one which is too free.

2—No American cars are regularly equipped with the Claudel carbureter.

3—THE AUTOMOBILE has never carried out any experiments with this carbureter on the cars you mention, and since this is the only way of determining the results, no information can be given you on this matter. It might be possible that the companies referred to have experimented on this carbureter on their respective makes, and would be willing to give you the desired information.

4—You do not mention the gear ratio in questions 4 or 5. Under most advantageous conditions it is difficult to fix a maximum speed for any car as it will vary, even on the same make. Under touring conditions, any of the cars you mention should be able to do 65 miles per hour.

5—Complete specifications of the Packard Twin Six will be found in THE AUTOMOBILE for May 27, 1915, page 933.

Advanced Spark Causes a Pound

Editor THE AUTOMOBILE:—What is it that causes the tapping sound in a motor when the spark is advanced too far, when motor is laboring? Why is it that this happens when a motor is new and the pistons, wristpins and rings are absolutely tight and perfect fitting? Is it a piston slap?

Newark, N. J. L. A. MILLER.

—Very often with the spark advanced too far, the pound given by the motor is simply the impact of the working parts transmitted to the volume of exploding gas in the combustion chamber. This is communicated throughout the motor and the resonant qualities of the metal in the motor permit a pounding effect to ensue. With pistons that are any way loose at the bottom, the reversed power causes a slap as you mentioned, but even without the piston slap the pounding noise would be in evidence. The reason for this jarring is evident from a diagram which explains the opposition of the two forces acting upon the motor during pre-ignition. These are, first, the tangential force on the crankpin and, secondly, the downward thrust of explosion along the connecting rod. Referring to Fig. 1, the tangential force *A* is tending to force the moving parts in the direction of the arrow and the thrust along the connecting rod is tending to act in the direction *EB* at an angle to *EF*, the axis of the cylinder. *CD* is the projection of the horizontal plane through the crankpin. To the right of the same illustration is shown the parallel set of conditions when ignition takes place beyond upper dead center. In the latter case it will be noted that the forces represented by the arrows *A* and *B* or, in other words, the tangential and thrust forces are in the same quadrant as regards the vertical and horizontal planes. They are therefore acting with each other and not against each other as at *A* and *B*.

With the present tendency of putting the piston rings at the top and none at the bottom, there is sometimes a slap caused by the oscillating of the piston about one of the upper rings, brought on due to the reversal of power to pre-ignition. It must be remembered, however, that even with the best fitting motors, a charge pre-ignited will find any place where there is backlash, as the reaction even carries through the timing gears, valve mechanism, etc.

Knock Due to Over-compression

Editor THE AUTOMOBILE:—Would be pleased to have your opinion on the following: A 1913 Ford has been run about 8,000 miles and it has a knock which seems to be in the two front cylinders. It knocks when the car is running on the road or when it is standing still with the motor running. All the bearings have been carefully gone over by two different garagemen but neither could find the trouble. It does not knock any harder when car is climbing a hill than it does when running on the level. When the spark is retarded, the knock can scarcely be heard.

Johnstown, O. W. D. DAVIS.

—Although it is impossible to judge the source of this knock from the particulars which you give in your letter, it would seem very possible that for some reason or other the motor has too much compression. If the cylinders are removed and a fiber gasket fitted between them and the crankcase it is possible that the knock will disappear.

Oil Not Suitable for Two Purposes

Editor THE AUTOMOBILE:—Is there a six-cylinder roadster of standard make that weighs under 2,300 pounds?

2—Is there an underslung roadster made which has the multiple disk clutch running in oil?

3—What is the objection found to transmission gears built in and receiving the same oil as the cylinders? Is there any great objection to this oil as used in crankcase as a lubricant to the transmission gears?

4—What final ratio is considered best on cars with 33 by 4

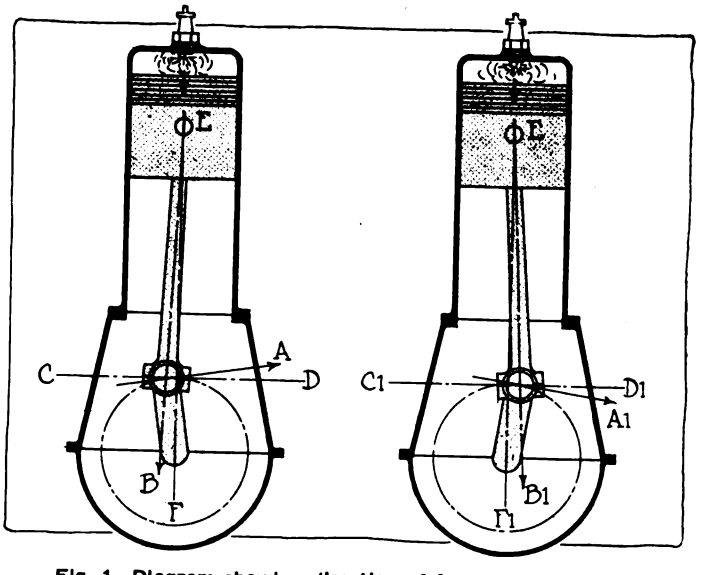


Fig. 1—Diagram showing direction of forces on preignition

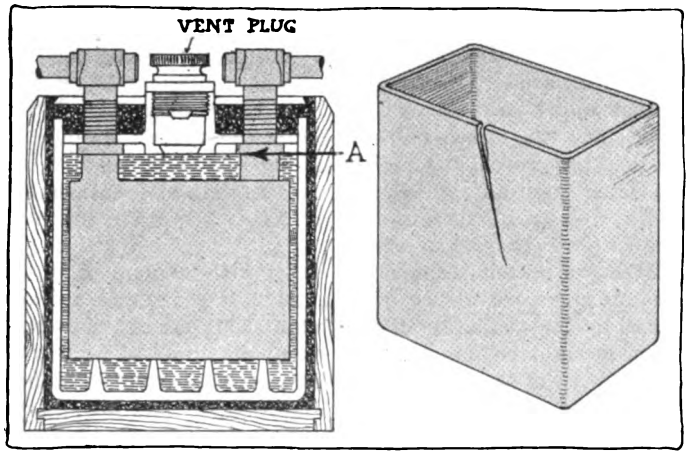


Fig. 2—Section through Willard battery and a cracked jar which sometimes causes a leak. Battery should be filled to A

tires and what speed should be obtained from this ratio?

5—Can the low speed of an ordinary gearset be changed to a lower ratio without changing the two higher speeds?

6—Is there a serious objection to mixing cylinder oil with the gasoline and is there any advantage of it as a lubricant to the cylinders?

7—What may be the injury caused by using over tension on clutch springs? Is there an excessive pressure brought to bear on the crankshaft bearing by using tight clutch springs?

8—Is there a satisfactory fluid that can be inserted into the inner tube which will take the place of air?

Graysonia, Ark. AUTOMOBILE STUDENT.

—We have no record of any standard six-cylinder roadster weighing under 2,300 pounds.

2—No more underslung cars are listed among the 1915 models.

3—The main objection to this is that the lubricant which is suitable for cylinders is not suitable for gears. Gears require a viscous lubricant which clings to the surface and provides a substantial film between the teeth. The gear wheel must be able to carry the oil around with it. In the cylinder the oil requirements are entirely different. The difficulties of high temperatures must be met with and since an entirely different set of conditions are to be faced the oil will naturally have to be different if it is to provide ideal lubrication. Very often makers in the past have connected the gearset to the crankcase so that the oil in the latter worked its way to the former and vice versa. These makers have gradually abandoned the method however, as the oil from the crankcase was not considered to be ideal for the gearset. Another great objection to the use of the interconnected gearset and crankcase is that the car user would often put heavy oil in the gearbox with the result that it would work its way into the crankcase and cause carbonization of the cylinders.

4—The size of the tires is not the all-important factor in determining the proper gear ratio as there are many other points to be considered, such as the most efficient speed of the motor, the weight of the car, etc. These may so alter the proper gear ratio that the mere size of the tires becomes insignificant in determining the final reduction. With this in view, it is impossible to state that any given final reduction is best for a given tire size.

5—If the gearbox is well laid out in the first place, the changing of the lowest gear ratio alters the proper progression from one gear to another. In most instances the gearbox is laid out on either a geometric or arithmetic progression. Therefore, if the lowest ratio is changed, it will throw the proper progression from one gear to another into disarrangement and therefore, should not be done unless the gearbox is incorrect in the first place.

6—There is no objection to mixing cylinder oil with the gasoline. It serves as a lubricant to the cylinders and is claimed by many to be an advantage especially as regards two-cycle motors.

7—If the clutch is properly designed with a thrust bearing, there will be no pressure brought to bear upon the crankshaft bearing by the clutch springs. The big objection to too tight an adjustment on the clutch spring is that it will make the clutch grab instead of giving it a gradual engagement.

8—There are many fluids which have been inserted in the inner tube to take the place of air but none of them have come into any extended use, the main objection having been that they were not resilient enough or that they crumbled under the stress of rough roads.

Lever Slips Out of High Gear

Editor THE AUTOMOBILE:—I have had some trouble with slipping out of high on my Cole eight while going down grade and could probably remedy it if I knew what to look for. What would you suggest? H. W. KIMBALL.

Haverhill, Mass.

—It is very likely that the lower end of the control lever has been fitted too tightly against the shifting bars in the gearset. By removing control lever and reducing the diameter of the boss which enters into the shifting gears your difficulty should be eliminated.

Lincoln Highway Office Is in Detroit

Editor THE AUTOMOBILE:—Can you tell me where I can get information on the Lincoln Highway, the route and distance to San Francisco?

Montrose, Mich. C. A. WALKER.

—You can get full information on the Lincoln Highway by addressing the Lincoln Highway Assn., Free Press Bldg., Detroit, Mich.

Welding May Save Crow-Elkhart Cylinder

Editor THE AUTOMOBILE:—I have a Crow-Elkhart car and the motor block is broken so as to be beyond repair. I wonder whether you could tell me where to get parts for it. I also need a piston, connecting-rod, wristpin and bushing and connecting-rod bearings.

Newark, N. J. H. J. ANDERSON.

—Parts for the Crow-Elkhart car can be secured from the Puritan Machine Co., Detroit, Mich. Before giving up the cylinder casting however, you should take it to a good welder and have it gone over. Many an apparently hopeless job has been repaired by the welding process.

To Find Leaking Battery Cell

Editor THE AUTOMOBILE:—I have a 1912 Cameron runabout which has given me trouble with the differential gear. The cogs in the small differential pinions have broken off three different times. The car is equipped with 32-in. wheels, but was intended to use but 30-in. wheels.

1. Can you explain how I can remedy this trouble? Where can I get repairs for this car?

2. How can you tell which cells in an L. B. A. storage battery are leaking?

3. Is there a paint or chemical which will stop the acid from eating away the metal with which it comes in contact?

E. WEAVER.

Attica, O.

—As THE AUTOMOBILE has no record of anyone who is selling parts for the Cameron car, you will have to have new gears made or have the teeth repaired by having new teeth cut and fastened to the old gear. It will probably be

cheaper and better to have new gears made by a factory equipped to do this work and in all probability it will have to be handled by one of the large orphan car specialists.

2. The only manner in which you can tell which cells of a battery, Fig. 2, are leaking would be to fill them all to the same level with distilled or clean rain water, then after allowing the batteries to stand in a dry place for twenty-four hours, look at the height of the electrolite in the different cells and if there is any difference in the level, the one which is lowest is the one which is leaking.

3. The material used for protecting wood and metal against the inroad of acids, such as is used in storage batteries, is lead or lead paint.

Double Magneto for High-Speed Work

Editor THE AUTOMOBILE:—I have a 45 foreign Fiat T-head motor and would like to install a two-point ignition. Would you advise me how to couple same with a Bosch three-magnet H. T. magneto? Also, how much power would this give? What would be the extra stress on the engine and whether it would be able to stand same?

2. Can a steering wheel be changed from stiff to adjustable rake, and how?

3. Could you give me a diagram of the oiling system on the 1909 Fiat?

4. Could you tell me where I can obtain a book on construction and care of the 1909 Fiat or a car of similar make? The Fiat Co. could not furnish me with same.

5. Please give me the strongest solution to place just in the cylinder jacket, not in the radiator. Would lye do, and how long should it stand to loosen rust and corrosion?

Jersey City, N. J. A. MECHANIC.

—If you intend to use the car for high-speed work, two-point ignition would be very satisfactory and can be secured in two ways. First, by coupling the plugs in multiple by means of special plugs for the purpose, and secondly, by changing the magneto for one with a double distributer. If you intend to use the car for speed work it would be better to change the magneto, but for ordinary work it would hardly be worth while to go to the expense of changing it.

2. The steering wheel itself cannot be changed, but you no doubt refer to the column or post, which can be lowered or raised to any desired position.

3. THE AUTOMOBILE has no diagram of the foreign Fiat on hand. As the American car is quite similar in this respect, however, this diagram is given instead in Fig. 3.

4. A book on the care of the American Fiat can be secured from the Fiat Repairs Co., 640 West Fifty-eighth Street, New York City. This is practically the same as the foreign car.

5. The best way to remove the rust would be to take the cap from the top of the cylinder and scrape the rust from the water jacket space.

Piston Slap May Cause Knock

Editor THE AUTOMOBILE:—As a service man I have found in repairing and adjusting a motor, a knock which I cannot place or eliminate. In the first place, when the car was brought in, there was no knock. It was brought in for more power. We put in new patent rings, scraped carbon and ground in the valves. After this was done the knock came. It is really a tap, almost like a low tappet sound. We then took out the valves, thinking the stems were sprung. We had them all trued and faced off, then ground them in again. The knock was still there. We then put in new wristpins and bushings. Still it was evident. Last of all we raised the cylinders with fiber plates 3-16 inch, but to no avail. Where is the knock?

Holyoke, Mass. H. O. S. S.

—You have not mentioned piston slap which is a possibility due to the fact that the pistons might tend to oscillate about the patent rings in the top of the cylinders and slap at their lower end. Another possibility is that the rings do not fit tightly enough in the piston grooves thereby giving a backlash at the end of each stroke. The crankpin and crankshaft bearings also should not be overlooked.

Power Not Accurate by Formula

Editor THE AUTOMOBILE:—Can you give me a way to calculate the power of motors to determine the exact brake horsepower?

Jonesville, S. C. H. W. L.

—It is impossible to calculate accurately the horsepower of a motor by formula. If this were so, the formula would have to include every possible variable, because if it did not, it would be incorrect for every value of that variable except one. Since the power developed by a motor includes such things as cam contours, manifold and port designs, shape of combustion chamber, tightness of piston rings, frictional horsepower, losses through the bearings, etc., it is obvious that a formula which can furnish brake horsepower is impossible.

Three Possible Causes for Knock

Editor THE AUTOMOBILE:—I drive a 1911 Hudson 33 which is in good order and will run smoothly and quietly if I keep it at a steady speed of from 16 to 25 miles per hour, but after stopping it will knock until I gain spee dagain. The car runs with this knock in running slowly or in starting. Retarding the spark makes no difference. Can you suggest a remedy?

Mansfield, Mass. S. F. FRENCH.

—There are three possible causes for the knocking. One, excess of carbon; two, a loose connecting rod; three, a loose bearing. First try removing all the carbon by having it scraped or burned out, and if this does not cure the trouble, the motor should be taken down and the bearings inspected for looseness. What is known as a gas knock often develops from a badly adjusted carbureter.

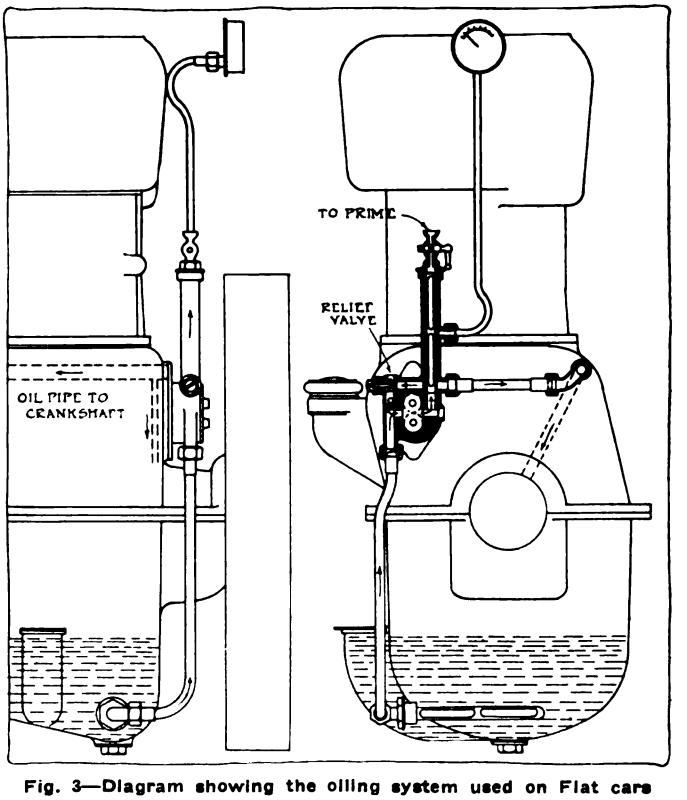


Fig. 3—Diagram showing the oiling system used on Fiat cars

ACCESSORIES

Kemco Electric Starter

THE Kemco Electric Mfg. Co. has brought out an additional unit for starting which can be used in connection with the fan type dynamo. This makes up a two-unit starting and lighting system which can be fitted to cars not originally equipped with electric cranking. The cranking motor is designed to fit on the front of the car, replacing the hand crank, and to duplicate the action of hand cranking. When the switch button is pressed the same starting clutch as would have been employed with a hand crank is slipped into engagement with the crankshaft and the motor is spun until it fires. When the engine starts under its own speed the starting clutch is automatically thrown out in the same manner that the hand crank is thrown out of engagement when the engine starts.

The system works at 6 volts and should be installed in connection with a 100-ampere hour storage battery. The starter is made in two different sizes so that all classes of cars are covered. The gear ratio between the armature of the cranking motor and the crankshaft is 9.5 to 1.

Some of the special electrical features in connection with this machine are particularly its automatic action in engaging to the crankshaft by means of a magnetic control when the starting button is depressed. The release is altogether independent from the solenoid coil which engages the cranking motor with the crankshaft, being due as explained, to the declutching of the cranking motor. The starter is controlled by the car operator by a button depressed by the foot. It can be applied to practically any make of car by means of universal fittings which attach across the front of the frame and are adjustable in every possible way so as to fit the car properly. With this arrangement no drilling or machine work is necessary.

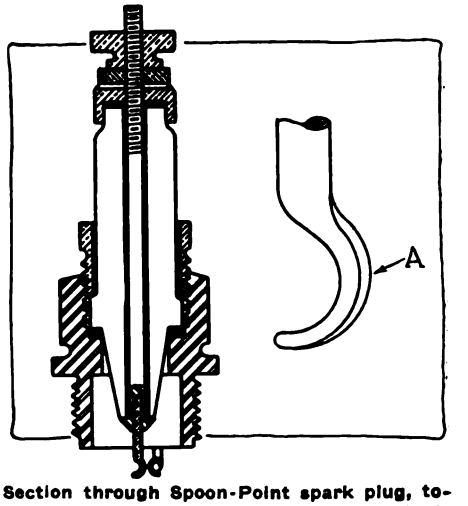
In connection with the new cranking motor there is also brought out a positive drive for the Kemco fan generator. This gives an improved two-unit starting and lighting system with which a car can be completely electrically equipped.

The overall dimensions of the cranking motor are 9 by 7 inches. Its weight is approximately 33 pounds and since the weight of the generator is 11 pounds, the two principal units total less than 50 pounds.

A special two-unit electric starting and lighting system for Ford cars has also been brought out, operating on the same principle as the larger one but adapted especially for the Ford. The entire outfit, including the electrical fittings, lamps, side lights, tail lights, wire, etc., is $95 for the Ford, $125 for medium size cars and $150 for large cars.—The Kemco Elec. Mfg. Co., Cleveland, O.

Spoon-Point Spark Plug

Of conventional design, except for the shape of the terminals, the material of which is a new alloy, the Spoon-Point spark plug has entered the field. The terminals are spoon-shaped, as may be seen in the accompanying illustration, the spoon being 3 millimeters in diameter, the convex surface about 1 1-2 millimeters above center, and the concave surface about 1 millimeter deep, giving an unusually large sparking and wearing surface. The inside convexity of the terminals is claimed to prevent the accumulation of oil and carbon between the terminals, and produces a flat circular spark which is not diffused, but hot and effective, while the concave construction affords a drain for oil.



Section through Spoon-Point spark plug, together with detail of spoon-shaped terminal

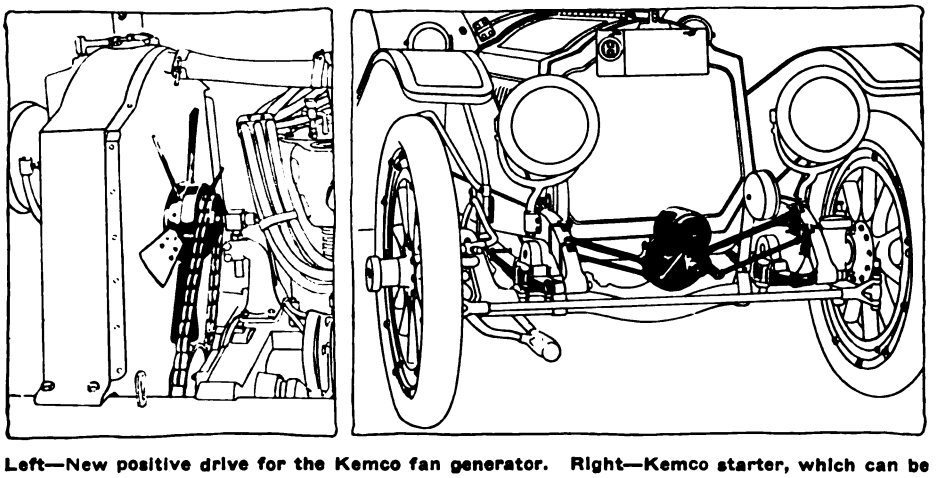
A feature of this plug, in addition to the distinctive shape of the terminals, is the white alloy manufactured after a secret patented process which is used for the terminal spoons. This alloy is somewhat lighter in color than platinum and is claimed to be very durable and especially suitable for spark plug work, remaining bright under the most intense heat, regardless of the amount of oil used in lubricating the motor. The porcelain to be used in Spoon-Point plugs is also a special process product, patent application now pending. Ordinary porcelain is being used until this patent is granted. The manufacturer guarantees these plugs and will replace any defect in workmanship or material, free of charge. Plugs will sell at retail for $1 apiece.—Spoon-Point Spark Plug Co., La Porte, Ind.

Lock Switches

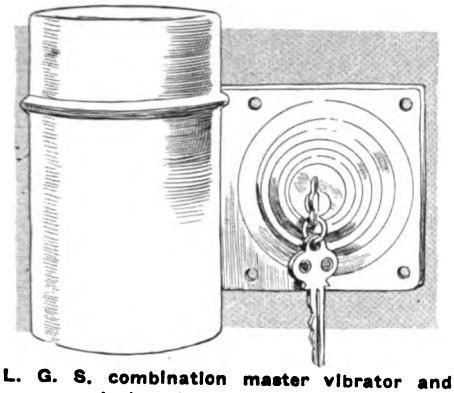
Master vibrators are popular attachments for Ford cars and the L. G. S. is a combination of vibrator and lock switch. The switch is a Yale lock job and nothing can be done with the ignition as long as the lock is thrown open. The same switch lock can also be had without the vibrator, and the attaching screws are so arranged that they cannot be withdrawn when the current is locked Off. This effect is obtained by making the heads of the screws accessible through holes in the cover plate, and when the key is turned pieces of brass are drawn across the holes. The switch alone costs $3 and the switch combined with master vibrator $12.—Bass-Moody Co., Peoria, Ill.

Universal Test Clips

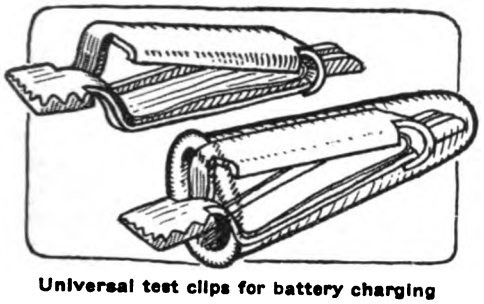
For making quick connections the Universal test clip has been brought out to fill the field in ignition and battery charging service. These are manufac-



Left—New positive drive for the Kemco fan generator. Right—Kemco starter, which can be used in connection with the fan type generator



L. G. S. combination master vibrator and lock switch for Ford cars



Universal test clips for battery charging

tured under different numbers pertaining to different types and examples of their construction, types 8 and 9 being illustrated herewith. The clip generally used by the automobile trade is No. 13-A, a 20-ampere lead plate design used chiefly for charging the batteries which come with the electrically equipped gasoline cars. Automobile manufacturers who receive these batteries in quantities line them up on great long tables and by means of jumpers fitted with Universal test clips connect the batteries up in series for charging. The jumpers are made by taking a piece of lamp cord 15 to 18 inches long and fitting the test clips on each end.

The battery charging stations and garages which have occasion to recharge these batteries also find use for the clips as a quick and ready means of making a connection. The teeth of the clips will bite through the corrosion on battery terminals, thus making it unnecessary for the garage man to clean the terminals.—R. S. Mueller & Co., Cleveland, O.

Spranger Rim and Wheel

This is a form of wire wheel which has the demountable rim feature and comprises a standard form of rim holding the tire, which rim fits onto a steel channel felloe to which the wire spokes run. Pairs of lugs are welded at equally spaced intervals around the inner surface of the rim, there being either three or four sets, depending upon the size. These lugs fit into slots cut in the channel sides of the felloe and make the firm attachment of the two parts. On the felloe is the locking mechanism shown in Fig. 1. The dogs A which are pivoted to the felloe may be swung outward by the threaded nut B on the bolt C. When the rim is in place, the bolt is turned and the dogs then enter slots cut in the adjacent sides of the lugs on the rim, preventing the latter from coming off. To prevent the bolt from turning, a flat piece of steel goes over the head and is held in place by its springing into a small indentation in the channel side of the felloe.

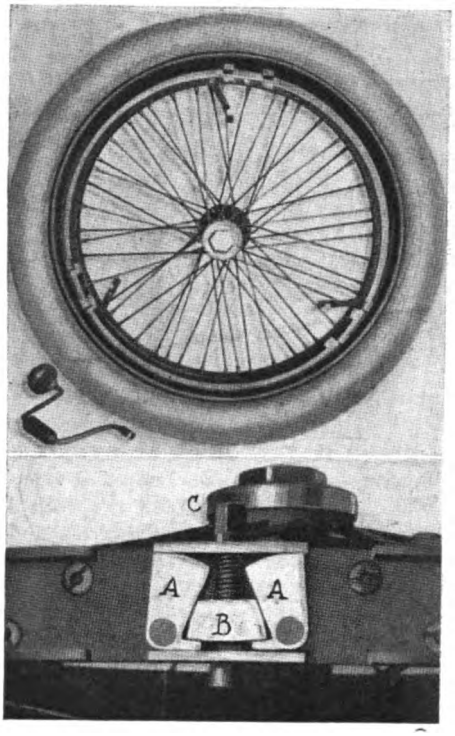
With this demountable feature, it is pointed out that the wire wheel is as simple to have as the wooden type. It is not necessary to carry extra wheels but simply the rims as would be the case with wood types. However, the Spranger concern makes this wire wheel with the demountable hub feature as well, the locking method being by means of two hub caps screwing on in opposite directions and thus holding each other in place.—Spranger Rim & Wheel Co., Detroit, Mich.

Johnson's Wax Body Polish

With the idea of meeting the need for a protection for the high finish of the body, hood and fenders of all sorts of cars, S. C. Johnson & Son are manufacturing a hard, dry wax, which they claim prevents both dust and water from sticking to the surface. This wax has long been used for polishing woodwork, floors, furniture, pianos, etc., which suggested to the makers that its quality of holding luster indefinitely because of its hard, dry impervious nature, would render it of value for automobile work. The wax is said to cover up small scratches, an advantage being that it is said to produce as fine a finish over varnish of poor quality as over that of high grade, the wax acting entirely independent of the original finish on the car, and being equally effective as a protective agent, irrespective of the condition of the surface to which it is applied.—S. C. Johnson & Son, Racine, Wis.

Steering Steady

To prevent the sidesway in a Ford car due to the construction of the spring assembly wherein both front and rear springs are hung between two shackles or links that are free to move sidewise, is the purpose of an invention known as the L-A Steady Steerer. It consists of a strut as shown in the illustration which

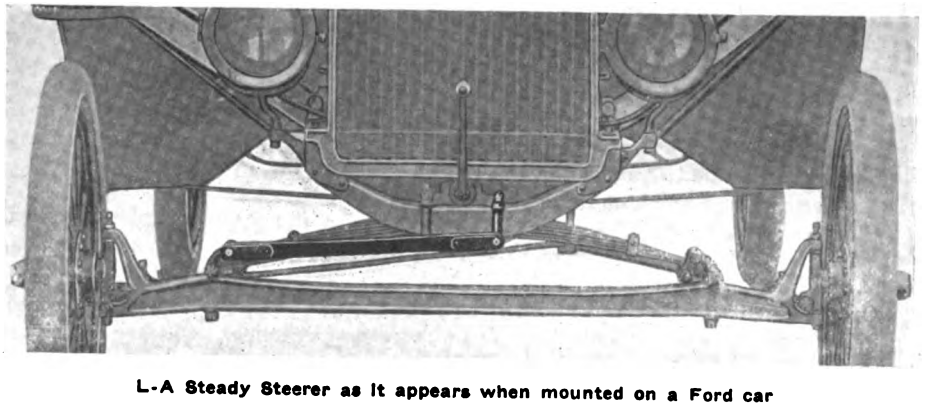


Upper—Spranger wire wheel with demountable rim. Lower—Locking mechanism

is so connected between the body and the axle as to hold the latter in a position that will cause the road wheels to remain in a straight course set by the steering wheel. It accomplishes this by drawing the axle sidewise on upward movement, and by pushing it on downward movement, keeping the relation constant.

This is advantageous because, it is pointed out by the maker, whenever the Ford machine not equipped with the steerer receives an axle side pull sufficient to overcome the weight of the body, which weight ordinarily holds the body, central on the chassis, then the axle moves sidewise in exact proportion to the force exerted.

In application, the end of the strut attaching to the frame is fitted with a spring bolt to take the place of one of those ordinarily attaching spring to frame, while at the axle end it attaches to the regular link bolt which connects between the link and the spring shackle. —Lockwood-Ash Motor Co., Jackson, Mich.



L-A Steady Steerer as it appears when mounted on a Ford car

Four Cylinders and Their Future

Is There a Market for the $1,000 Four?—Some Thoughts Suggested by Gossip on the Recent Society of Automobile Engineers' Trip

By A. Ludlow Clayden

THE past, present and future position of the four-cylinder automobile in America has been a favorite subject of discussion among engineers for several years, but on board the steamship Noronic on the recent summer session of the Society of Automobile Engineers it seemed to rival any other topic when three or four engineers got together between the meetings. The writer, having taken a share in several such informal conferences, finds, after a week's reflection, that there arise upmost in his recollection a few leading ideas on which agreement seems fairly general.

First of these, without a doubt, is that the four-cylinder motor has seldom, if ever, been given a proper chance to show its quality, because it is in isolated instances only that it has been made with an eye to anything but low production cost.

Making a Cheap Motor

Now, there is only one way, as a rule, to discover or create an inexpensive *good* article of any kind and that is to make it good first and cheap afterwards. Since engineers have discovered how to make good sixes and good eights, to say nothing of good twelves, hardly anyone has had the time to make a four along similar lines, and it is safe to say that nobody has, till recently, given deep attention to the possibility of creating a really good four-cylinder motor that could find a place in a $1,000 chassis.

There are, of course, motors which are used in cars of about this price whose manufacturers would consider them good motors, and they *are* good from several viewpoints; but they are not modern designs of the high-speed, high-efficiency type directly comparable with the eights. We have nothing on the motor market that resembles one-half a Cadillac, for instance.

There are some big fours of excellent design and comparable with any modern work at home or abroad, but these are in fairly high-priced cars and are not to be bought for assembly manufacturing. Yet, considering what we now know concerning the cost of making a highly efficient eight of dimensions approximately 3 by 5 in., it seems reasonable to suppose that an equally well made four *could* be produced at a price which would make possible its incorporation in a $1,000 car.

Buyer's Taste a Question

It is obvious that such a motor would give us only about one-half the power of a 3 by 5 eight or two-thirds that of a six of similar dimensions, though in practice the power should be a little in excess of this proportion at equivalent crankshaft speeds, so we come to the point of wondering whether the power available is enough for any sort of automobile that the American user would accept.

Question: Is there still magic in the words six and eight, or is it the absence of the kind of car we are considering that makes the absence of the demand?

Or putting it another way: Will the man who now uses a $720 four pay another $250 for a little more power, much smoother running and much better finish on a car of the *same size.*

The writer, realizing how greatly conditions differ both as to service and to public taste on opposite sides of the Atlantic, always hesitates to bring in any argument based on European experience solely, but in this connection it is not out of place to just mention the fact that the well made, small size and rather costly car was an experiment when it came on the European markets. Europe has not had any good $1,000 cars to carry four people, but that is a matter of quantity only. There are several British and French automobiles of four-passenger capacity which are regarded as good material, workmanship and finish, that could easily be sold for this price if they could be made in thousands instead of hundreds. Now, the British and French buyer was very skeptical about these cars when they first appeared, very skeptical indeed, and it took experience to show him that their wonderful economy in upkeep combined with better performance than that anticipated made them desirable things to own. Might not the same thing reasonably happen here?

Who?

At this point comes the greatest divergence of opinion. The writer confesses to an open mind and merely observes that the engineers divide into two main camps, those who say that the American user thinks more of size than anything else, and those who say that "they would like to see some one else try out the scheme."

In estimation of the buyer's predilections the salesman ought to know, but it is the experience of many different sorts of business that the salesman often is too conservative. He hates to change a thing which is going moderately well for fear it should not be approved. He is a little loth to gamble on a new article.

Thus one may query the estimate of the public mind.

Quality Beats Quantity Sometimes

Taking the broad view, there are many things which the American man or woman likes to have of the highest possible quality regardless of cost. In fact, does not this apply to all the surroundings of daily life, to furniture, to homes, to food, to clothes even? There is no rush for the largest house, the largest chair or the widest menu that a given price will buy, so why should there be regard for bigness only in automobiles?

Here no doubt many of my readers will say, "That may be all very well for other places, but size for money has been the manufacturer's cry so long in the automobile field that it is too late to try any other tack." Well, it may be so, but there are many engineers and many manufacturers who do not seem to be so sure about it.

Precedent Broken by Eights

Perhaps the coming of the multi-cylinder motors after we thought that everything had settled down to sixes and fours has shaken convictions. Perhaps it was the ready way in which expensive cars of new construction were seized upon by the motorist, which has disturbed the tranquil attitude of two years back, but it *is* disturbed and there are chances

now for many novelties which had no chance till something happened along to shake the automobile industry to its very foundation; and, let it be remembered, the ultimate user, the customer, is a part of the industry, just so soon as he buys his first car, and he is shaken, too, with the rest of the trade.

A Household Parallel

America of all places in the world is the last where conservatism of the buyer need be considered as paramount, for in no other country on the globe are people educated to the point where the rapidity of advance of science and manufacture is realized. There are literally thousands of petty, labor-saving household tools and utensils in universal use in U. S. A. which could not be sold in any other market without an educative campaign spread over years.

Does this not really mean that if the manufacturer has something he knows is good, something which will give satisfaction to the man who buys it, it will take less effort on his part to make the buyer fall in with his views in America than it would anywhere else? If this is true, then it is not really necessary to think about the buyer and his supposed tastes, since it is possible to *create* a new taste with very little effort.

Now, given our small, but highly-efficient motor, we know that good road performance is obtainable by putting it into a car of a weight in proportion to its power. Half a Cadillac motor will pull half a Cadillac car. Can we make that half car is the question troubling many engineers.

It is, of course, obvious that we cannot make it to hold the same number of people, the load must also be in proportion, but, if we continue the Cadillac allegory, and assume that this car gives a proper power for seven passengers, then the half size motor should be almost equally at home with four passengers and well content with three.

Most of the cheap five-passenger cars on the American market to-day are not big enough for their rated load. They are comfortable for four, but a tight fit for five, and it is noticeable on the road that the normal load is three or four. Past four there is just as strong a chance of finding six or seven aboard as of the rated five. So it is open to question whether the nominal five-seat capacity is so important as some people would have us believe.

In conclusion, the writer again wishes to emphasize the fact that he is unconvinced either way. He sets up no pretense to be a judge of the buyer's taste, but when so many engineers and so many manufacturers are found discussing somewhat along the lines here expressed, the questions become matters that the motorist and the member of the trade ought alike to consider. Perhaps nothing will happen, perhaps much will transpire; it is far too early yet to offer even an opinion on the subject. The purpose of the writer is to throw a little light on some straws which are fluttering in the breezes of Michigan and Ohio and have not yet taken a sufficiently settled position to indicate the way the wind is going to blow.

Argentina an American Automobile Market

AMERICAN-MADE automobiles are steadily gaining in popularity in the Argentine market, their proportion of the total imports of automobiles into that country having risen from 10½ per cent in 1912 to more than 19 per cent in 1913, the latest period for which detailed official returns are available.

The imports of automobiles into Argentina during 1913 were valued at $5,194,200, supplied chiefly by France, the United States, Germany, Italy, the United Kingdom, and Belgium, in the order named. While France still ranked first in the importation of automobiles into Argentina in 1913, the United States made a larger actual and relative gain than any of the other countries named, and rose from fourth place in 1912 to second place in 1913. In 1914, when the world-wide depression reduced the value of automobile imports into Argentina to about one-fifth of their normal total, those from the United States also decreased, the exports of automobiles from the United States to Argentina and other countries of South America in that year being a little over one-third of those of the preceding year.

Exports from United States

The imports of automobiles into Argentina during the last four years were as follows: 1911—2461, valued at $2,346,600; 1912—4281, valued at $5,159,000; 1913—5115, valued at $5,194,200; 1914; 2185, valued at $1,105,700.

Exports of automobiles from the United States to all countries increased from 329, valued at $2,833,154, in April, 1914, to 5345, valued at $8,045,222, in April, 1915. This growth was almost exclusively in commercial automobiles, of which the exports rose from 52, valued at $72,676, in April, 1914, to 2267, valued at $5,240,481, in April, 1915. About half of these commercial automobiles went to France and the remainder chiefly to England and other European countries. In the 10 months preceding May 1, 1915, exports of passenger automobiles aggregated 14,641, valued at $12,356,472, as against 23,167, valued at $20,664,480, in the corresponding period one year earlier; while those of commercial automobiles numbered 8580, with an aggregate valuation of $23,977,968, compared with 595, valued at $934,330 in 1913-14.

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Road Dust in Cylinders, Etc.

(*Continued from page* 18)

anism with a lot of exposed parts and journals and electrical connections and then actually suck all the dirt there is around the country in upon it."

Mr. Jehle cited German experiments to the effect that it was more important for cooling purposes to subdivide the air into small parts than to subdivide the water.

On the whole it was generally admitted at the meeting that the current of air which the fan of the average car is capable of drawing in through the average radiator is very wastefully applied, from which it would follow that the total area of air intake, at the front or rear of the radiator or behind the fan, could be reduced without harm if the means used for this purpose involved a more equable distribution of the air supply in all portions of the radiator and less violent counter-swirling of the air once it was under the hood. The problem of reconciling and combining such improved construction with provisions for filtering or precipitating the road dust before it reaches the carbureter is now bidding for an experimental solution which in course of due time may find its way into standard design.

For the first experiments it may perhaps be preferable to determine the dust question independently of all complication with the efficiency of the cooling system and to erect a filter box of ample dimensions around the whole carbureter, including hot, cold and auxiliary air intakes, but if the premises are found correct, according to which there are faults to be remedied at the primary air intake through the radiator as well as at the secondary intakes in the carbureter, the prettier and more thorough improvement must evidently in the long run be one which strikes the evil at its root, excluding dust from all air entering under the hood.

Among desirable data, meanwhile, would be such as would make it clear whether dusty country driving produces carbon deposit more rapidly than city driving, under otherwise equal conditions.—M. C. K.

Studebaker Refines Four and Six

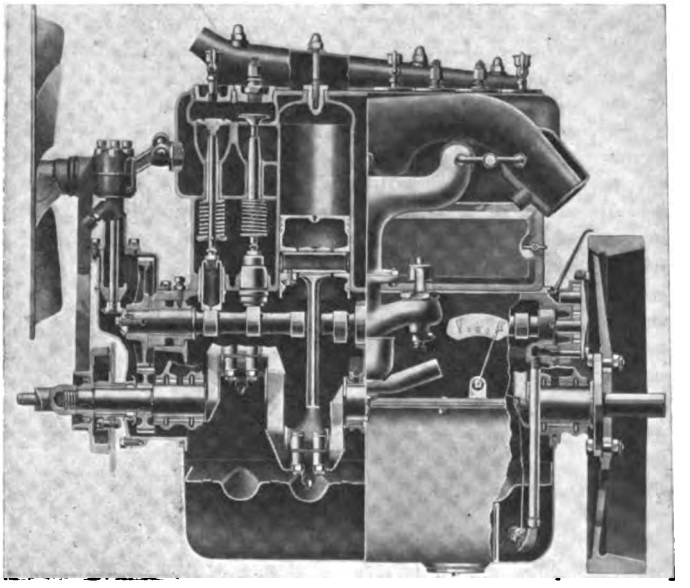
Cars for 1916 More Powerful, Larger, and Sold at Lower Price —Standardization of Parts Lessens Cost of Manufacture

GREATER standardization of the parts entering into its two chassis—four and a six—and further attention to production make it possible for the Studebaker Corp. to bring out its new models in larger and more powerful form at reduced prices.

The price cut is most emphasized in the six, which is to sell at $1,050 as a seven-passenger touring model, and $1,000 as a roadster. For the previous seven-passenger six, the price was $1,450. In the seven-passenger touring model on the four-cylinder chassis, the cut has been $100, making it $885; while the new roadster is $135 less than previously, or $850.

The bodies are practically alike on four and six chassis and most of the difference in wheelbase is taken up by the engine. The cars are made to conform to the same general design throughout, so far as possible. In fact, they are much more similar this year than ever before, and practically the only differences in addition to the difference in number of cylinders, are the wheelbase, rear axle gear ratio, and rear spring size.

This standardization is reflected in the prices.



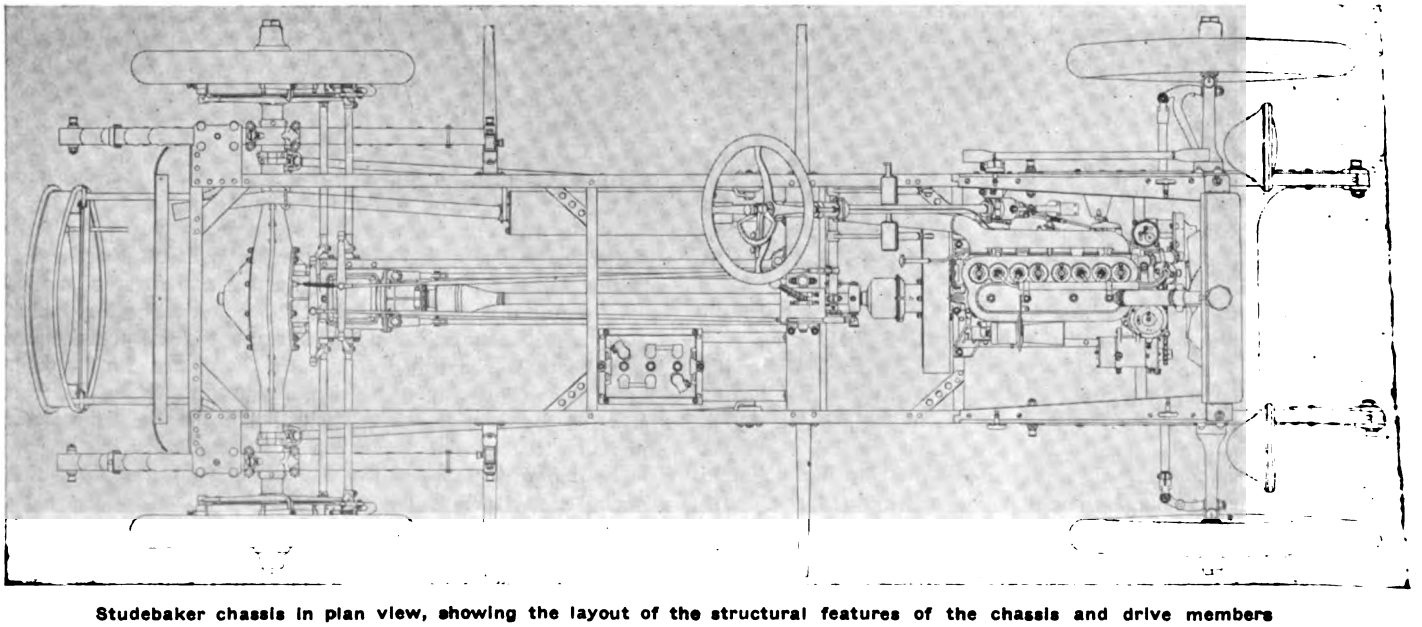
Studebaker four-cylinder motor similar design to six used for 1916

Greater Accessibility

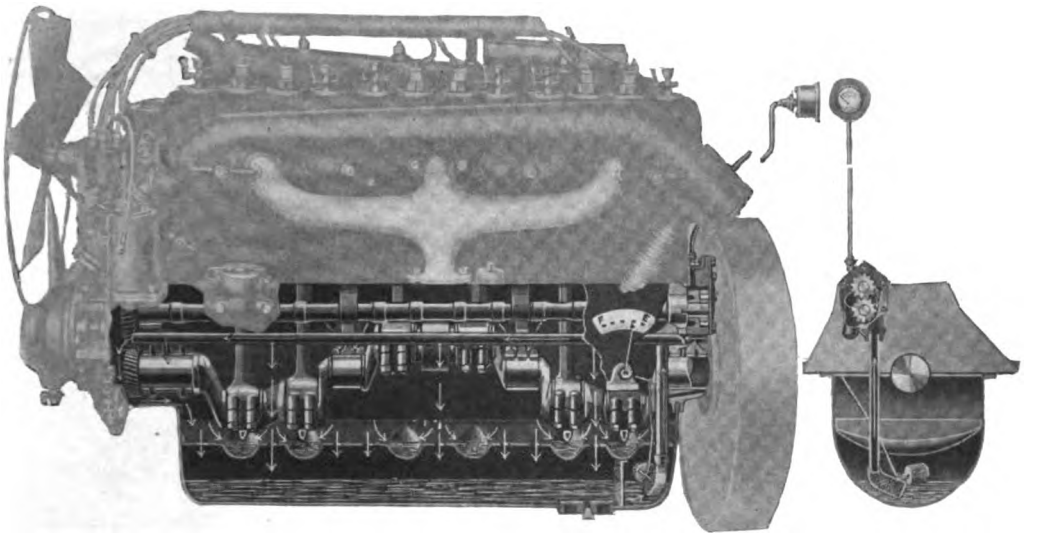
One of the main changes in the cars as compared with the previous types is in the redesigning of the engine for greater accessibility and quietness along with more power. The bore has been increased from 3½ in. to 3⅞ in., the stroke remaining the same as it was, at 5 in. The cross-shaft at the front has been removed, and there is a big change in the manifolding. The wheelbase has been lengthened on both chassis, the six getting 1 in. more, making it 122 in., and the four having 4 in. added to give it 112 in.

Improvement in the clutch, enlarging of the propeller shaft, a general smoothing out of the lines of the bodies, changes and simplifications in the electric system and the wiring, the use of real leather upholstery and some other minor improvements in the chassis and frame are points which will indicate that although Studebaker has seen fit to come down in the prices of its cars, there has been no curtailment of their value. In fact the cars are larger, more comfortable and have greater power.

In general, however, characteristic Studebaker design still holds in the mechanical make-up of the cars. The gearset is still in combination with the floating rear axle; a cone clutch is used; the Wagner electric lighting and cranking combination is employed, and the gasoline tank is in the cowl.



Studebaker chassis in plan view, showing the layout of the structural features of the chassis and drive members



Refined lubricating system as used in the six-cylinder model

The increase of the bore of the motor, together with the other alterations, add about 22.5 per cent to the piston displacement of the powerplants, and it is claimed that an even greater percentage of increase is made in the horsepower. The six has a displacement of 353.8 cu. in., and is rated by the maker at 60 hp., while the four has a 235.3 cu. in. capacity with rated horsepower of 40.

Cross-Shaft Removed

Probably the most important change in the engine design is in the removal of the cross-shaft at the front. This was spirally driven from the camshaft gear and operated the water pump on one end and the ignition distributer on the other. Now the pump is driven from the camshaft gear on the left, and the distributer is vertical and operated through bevel gear connection with the front end of the camshaft. The other unit affected by the change is the generator, which now sets on end with its armature shaft vertical and has spiral gear drive from the front gears. This is on the right forward side.

The starter motor is also placed at the front and on the right side. It is arranged horizontally and drives the crankshaft through a roller chain connection and a housed-in train of reduction gearing. The chain is not inclosed, and is compactly placed between the fan pulley and the gear housing. The driving sprocket has nine teeth, and the sprocket on the crankshaft end has forty teeth. In the front gear driving system of the new motors, the matter of silence is provided for by the making of the mainshaft and generator gears of case-hardened steel, with the camshaft gear of cast iron. This gives steel running against iron.

Manifolds Redesigned

Another big change is the abolition of the internally-cored passages for the distribution of the gases to the cylinders. The carbureter formerly occupied a position on the right side, and the gases thus went through the water jackets to the valves on the opposite side. Now, however, Studebaker has gone back to the original method of placing the carbureter on the valve side, and using separate manifolds to get the gases to the intake openings. It is believed that by using these manifolds with smooth and uniform passages, the power is augmented, for there is less friction. Cored passages are bound to be somewhat rough on the inside, and then, too, it is difficult to make the section uniform. With this new intake manifold construction, the exhaust header is shaped so that the intake piping can go below it without interference with the valve cover.

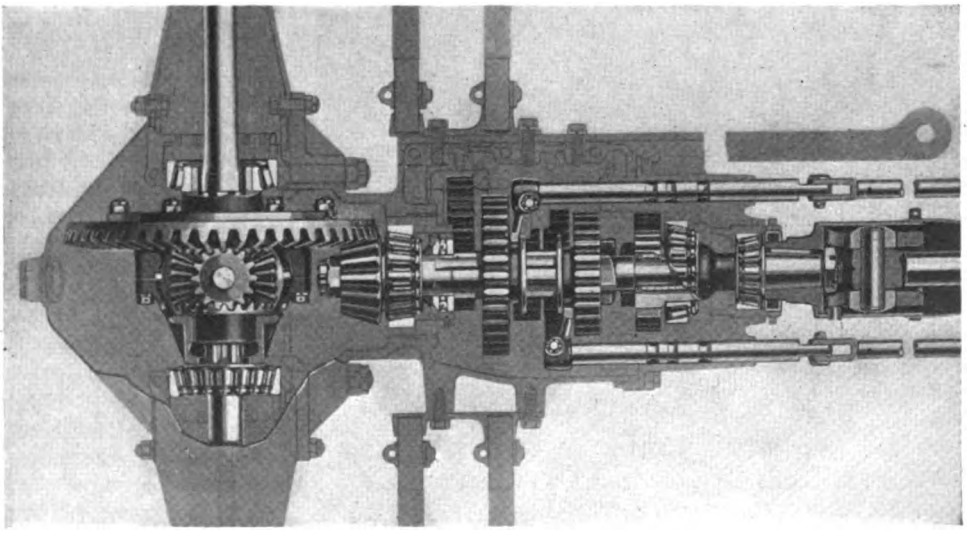
Along with stiffer rods and larger crankshafts, the pistons have been lengthened 5/8 in. to make them 4 5/8 in. long. The pins now are secured to the pistons by set screws, which is in contrast to the old method of pressing them into the rod end with bearing in the piston bosses.

A change has also been made in the tappet design, making it much easier to take them out if necessary. They used to be made of mushroom shape, that is, with the big end at the bottom, making it compulsory to take them out through the crankcase. Now they are the same diameter all the way down, so that they can come out through the top as soon as the valve and spring are out of the way.

Oiling System Altered

There is a change in the circulating splash oiling system, which is conducive to a more positive oiling at low engine speeds. The former plunger pump located on the side of the crankcase and driven by a camshaft eccentric has given way to a gear pump on the rear end of the camshaft. This also does away with the slight noise which the old type made. Also, the sight feed on the dash has been replaced by a pump pressure indicator.

A very clever improvement over the former wiring of the electric system is made in the fitting of a junction box. This box is placed on the right rear side of the engine where it is very accessible. All wires go to this box, and there is practically none on the body with the exception of that going to the control apparatus on the instrument board. A cover



Rear axle and transmission system which has been continued in the refined models

plate over this junction box held by four screws gives access to the wiring connection for the entire system. As this box is very close to the motor generator and starter, the wiring is consequently very short from them. All of the wires run through waterproof conduit, and as the system is of the one-wire type, it is doubtful if a more compact or simpler wiring layout could be worked out.

Should it be necessary to remove the body from the chassis, the minimum disturbance of the wiring would be necessary, due to this mounting on chassis and motor. Further, it is usually considered that the greatest troubles from the electric systems of the modern car are due to the working loose of connections, and as most of them on these new Studebakers are a part of the rigid portion of the machines, any body movements will not affect them—factors which should make a very efficient electrical system on the whole.

Six-Volt Electric System

The storage battery, a 100-amp.-hr. Willard, is placed under the right front seat and attached to the frame in a special hanger. The electric system operates at 6 volts, and though the starting unit is smaller and of lighter weight, it is said to be more efficient, cranking the engine at higher speed through being geared higher.

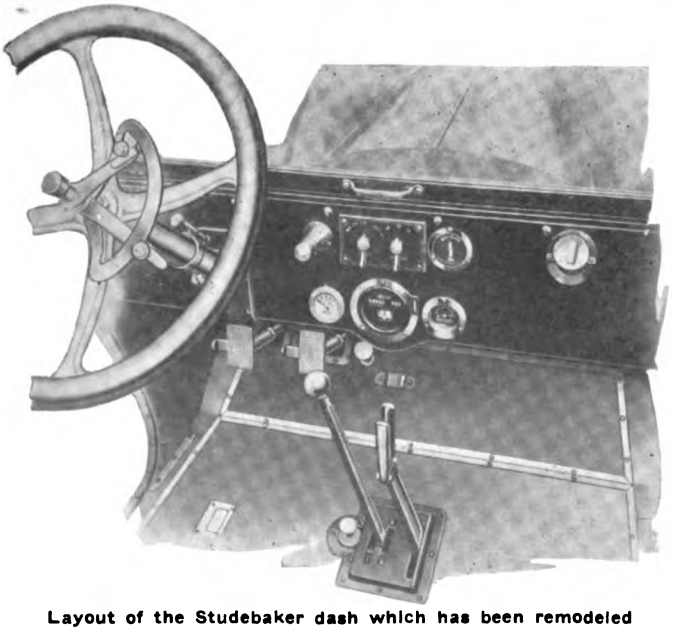
In the clutch a change has been made to make this unit more serviceable. The former bronze clutch collar has been replaced by a ball-bearing throwout, this tending to less wear and requiring less attention.

The propeller shaft has been made more substantial and whipping has been prevented by increasing the diameter from 1⅛ in. to 1 5/16 in. The shaft is an alloy steel design, fitted with a universal at either end.

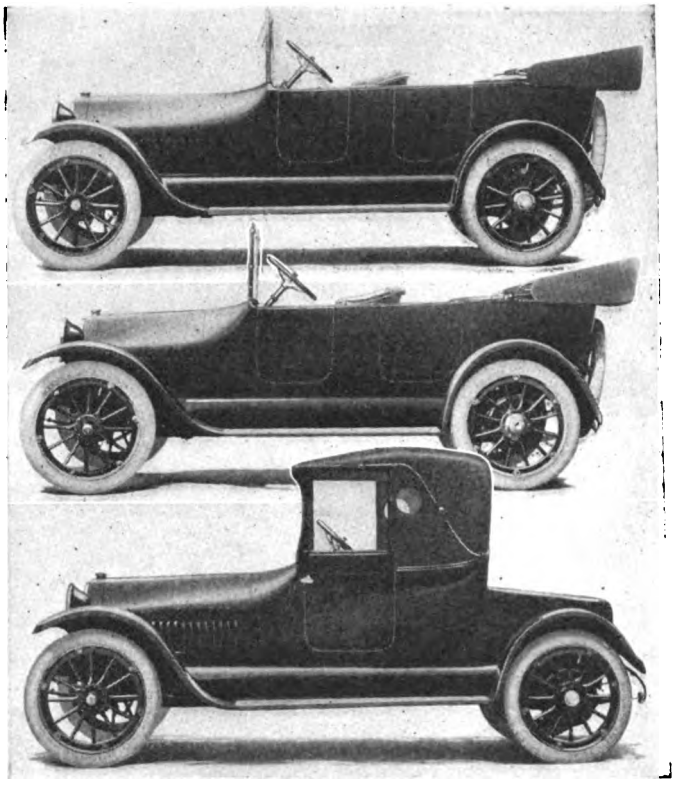
The gearset bolts through a flange to the pressed-steel housing of the rear axle, and on the left side of it is attached a pressed-steel torsion arm which runs forward to a mounting on the intermediate frame cross-member. Radius rods run forward to the frame side members to do their part in preserving axle alignment.

Brake operating shafts and equalizers are now carried on the rear axle unit, and the brakes and radius rods now swing on the same center making for uniform brake action regardless of car load. In the gearset there are no changes, but the axle housing has been made heavier. The four-cylinder chassis has an axle ratio of 4 to 1, and that of the six is 3.7 to 1.

The entire spring suspension has been gone over, and on all cars three-quarter elliptic rear springs are fitted, these being underslung from the axle. They measure 51 in. rear and 38 in. front on both cars. The previous four has elliptic rear springs, although the six used three-quarter elliptics. The cars are lower hung than formerly also, this being brought about by the lowering of the rear springs along with the dropping of the front axle at the spring seats.



Layout of the Studebaker dash which has been remodeled



Studebaker bodies for the 1916 season, showing from top six-cylinder seven-passenger, five-passenger design and coupé

Frames have been strengthened by having fewer holes in them, and these are not in line, so that no weakening should result. Another minor chassis detail is the fitting of a long tail pipe to the muffler to avoid noise under the body.

Tires are 34 by 4 on either chassis, this being an increase on the four which formerly was shod with 33 by 4's. Straight sides are used, the rear set being of the safety tread type. A new form of rim is also supplied, the main feature of which is a special form of pawl lock which makes it easier to detach the tire.

The wheelbase increases give more body room, and along with this, the bodies are well proportioned and of excellent lines. The back of the front seat has been shaped to fit the back, really making an individual back for each of the front passengers. A new form of auxiliary seat is provided. These fold into compartments in the floor of the tonneau, and when not in use, they are flush with the floor. But when unfolded, they leave a sub-floor exposed, and in this the seat occupant can comfortably put his feet.

These comfort features taken together with the fact that more attention has been given to balance than ever before, so that vibration and motor noises have been materially reduced, gives a more efficient power-plant as well as a more efficient chassis. Heavier dimensions in critical parts from crankshaft throughout the entire chassis are in a measure responsible for the excellent results.

In the control of the cars, the improvements are principally the providing of adjustable pedals, and the locating of the starter pedal more conveniently at the gearshift gate. A new dash arrangement has also been effected with the instruments all grouped for one light. The rotary electric switch has been removed from the heel board and mounted on the dash, and a lock is provided for the ignition switch. A vibrator type of horn has given way to a Sparton.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, July 1, 1915 No. 1

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
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Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Aluminum Pistons

ONE of the significant points of the S. A. E. summer session was the fact developed that aluminum pistons are here to stay. They have come as only another interpretation of the practically universal trend towards small bore and high speed.

Granted then, that this field has been opened to the aluminum foundrymen and the aluminum piston has been accepted, there are still some points which have not been reduced to standard practice. The formula for the alloy itself is still in the trade-secret class and naturally the subject of a difference of opinion. The exact clearances necessary are still debated and the reinforcing of the piston head to take care of the effect of the high temperatures on the strength of the material is a necessary precaution which must not be underestimated.

These and the other technical questions must be studied by the foundrymen because there is no doubt in the light of present developments that the car designer is going to call upon them to furnish these light castings. In the discussion at the S. A. E. meeting on the Lakes no one brought any serious objection against the light pistons, and now that the engineers of the automobile industry have given their approval it is to be expected that cars regularly equipped with these pistons will rapidly increase. In meeting the demands for light weight in pistons aluminum alloys are today occupying the position that cast steel was booked to take.

100 Miles Per Hour

FIVE HUNDRED miles in 5 hr., almost if not quite, for 7½ min., less would have done it! Pause and think, for it is truly something worth thinking about.

What does it *mean?*

This perfectly prodigious speed means that firstly, the machine has been created of the needed power and stamina; secondly, that the air-filled tires have been made to carry the machine and transmit the power; and thirdly, that the track has been built on which such a machine can run in safety.

For the track, all credit to those who constructed it, but no deep problems of science had first to be mastered.

For the tires, the mechanical clear thinking which produced the cord construction and the labor of rubber experts calls for praise and admiration.

For the machine, we have to make acclamation to thousands of engineers and thousands of metallurgists of many nations, who together have devised new and ever new ways for loading metal as it never was loaded before, and for making new metal to bear the stress.

Like all marvels of this age, we, a people dulled to appreciation by ever-repeated wonders of mechanics, are apt to regard it very calmly.

What, after all, is there so very wonderful about it?

Well, let us pour out a bucket-full of gasoline and placing it on the floor take in our hands four aluminum pistons weighing, say, a pound apiece. Problem: From some stuff like that limpid liquid in the bucket, through the medium of these four bits of bright metal, push 2 tons on wheels 500 miles in 5 hr.

What would you have said 10 years ago?

Don't Stampede

A NOTED English engineer recently voiced the opinion that the multi-cylinder movement which has gained such headway in this country will serve to develop the four and the six. In Europe the same conditions were experienced, only instead of eights and twelves, the six was the disturber. For several years Europe took up sixes enthusiastically, but now there are few made abroad. The six was more flexible and a better performer than the fours then built, but its coming stirred the designers of fours to greater activity, with the result that before long they were producing fours that were as good performers as the sixes. It took the six to waken them.

The public is not going to care whether it rides behind a four or an eight or a twenty-four so long as one performs as well as the other, so is not the main thing to bring the fours and sixes up to the standard of the eights and twelves? It will be easier for many engineers—and better perhaps for the dividends of the concerns they represent—to concentrate upon the making of better engines of types with which they are already familiar, than to strike out blindly into a field of design that is wholly new.

Two-Speed Rear Axle Suit

Washington Patent Attorney Sues Cadillac Dealer and Detroit Maker

WASHINGTON, D. C., June 26—Claiming damages in the sum of $100,000 Dempster M. Smith has filed suit in the District supreme court against the Cadillac Motor Car Co., Detroit, Mich., and the Cook & Stoddard Co., their agents here. Smith claims that he is the inventor of certain improvements for a motor car to change the speed gearing; that letters patent were issued to him by the patent office on February 7, 1911, and January 27, 1914, for these inventions. He further alleges that the Cadillac Co. and the Cook & Stoddard Co. have sold cars equipped with double direct-drive transmission gearing, which, he claims, is an infringement on his invention and that said gearing is in all respects similar to the gearing covered by the letters patent which he holds. He alleges that these cars have been exposed for sale since the issuance of the patents to him. Smith is a patent attorney and is associated with a patent law firm here.

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Two Hudson Additions

DETROIT, MICH., June 28—The Hudson Motor Car Co. has contracted for two additions to its plant which will cost about $40,000. The first addition, a two-story building, 60 by 180 ft., will provide more room for the tooling and enameling departments. The second addition will consist of a three-story building, 60 by 100 ft., to the chassis and chassis painting departments.

—

Monarch Officials Resign

DETROIT, MICH., June 28—Three officials of the Monarch Motor Car Co., H. D. W. Mackaye, sales manager; W. R. Bamford, production manager, and A. A. Lehr, director of purchases, have severed their connection with the company and will enter into business for themselves.

—

Tire Co. to Start Near Denver

DENVER, COL., June 24—Colorado will soon have a modern tire factory, which will make tubes and casings especially adapted for the dry climate of the Rocky Mountain region. The plant is now being constructed and equipped at Arvada, 7 miles from Denver, by the Dry Climate Tire Mfg. Co., a Colorado corporation.

The first unit of the factory, a one-story building 75 by 200 feet, has been completed, and the machinery will be installed at once. The new concern expects to have tires ready for the market by July 1. The plant will be of modern construction throughout, equipped with the latest machinery, and expert tire builders will be brought in to take charge of the work.

Among the experienced tire men connected with the new enterprise is F. B. Clark, for several years with the B. F. Goodrich Co., who will be sales manager for the Dry Climate tire and who is well known to the trade throughout the ten or twelve states comprising the territory for which the new tires will be especially made. In the beginning, at least, the company expects to confine its trade to Colorado, Wyoming, Idaho, Utah, Arizona, New Mexico and part of Oklahoma, Texas, Kansas, Nebraska and South Dakota. This territory is now showing a yearly increase of about 10 per cent in the tire business.

The promoters of the new project have been experimenting for a year and a half to ascertain results of curing and vulcanizing tires in this climate, and claim that they will be able to sell their "acclimated" tires at standard prices and also furnish a 10 per cent. better guarantee.

The factory is being erected on a two-acre site donated by the people of Arvada, and the company has an option on an adjacent tract of five acres for expanding. The concern is incorporated for $200,000 and is financed entirely by Colorado capital.

There is no other tire factory in this vast territory between the Mississippi Valley and California.

The present size of the plant will have a capacity of 100 tubes and cases daily.

—

Fight Tar Nuisance

BOSTON, MASS., June 19—The first gun in the campaign to abolish the tar nuisance where the entire width of the highway is spread with it at one time took definite form here last week when the Automobile Legal Association sent out a request to newspapers and other organizations to fight the matter. The Bay State A. A. officials at once pledged their aid and the fight will be made throughout the State. The Highway Commission is to be asked to specify in all its contracts that but one side of the road shall be tarred at a time. In its request issued to-day the Automobile Legal Association states that the tarring of the entire width of the highway is not only responsible for damaging cars, but it also makes traveling dangerous, and increases the chances of accidents. And as the motorists pay more than $1,000,000 now in fees alone, exclusive of personal property taxes, it is felt that such nuisances should be abolished.

U. S. L. & Heat Co. Reorganized

Capital, $7,000,000—Headquarters at Niagara Falls—To Sell Old Co. July 1

ALBANY, N. Y., June 28—The United States Light & Heat Corporation of Niagara Falls, was incorporated to-day with a capital of $7,000,000. The company purposes to manufacture machinery and apparatus for the production of light, heat and power. The directors include A. Stanley Jones of 61 Broadway, New York; G. M. Walker and A. L. Fowle, 60 Broadway, New York.

The new company is to take over all the property and assets of the old United States Light & Heating Co., valued at approximately $2,500,000. The stockholders of the old company already have paid in assessments amounting to $472,000 and it is expected that before the new company begins business on July 1 at least $525,000 will have been received.

The sale of the property of the United States Light & Heating Co. is to take place at Niagara Falls on July 1 next and the stockholders' protective committee will bid for the property on that date, an amount probably slightly in excess of the $750,000 of debts of the old company.

It is the purpose of the management of the new company to eliminate the New York office, having its headquarters in Niagara Falls.

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Chalmers Twin City Change

MINNEAPOLIS, MINN., June 29—The Chalmers Northwest Co. has been organized and incorporated, its capital stock being $50,000, of which $35,000 has been paid in. The new company has been appointed distributor for the Chalmers for practically the entire state of Minnesota and sixteen counties in Wisconsin. E. C. Thompson is president of the company; G. N. Michaud, vice-president; R. V. Hess, secretary-treasurer. Joseph Warren, formerly with the Chalmers Motor Co., Detroit, is sales manager for Minneapolis and G. N. Michaud is sales manager for the branch which will be operated in St. Paul.

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Keeton Plant Sold

DETROIT, MICH., June 28—The Detroit Trust Co., receiver for the American Voiturette Co., which made the Car-Nation and Keeton cars, has sold the bankrupt concern's plant to Louis R. Grosslight, Detroit, and Isaac Gersen, Toledo, Ohio. The plant and factory property were appraised at $45,000 and it is said that this amount will be realized by the sale.

1916 Crow Price Reduced

Four-Cylinder Model Offered at $725 or $425 Lower—Complete Equipment

NEW YORK CITY, June 24—The Crow Motor Car Co., Elkhart, Ind., is offering a popular priced model for 1916 listing at $725 with full electrical equipment. This is a reduction of $425.

This new model known as the CE "30" is the largest four-cylinder Crow model that will be produced this year. The 3½ by 5 long stroke motor develops 34.9 hp., on brake test. The cylinders are cast en bloc with water jackets integral. The cylinders and head are cast separately. The head is removable. The connecting rods and crankshaft are drop-forged, 40 per cent carbon steel, double heat treated. The exhaust manifold is cast with an inner partition to prevent back pressure from one cylinder to another. The front crankshaft bearing is 1¾ in. diameter by 3¼ in. long and the rear is 1¾ in. by 3 15/16 in. long.

The axles are of the same design as previously used in Crow cars. The rear axle is full-floating with differential gears of nickel steel and is accessible for adjustments. The front axle is an I-beam section, drop-forged in one heating with no welding. The brakes have 11-in. drums and a 100 per cent braking surface. The front springs are full elliptic; rear springs are three-quarter elliptic and are slung under the axle with supports which swivel on the crucible steel axle housing.

Thermo-syphon cooling system is used. Lubrication is by means of the splash, constant level system; the level being maintained by a plunger pump. The crankcase is reinforced aluminum. It is possible to remove any connecting rods and pistons without disturbing the adjustment of the main bearings.

The equipment is complete including head-light dimmers, dash light, muffler cut-out, combination tail-light and license bracket, hinged robe-rail, tire and rim carrier in rear and extra rim.

The body is of streamline design. The built-in windshield is of the rain vision, full ventilating type. The steering column is placed at the left with gear shifting lever and emergency brake in center. The Disco starting, lighting and generating system is of the single-unit type with a 12-volt battery under the front seat. Stewart speedometer, dash light, electric switch and gasoline tank filler are located on the instrument board.

The wheels are 32 inches, equipped with 3½-in. tires and demountable rims.

Auburn Four and Six for 1916

NEW YORK CITY, June 25—The Auburn Automobile Co., Auburn, Ind., has announced a four and a six for 1916. The four will sell for $985 and the six for $1,550.

The four is a T-head motor, cast en bloc, 3⅞ by 5, unit power plant with three point suspension. Other features are cantilever springs, left drive and center control, electric lights and electric starter, one-man top, and fully equipped without extra cost. The wheelbase is 114 in. and the tread is standard.

The six seven-passenger touring car has a 3½ by 5 motor, center control, left drive, cantilever springs, electric lights and starter, one-man top and folding and disappearing extra seats. The wheelbase is 126 in.

1916 Moon Six at $1,475

NEW YORK CITY, June 26—The Moon Motor Car Co., St. Louis, Mo., has announced a seven-passenger six for 1916 selling at $1,475.

A 40 hp. 3½ by 5 Continental-Moon motor, with Delco starting, lighting and ignition system with a new switch, having an ammeter on the dash, is used. Other features are a Hotchkiss drive with underslung rear springs; a longer wheelbase, 125 in.; streamline body with disappearing seats entirely concealed when not in use; Stewart vacuum gasoline feed and speedometer; full-floating rear axle, crown fenders and one-man top.

A larger six, 50 hp., selling at $2250, will also be manufactured. This car embodies the same mechanical design as the 1915 model. The company will manufacture only these two sixes for 1916.

Ford Postpones Capital Increase

DETROIT, MICH., June 28—Rather than incorporate in another State than Michigan, the Ford Motor Co., it was said yesterday, will delay for two years the payment of its stock dividend and increase its capital from $2,000,000 to $50,000,000.

The directors recently decided to make the increase in capital stock and to pay a stock dividend of $48,000,000. It was discovered, however, that Michigan laws provide that no company incorporated under its statute shall have a capitalization in excess of $25,000,000. The company has therefore decided to wait until legislative action empowers it to carry out its proposed plan.

Overland Raises Wages

TOLEDO, OHIO., June 25—The Willys-Overland Co. has raised the wages of its 10,500 employees 5 per cent, effective July 15. The increase was voluntary, and will add $520,000 a year to the payroll.

Apperson Eight at $1,850

Two Sixes Also to Be Made by Kokomo Concern—Four Dropped

KOKOMA, IND., June 28—Apperson Bros. Automobile Co. of this city, has announced an eight-cylinder car for the 1916 season. It will be known as the eight-sixteen and will be made in a seven-passenger touring car and a four-passenger roadster. The wheelbase is 128 in. and the eight-cylinder motor is a V-type having 3⅛-in. bore and 5-in. stroke. The cylinders are cast in blocks of four and mounted on an angle of 90 deg. on the crankcase.

In addition to the eight, there will be two sixes. A large car known as the six-sixty, of 135-in. wheelbase and a T-head 4¼ by 5 block motor on which is carried a seven-passenger touring body and a smaller six known as the six-sixteen, which will have a five-passenger car mounted on 122-in. wheelbase and a seven-passenger touring and four-passenger roadster on 128-in. wheelbase. The motor in this car is an L-head 3½ by 5⅛ with the cylinders cast in a block.

Large Size, $2,350

The prices for the eight-cylinder cars are $1,850 for the larger six; $2,350 for the smaller six; $1,485 for the five-passenger car; $1,550 for the roadster and seven-passenger design. The four-cylinder model made for 1915 has been discontinued.

Chief interest centers around the eight-cylinder car as it marks the entrance of one of the older concerns in America in this new field. The car is fitted with a three-speed gearset, floating axle and full electric lighting and starting equipment. It is of distinctive appearance having a V-shaped radiator which is used in connection with a thermo-syphon system. The tires are 34 by 4 in. on demountable rims and gasoline is fed by means of a vacuum system.

Compression Band Clutch

The six-sixty also uses a three-speed gearset with floating axle and is fitted with the Apperson compression band clutch. Cooling on this car is by vein pump and the V-shaped radiator is also employed. The tires on this car are 37 by 4½. The oversize for the 36 by 4 wheel. On the smaller six, known as the six-sixteen, pump water circulation is also used, together with three-speed gearset and floating rear axle. The tires are 34 by 4 on demountable rims and the gasoline is fed by vacuum system. All the cars are fully equipped, the fittings being included in the purchase price.

Briggs-Detroiter Bankrupt

Liabilities $350,000, Assets $150,000—Detroit Trust Co. Appointed Receiver

DETROIT, MICH., June 28—Referee in bankruptcy Lee E. Joslyn, to-day adjudicated the Briggs-Detroiter Co., manufacturer of the Detroiter cars, bankrupt, Saturday, June 26, Judge Tuttle of the United States district court, appointed the Detroit Trust Co. receiver for the automobile manufacturing company. Since June 16 the trust company has acted as custodian for the automobile concern.

An inventory of the liabilities and assets of the concern is now being prepared by tht Detroit Trust Co. and will not be completed for several days, but it is estimated by officials of this company that the liabilities will total between $350,000 and $400,000 and the assets $150,000 or thereabouts.

The creditors' committee which has been trying to re-adjust the affairs of the company was composed of R. K. Davis, Penn Spring Works, chairman; Louis S. Smith, Griswold Motor & Body Co.; M. A. Monahan, Gemmer Mfg. Co.; M. Brooks, Kelsey Wheel Co., and Attorney Luman W. Goodenough. The Briggs-Detroiter Co. was organized in November, 1911, with a capital stock of $200,000.

Westinghouse Rebuilding Cleveland Plant

EAST PITTSBURGH, PA., June 24—The Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., has obtained a permit to make extensive alterations in its Cleveland plant. It is stated that all wooden buildings will be replaced with modern fireproof structures. On completion of the new foundry the company plans the removal of the Pittsburgh foundry equipment to Cleveland.

Syndicate Buys 40,000 Shares of Stewart-Warner Common

NEW YORK CITY, June 28—A syndicate headed by White, Weld & Co. and Hornblower & Weeks, in which John Burnham & Co., Kissel, Kinnicutt & Co., and others are interested, has purchased from President J. K. Stewart of the Stewart-Warner Speedometer Corporation, 40,000 shares of his holdings of common stock in that concern. Mr. Stewart was the owner of considerably more than half of the $10,000,000 common stock and still remains the largest individual shareholder. He will continue as president, his contract to fill that office running until July 1, 1916.

The syndicate intends to resell the stock privately to investors and the syndicate agreement runs until Sept. 1.

To date the company has made about 150,000 horns and 80,000 vacuum tank gasoline feed systems. Net earnings of the company for the first quarter of 1915 increased approximately $185,000 over the corresponding period of 1914, and gross sales for the second quarter are estimated to be 25 per cent ahead of a year ago.

Picard to Distribute Connecticut-Ford Ignition System

NEW YORK, June 30—A. J. Picard & Co. has been appointed exclusive distributor by the Connecticut Telephone & Electric Co., Meriden, Conn., for a new ignition system for Ford cars which the latter company is just placing on the market. This is the standard Connecticut automatic ignition system with the necessary brackets and wiring adapting it for a Ford car. The system is designed for use on any Ford car which is equipped with a storage battery for lighting purposes. A feature is that only the switch appears on the dash, the coil being mounted on the engine close to the distributer.

Postal Service to Order 100 Trucks

WASHINGTON, D. C., June 29—*Special Telegram*—Within the next few days, the purchasing agent of the postal service will issue a call for bids for furnishing approximately 100 trucks for the city and rural delivery service.

The conditions to be presented in the proposals will be such as to make it possible for every manufacturer of trucks to enter the competition. The date of the opening of the bids in this city will be announced by the postoffice department later.

Continental After Boat Factory

MUSKEGON, MICH., June 26—The Continental Motor Manufacturing Co. is trying to secure for a period of about six months half of the shops of the Racine-Truscott Shell Lake Boat Co. and has taken up the matter with the receivers for that concern. Although more than 1600 men are now employed by the Continental company and large additions are in course of construction, more room is needed at once. If the shops are secured it will mean that the working force will be increased by 250 to 350 men at once.

$175,000 Addition for Packard

DETROIT, MICH., June 22—The Packard Motor Car Co. will erect a five-story factory addition, 395 by 60 ft., of reinforced concrete. It will cost $175,000.

Australia Requires Motor Trucks

Right-Side Drive Vehicles Are Desired—Dealers Want Sound Financial Makers

SYDNEY, AUSTRALIA, June 4—Motor truck business is going to be enormous in Australia, in fact, it would not be surprising if inside of a year the country would be taken by storm in the demand for trucks. Horse feed is to-day at a premium and of an inferior quality at that. Horses are getting scarce, due to the increased demands of the war. Everything points to a shortage of both vehicles and men and in the transportation of goods the solution seems to lie in the path of the motor truck.

Conditions in this country at the present time are prosperous, extraordinarily so, but it is difficult to see from what source such prosperity is going to continue. This country is one of enormous wealth and it is marvelous where money comes from, so it will not be surprising to see the trade hold up in spite of the war.

The jitney bus is arriving. Some operators are using ¾-ton trucks which have been fitted with special bus bodies. The jitney is going to command great attention as this country has great opportunities for motor passenger service.

In this country the motorists are glad to see that America is taking up the movement THE AUTOMOBILE advocated for years, namely, smaller high-speed engines as exploited in Europe. Over here, the big, low-speed American motor has been objectionable to buyers and it is only the price of American cars that has kept them in the lead. With the advent of the high-speed, smooth-running motor you can rest assured that American cars are going to come into public favor more than ever before. At the present time it looks as if eight- and twelve-cylinder cars will not be popular.

At present some of the leading dealers in Sydney and Melbourne are in the market for a good line of trucks ranging in capacity from ¾ to 4 or 5 tons. These dealers are particularly interested to get agencies from companies that are well backed financially and not likely to go out of business in a few years. It is necessary to have right-hand drive vehicles here, the left-hand drive is prohibited in some of the states of Australia and it is possible that this prohibition will extend throughout the entire Continent.

Rands Top to Add

DETROIT, MICH., June 24—The Rands Mfg. Co., top and specialty makers, will build a three-story factory addition to cost $20,000.

Dealers' Activity in Middle West

Many Changes in Dealers in Kansas Territory—Limit Dealers' Tag Use

KANSAS CITY, MO., June 30—There has been considerable change in many dealers throughout the Kansas territory during the present month. A. L. Ellwood has succeeded Capt. W. F. Siegmund as manager of the Kansas City branch of the Marmon company. This branch will have henceforth larger scope, and will be the distributing center for Kansas, western Missouri, Oklahoma, Nebraska, northern Texas and southern Iowa. Mr. Ellwood comes from St. Louis, where he was Western salesmanager of the Locomobile. Captain Siegmund resigned to become vice-president and general manager of the Automobile Sales & Service Co., in St. Joseph, Mo., which will handle Marmon, Maxwell, Hudson, Detroit Electric and the G. M. C. The Fifth St. Garage & Repair Co., 210-14 East Fifth Street, is extending its quarters and will have capacity for sixty cars in the garage department.

E. W. Arrasmith, formerly in charge of the retail department of the Oakland Motor Co., of Kansas City, has organized the Kansas City Oakland Automobile Co., which will have the retail business of the Oakland here. The Oakland Motor Co. will do only a wholesale business. The headquarters will continue as heretofore at 1521-23 McGee Street.

Kansas Dealers' Tags Restricted

TOPEKA, KAN., June 24—J. T. Botkin, Secretary of State, in sending out blank applications for motor license tags, has issued a general warning that in Kansas dealers' tags can be used only on demonstration machines, and their lending to customers of the dealers is a violation of law, and will be prosecuted.

Packard Missouri Co. Expands

ST. LOUIS, MO., June 26—It became known here recently that $175,000 was the price paid by the Packard Missouri Motor Co. to the Halsey Automobile Co., for the latter's four-story building here. W. J. Parrish, who recently bought out O. L. Halsey's interest in the company bearing his name, has moved from Kansas City to St. Louis and from the newly acquired building here, will direct the distribution of the Packard company's cars into Missouri, Kansas and Oklahoma.

Goodrich Expands Service in Joplin

JOPLIN, MO., June 25—The B. F. Goodrich Rubber Co. has established its third mechanical depot branch here, putting this city in the class for distribution purposes, with Birmingham, Ala., and Norfolk, Va. N. B. Finney, formerly of Denver, Col., will have charge of the sales. John W. Pratt was transferred from Buffalo, N. Y., to take command of the local branch. The Middle West and Southern States will be supplied from this branch.

Dodge Bros. Contest Income Tax

WASHINGTON, D. C., June 26—Counsel for John F. and Horace E. Dodge, of Dodge Bros., Detroit, Mich., yesterday filed a brief for argument before the United States Supreme Court, attacking the surtax on incomes of individuals under the Federal Income Tax law. This is the first attack to be made on the constitutionality of this law.

The case was begun to prevent the collector of internal revenue at Detroit from collecting a surtax on each of the Dodges of approximately $45,000 for the year 1913. The Federal district court in Michigan held the tax valid.

Three main reasons were assigned for claiming the surtax provision of the law is invalid. Stockholders in corporations, it is asserted, when computing their surtaxes, are subjected to liability for the gains and profits of the corporations which have not been divided or distributed. "To tax a stockholder on prospective dividends which he may never receive can only be properly characterized as so utterly absurd as to induce levity," the brief declares.

It is charged also that the provision vests in the Secretary of the Treasury an arbitrary power of determining, without a hearing, whether any corporation has accumulated a greater undivided surplus than is reasonable for the needs of the business. "How can he reach such a decision?" it is asked. "The law makes no provision to aid him."

A third reason is that the provision permits corporations to accumulate and withhold from surtax such part of their profits as may be reasonably necessary for the needs and purposes of their business, and does not accord such business privilege to individuals and partnerships. It is urged that corporations are thus favored by a "most invidious discrimination."

The brief urges that the sixteenth amendment to the constitution did not obliterate entirely the provisions of the constitution against "direct taxes," and that Congress can only tax income and not real or personal property. It is contended that Congress can make no distinctions as to the source of income.

New Studebaker Truck Manager

ST. LOUIS, MO., June 26—J. L. Bergs, formerly Illinois territory representative of the Studebaker company, has been placed in charge of the commercial car sales of the St. Louis branch of the Studebaker corporation.

Sioux City, Omaha and Tacoma Ready

Entries Full at Three Speedways—Omaha Ready for Inaugural Opening

CHICAGO, June 29—*Special Telegram*—The majority of the racing cars and drivers who participated in the 500-mile race on the new speedway here last Saturday have shipped their cars for Sioux City and Tacoma, where races will be held during the national holiday. The Sioux City 300-mile race which was started last year will be held on Saturday, July 3, on the 2-mile dirt speedway in that city. On the following Monday the opening of the 1.25-mile board speedway at Omaha, Neb., will take place with a 300-mile race. At Tacoma, Wash., three races will be held on Sunday and Monday, July 4 and 5, on the new 2-mile board speedway, which was opened last year as a dirt track and has since been boarded. Prizes amounting to $15,000 will be given at both Sioux City and Omaha.

Three of the drivers that competed at Chicago will pilot cars at Tacoma. They are Earl Cooper, Bob Burman and Billy Carlson. All three left for the Northwest Sunday morning.

Dario Resta, winner of the Chicago race, will be the headliner at both Sioux City and Omaha, while Burman, Cooper and Carlson will have to divide the glare of the spotlight with Barney Oldfield at Tacoma.

Sioux City Entries

The following twenty-two entries have been recived for the Sioux City race:

Peugeot, Resta; Maxwell, Rickenbacher; Maxwell, Orr; Duesenberg, Alley; Duesenberg, O'Donnell; Duesenberg, Haupt; Erwin Special, Grover Bergdoll; Erwin Special, driver unnamed; Duchesneau, Brown; Mais Special, Mais; Sebring, Joe Cooper; Emden, Grant Donaldson; Mulford Special, Ralph Mulford; Ogren, Chandler; National, Butler; Chalmers, Wetmore; White, Shrunk; O'Connell Special, driver unnamed; Anderson Special, Scott; Berwyn Baby, Zucher; and Donaldson Special, Lou Donaldson.

The prediction is common that Rickenbacher's average of last year 78.6 miles an hour will be shattered. The track, hard packed and oiled, is much faster than in 1914, and cars have shown greater velocity this season than they did last.

Porter-Knight Withdraws

The three Knight-motored Porter Knight cars entered at Omaha were withdrawn by Finley R. Porter.

Analysis of Automobile Industry in Great Britain During War

Factories Busy on Aeroplane Motors— Private Car Output One-Third Normal— Used-Car Values Advanced 7 Per Cent

LONDON, June 17—It is not easy to write on the present position of affairs in the automobile world here, partly because the picture is as everchanging as the chameleon, and partly because, since the government order which has led to the taking over of some of the most important factories, those works have been completely shut, barred and sealed to all outside enquiries. This order came into force March 15, chiefly as the result of labor troubles. Strikes and this order have introduced the public to the word output, which, formerly the keynote of the manufacturing engineer, has now become the shibboleth of the man in the street. Two main factors have affected the motor output of this country: 1. shortage of labor; and 2, strikes.

In comparing British automobile output before and during the war one can only generalize, for there are all sorts of conditions to throw out any accurate computation. Many factories, as, for instance, the old Argyll works, which have been bought by Armstrongs, are turned on to ammunition making. Others, like Wolseley, Daimler, Sunbeam and Austins are making aeroplane engines, some of them of the eight-cylinder V-pattern, others of the Gnome rotating-cylinder type, others with twelve cylinders 90 x 150 mm. arranged V-pattern, these last being intended for sea planes.

Again, private car manufacture is being ousted by the call for trucks. Some firms, like the Star, that did comparatively little in this line have been turning out a lot, some I believe for Russia (Austins have also done a vast amount for the Russian Government), while others like the Daimler or the Wolseley, that made commercials in considerable numbers, are turning them out in far greater numbers. And the demand does not stop with the truck: for instance, one big midland firm is making big sleeve-valve engines for gun tractors. Then again another firm is engaged in armoring and fitting up a lot of Pierce-Arrow commercial chassis for use with armored cars and to carry a gun. Again, to give another example of how difficult it is to obtain a basis for estimating the output of the present, let me mention the case of a commercial truck making firm with an output of twelve or fourteen trucks a week in normal peace time: at present they are not turning out a single car, but are devoting themselves to the making of spare parts.

This demand for spare parts assumes considerable dimensions. For instance, for every twenty chassis the British War Office requires one extra steering gear and housing; for every ten chassis one water pump, one set of holding-down dogs for tappet guides, one gasoline tank, and one set of selector mechanism have to be supplied; for every five chassis one complete set of connecting rods with bolts, one set of radiator tubes, one set of gearbox ball bearings and thrust washers. Every three chassis have a complete spare radiator; every two chassis a set of big end and crankshaft bearings. Each single chassis has its spare set of pistons with wrist pins and rings, and two sets of liners for shoes for the foot brake.

Output, 35,000

The normal British output of makers of private cars, light vans on pneumatic tires, in fact, all vehicles having the characteristics of private car chassis, may be put at not more than 30,000 to 35,000. It is impossible to give a closer estimate as no figures are available. Whether commandeered lock, stock, and barrel, or left alone, the total output of private cars from British factories at the present time scarcely exceeds one-third the normal for this time of the year, the rest of the industry's energy being devoted to war material, either as contractors or sub-contractors. On the known weekly output of all the leading commercial automobile works in Great Britain the normal annual output of heavier vehicles may be placed at 10,000 to 12,000, and careful enquiries point quite decidedly to the fact that some 40 per cent. more stuff is now being turned out than before the war.

The output of the big private car-making works, like those of the Daimler, Sunbeam, Lanchester, and Rolls-Royce, have been practically taken over by the government, while even considerable firms that are not requisitioned, such as the Rover and Swift or Standard companies, at the time of writing are devoting somewhere about two-thirds of their work to government output, as sub-contractors: one is making gearboxes for a lorry firm; another back axles; a third certain engine parts; while at least one is doing some ammunition work.

Talking of ammunition work, the Vauxhall company has put up an ammunition factory quite separate from its motor works, a performance that will be regarded as quite a feat of construction at any other time than the present.

In private car output the firms most affected have been those making cars too small to do what the government wants. The smallest cars taken have been the 16-horsepower Sunbeam, four-cylinders, 80 x 150 mm., and the 16-horsepower Vauxhall, 90 x 120 mm. In both cases these have been mainly used for ambulance work, though some are employed as staff cars. For most of the staff work something bigger is wanted, like the 25-horsepower Vauxhall, 95 x 140 mm., or the 20-horsepower Daimler, 90 x 130 mm.

Incidentally, no car with less than four speeds has been officially bought, though, of course, odd purchases of all kinds of cars have been made under individual pressure of circumstances. If we except an experimental order for sixty light cars to be used as two-seaters for some purposes not yet known, no order has been given in cold blood for anything smaller than the Sunbeam.

The 20-horsepower Daimlers, already mentioned, are being turned out, some as complete open cars, some as sort of light vans to carry 1120 lb. of material or men, for which there is seating accommodation. Though the Vauxhall people have supplied 16 horsepower they are at present devoting themselves wholly and solely to their 25-horsepower cars, 95 by 140 mm., and they, Wolseley and Daimler, are supplying some big cars for staff purposes; in some cases the staff cars have their seats so arranged that the car interior can be used as a sleeping apartment for staff officers. The royal naval air service is absorbing a goodly number of cars, mostly Talbots, and though a good few such cars as Vauxhalls are used a lot of these are armored. Rolls-Royce, Lanchester and Austin, among others, are turning out staff cars and armored cars, the latter in no small measure for Russian requirements. Humbers are making field kitchens, which is an engineer's rather than a body maker's job. Arrol Johnson has for a long time past been making such parts as maxim gun tripods, and Napiers are on gun parts, etc.

All 3 and 4-Tonners Commandeered

Further, practically all the output of 3 and 4-ton trucks throughout the country has been commandeered, for be it realized that the 3-ton subvention type of the British army to all intents and purposes is a 4-tonner for civilian work, while their 3,360-lb. class is capable of taking anywhere from 2 to 2½ tons. Indeed, many are building in no other sizes. Some few 5-tonners are being taken, but not many: they are too un-

wieldy, except for special purposes. The tendency, indeed, points rather to the absorption in the future of smaller types, such as 2-tonners.

But though demand exceeds the labor supply for every firm of any effectiveness in the country manufacturers are not without troubles. It is true that, selling only to government, they can reduce their selling costs, but labor dearth is having its effect, and the rise of price in material is feeding on its own growth. Yet in spite of this, automobile makers are being paid less by the government than they would be by their agents.

But with the substitution of many public buyers for a single government as customer dealing direct with the manufacturers, the dealer is having a very bad time. A good few of the smaller and less intelligent have already gone under, those who survive adapting themselves to present-day requirements. For instance, they are devoting more attention to the commercial vehicle, and some, realizing the unsatisfactory state of railway transport, for the railways have been taken over by the government, are contracting for motor transport. In some few instances, however, which have come to my notice they are handicapped with a lack of proper knowledge of working costs.

Price Question on Second-Hand Cars

The question of the second-hand vehicle is likely to assume proportions. Quite recently there was a trade debate on the possibility of fixing a minimum price for second-hand cars, though it was generally thought to be impracticable to saddle the public with restrictions. It is a question, however, whether the same impracticability applies to battle-worn cars after the war. The whole matter will lie in the hands of the government, and though not generally expressed it is felt that the government should treat with every consideration the interests of the automobile trade to whose help they owe so much in this campaign.

So far the most practicable suggestion is one advocating that since each manufacturer's reputation is dependent on the performance of his vehicles, each manufacturer should be appointed by the military authorities as agent for the sale of his own second-hand war vehicles. These would be turned over to him on the understanding that they would not be sold below a certain minimum price, and that no vehicle would be sent out without the manufacturer's guarantee of its sound condition.

Dearth of New Cars

Even now the second-hand car problem is with us, but at present rather from the opposite point of view, demand exceeding supply. It is said that the dearth of new cars, especially in the larger sizes, is sending up the price of the second-handers. The other day a man in the trade said he had advanced 17½ per cent. Comparison of the prices certainly shows a general rise, though in some cases, as, for example, Fords, 1915 second-hand prices strangely enough appear down on those of last year. From a careful comparison of prices of similar second-hand cars of this and last year 7 1-2 per cent advance for 1915 appears much the more correct general figure. We have heard a good deal about a coming car famine, but with the general public going very carefully in financial matters, and some 2,000,000 additional men away on military duty, this possibility is likely to be overrated.

N. A. C. C. Cross-Licensing Patent Plans Now Almost Completed

Sixty-Nine Companies Already Have Agreed to It—These Control Over 300 Patents—Rest of Ninety-Three Members Expected to Join in Agreement

NEW YORK, June 29—The cross-licensing plan recently formulated by the National Automobile Chamber of Commerce, whereby one automobile maker holding patents can enjoy reciprocal privileges with makers holding other patents, thereby avoiding needless patent litigation, has been practically assured success. To date sixty-nine companies of the ninety-three that are members of the N. A. C. C. have formally agreed to this cross-licensing plan, and six other companies have agreed to the cross-licensing principle but are awaiting action by their boards of directors. Other concerns have expressed approval of the plan and are awaiting action of their directors.

Action on this cross-licensing agreement was entirely voluntary on the part of any members and it was further provided that the plan would not be operative until sixty-one companies controlling in all 300 patents had executed the necessary document of agreement. This has now been more than accomplished.

Practically all members of the N. A. C. C. hold patents of one kind or another and this cross-licensing agreement is expected to bring about better business relationships, to reduce patent litigation, and also to leave the members free to expend their resources in developing scientific manufacturing, selling and advertising, rather than squandering them in patent law suits. It was expected that with few exceptions all of the ninety-three members of the N. A. C. C. would eventually be pledged in this cross-licensing scheme.

Committee in Charge

The patents committee in charge of this work includes, Messrs. C. C. Hanch, Studebaker; W. H. VanDervoort, Moline; Windsor T. White, White; Wilfred C. Leland, Cadillac, and Howard E. Coffin, Hudson.

The plan of the cross-licensing agreement provides that each member give licenses under the patents he owns to all other members of the chamber, who do likewise. For example: A company may have only five or six patents, yet that company is certain, upon entering the agreement, to have reciprocal rights to not fewer than 300 patents owned by other members.

While each member may consider its patents of value and important, it could not but feel that they were of less importance than the patents owned by the balance of the industry. It is just that broad situation which has made possible the success of the plan.

The agreement covers an arrangement by which members are to exchange free licenses under all their motor vehicle patents, with the exception of design patents and certain patents on trucks, tractors, fire engines and ambulances, and with the further exception of basic patents of revolutionary character that may be developed within the member's own organization. Although a large number of patents in the chamber are of vital importance, the greatest trouble has arisen from patents of trivial character and minor importance, the evils of which are overcome by this agreement when it becomes operative, whereas there is still the same inducement as there always has been for real advancement in the art by the provision which excepts patents of revolutionary character.

The Agreement

In a brief issued by the N. A. C. C., the main points of the agreement are given as follows:

1—It is obviously for the interests of the manufacturing members of the Chamber to remove the possibility of patent litigation between them.

2—No matter how many patents any single member may own, it is certain that license rights under the aggregation of patents which will come under this agreement will be much more valu-

(*Continued on page* 45)

Gasoline Price War in Missouri

Reduced 10 Cents in 18 Months —Small Dealers Hit Hardest by S. O. Cuts

ST. LOUIS, MO., June 26—There is a gasoline price-cutting war on in St. Louis and surrounding territory, but in the opinion of the independent dealers it is only a sham battle between the Standard company and the Pierce Oil Corp. with the two-fold purpose of freezing out the small dealers and at the same time cornering the oil surplus.

In eighteen months the price of gasoline has been reduced by 1 cent cuts from 17½ cents a gallon to 7 9/10 cents a gallon. In each case the cut was first announced by the Standard Oil Co. This usually was followed on the next day by the Pierce company's announcement of a similar cut. The independents by necessity then met the new price—only to be forced to meet another cut of 1 cent a few months later.

At present the refined product is sold to the consumer here for 8 9/10 cents a gallon in lots of from 10 to 100 gallons. In 100-gallon lots—as it is bought by many automobile owners—gasoline is sold here now for 7 9/10 cents. Quantity prices were introduced here only a few months ago.

The following view of the so-called war, which is characteristic of local independent dealers, is given by F. C. Bretsnyder of the Bell Oil Co., an officer in the national organization of independents:

"During the last two years there has been an over-production of crude oil. This gave the Standard Oil Co. an excuse for cutting the price of the crude product gradually from $1.05 a barrel to 40 cents a barrel, Pennsylvania crude from $2.50 to $1.35 a barrel.

"The time came when with each Standard Oil cut in the price of gasoline one or more small dealers went out of business. Even now the larger independent dealers are compelled to turn their business to other lines such as lubricating oils in order to survive the price-cutting sham battle between the Standard and Pierce companies.

"When these two companies get gasoline down to the price at which it will suit them to buy they will corner all the surplus; then the price will begin to go up again. The independents see through this scheme, but are powerless to stop it as the Standard Oil's operations are wholly within the law. Of course the independents are organizing more and more to protect themselves and I think we have found ways of holding out until the price-cutting war is over."

Mr. Bretsnyder denied, however, that the independents are co-operating to facilitate the merchandising of their wares, except in so far as the export committees and organizations are concerned.

Market Prices Steady

NEW YORK CITY, June 29—Changes this week in the market prices were exceptionally few. Changes, if any, were higher. Lead went up 50 cents per 100 lb., while electrolytic and Lake coppers went up ¼ and 1 cent, respectively. Fine Up-River Para went down ½ cent. The rest of the products remained throughout the week unchanged.

The tin market was easy with activity in London. The demand for aluminum is limited and the market is nominal. There was a fair demand for lead.

The rubber market was firm with no new developments. The trade in various kinds of manufactured rubber continues good.

The oils and lubricants markets were steady throughout the week.

Four-Wheel Drive Adds

CLINTONVILLE, WIS., June 25—The Four Wheel Drive Co. has broken ground for a large addition to the present plant. The new building will be built adjoining the present factory and will cover an area 100 by 185 ft. The structure will correspond in construction to the present buildings, will be brick and steel, and fireproof. It will be used for assembly poses.

At the same time additional machine shop facilities will be added covering a like space.

This addition to the present plant is the fourth building erected in the last 3 years. At the present time the company is turning out approximately seventy-five 3- and 5-ton chassis a month. The enlarged factory and improved facilities will permit an output of 100 to 125 trucks a month.

A day and night shift has been working several months.

Duplex Truck to Add

CHARLOTTE, MICH., June 24—The Duplex Power Car Co., which for some time has contemplated increasing its capital stock from $100,000 to $200,000, will place only about $25,000 of the stock upon the market, the remainder having been subscribed for. The concern intends to enlarge its plant and add machinery.

Chase 117 per Cent. Gain

SYRACUSE, N. Y., June 21—A financial report covering the affairs of the Chase Motor Truck Co., of this city, for the first 5 months of the present year shows an increase in its truck business of 117 per cent. as compared with the same months a year ago.

$175,000 to Lozier Creditors

DETROIT, MICH., June 28—Within a few days the Detroit Trust Co. will pay a second dividend of 5 per cent, amounting to about $175,000, to the creditors of the old Lozier Motor Co. About two months ago the first payment of a 5 per cent dividend was made.

Durant Takes on 'Frisco Chevrolet

SAN FRANCISCO, CAL., June 26—Norman DeVaux and R. C. Durant have formed the Chevrolet Motor Co. of California and will distribute that car throughout the Pacific Coast. Durant, who is the son of W. C. Durant of the Chevrolet Motor Co., will make his headquarters at 1212 S. Olive Street, Los Angeles, and will have charge of he company's Southern business. DeVaux will make his headquarters at 1622 Van Ness Avenue, this city, and will manage the Northern business.

Mohawk Motor Truck Co. Incorporated

RAVENNA, OHIO, June 24—The Mohawk Motor Truck Co., Ravenna, Ohio, has been incorporated under the laws of Ohio, with a capital of $25,000, for the purpose of manufacturing motor trucks. The new corporation will take over the plant and personal property of the Ravenna Motor Truck Co., which has been

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.32	.32	.32	.32	.32	.32	.....
Antimony	.36½	.36½	.36½	.36½	.36½	.36½	.....
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	19.00	19.00	19.00	19.00	19.00	19.00	.....
Copper, Elec., lb.	.20	.20	.20	.20	.20	.20	.....
Copper, Lake, lb.	.20¼	.20¼	.20¼	.21	.21	.21	+.00¼
Cottonseed Oil, bbl.	6.00	5.95	5.92	5.95	5.95	6.01	+.01
Cyanide Potash, lb.	.24	.24	.24	.24	.24	.24	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	5.25	5.50	5.50	5.75	5.75	5.75	+.50
Linseed Oil	.62	.62	.62	.62	.62	.62	.....
Open-Hearth Steel, ton	19.50	19.50	19.50	19.50	19.50	19.50	.....
Petroleum, bbl., Kans., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined	.85	.85	.85	.85	.85	.85	.....
Rubber, Fine Up-River, Para	.63½	.63	.63	.63	.63	.63	—.00½
Silk, raw, Ital.	3.80	..	3.75	..	..	3.75	—.05
Silk, raw, Japan	3.32½	..	3.35	..	..	3.37½	+.05
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	41.50	41.38	41.50	41.50	41.50	41.50	.....
Tire Scrap	.04¼	.04¼	.04¼	.04¼	.04¼	.04¼	.....

in business for some time. At a meeting held recently officers and stockholders decided to reorganize and to change the name of the concern.

A statement given out by the officers of the company stated that the plant would be operated 24 hours a day in the future.

The incorporators of the new concern are S. C. Dougherty, E. E. Jones, E. W. Chapman, Herman Hill and W. K. Dougherty.

Reo Athletic Assn. Formed

LANSING, MICH., June 24—The Reo Motor Car Co. has taken over and is now managing the Reo Athletic Association, J. M. Amiss being in charge. There is to be no membership arrangement nor annual fees, every Reo employee being entitled to the privileges of the association building and grounds. The rooms will be reserved to Reo employees and their families. Three double tennis courts are now being prepared and tennis and other athletic tournaments will be held during the summer.

Mutual Electric Moves to Detroit

DETROIT, MICH., June 23—The Mutual Electric & Machine Co., Wheeling, W. Va., has leased the building formerly occupied by the Detroit Electric Starter Co., Fort Street, West, and Fourth Street, and will move practically all of its plant here. While the concern's principal business is that of making switchboards and switches, it also makes materials used in the making of self-starters. The officials who will locate here are General Manager H. J. L. Frank, Sales Manager L. H. Frank, Chief Engineer F. A. Hagan and Consulting Engineer G. H. Morse.

Security Prices Normal

Break in U. S. Rubber Due to Rumors on Common Dividend Action

NEW YORK CITY, June 28—Security quotations last week held strong with few changes. Tire issues again featured the market with Firestone and U. S. Rubber in the fore. Firestone common showed a 13 point gain and a new high mark, 503, while U. S. Rubber went down 13 points, the break occurring on acount of rumors that the dividend on the common might not only be reduced but passed altogether, so as to give the company an opportunity to accumulate the large supply of working capital needed in connection with the development of great activity in the business.

Studebaker common during the course of the week made a new high mark, 80. Froh the break that followed the declaration of the 5 per cent dividend, there has been a 20 point rally. It is expected that the next payment will be at the rate of 6 per cent per annum. The preferred, which went off five points last month, is now back to about its previous high.

Most of the stocks picked up on Saturday and a few of them showed substantial gains at the close. Goodrich common and preferred, ½ and 1 points, respectively; Maxwell common went up 4 points; Goodyear common rose 2 points; and Reo Truck closed with a ⅝-point gain.

Walpole Stockholders Files Petition

BOSTON, MASS., June 28—The Walpole Tire & Rubber Co. case, which has been before the United States district court for nearly two years, took a new turn today, when M. G. Sollers, one of the preferred stockholders, filed a petition asking permission to intervene in the case for the purpose of taking appeals from decrees of the court ordering the sale.

M. and S. Differential for Fords

KANSAS CITY, MO., June 24—The M. & S. Gear Co., this city, are announcing that they are now in a position to make deliveries on their differential for Ford cars. The feature of the differential is that by the use of spiral gearing the power is equally applied to both wheels under all conditions. The gear is perfectly interchangeable with the bevel-gear type on the Ford at the present time and sells for but a trifle more than the Ford outfit.

Accessory Jobbers Meet July 21

CHICAGO, ILL., June 28—The National Association of Automobile Accessory Jobbers will hold its next meeting in this city July 21. Present indications are that a good attendance will mark this first meeting to start the organization of the association. Suite 1813 to 18, City Hall Square Building, has been selected as headquarters.

Goodyear Continues Refund Offer

AKRON, O., June 26—The Goodyear Tire & Rubber Co. announces a continuance through July, August and September of the offer to refund the entire purchase price if Goodyear S-V tires fail to prove superior to competing makes.

Automobile Securities on New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	220	..	300	..	..
Ajax-Grieb Rubber Co. pfd	99	103	101	110	..
Aluminum Castings pfd	98	100	98	100	..
J. I. Case pfd	80¼	90	70	80	..
Chalmers Motor Company com	99	103	92	93½	— ½
Chalmers Motor Company pfd	95½	98½	95	97	..
Electric Storage Battery Co	51	51½	52	54	—2
Firestone Tire & Rubber Co. com	300	304	503	510	+13
Firestone Tire & Rubber Co. pfd	108	109½	111	..	+1
General Motors Company com	90	92	152	154	+1
General Motors Company pfd	92½	95	101	102½	..
B. F. Goodrich Company com	23⅛	24	51½	53½	+ ½
B. F. Goodrich Company pfd	86¼	87¼	101	102	+1
Goodyear Tire & Rubber Co. com	166	172	265	274	+2
Goodyear Tire & Rubber Co. pfd	96½	98½	105	106¼	—1
Gray & Davis, Inc., pfd	98	102	..	..	..
International Motor Co. com	..	4	13	14	..
International Motor Co. pfd	3	9	35	37	+1
Kelly-Springfield Tire Co. com	58	60	159	162	+1
Kelly-Springfield Tire Co. 1st pfd	75	80	86	87	..
Kelly-Springfield Tire Co. 2d pfd	94	100	160	165	..
Maxwell Motor Co. com	13½	14	39	41	+4
Maxwell Motor Co. 1st pfd	40	41	84	86	—2
Maxwell Motor Co. 2d pfd	16¾	17½	34	35	—3
Miller Rubber Co. com	..	..	185	187	..
Miller Rubber Co. pfd	..	..	104	106	..
New Departure Mfg. Co. com	126	128	..	..	..
New Departure Mfg. Co. pfd	106	..	..	..	..
Packard Motor Car Co. com	103	..	104	..	..
Packard Motor Car Co. pfd	97	100	96¼	100	—2¾
Peerless Motor Car Co. com	18	25	67	70	..
Peerless Motor Car Co. pfd	..	62½	94	96	..
Portage Rubber Co. com	..	40	35	39	..
Portage Rubber Co. pfd	..	90	92	93	..
Reo Motor Truck Co	10½	11½	15⅛	15¾	+ ⅝
Reo Motor Car Co	17½	18½	..	31	..
Splitdorf Electric Co pfd	40	50	..	..	..
Stewart-Warner Speed. Corp. com	47½	48½	68	68⅛	— ½
Stewart-Warner Speed. Corp. pfd	98½	99½	105	..	..
Studebaker Corporation com	28	28⅛	78	80	+2½
Studebaker Corporation pfd	80	83	98½	100	+ ½
Swinehart Tire & Rubber Co	85	86	77	79	—2
Texas Company	143½	144	124	128	..
U. S. Rubber Co. com	58	58½	51	53	—13
U. S. Rubber Co. pfd	102⅛	103	106	107	— ½
Vacuum Oil Co	218	221	197	199	—1
White Company pfd	107	110	103	108	..
Willys-Overland Co. com	78	81	128	129	—1
Willys-Overland Co. pfd	92	95	102½	103½	— ½
OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE					
ACTIVE STOCKS					
Chalmers Motor Co. com	101	107½	90	95	—1½
Chalmers Motor Co. pfd	94	97	93½	97	—1¾
Continental Motor Co. com	..	180	180	..	+5
Continental Motor Co. pfd	..	75	82	86	..
General Motors Co. com	91	93	151½	153	—1½
General Motors Co. pfd	92½	95	101½	103½	+ ½
Maxwell Motor Co. com	13¼	14¼	39	42	—3½
Maxwell Motor Co. 1st pfd	40	42	84½	87	—1¾
Maxwell Motor Co. 2d pfd	16½	18	35	38	—1½
Packard Motor Car Co. com	103	..	106	..	+3
Packard Motor Car Co. pfd	97	100	97¼	100	+1
*Reo Motor Car Co	17¾	18½	..	30½	—2
*Reo Motor Truck Co	11½	12½	15⅛	15¾	+ ¾
Studebaker Corporation com	..	..	78	80	+2½
Studebaker Corporation pfd	..	..	98	100½	—1¾
INACTIVE STOCKS					
*Atlas Drop Forge Co	19	..	26	26	..
Ford Motor Co. of Canada	..	555	1000	..	..
Kelsey Wheel Co	185	..	200	..	..
*W. K. Prudden Co	..	20½	19½	21	..
Regal Motor Car Co. pfd	20	..	..	25	..
BONDS					
General Motors, notes, 6s, 1915	101	102	..	..	..
Packard Motor Co. 5s, 1916	95	98½	98¼	..	..

*Par value, $10; all others, $100 par value.

Goodrich Truck Tire Policy

Favors Small Singles to Duals—Large Duals Over Too Large Singles

AKRON, OHIO, June 29—A new step in the policy of the Goodrich Tire Co., of this city has been suggested by S. V. Norton, sales manager, for the truck tire department in which the company recommends the use of 5- and 6-inch single solid tires in preference to 3- and 3½-in. duals; but where singles are larger than 7 in., it is more desirable to use 4-, 5- and 6-in. duals as the conditions demand.

"Momentary overloading of solid truck tires," says Mr. Norton, "which ruptures the rubber by displacing it beyond the limits of its ability to recuperate, is the cause for more tire failures than probably any other factor.

"Momentary overloading means excessive strain or shock on the tire at certain points, due to the tire being forced to bear in one way or another more load for an instant than it is intended to support. This may be due to road inequalities, or other conditions. The result is the normal displacement and the creation of undue internal friction and heating which is not quickly radiated, so that the tire is damaged beyond repair.

Injuries to Duals

"In the smaller dual sizes those made up of less than 4-inch units neither tire is itself large enough to withstand these momentary loads, such as when one of the singles comprising the dual set, takes the entire load and the other is not touching the ground. A modification of these conditions happens on crowned roads where the curve of the surface places more load on the inner tire than the outer. The net result of this condition in which the load is alternately shifted from one to the other is a permanent rupture."

Evils of Large Tires

Mr. Norton further believes that the best results come from a happy medium and consequently for single tires larger than 7-inch sizes are used, the displacement on tires with a load takes place in such direction that it causes undue internal friction and the generation of heat which is not quickly radiated when the tire section is too large.

Many advantages are advanced for the use of 5- and 6-in. singles in preference to 3- and 3½-in. duals, some of which are as follows: One, saving in tire cost. Two, saving in wheel cost, due to narrower felloe, narrower felloe band, and other changes in wheel design. Three, saving in unsprung weight of wheel, tire and metal equipment. Four, saving in applying one tire to the wheel as applying two. Five, larger tire units will better absorb uneven road surfaces, and better compensate for excessive road crown thereby keeping the whole tire always in use rather than alternately one tire and the other as is the case with small duals, neither of which is large enough to bear the strain alone. Six, more readily fitted with non-skid chains. Seven, better trackage of rear wheels with front wheels. Eight, greater height of rubber tread, and consequently more cushion and increased life in tires, greater than 3 in., which are ¼ in. lower than regular sections of greater width. Nine, less leverage strain on the axle and bearings, due to the decreased width of wheel tread.

Mr. Norton believes that the schedule of tire ratings now in use which rates duals higher than the equivalent singles is open to criticisms and this rating may be altered in the near future. He belies that dual tires cannot possibly have a greater carrying capacity than twice that of a single tire of which it is composed, and hence the error in the existing ratings.

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Davis J. I. Case Mechanical Engineer

MILWAUKEE, WIS., June 24—R. E. Davis, instructor in automobile and gas engine practice in the Milwaukee continuation school, Milwaukee, Wis., will retire July 1 to become mechanical engineer in the staff of the J. I. Case T. M. Co., Racine, Wis. Mr. Davis was formerly associated with Packard, Marmon, F. A. L. and Midland, and in 1913 took charge of the short course in the care and operation of automobiles instituted by the Iowa State College. In the fall of 1914 he came to Milwaukee to take charge of the motor course in the continuation schools. In his new position he will be the point of contact between the engineering department and the service, sales, advertising and publicity departments. He is to be succeeded at Milwaukee by H. L. Connell, formerly of Detroit, and well known member of the S. A. E., who came to Milwaukee last February to supervise the short course in motor car practice in the continuation school.

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Saxon Drive-Away Day July 15

DETROIT, MICH., June 28—The Saxon Motor Co. has promoted a drive-away day for dealers to be held July 15. Saxon sixes exclusively will be driven away. To make the event more interesting a silver loving cup will be given to the dealer who in driving home makes at least 100 miles and consumes the smallest amount of gasoline and oil.

Tire Lessons from Chicago Race

Tires Destroyed at Over 100 M.P.H.—Board Track Better than Brick

By John F. Palmer

CHICAGO, ILL., June 26—An interesting side light on the long string of records that went to smash at the running of the Chicago speedway to-day is the bearing a wood surface appears to have on tire wear and practice.

As at Indianapolis all of the first ten cars to finish used cord tires and a comparative analysis of performance under the differing conditions obtaining should be interesting and possibly instructive.

First: Weather conditions were much the same, race day being cloudy and cool and preceded by much rain in both instances. Second: The cars contesting at Chicago ran true to the form shown at Indianapolis, Rickenbacker's Maxwell being the one exception. The practice and tuning up made possible by the time interval between the two races, enabled the Maxwell to justify the hopes had of it and stamping its design in the front rank of race car engineers. Third: Except change of carbureters in a few instances, equipment was identical.

What then made possible the phenomenal jump in average speed at Chicago over Indianapolis from 89.84 to 97.58 m.p.h.?

In my opinion the two chief factors were surface and banking, wood laid lengthwise of the track offering less rattling resistance and the minimum of vibration due to the longitudinal disposition of the joints, this contributing also a measurable resistance to skidding on the turns while the banking carried to an angle correcting side slip up to 90 m.p.h. contributed not only greater safety but automatically increasing traction by adding the enormous pressure of centrifugal force to the weight of car approximately at right angles to the axis of wheel rotation. This turned a force, that at Indianapolis made for danger skidding and tire wear, into added power efficiency that lessened slips.

100 M.P.H. Destruction

Curiously enough tire failure only began when the speed approached 100 m.p.h., when tires were literally torn in two by the complicated stresses introduced by taking turns at a speed higher than the track was designed for in combination with heavier tractive duty made possible by the high banking.

The foregoing is not offered as my final judgment but as an interesting line

(*Contined on page* 43)

Packard Stars at Uniontown

Breaks All Previous Records on 3-Mile Hill, Making It in 3:27 2/5

UNIONTOWN, PA., June 24—All previous records were broken at to-day's Uniontown hillclimb, when a Packard, driven by Charles Johnson, president of the local automobile association, traveled up the mountain side, a distance of 3 miles, in 3:27 2/5. The average grade for the course runs 7.754 per cent. The annual hill climb is held under the direction of the Uniontown Motoring Association.

A Chalmers, driven by A. E. Walden, won in the Class E, Non-Stock race, this being open to Class C cars with a piston displacement of 230 cu. in. and under. His time for the climb was 3:50.

Ralph De Palma participated in both races but failed to come in better than fifth in any of them. In the Class D, Non-Stock Free-for-All event, won by Johnson, he finished sixth in his Mercedes Special, his time being 3:55 2/5. In this event his magneto broke down, and his going was somewhat slowed down at times when the crowd stood too near the course.

The attendance was about 30,000.

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Lessons from Chicago Race

(*Continued from page* 42)

of reasoning that to me seems to offer at least one possible explanation of the proved superiority in speed possibility of the wood over the brick surface.

Again: There is a doubt of the superiority of the sand paper surface of brick over the wood purely from a traction standpoint. The wood, however, undeniably conserves tire treads up to 90 m.p.h., as is evidenced by the performance of the slower cars, notably Grant's Sunbeam, though in his case there was a contributing element in the smoother flow of power and lighter impulses of his six-cylinder motor; and if banking is such a factor as it seems, the only limit to speed possibility and tire dependability is scientific banking that will reduce the tire strains to the comparatively simple ones, of power transmission and air pressure.

I can see large possibility of better coordination of track and tire design to the end that pure speed may reach its highest development and shall welcome further experience along this line.

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Burman's Bakersfield Records Allowed

NEW YORK CITY, June 28—The following official records, made at Bakersfield, Cal., on January 3, 1915, were allowed and accepted at the meeting of the contest board of the A. A. A., held June 18:

ONE MILE CIRCULAR DIRT TRACK RECORDS

Distance	Time	Driver	Car
10	8:16.4	Burman	Peugeot
15	12:23.2	Burman	Peugeot
20	16:25.6	Burman	Peugeot
25	20:28.8	Burman	Peugeot
50	40:57.8	Burman	Peugeot

—

Elgin Entry Blanks Recalled

CHICAGO, ILL., June 28—*Special Telegram*—The entry blanks for the Elgin road races scheduled for August 20 and 21 were recalled to-day by Chairman George Ballou of the Contest Board, of the Chicago Automobile Club, in order to incorporate in them the change made recently in the A. A. A. three-car rule, which was amended so as to permit five cars to start in any race, provided only three are nominated by the manufacturer the blanks will be re-issued this week.

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Arizona Grand Prize

PHOENIX, ARIZ., June 25—The Arizona Grand Prize race of 150 miles will be held on the 1-mile dirt track at the Fair grounds here November 20, which will be the last day of the State Fair. The Fair commission is promoting the event, which will be under A. A. A. sanction.

Results of Uniontown Hillclimb

EVENT NO. 2—CLASS E NON-STOCK. OPEN TO CLASS C CARS WITH A PISTON DISPLACEMENT OF 230 CU. IN. AND UNDER

Car	Owner	Driver	Time	
Chalmers	Keystone Auto Co.	A. E. Walden	3:50	First
Saxon	Keystone Auto Co.	M. A. Crocker	4:4	Second
Buick	A. D. Spencer	A. B. Spencer	4:4 3/5	Third
Maxwell	William Burley	C. M. Hansel	4:14 4/5	Fourth
Hispana Suiza	Loveland Co.	Ralph De Palma	4:30 4/5	Fifth
Morse Cyclecar	Morse Cycle Car Co.	E. Bennett	6:9 3/5	Sixth
Ford	Guy Woodward	Guy Woodward	9	Seventh

EVENT NO. 3—CLASS D NON-STOCK FREE-FOR-ALL.

Car	Owner	Driver	Time	
Packard	C. W. Johnson	C. W. Johnson	3:27 2/5	First
Simplex	A. C. Smith	I. P. Fetterman	3:46 3/5	Second
Marmon	Poffinberger M. C. Co.	W. L. Poffinberger	3:47 4/5	Third
Chalmers	Keystone Auto Co.	A. E. Walden	3:48 1/5	Fourth
Dickinson Special	J. W. Dickinson	J. W. Dickinson / R. E. Wier	3:54 4/5	Fifth
Mercedes Special	Ralph DePalma	Ralph De Palma	3:55 2/5	Sixth
Buick	C. W. Johnson	Roy Stentz	4:15	Seventh
Lozier	H. E. Cupps	H. E. Cupps	4:16 3/5	Eighth
Overland	T. S. O'Rorke	T. S. O'Rorke	6:13 4/5	Ninth

170 Miles Per Tire

Chicago Speedway Eclipses Indianapolis Where 100 Miles Per Tire Was Average

CHICAGO, ILL., June 26—To-day's inaugural of the new Chicago speedway served to prove among the many questions which were subject of speculation, the fact that the 2-mile board track here is considerably easier on tires than is the Indianapolis speedway. This may be shown by the fact that on the twelve cars which finished to-day's race only forty-one new tires were required, as against forty-four new tires taken on by the eleven cars which finished the Hoosier classic. This means that in the 6000 miles covered by the finishers to-day it took one new tire for each 146 miles, whereas at Indianapolis the 5500 miles took a new tire for each 100 miles; that is, the tires ran 46 per cent further on the board oval than they did on the brick.

Forty-nine Tires Used

Forty-nine tires in all were used in the 8370 miles of running of the twenty-four cars in to-day's race. This is an average for the total number of starters of 170 miles per tire. The finishers in to-day's race used just over three new tires per car, whereas at Indianapolis they took four tires per car.

To-day's event was a complete victory for Silvertown cords, as the record for tire mileage in racing made by the Goodrich company with its cord tires at Indianapolis was shattered to-day when the same make of tires made a showing even better than was expected on the basis of the Indianapolis performance.

Grant Made No Changes

The palm must be handed to Grant and his six-cylinder Sunbeam on tire performance, for Grant not only did not change a tire, but made no stop for any reason whatsoever during the race. His feat, however, was duplicated by three other cars, so far as tire consumption was concerned, Alley in the Duesenberg, Babcock in the Peugeot and Cooper in the Sebring, all running the entire 500 miles without a tire change.

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FALL SHOW ANNOUNCEMENTS

COLUMBUS, OHIO, June 28—Plans are progressing for the fall automobile show to be held by the Columbus Automobile Show Co., at the Ohio State Fair, August 30 to September 3. The show will be something out of the ordinary as one whole building has been leased by the company to display pleasure and commercial vehicles.

Goodrich Truck Tire Policy

Favors Small Singles to Duals—Large Duals Over Too Large Singles

AKRON, OHIO, June 29—A new step in the policy of the Goodrich Tire Co., of this city has been suggested by S. V. Norton, sales manager, for the truck tire department in which the company recommends the use of 5- and 6-inch single solid tires in preference to 3- and 3½-in. duals; but where singles are larger than 7 in., it is more desirable to use 4-, 5- and 6-in. duals as the conditions demand.

"Momentary overloading of solid truck tires," says Mr. Norton, "which ruptures the rubber by displacing it beyond the limits of its ability to recuperate, is the cause for more tire failures than probably any other factor.

"Momentary overloading means excessive strain or shock on the tire at certain points, due to the tire being forced to bear in one way or another more load for an instant than it is intended to support. This may be due to road inequalities, or other conditions. The result is the normal displacement and the creation of undue internal friction and heating which is not quickly radiated, so that the tire is damaged beyond repair.

Injuries to Duals

"In the smaller dual sizes those made up of less than 4-inch units neither tire is itself large enough to withstand these momentary loads, such as when one of the singles comprising the dual set, takes the entire load and the other is not touching the ground. A modification of these conditions happens on crowned roads where the curve of the surface places more load on the inner tire tha the outer. The net result of this co tion in which the load is alterna shifted from one to the other is manent rupture."

Evils of Large Tires

Mr. Norton further believ best results come from a h and consequently for sing than 7-inch sizes are us ment on tires with a l such direction that it ternal friction and heat which is not the tire section i

Many advant the use of 5- a erence to 3- and 3½ which are as follows: O tire cost. Two, saving in wheel c to narrower felloe, narrower felloe ban and other changes in wheel design. Three, saving in unsprung weight of wheel, tire and metal equipment. Four, saving in applying one tire to the wheel as applying two. Five, larger tire units will better absorb uneven road surfaces, and better compensate for excessive road crown thereby keeping the whole tire always in use rather than alternately one tire and the other as is the case with small duals, neither of which is large enough to bear the strain alone. Six, more readily fitted with non-skid chains. Seven, better trackage of rear wheels with front wheels. Eight, greater height of rubber tread, and consequently more cushion and increased life in tires, greater than 3 in., which are ¼ in. lower than regular sections of greater width. Nine, less leverage strain on t axle and bearings, due to the decrea width of wheel tread.

Mr. Norton believes that the sch of tire ratings now in use whic duals higher than the equivalen is open to criticisms and this r be altered in the near futu lies that dual tires cannot a greater carrying capac that of a single tire of posed, and hence the err ratings.

Davis J. I. Ca

MILWAUKEE, Davis, instru engine prac tinuation retire Ju gineer Co., P merl F. c

Tire L Chi

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C ing or o

ckard Stars a
Uniontown

Breaks All Previous Record
on 3-Mile Hill, Making It
in 3:27 2/5

UNIONTOWN, PA., June 2 ... records were broken ... Uniontown hillclimb, when ... driven by Charles Johnson, ... of the local automobile association, ... up the mountain side, ... miles, in 3:27 2/5. The ... grade for the course runs ... The annual hill climb is held ... direction of the Uniontown ... Association.

A Chalmers, driven by ... in the Class E, Non-Stock ... open to Class C cars ... displacement of 230 cu. in. ... time for the climb was ... Ralph De Palma participated ... but failed to come in ... any of them. In the ... Free-for-All event, ... Johnson, he finished sixth in ... Special, his time being ... but his magneto broke down ... going was somewhat ... times when the crowd ... course.

The attendance ...

Lessons from Chica...

(Continued from ...

reasoning that ... at least one possi... speed superior...

... have been ... apply for ... gers will be ... four tracks ... on the board. ... eedways asso- ... protection and ... ves are not an- ... many have been

... adopt a schedule so ... conflicts in dates, ... osition to buy racing ... commodity at the ... ll appoint a common ... isit Europe and en- ... rs not for one race but ... omoted during the sea- ... classify speedways and ... practice of one promoter ... rger purse than another ... ract entries.

...ganization

... ount aims of the new organ- ... best expressed in the follow- ... s from the speedways asso- ... laws:

... he objects of the association ... govern, contract and manage ... ays for speed contests or ... expeditions.

... To secure the co-operation and ... cipation in the same.

... To encourage and promote the ... lopment, use and sale of motor ... and to promote speed contests ... a pastime in America and other ... untries, and to surround it with ... afeguards such as will insure pub- ... ic confidence in its integrity and methods and improve the standard of skill and sportsmanship of the participants therein.

4—To establish uniform rules and regulations for such speed contests and exhibitions and for the safety of the drivers and public.

5—To protect the property rights of those engaged without sacrificing the spirit of competition.

6—To promote the welfare of drivers, mechanicians and other participants by developing and perfecting them in their profession and aiding them in securing adequate compensation for expertness to protect and aid them to secure prizes.

7—To schedule dates and places for speed contests and exhibitions.

8—To foster and encourage the engaging of foreign entrants.

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N. A. C. C. Cross-Licensing Plans

(Contin... from page 39)

able than ... mber's individual patents.

3—It ... he industry together in a co... rit which is in keeping wi... cy of the times.

4—T... n little or no money made ... ts in the automobile industr... not likely that any money ... de out ... tents by litigati... the ... a patent lawsuit ... eive ... ch.

5—L... rofi... e from proper manufacturing and selling of cars, and not from exploitation of patents which generally do not represent more than the incidental development of motor cars, for which engineers are generally responsible whether they take out patents or not.

6—The main thing is to establish a substantial business with patents only as a protection against patent litigation. Primarily, it should be the object to get business, as patents are merely incidental to business.

7—While everyone hopes to obtain good patents in the future it is apparent that the patents taken out by any one member are not likely to be as valuable to him as rights under patents taken out by 75 to 100 other members.

8—Each member will be left free to display his originality along the line of design patents.

9—The agreement is largely limited to chassis units and parts; that is to say, units and parts that are common to either trucks or motor vehicles primarily adapted to private passenger use. No attempt has been made to include undeveloped and rapidly evolving things such as loading and unloading devices, fire apparatus, tractors, etc.

10—It is an entirely new and original plan in line with the co-operative movement of the day, which has obtained in the automobile industry with better results than in any other field.

11—Equitable provision has been made to exclude and leave free for special consideration any basic or revolutionary patent of great value which may hereafter be developed within the organization of any member, thus encouraging a continued advance in the art but eliminating those patents of minor importance that are many times used for harassing purposes.

12—The plan requires the signature of sixty-one members owning at least 300 patents coming within the terms of the agreement before it becomes operative, which insures protection of the most substantial order for each manufacturer before he is required to grant any rights under his own patents.

300-Mile Race for Chicago Oct. 9

CHICAGO, ILL., June 29—*Special Telegram*—Encouraged over the success attendant upon the inaugural race run over their new track Saturday the directors of the Chicago speedway now are contemplating the promotion of another contest in the fall and have requested Chairman Kennerdell of the A. A. A. contest board to reserve Oct. 9, for such an event. According to present plans the fall race will be 300 miles in length and $25,000 will be hung up in prize money.

Maxwell Laboratory at Chicago Track

CHICAGO, ILL., June 28—Believing that the Chicago speedway offers unexcelled advantages for testing automobiles Ray Harroun, the former racing driver, who is now head of the engineering department of the Maxwell Motor Co., Detroit, has made arrangements to establish an engineering laboratory at the local track and this summer will try out all the new models on the 2-mile board oval.

The building has a floor space of 40,000 sq. ft., all of which will be used for the showing of automobiles. Practically all of the space has been sold. It will be the first attempt to hold an automobile show on the State fair grounds.

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LOS ANGELES, CAL., June 28—The Motor Car Dealers' Association of Los Angeles, has set the date for its fall show. This will be held during the week of September 18-25 in the Shrine Auditorium.

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WESTERVILLE, OHIO, June 28—A large number of automobile agents of Columbus will give an automobile show at Westerville, Ohio, located about a dozen miles to the northeast, July 3. The show will be given in conjunction with the usual Fourth of July celebration and will be held on the principal street of the village. Spaces will be marked off on the paved streets and it is believed that about thirty different makes will be displayed. The idea is a new one and is being tried as an experiment.

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Missouri Ad Law in Effect

ST. LOUIS, MO., June 24—Missouri's honest advertising law, created by the last General Assembly is effective. The law applies to every form of business and prohibits the mis-statement of fact in any form of advertising. Newspapers, posters, circulars and letters are specifically mentioned. Fines and jail penalties are provided for violations of the law.

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Capital Stock Increased

DETROIT, MICH.—Consolidated Car Co., from $100,000 to $200,000.

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DETROIT, MICH.—United States Auto Supply Co., from $5,000 to $75,000.

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Four-Story Pierce Addition

BUFFALO, N. Y., June 26—The Pierce-Arrow Motor Car Co. will construct a new concrete flat-slab building on its site here at 1695 Elmwood Avenue. It will be four stories high, 410 ft. long, and 61 ft. wide.

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Princess Leases Old Saxon Plant

DETROIT, MICH., June 28—The Princess Motor Car Co., organized in June, 1914, and located at 348 Clay Avenue, has leased the former plant of the Saxon Motor Co., Bellevue Avenue, and will move to it in a few days.

—

Gets New Era Contract

BATTLE CREEK, MICH., June 24—H. E. Petrie, who in addition to conducting the business of the Independent Garage, makes foot accelerators for Ford cars, has received an order for 70,000 from the New Era Spring & Specialty Co., of Detroit.

Standard Service Advocated

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Service Managers Would Restrict Dealer's Parts—Different Truck and Car Service

DETROIT, MICH., June 29—*Special Telegram*—Ninety service managers and other representatives of fifty automobile and truck manufacturing concerns were in attendance at to-day's session of the service managers convention called here by the National Automobile Chamber of Commerce. Papers and discussions dealt mainly with the phases of the relation between the factory service department and the dealer, although there was much airing of views as to what the owner should expect in the way of service.

Co-operation Needed

In opening the two-day meeting, Alfred Reeves, general manager of the N. A. C. C., spoke for the same interchange of thought among the service men as is being practised by the heads of concerns in the organization.

Alvan Macauley, Packard vice-president and general manager, welcomed the delegates and said that service and service policy are the vital part of the business, and whether or not the makers get this down to a reasonable basis and hold it there will largely be a governing factor in their staying in business. That a standard policy is needed he is positive, and believes it necessary to survival.

Limiting Dealer's Parts

The consensus of opinion was that dealers' parts orders should be censored. That is, the amount ordered should be cut down if the manufacturer thinks such a large requisition not commensurate with the number of cars the dealer sells. It did not seem necessary for a dealer to carry parts for cars over two years old, the maker carrying these. A campaign of education seems advisable to get dealers to carry proper parts stocks.

It was quite generally conceded that there should be a standardized plan for handling parts accounts with dealers, but the methods are about as many as there are manufacturers.

Discussion of the subject of how the manufacturer can satisfy himself that the dealer who receives a credit installs the part in the customer's car without charge brought only the one answer, that, the customer should be notified of such credit to the dealer.

Owner's Service

What constitutes service to the owner was dealt with by Charles Gould, Maxwell service manager, who said that the four essentials to service are the carrying of repair parts, efficient repairs, supervised instruction and co-operation between dealer and owner as was to be expected, there was much difficulty in defining service, many definitions being proposed.

Committees will be appointed by Mr. Reeves to report on the various questions brought up by the papers and discussions, and strenuous effort will be made to get at the difficult matter of arriving at a standard service policy.

Cars and Trucks Differ

Morning and afternoon sessions Wednesday will close the meeting. Among the important subjects to be discussed are the reasons why there should be different service policies for passenger cars and trucks, Mr. Macauley reading a paper dealing with the question, Do Free Inspection and Adjustment Legally Extend the Manufacturer's Warranty. Pierre Schon, service manager General Motors Truck Co. will answer this.

—

N. A. C. C. Service Convention Opens

DETROIT, MICH., June 28—Forty-nine automobile manufacturers are represented at the 2-day service manager's convention promoted by the National Automobile Chamber of Commerce which opened its sessions this morning at the Hotel Statler. Eighty-four men prominent in the trade, including presidents, general managers, and sales and service managers are listed to take part in the discussions of the following important papers:

"Should there be a Standardized Plan for Handling Parts Accounts with Dealers?" by A. H. Ransen, manager of the Parts Order Department of the Studebaker Corp. "How Can Manufacturers Assist in Preventing Dealers Overstocking and being Obliged to Stock Obsolete Parts?" by C. W. Matheson, Director of Service, Dodge Bros. "Should Manufacturers Encourage General Repairshops by Selling Them Parts?" by J. A. Harris, Jr., Advertising Manager White Co. "How Can the Manufacturer Satisfy Himself that the Dealer Who Receives Credit Installs the Part in the Customer's Car Without Charge?" by E. T. Klee, Service Manager, Stutz Motor Car Co. "What Constitutes Service to the Owners?" by Charles Gould, Manager of Service, Maxwell Motor Co. "Why a Standard Service Policy Should be Adopted by All Members for the Benefit of the Car Builder," by A. B. Hansom, Manager Directing Service Division, Chalmers Motor Co. "Should the Dealer's Service Policy Go Farther than the Manufacturer's Warranty, and If So in What Respect?" for open discussion. "Should There be Different Service Policies for Passenger and Commercial Vehicles and Why?" by Alvan Macauley, vice-president, Packard Motor Car Co. "Do Free Inspection and Adjustment Legally Extend the Manufacturer's Warranty?" by Pierre Schon, Service Manager, General Motors Truck Co. "Advantages of Issuing Books of Coupons Entitling Owners to a Specified Amount of Repair Work Free."

Speedway Organization Incorporated

Speedway Assn. of America formed, Officers Elected—Will follow Baseball Ideas

CHICAGO, ILL., June 25—*Special Telegram*—Seven representatives of the Indianapolis, New York and Twin City speedways met here this afternoon, adjourned the meet at Hammond, Ind., a Chicago suburb, this evening and there effected the permanent organization of the Speedways Assn. of America by filing its corporation papers with the Secretary of State of the Hoosier commonwealth and electing officers and a board of managers.

The Speedway Assn. of America was born at Indianapolis just prior to this year's Hoosier classic. Representatives of the Indianapolis, Twin City, New York, Tacoma, Sioux City, Omaha and Chicago speedways were in attendance and a temporary organization was effected. Not until the association had been incorporated, however, was the organization in a position to start its campaign for the advancement of speedway racing and to take such important action was the purpose of to-day's session.

Edward E. Gates, chief attorney for the Federal baseball league and a resident of Indianapolis acted for the speedway associations drawing up the incorporation papers and filing them this morning. As soon as word was received that incorporation papers had been granted the seven representatives boarded a train for Hammond where the first stockholders meeting was held, the incorporation laws of Indiana stipulating that a company incorporated in that State must hold its first stockholders' meeting within the boundaries of that commonwealth. At the stockholders' meeting a constitution and by-laws were adopted and the following officers elected:

Temporary Board

President, Charles W. Sedwick, Indianapolis; vice-president, James C. Nichols, New York; secretary and treasurer, James A. Allison, Indianapolis; board of managers: Carl G. Fisher, Indianapolis; Jas. A. Allison, Indianapolis; F. H. Wheeler, Indianapolis; Charles W. Sedwick, Indianapolis; James C. Nichols, New York; Dr. C. E. Dutton, Minneapolis, and D. L. Wheeler, Minneapolis.

Although Chicago, Tacoma, Sioux City and Omaha were not represented at to-day's meeting officials of these four tracks agreed to become members of the association at the time of Indianapolis session and admission blanks have been sent them. As soon as they apply for admission the board of managers will be changed in order that these four tracks may have representation on the board.

The chief aim of the speedways association is that of mutual protection and co-operation and its motives are not antagonistic to drivers, as many have been led to believe.

Adopts Baseball Ideas

Each year it will adopt a schedule so that there will be no conflicts in dates, it also will be in a position to buy racing cars, a very scarce commodity at the present time, and will appoint a common representative to visit Europe and engage foreign drivers not for one race but for all contests promoted during the season. It will also classify speedways and put a stop to the practice of one promoter hanging up a larger purse than another in order to attract entries.

Objects of Organization

The paramount aims of the new organization are best expressed in the following excerpts from the speedways association by-laws:

1—The objects of the association are to govern, contract and manage speedways for speed contests or other expeditions.

2—To secure the co-operation and participation in the same.

3—To encourage and promote the development, use and sale of motor cars and to promote speed contests as a pastime in America and other countries, and to surround it with safeguards such as will insure public confidence in its integrity and methods and improve the standard of skill and sportsmanship of the participants therein.

4—To establish uniform rules and regulations for such speed contests and exhibitions and for the safety of the drivers and public.

5—To protect the property rights of those engaged without sacrificing the spirit of competition.

6—To promote the welfare of drivers, mechanicians and other participants by developing and perfecting them in their profession and aiding them in securing adequate compensation for expertness to protect and aid them to secure prizes.

7—To schedule dates and places for speed contests and exhibitions.

8—To foster and encourage the engaging of foreign entrants.

N. A. C. C. Cross-Licensing Plans

(*Continued from page* 39)

able than the member's individual patents.

3—It will cement the industry together in a co-operative spirit which is in keeping with the tendency of the times.

4—There has been little or no money made out of patents in the automobile industry, and it is not likely that any money can be made out of patents by litigating them, as the winner in a patent lawsuit seldom receives very much.

5—Legitimate profit should come from proper manufacturing and selling of cars, and not from exploitation of patents which generally do not represent more than the incidental development of motor cars, for which engineers are generally responsible whether they take out patents or not.

6—The main thing is to establish a substantial business with patents only as a protection against patent litigation. Primarily, it should be the object to get business, as patents are merely incidental to business.

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Race Motors Behave Marvelously

(*Continued from page 7*)

That the smoothness of the board track had the effect of lessening the shocks to which the cars were subjected is undeniable, but shocks have only a little influence in motor reliability, although they play a big part in the lasting power of springs and axles. Perhaps the roughness of the Indianapolis brick might be blamed for the loosening of the magneto platform on Van Raalte's Sunbeam, but that is about the only motor trouble in the former race which could fairly be blamed to shock.

Stupendous Reliability

It is quite difficult at first to realize what the speed of this Chicago race really means. The tabulation of reliability given above is but a pale outline of a few of the things which together make the most wonderful demonstration of motor efficiency which the world has ever seen. Perhaps the casual observer is liable to give weight to the fact that the first and second cars were both of foreign origin, but anyone knowing to how great an extent small things outside the chassis construction play their part in race winning, will pay but little regard to who won, rather will he look to the whole ten who made more than the 90 miles an hour.

Take the Stutz case, for example. Here we had evidence of a speed capability, in Wilcox's car, at least equal to and perhaps in excess of that possessed by either the Peugeot or the Sunbeam and the two Stutzes which finished within 12 minutes of the winner, both had many tire stops. Out of this time Anderson spent nearly 7 minutes more than Resta on tires alone, so his car was only a minute an hour slower than Resta's.

The first three cars to finish used the Zenith carbureter and Oilzum was used for lubrication on the cars finishing first, third, fifth, sixth, seventh, eighth, ninth and tenth, or eight out of the ten prize winners.

Stutz Tire Troubles

Why the Stutz men were so unfortunate with tires remains a mystery up to the present, for they were using the same sort as their luckier brethren and using them under the same conditions. Possibly the cars were held a little lower down on the banking than the Peugeot or the Sunbeam but even John Palmer, inventor of the cord tire, is not prepared with any explanation as to the remarkable difference in tire reliability as between one car and another.

Still, to keep to the motors, at Indianapolis, the general idea was that in putting up a speed which represented the limit of the track, the limit of the motor had been reached as well. Chicago proves this is wrong so the present idea is rather that the faster and easier course brings us back to tires and human endurance once more. Had the Chicago race been for 300 instead of 500 miles it would undoubtedly have been won at well over 100 miles an hour.

Sixteen-Valve Motors

In a mechanical review of the happenings of a race it is generally possible to take instances of trouble or failure and therefrom to extract lessons of engineering interest. Concerning this race so little happened, there was so little trouble, that the arising question is, "How can we get more speed?" instead of "How can we maintain the speed set as a standard?"

Chicago sets the mark of the multi-valve motor, it shows the sixteen-valve, four-cylinder motor developed to an equal pitch by America, France and England. Carburetion has been got in hand, ignition difficulties are overcome, and aluminum-alloy pistons have established their place.

But in this review let us not forget Harry Grant's old Sunbeam, for this is no modern creation, but an old warrior among the veterans of the race track with an L-head motor, two valves per cylinder and none of the aids to power developed within the last 2 years. Grant made his show largely by knowing how fast he could drive without trouble, by knowing that he had gas and oil enough for the whole journey and by having good reason to trust in his tires. Perhaps the smoother torque of the six cylinders had something to do with his tire reliability, without a shadow of doubt, his steady speed without 100-mile-an-hour bursts had a great deal more to do with it. Probably his speed is the limit of which the car is capable but it is considerably higher than the manufacturers ever expected of it in a race as long as 500 miles.

Turning now to those which fell by the way the Ogren suffered a mishap which might be due to faulty material or to insufficiently strong design. An extraordinary sort of failure altogether. It was the fracture of the casing which holds the bevel pinion and its bearings, thus allowing the pinion to fall out of mesh with the ring gear. In such a case nothing could possibly be attempted.

Too Much Oil

The old Mercer reported that no spark could be kept going and investigation made by the writer with the aid of the Bosch representatives disclosed the fact that the pistons, whether from too large a tolerance or some other cause were allowing so much oil to pass that the plugs became literally filled up with it. No plug on earth could have sparked under such a smothering cloud of lubricant.

Wilcox's Stutz after making very high speed for quite a long time suffered a broken piston.

Of the Dusenbergs one burned out a connecting rod bearing, probably through momentary failure of the lubrication, or a tiny bit of dirt in the oil channel perhaps. The other suffered a derangement of the clutch which made gear changing impossible.

Lastly, Limberg's old Sunbeam, a sister car to Harry Grant's, burned a bearing or broke a connecting-rod bolt, causing some complications inside which resulted in a punctured crankcase. Investigation by pulling down the motor was not made on the spot but it might reasonably be supposed that an instant's pause in the oil supply to some bearing or other was the primary cause.

Sunbeam Bearing Trouble

Of the cars which were left running after the first ten were in, Van Raalte had a broken connecting-rod and had been running for a couple of hours on three cylinders. The piston or the connecting-road bearing seized, the rod broke, hit the piston and so bent it that it jammed in the cylinder mouth and the bits of rod then dropped harmlessly into the crankcase. A hole was punched in the side of the case during these events, but this did not matter because of the lubrication system. On the Sunbeams oil is sucked back to the tank directly it gets through the bearings and drops to the base, so the latter never contains any oil.

The two Maxwells which failed to get among the prize winners appeared simply to be insufficiently fast.

CAUSES OF RETIREMENT IN LAST THREE SPEEDWAY RACES

Indianapolis, 1914	Indianapolis, 1915	Chicago, 1915
Broken cam	Broken connecting rod.	Broken bevel pinion housing.
Broken connecting rod.	Broken timing gear	Broken piston.
Broken rocker arm	Broken piston	Broken connecting rod.
Broken piston	Broken connecting rod.	Burned out bearing.
Broken valve & piston.	Broken wheel	Oil on plugs.
Broken connecting rod.	Broken piston	Faulty clutch.
Broken valve	Broken rear axle bearing	
Broken wheel	Loose flywheel	
Broken camshaft		
Broken camshaft	Smoking exhaust	
Broken connecting rod.	Cranked cylinder	
Broken ball bearing	Loose mud pan	
Broken frame		
Loosened cylinder		
Per cent retirement caused by broken parts, 93	Per cent. retirement caused by broken parts, 64	Per cent. retirement caused by broken parts, 50

Globe Tire Adds—The Globe Rubber Tire Co., Trenton, N. J., will build a two-story brick addition to its plant on Prospect street.

To Mfg. Tractors—J. C. Kerst is having plans made for factory to manufacture motor-driven farm machinery in Springfield, Ill.

Xenia Rubber Buys New Plant—The Xenia Rubber Co., Xenia, Ohio, has purchased the mills of the Belden elevator, 2½ miles from that city.

Portage Tire Purchases Plant—The Portage Rubber Co., Barberton, O., has purchased the old plant of the American Strawboard Co. and will erect buildings costing $300,000.

To Make Bumpers—The American Automatic Save-A-Life Co., Washington, D. C., will construct a plant at Cameron, W. Va., for the manufacture of automobile accessories and bumpers.

To Mfr. Diesel Engines—The Enkel Motor Co., Auburn, N. Y., will erect a plant for the manufacture of the Diesel type of automobile motor. C. H. Williams is vice-president and general manager.

Lenox May Move.—There has been some talk that the Lenox Motor Car Co. of Hyde Park, Mass., might move to Lowell, Mass., in the near future, if sufficient inducements were held out by the latter city.

To Manufacture Accessories—The Furgason Mfg. Co., Lansing, Mich., has acquired a new plant and will add the manufacture of automobile accessories to its present line of general machine shop products.

To Make Tires—The Essex Tire Construction Co. has been incorporated to manufacture automobile tires with a capital stock of $125,000. The plant will be in Irvington, N. J. The incorporators are W. Barth, F. H. Butterthworth and F. M. Mervin.

Gordon Rubber to Add—The Gordon Rubber Co., Canton, Ohio, has increased its capital stock from $300,000 to $600,000 and has under consideration the erection of new buildings that will double the capacity of its plant.

Newark Co. to Make Carbureters—The Mfg. & Sales Co. of the Float-Jet carbureter, has been incorporated to make carbureters in Newark, N. J. The capital is $300,000 and the incorporators are Siegfried Leschinger, C. F. Kraemer and J. M. Reilly, all of Newark.

Kellogg to Increase—The Kellogg Mfg. Co. plant has been working in day and night shifts for the last three months to keep up with orders for its engine-driven tire pumps. Recently the company added 15,000 feet of floor space. Plans are prepared for a larger plant and equipment to be ready as needed.

Tire Co. in Conn.—The Monarch Stitched Tire Co., formed recently in Maine, has purchased the Munroe-Eastman Co.'s plant at the border line between Newington and New Britain, Conn., in which the company will manufacture its product. The carcass of the tire is both stitched and cemented into the tread, and a guarantee of 6,000 miles without the adjustment clause will be given by the makers.

Falls Motor Adds—The Falls Motor Co., Sheboygan Falls, Wis., manufacturer of gasoline engines for automobiles, is about to erect a large new testing shop building. The new shop will be of brick and steel, 45 by 154 ft. in size, with concrete floors. The present testing shop is being equipped with machinery for motor construction. Overtime operations have been in effect for some months and the plant is employing more men than at any other time since its establishment.

Hoover Steel Starts Building—The Hoover Steel Ball Co., Ann Arbor, Mich., has broken ground for an additional new building, which will be 40 by 313 ft. and is to be filled with ball-making machinery. This will make the third new building which the company has erected since Sept. 1, last year, and comprising over 29,000 sq. ft. of floor space. This will allow the company to increase its payroll to between 500 and 600 employees. The company has contracted for approximately $65,000 worth of additional ball-making machinery.

$100,000 Addition for Fedders—The Fedders Mfg. Co., Buffalo, N. Y., will spend $100,000 on a new four-story addition to its plant. When the new place is finished the floor space of the plant will be doubled. The offices, which are now in one of the old buildings, will be moved there and the space that they occupy at the present time will be added to the factory. Besides housing the offices it will include the service department. The new building is one story higher than the other buildings which comprise the plant. Brick and steel are the principal materials being used in its construction.

The Automobile Calendar

July 3.....Utica, N. Y., Hill Climb, Automobile Club of Utica.
July 3.....Sioux City, Ia., 300-Mile Race, Sioux City Speedway Assn.
July 3.....Westerville, O., Show.
July 4.....Visalia, Cal., Road Race; Tulare County Automobile Assn.
July 4-5.....Tacoma, Wash., Road Race, Tacoma Speedway Assn.
July 5.....Omaha, Neb., Speedway Races, Omaha Motor Speedway.
July 5.....Visalia, Cal., Road Race, Tulare Co. Auto. Assn.
July 7-8.....Taylor, Texas, Track Race, Taylor Automobile Club.
July 9.....Burlington, Ia., 100-Mile Track Race; Tri-State Fair.
Aug. ..... Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3..... San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21.....Elgin, Ill., Road Races.
Sept. .....Indianapolis, Ind., Fall Show, Indiana State Fair.
Sept. .....Peoria, Ill., Second Northwestern Road Congress.
Sept. 3.....Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept. 6.....Providence, R. I., Speedway Race; F. E. Perkins.
Sept. 6.....Detroit, Mich., Speedway Race; Detroit Speedway Club.
Sept. 8-11.....Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13.....Oakland, Cal., Pan-American Road Congress.
Sept. 17-18.....Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Sept. 18-25.....Los Angeles, Cal., Show, Shrine Auditorium.
Oct. .....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 1.....Minneapolis, Minn., Track Race, Twin City Motor Speedway Co.
Oct. 1-2.....Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 6-16 .....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Nov. 18..... Arizona 150-mile Grand Prix.
Dec. 31..... New York City, Show; Grand Central Palace.
Jan. 22, 1916....Chicago, Ill., Show; Coliseum.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Miller Chalmers Assistant Sales Mgr.—H. W. Miller, formerly of Studebaker, has joined the Chalmers Motor Co., Detroit, Mich., in the capacity of assistant to the sales manager.

Suhr in Oregon—F. W. Suhr, special representative of the motor truck department of the Firestone Tire & Rubber Co., has been a visitor at the Portland (Ore.) branch for the past fortnight.

Wentworth Buys Out Portland Overland—Frank E. Wentworth, who is a partner of the Wentworth-Fosdick Co., Hupmobile distributors in Boston, and who has several other motor concerns in New England, has bought out the Overland branch in Portland, Ore., and in future it will be known as the F. E. Wentworth Corp. He has placed the agency in charge of E. A. Smith, who had charge of the Overland agency at Manchester, N. H., for some years. Salesrooms have been opened at the corner of Park and Congress Streets, and Mr. Wentworth had to give an order for 1000 Overlands to get the business.

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Garage

N. Y. Co. Moves—The Bryant Motor Service Co. has moved into larger quarters at 1926 Broadway, New York City.

McNaull Tire Opens in Brooklyn—The McNaull Tire Co. has opened a branch in Brooklyn, N. Y., at 1246 Bedford Avenue, under the management of W. H. Byrnes.

Falls Tire in Seattle—H. H. Hazeltine and A. W. Hoppock are joint owners of the Seattle Tire & Rubber Co., 1624 Broadway, Seattle, Wash., representing the Falls tire.

Auto Utilities in N. Y.—The Auto Utilities Corp. has opened a salesroom at 1898 Broadway, New York City, for the sale of Disco electric lighting and engine starting equipment.

N. Y. Kissel Moves—Clodio & Engs, Metropolitan Kissel distributor, has moved into larger quarters in the new Circle Building, Central Park West and Sixty-first Street, New York City.

Toledo Garage Moves—The United Garage Co., Toledo, Ohio, will move Sept. 1 to larger quarters at Jefferson and Ontario Streets. M. R. Himes, manager of the concern, has taken a 20-year lease on the structure. The building is fireproof and will be equipped throughout with a sprinkler system.

Motor Men in New Roles

Halladay Resigns—C. L. Halladay has resigned as chief engineer and factory manager of the Lewis Spring & Axle Co., Jackson, Mich.

Emerson King Purchasing Agent—J. R. Emerson has been appointed purchasing agent for the King Motor Car Co., Detroit, Mich.

Chamberlain Garford Mgr.—R. E. Chamberlain is the manager of the Kansas City branch of the Garford Motor Truck Co., Lima, Ohio.

Bonniwell Assistant Advertising Mgr.—C. A. Bonniwell has been appointed assistant sales and advertising manager of the Auburn Automobile Co., Auburn, Ind.

Hobbs With Hoyt in Detroit—E. M. Hobbs has been appointed district sales manager of the Hoyt Electrical Instrument Works, Penacook, N. H., with headquarters at 967½ Woodward Avenue, Detroit.

Wayne's Temporary Officers—Temporary officers have been named by the Wayne Steering Wheel & Box Co. They are: J. C. Coleman, sales manager; Anthony Snyder, treasurer, and W. M. Wetherell, factory manager.

Tormey Frisco Tire Mgr.—James Tormey, formerly with the San Francisco branch of the Goodyear Tire & Rubber Co., is the new manager of the Service Tire and Oil Co., San Francisco, Cal., distributor for Nassau tires.

Hardin St. Louis Dealers' Secretary—W. O. Hardin has been made secretary of the St. Louis Automobile Manufacturers' and Dealers' Assn., succeeding P. J. Fisher, who has resigned. Hardin will assume his new duties July 1.

Dunham in Garfield Bldg.—G. W. Dunham, formerly vice-president and consulting engineer of the Chalmers Motor Co., who resigned to start into business for himself as a consulting engineer, has located his offices in the Garfield Bldg., Woodward Avenue, Detroit.

Jennings Dodge District Rep.—C. H. Jennings has been appointed district representative for Dodge Bros. in New York City. Mr. Jennings has been actively in charge since C. W. Matheson, formerly New York district man, became service director of Dodge Bros. several months ago.

See Winnipeg Mgr.—The Dominion Auto Supply Co. has been formed in Winnipeg under the management of G. W. See. This new concern has taken over the premises recently vacated by the Western Canada Motor Car Co., and will conduct a general garage and supply business.

Rengers Assistant to Pres.—F. H. Rengers in becoming the assistant to J. W. Moon takes charge of the correspondence department of the Moon Motor Car Co., and inside work and office work of an assistant nature to Mr. Moon. Mr. Rengers succeeds C. C. Culbertson to this position.

Colgrove Gets Hudson for Grand Rapids—L. E. Colgrove, who has been manager for the Mitchell Motor Sales Co., Grand Rapids, Mich., has become Hudson dealer in that city. He has secured quarters in the Burton A. Spring garage on Jefferson Avenue and will maintain salesrooms and a service station.

Jenkins Returns to Coast—W. M. Jenkins, who has been sales manager of the Master Carbureter Corp. since this concern was started in Detroit, Mich., last year, has returned to the Pacific Coast to take charge of the sales of the Master Carbureter Co., Ltd., Los Angeles, Cal. The business of the Detroit concern is now conducted from the new plant at 1523 Fort Street, West.

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Dealer

N. Y. Remington Makes Lease—The Remington Motor Sales Corp. has leased offices in the United States Rubber Bldg., Broadway and Fifty-eighth Street, New York City.

Opens Seattle Repair Shop—H. V. Hoffman, formerly with the Buick in Seattle, Wash., has opened a repair shop and storage plant at 5322 Rainier Avenue, Seattle.

N. Y. Federal Truck Enlarges—The present quarters of the Federal Truck Co. in New York City have been found inadequate. Arrangements have been made to secure the whole second-floor space at 146 West Fifty-second Street, the company at present occupying the first floor. The first floor will be entirely devoted to service quarters, garage and repair shop, with an entrance directly off the street. The whole second floor is given over to showroom, general offices and sales department, together with a department for spare parts. The company has established a station in Newark, N. J., at 985-987 Broad Street.

VOL. XXXIII NEW YORK—THURSDAY, JULY 8, 1915—CHICAGO No. 2

The AUTOMOBILE

Belligerents Exhaust Swiss Output

Truck Factories Work All-Day Shifts—France Wants Gasoline Farm Tractors—New Magneto Industry Started in France

By W. F. Bradley

Staff Representative of the AUTOMOBILE *in Europe*

GENEVA, SWITZERLAND, June 17—Since the month of November Swiss automobile factories have been working at high pressure on orders for the German and Allied armies. A difficulty is experienced in getting raw material and in many cases trucks are delivered to foreign governments without magnetos.

The Saurer company, which occupies the leading position in the Swiss automobile industry, now employs 2000 men instead of 1500 before the war, and is operating a day-and-night shift. This firm has branch factories in both France and Germany and is supplying trucks to the German, French and English governments. It is estimated that the Swiss factory is producing eighty trucks per month. The output is limited to a certain extent by the lack of raw material. A few years ago the firm brought out a gun which gave good results, but at the present time it is not producing arms.

The Berna factory was stopped entirely during August and September. Since then it has been producing trucks at the rate of thirty per month, supplying them to France, England and Germany.

The Franz company is producing fifteen trucks a month, but as this concern is under German control the entire output is absorbed by Germany.

The Piccard-Pictet company is producing but a small quantity of complete automobiles, but has accepted contracts from the Swiss and foreign governments for car and artillery parts. There is a sufficiency of this class of work to allow the company to give it out in sub-contracts to other automobile and general engineering firms.

Martini is working with an increased staff of men producing touring cars for the Swiss and French governments. All private automobile trade has been stopped and it is impossible to export to England. With warring nations all around her, there is plenty of work for the Swiss factories on automobiles, or, if these cannot be produced, on gun parts.

PARIS, June 19—Orders have been issued by the French war department that the state arsenals and private factories producing guns and ammunition must be worked to their highest capacity. In order to make this possible all the necessary men have been released from service in the field to take up their former positions in the workshops.

The effect of this order will be to make the automobile factories busier than ever. It is doubtful if there is a machine shop in France which has not for months past been working for the army or navy. The military authorities, however, had the first call on the men, and recent investigations have shown that numbers of factories, although working 20 to 24 hours a day, were 10 to 30 per cent below their maximum production. Since the war broke out all shortage of machine tools has been met by supplies from America, and only men were needed to work these tools. Under the new regulations the increase in the output of munitions will be immediately apparent, for the entire organization existed and it is only a question of putting more men to work in the shops.

French Factory Activities

Automobile factories are particularly useful for the production of shells, machine gun tripods, aeroplane darts and bombs. All these can be produced economically with practically no change in the plant. The new orders will not make any change in the purely automobile work of the factories. By reason of her heavy purchases abroad France is well supplied with trucks, tractors and touring cars. There is a high demand for aeroplane motors, also for aeroplanes, but the factories specializing in this class of work are able to meet requirements.

Few Trucks Destroyed

During the present stage of the war the loss of automobiles is not excessive and is not likely to become so unless some dramatic military situation develops. So far as France is concerned, American manufacturers need not expect any important renewal of orders for trucks and cars. The army is well supplied and big reserves of automobiles are held. A serious reverse or an important success could so change the

Aultman and Taylor gas tractor from Ohio hauling a plow in France

conditions of operating that losses of trucks would be increased and more orders would have to be placed, but until that occurs France need not be expected to come into the market for a further big quantity of automobiles.

American Tractor Trade

Recently the Knox company's four-wheel-drive tractor has successfully passed army tests and an order has been placed for early delivery. The three-wheel type of tractor did not meet the approval of the French army authorities.

The four-wheel-drive tractor, which is a special proposition and very highly thought of by French military authorities, can only be produced in France in limited quantities and is not made at all in other European countries. Hence there is always an opportunity for America to supply more of this type of vehicle.

Light-Truck Orders

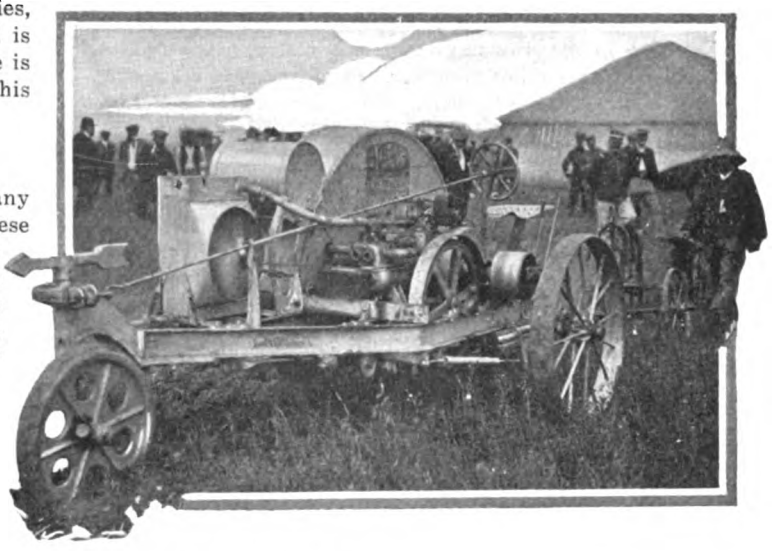
Orders have also been placed with the Jeffery company for light trucks running on pneumatic tires. Many of these have already been delivered. The French factories have supplied thousands of this type of automobile, for it is nothing more than a stout touring car chassis, and is made use of for light haulage and ambulance work. They might have been produced by the home factories, but the view of the authorities evidently was that it was cheaper to buy abroad than interrupt the shell making of the automobile factories. It can be taken as absolutely certain that when more automobiles are needed in the French army they will be secured from America, for it is better policy the keep the factories running uninterruptedly on shells than to switch them backward and forward from ammunition to cars. This, however, does not prevent the car departments of certain factories working at constant pressure for the army. The point is that when bigger numbers of automobiles are required an attempt is not made to get them out of the home factories, but recourse is had to America.

France Buys Direct

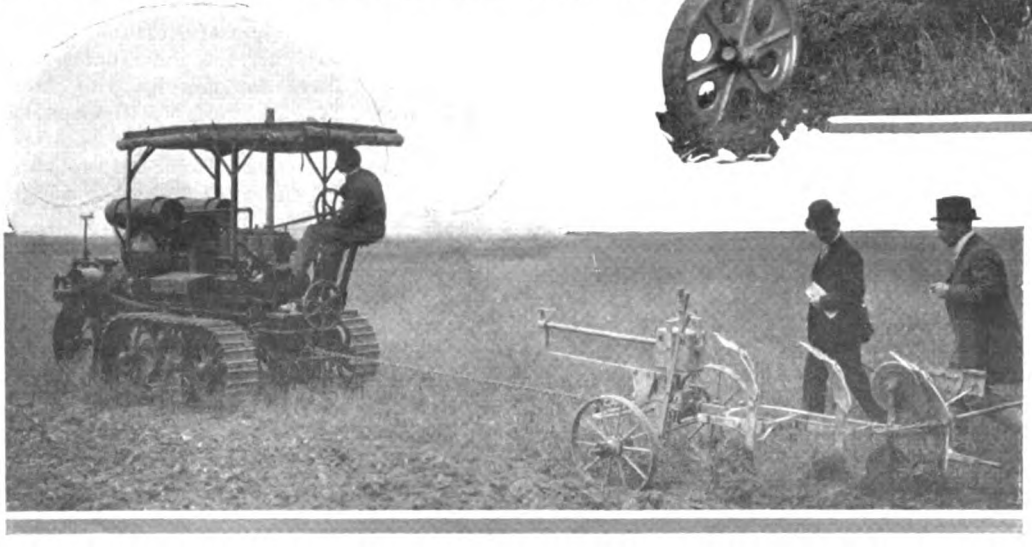
It is interesting to note that so far as France is concerned a comparatively small number of American firms have been able to get orders. The complete list of these firms is doubtless as follows: White, Pierce-Arrow, Packard, Kelly-Springfield, Jeffery quad and truck, Knox quad, Sternberg, and one make of American caterpillar tractor. There are scores of other American firms which have automobiles in army service in France, but they have never secured direct army contracts. Ford, for instance, has some hundreds of model T chassis in ambulance work, but it does not appear that the French army has ever bought one of these automobiles.

The English and the Canadians have bought and brought over all kinds of American trucks and automobiles, for much of their business is done through intermediaries. From the beginning the French war department has sought to keep the purchase of automobiles entirely in its own hands and has so well succeeded that it is hard to find an intermediary who has gained admission to the offices in the Boulevard St. Germain. A lot of enterprising salesman have come to Paris with catalogs and samples, but have sooner or later come to the conclusion that London and Petrograd are better places of business.

One field open right now to the American manufacturer is



Light Bull tractor which met with the approval of the French agriculturists



Bullock gasoline tractor being demonstrated to a French farmer

French officers on one of the Jeffery Quad trucks

Sending finished shells away on an American truck

the supply of agricultural gas tractors. There is and will be for a long time a dearth of agricultural labor and this shortage can only be met by the use of motor tractors. The French farmer is ready to adopt such machines. For 6 years he has been carefully educated to the value of gasoline on the land, this work having been undertaken by both automobile and farmers' associations, and if the average farmer has not broken away with tradition he has at any rate been convinced in his own mind that at some date he would have to make use of motor traction in his fields. The war has determined that that date shall be the year 1915.

Farm-Tractor Demonstration

As an indication of the seriousness with which this problem is being studied, a practical demonstraton of gas tractors in use on the land was made a few days ago in an important agricultural district 40 miles to the southwest of Paris. It is a mighty difficult matter at the present time to get up any demonstration in France which does not have the prosecution of the war as its direct object. Thus it is most significant that this event should have been attended by an official delegate from the Ministry of Agriculture, by French staff officers, by officers attached to the corps charged with the work of relieving civilian distress, and by the leading farmers of the surrounding country. The demonstration had been organized by the enterprising French agent of an American machinery company and comprised five makes of machines, four of which were entirely suitable for French conditions. Immediate business will be done here, and furthermore it will be of a permanent character.

French Farmer Slow

It must not be supposed that because the French farmer is now buying or intends to buy gas tractors that he is in the market for touring cars. It is a difficult matter to hurry the French agriculturalist into luxuries, and while a farmer is ready to believe that a tractor is a good business proposition, it will take a lot of argument to convert him to the use of a car for ordinary traveling.

Immediately after the war there will be an opportunity for the American automobile manufacturer to secure some business in France, but that business will not be done among the purely agricultural classes. Particularly, if the war ends abruptly, French, and indeed all European factories, will be unable to meet the demand for touring cars. This gives the American an opportunity to step right in, but advance arrangements will have to be made in order to do so.

There is also the fact that Germany will no longer be able, in view of public opinion, to market her wares in France. Her hold on the French automobile business was not great, but it is nevertheless worth considering. More important is the accessory business, of which Germany held a big share. This market is entirely open to America. The French do not excel in tools and accessories, Germany who held much of the business, will be wiped out, England will be too busy in other directions, and there is moreover, a very favorable impression toward this line of American products.

The prospect of after-the-war supply of American trucks to France is not brilliant. Whatever the conditions of peace, there will be more gasoline haulage after the war than ever occurred before. But the fact has to be faced that some thousands of trucks of both French and foreign construction will be released from military service in fairly satisfactory condition. These will be sufficient to meet civilian requirements for a year, perhaps more, and certainly until a return to normal working conditions.

As a result of the war the French army authorities will extend the truck subsidy scheme, thus making it impossible for foreign manufacturers to compete with home firms. One of the leading American firms doing touring car business in France and selling war trucks in various parts of Europe is so sure that development will be on these lines that no attempt is being made to cater for the ordinary French trade.

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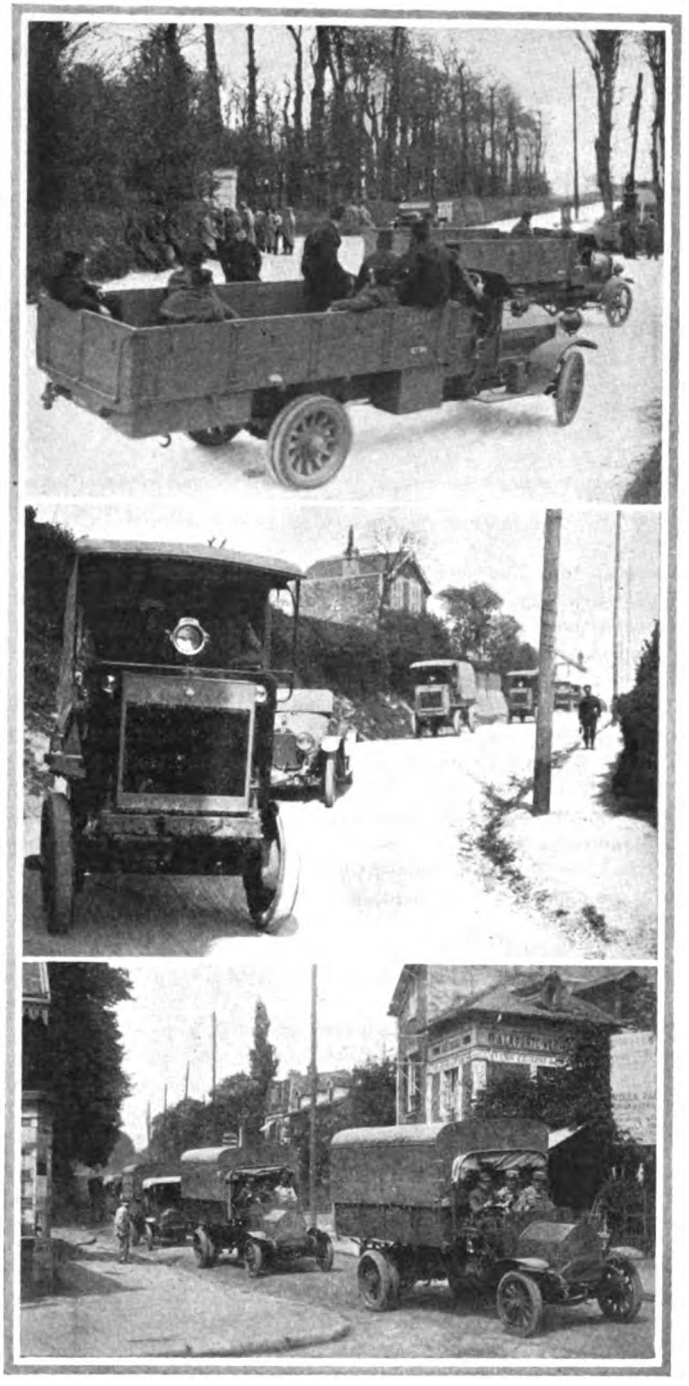
Founding Magneto Industry in France

PARIS, June 15—France is through with German magnetos. How near she was to the disaster of a magneto famine and how cleverly she made herself independent of products from across the Rhine is one of the best stories related in connection with the industrial organization of the war.

Last November the shortage of magnetos had become so serious that the Minister of War called in Louis Renault, the leading automobile manufacturer of France to ask him to suggest a solution. At that time the factories were working at full pressure, 22 to 24 hours a day, and seven days a week. Gnome and Renault were each producing nearly 100 aeroplane motors per week; Clerget, Salmson, Anzani, Le Rhone were building smaller quantities. These special aeroplane motors could not be bought in America, or indeed from any other European country. Every factory in France capable of making heavy or light trucks was employed to the utmost of its capacity. The touring car factories were producing such cars as were required and at the same time specializing on shells. Neutral Switzerland was filling truck orders for France, but only accepted the orders on condition that delivery should be made minus magneto. Italy, until the moment she declared war, was in the same position.

Louis Renault's reply to the Minister of War was that he could not personally undertake the construction of magnetos,



Top—English truck employed for work in the French army
Center—Jeffery Quads going through Northern France into Belgium
Bottom—Convoy of requisitioned Saurer trucks on the road in France

but he suggested a means whereby an immediate and permanent remedy could be secured. Within an hour of that interview an order was signed calling out of the firing line Soldier Dutreux, who from the first day of August to the beginning of November had been shouldering a rifle. Under the blue-gray uniform of Soldier Dutreux was a former manager of the Dunlop Tire Co., a director of the S. E. V. electric lighting company, a successful business manager of the Panhard-Levassor Co., in a word, one of the best organizers and business managers of automobile France.

When the war broke out the French government had sequestered, in common with all other German property, the factory and offices of the Bosch Magneto Co. in Paris. A complete inventory of the stock was taken by a public receiver, the Bosch sign was removed, and the French manager of the factory continued to build magnetos on a small scale for the French army authorities. So far as the public was concerned, the firm was in exactly the same position as a bankrupt company in the hands of an official receiver.

Foreman from the Front

Soldier-manager Dutreux received army orders to lay down his rifle, take charge of the Bosch factory and produce the greatest number of magnetos in the shortest possible time. Probably the efforts of such a capable manager would not have been productive of great results but for the forethought of the French war department. For the last eight or nine years the French army has held an annual truck competition, the successful vehicles in which were eligible for State subsidies. So successful has been this scheme that every truck maker in France takes part in it, and the last competition brought to a close by the declaration of war, had united 150 vehicles. One of the stringently observed clauses of this competition was that the whole of the truck must be produced in France, of French material, by a firm under French management. As an example, the Goodrich Tire Co., which supplied some of the rubber tires for these trucks was only eligible for this work by reason of having a French factory, obtaining its supplies from French sources, and working under the control of a technical director amenable to French military laws.

The Bosch company supplied a large proportion of these truck firms with magnetos, but those magnetos were constructed entirely in the Paris factory, and the whole of the material used in their construction was produced in France. Further, although the company was under German control, the technical head of the Paris factory was a Frenchman eligible for military service in the French army. The severity of the competition guaranteed the French-made magnetos being equal in every respect to those built in Germany; failure from any cause entailing disqualification, the individual manufacturers would have refused to fit a magneto which did not possess every guarantee of excellence.

Made Complete Magnetos

By this arrangement Manager Dutreux was in charge not merely of an assembly plant, but of a small, efficient factory producing complete magnetos. Starting in on the first day of November, Manager Dutreux had so organized his forces that on the first day of January the output of the factory was three times greater than it had been at any previous period of its history. The supply was sufficient to meet all the demands for aviation motors delivered to the French and several of the allied armies, France is supplying Belgium, Russia, Italy, and England to a small extent, and left a margin for trucks and touring cars.

The seriously threatened magneto famine had been averted. When the men were wanted for this work, an order signed by the war department brought them out of the trenches; if supply houses were hanging back in the matter of deliveries, the war department supplied the men from out of the ranks and requisitioned the material if it could not be obtained otherwise. Every man in the magneto factory, from the managing director to the caretaker, was under military orders. They had cast off their uniforms, but they had not been freed from military obligations. Instead of the cent a day they were entitled to draw in the firing line, they were paid the same wages as before the war.

While this work was in progress, plans were being laid which would make the French automobile and allied industries independent for all time of German magneto supplies. Two years ago Louis Renault founded the S. E. V. company for the production of electric lighting and starting outfits for automobiles. Eight other French car manufacturers were associated with Renault in this work. It was this company

(*Continued on page* 59)

Maxwell—Mercer—Duesenberg July 4 Winners

Sioux City

Rickenbacher in Maxwell first, averaging 74.7 m.p.h.

O'Donnell, Alley and Chandler, all in Duesenbergs, made 74, 71.25, and 65.85 m.p.h., respectively.

Orr's Maxwell was fifth at 64.40 m.p.h.

Shrunk's White averaged 61.20 for the race.

Tacoma

Ruckstell in the Mercer won the 250-mile Montamarathon at 84.5 m.p.h.

Pullen sent his Mercer over the finish line in the 200-mile race for the Golden Potlatch Trophy a winner at 85.2 m.p.h.

Parsons duplicated his feat of last year in winning the 100-mile Intercity.

Omaha

Making the highest average of any of the July 3, 4 and 5 races, Rickenbacher sent his Maxwell over the route to victory at 91.74 m.p.h.

O'Donnell made a good record with his Duesenberg—86.16 m.p.h. after a speed duel with the winner.

Orr's Maxwell took third place handily with an average speed of 82.3.

MAXWELL, Duesenberg and Mercer racing cars shared the leading honors of the speedway events held on July 4 and 5 at Omaha, Tacoma and Sioux City. Maxwell's were first at Omaha and Sioux City and Mercers won two of the three races at Tacoma. Duesenbergs took second prize at Omaha and second, third and fourth at Sioux City. A Maxwell was third at Omaha and fifth at Sioux City.

Highest Speed at Omaha

From the point of view of speed the record made on the little 1.25-mile board track at Omaha was far above those made at either Tacoma or Sioux City, although below the 91.58 m.p.h. recorded at Chicago, June 26, being 91.74 for Rickenbacher's Maxwell. Second and third drivers were well up, O'Donnell's Duesenberg averaging 86.16 and Orr's Maxwell 82.3. One reason for the speeds being lower than those at Chicago was that the drivers were afraid to open up too much on the small track for fear of losing control.

The results of the various races bring out strongly the value of the plank surface as a promoter of high speeds, the Omaha averages as well as those at the newly boarded Tacoma track being well above those made on the dirt track at Sioux City. It is evident that the board surface offers much better and more uniform traction with less tendency to skidding than the dirt track. It also gives the drivers greater confidence and enables them to get higher efficiency from their cars.

At Tacoma the speeds were 85.2 m.p.h. for Pullen's Mercer, winner of the 200-mile Potlatch race with 85 m.p.h. for Cooper's Stutz which was second, 79 for Ruckstell's Mercer in third position and 78.8 for Oldfield's Peugeot. In the Montmarathon over a 250-mile course Ruckstell's Mercer averaged 84.5 m.p.h. with Cooper's Stutz a close second at 84.22 and Pullen's Mercer third at 84.20. Burman and Oldfield in Peugeot's made 79.5 and 75.8 m.p.h., respectively. In the Intercity 100-mile event Parsons averaged 79.5 in his Parsons special, while Elliott in the Gordon was second at 74.7, the other averaging under 65 m.p.h.

At Sioux City Rickenbacher averaged 74.7 m.p.h., and O'Donnell's and Alley's Duesenbergs were close behind with 74 and 71.25 m.p.h., respectively. Chandler's Duesenberg made 65.85; Orr's Maxwell, 64.40, and Shrunk's White, 61.20.

Three Fatal Accidents

Three deaths marred the July 3, 4 and 5 racing this year, Billy Carlson and his mechanician Franzen being killed at Tacoma when a tire blew out on a turn and threw their car over a 30-ft. embakment. Franzen was killed instantly and Carlson, though rushed to a hospital, died without regaining consciousness. The third death was that of C. C. Cox, who drove the Ogren at Sioux City. Cox swung out to permit Rickenbacher to pass at the same time that another car was coming up behind which forced Cox to swing back again, and in so doing he struck wheels with Rickenbacher which threw the Ogren through the outside fence where it turned over. Cox was injured on Saturday and died on Sunday. His mechanician, McGraw, was also injured.

Maxwell Leads at Sioux City

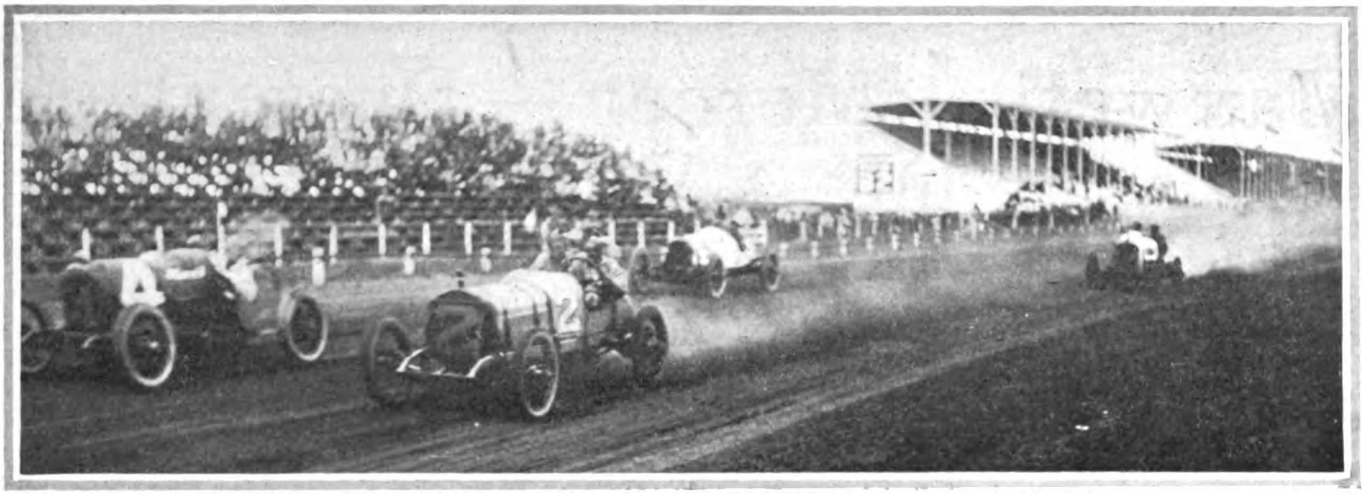
SIOUX CITY, IOWA, July 3—Rickenbacher, driving a Maxwell, won the 300-mile race here to-day on the 2-mile dirt speedway at an average of 74.7 m.p.h., a speed relatively slow in comparison with Indianapolis and Chicago speedways and also slow as compared with a speed of 78.8 m.p.h., made a year ago on this same dirt speedway here by the same Rickenbacher when he won on a Duesenberg. To-day the track was slow, due to incessant rains and scarcely more than 25 miles of the 300 were covered when the home stretch and one of the turns began breaking up and from that time to the finish the race was a severe test of the skill of the drivers and the stamina of the cars. The test to which the cars were put by this unusual track condition is best explained by the fact that of the fifteen starters which were sent away at 12.30 sharp, only six were able to finish the 300 miles by 5.30 p. m., the time set for the completing of the three centuries. The track was in good shape at the start but the 75 m.p.h. pace soon proved too much for it.

Finishers at Sioux City Race

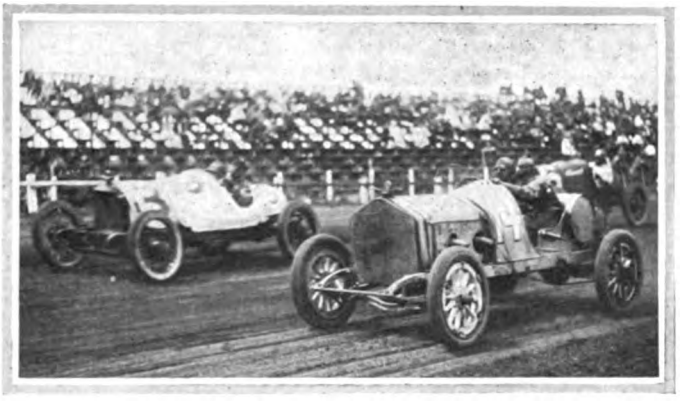
CAR	DRIVER	TIME	M.P.H.
Maxwell	Rickenbacher	4:00:56	74.7
Duesenberg	O'Donnell	4:03:21	74.0
Duesenberg	Alley	4:12:31	71.25
Duesenberg	Chandler	4:33:21	65.85
Maxwell	Orr	4:39:40	64.40
White	Shrunk	4:54:08	61.20

A Neck-and-Neck Race

To-day's race is the first important victory for Rickenbacher since he won on this speedway a year ago. He did



Rickenbacher in the Maxwell leading Shrunk in the White on the Sioux City dirt speedway



A lively brush between Alley's Duesenberg and the National in the Sioux City 300-mile race

not have matters at all his own way to-day. In fact it was a neck-and-neck race from start to finish with a Duesenberg entry, driven by O'Donnell. During the 300 miles the Duesenberg was never a lap behind the one leader and for 10 miles O'Donnell led Rickenbacher's Maxwell. At the finish O'Donnell was less than 2¼ min. behind the Maxwell. The fight between these two leaders might have been much closer had it not been that the Duesenberg was handicapped by a broken water pump which made it necessary to run the last 4 miles of the race without water. Rickenbacher's time for the 300 miles was 4:00.56, and O'Donnell's time was 3 min. and 21 sec. slower, his average being exactly 74 m.p.h.

Duel Between Rickenbacher and O'Donnell

These two contestants, Rickenbacher and O'Donnell, made the race from start to finish, and there were no other serious contenders for first or second place at any time.

Third honors went to Alley, driving another Duesenberg, who averaged 71.25 m.p.h., and was over 12 min. behind Rickenbacher. Alley ran consistently 6 miles or three laps behind the leaders, and nearly 20 min. ahead of the remainder of the field.

Chandler, in a third Duesenberg was fourth, at an average of 68.85 m.p.h.; a Maxwell driven by Orr was fifth at 64.40 m.p.h., and a local White, driven by Shrunk was sixth, averaging 61.20 m.p.h. These six were all the cars that finished. The performance of the Duesenbergs finishing second, third, and fourth was the feature of the race, after the duel between Rickenbacher and O'Donnell.

Donaldson in the Emden and Cooper in the Sebring were flagged while they still had several miles to go; and the remaining seven of the fifteen starters dropped out, five of them being eliminated before the 70-mile mark was passed.

Of those eliminated Resta in his new Peugeot, winner of the recent Chicago race, winner of second place at Indianapolis, and winner of the Grand Prize and Vanderbilt Cups at San Francisco, was looked upon as the greatest disappointment, as this entry played a major part in attracting many of the 20,000 spectators. Resta was never a factor, in fact, he never seemed interested in the race. He considered the course dangerous, and was out at the end of 12 miles with a broken oil lead and a broken bolt in a crankshaft bearing. While running he did not at any time appear to challenge Rickenbacher and O'Donnell, who led from the start.

One Fatal Accident

Only one accident marred the race. C. C. Cox, driving the Ogren, was injured and his mechanic, McGraw, also injured when Cox swung out to permit Rickenbacher to pass. At this moment Cox saw another car coming up behind and swung back again, but in doing so struck wheels with Rickenbacher, which threw Cox to the side, the car going through the outside fence and turning over. The wheel on Rickenbacher's Maxwell was slightly damaged, the most serious aspect of it, however, being the delay to change. Rickenbacher almost had to go through the fence to avoid crashing into the wreck. He was able to keep his car from upsetting and continue the race without losing the lead. Cox had his right leg broken, together with some ribs fractured, and the mechanic sustained fractured ribs and dislocated shoulder. Cox died of his injuries on Sunday. His mechanician is expected to recover.

Rickenbacher Takes the Lead

In the duel between Rickenbacher and O'Donnell, Rickenbacher took the lead at the end of the first lap and was at once pursued by O'Donnell's Duesenberg, together with Alley in the other Duesenberg. Resta's Peugeot was back in the field. At the end of the second lap the three leaders were making a runaway from the rest of the field and had lapped some of the other entries. Resta was running in seventh place. At this early point in the race the Sebring stopped at the pits as did the National entry.

Alley a Close Third

At the end of 20 miles Rickenbacher was leading O'Donnell's Duesenberg by fewer than 10 seconds, the Maxwell having averaged 75.5 m.p.h., or covering the 20 miles in 15.42. Alley, in the second Duesenberg, was less than 1 minute behind the leader. Resta's elimination at the twelfth mile was due to two causes, first a broken oil lead, and second a broken center bearing bolt which holds the outer ball race for the ball bearings carrying the crankshaft into position. The main oil lead had a rubber connection at its lower end and it

was this connection which punctured, allowing all of the oil flowing through it to drop outside of the motor.

O'Donnell 10 Sec. Behind

At the end of 40 miles Rickenbacher had his Maxwell still in the lead having averaged 78.9 m.p.h. O'Donnell had his Duesenberg but 10 sec. back of him and the second Duesenberg was trailing less than a minute back of the Maxwell. Soon Alley had to stop at the pits for some motor adjustment which placed him three laps behind, which did not endanger his third position as he was running more than 6 miles ahead of the rest of the field.

Sixty miles saw Rickenbacher, O'Donnell and Alley, running one, two, three, and miles ahead of the others. At this point the Maxwell averaged 76.6 m.p.h., O'Donnell was now 20 seconds back and Alley 6 miles back. O'Donnell all the time was making a persistent fight to overtake the speedy Maxwell but the dirt turns were getting so badly cut up and the home stretch was so rough that it was dangerous to attempt passing at this speed.

At 80 miles the positions remained unchanged, Rickenbacher averaging 76.6 m.p.h., O'Donnell was holding his position, Alley was 5 miles back, and 8 miles to the rear came the next group of drivers led by Orr in the Maxwell with Chandler in the third Duesenberg pursuing him. The White, Emden, Sebring, and Mulford were trailing.

By leading at 100 miles Rickenbacher won the $500 prize for premier position at this point, his average being 77.55 m.p.h., and his time for the distance, 1:18:24.30. O'Donnell was 1 min. and 16 sec. behind him.

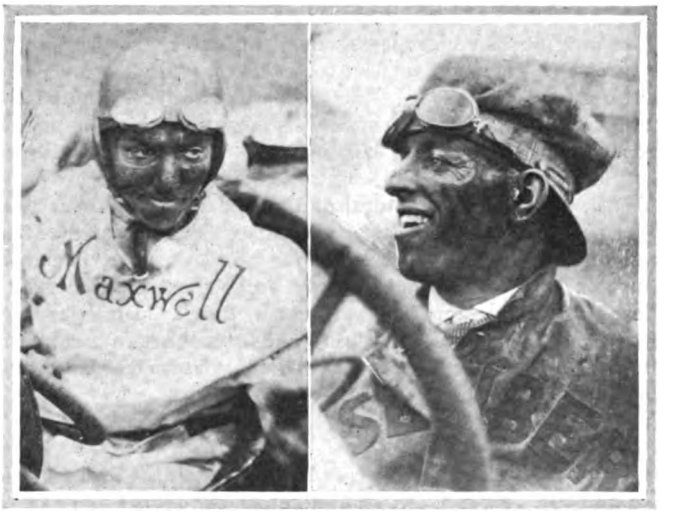
It was soon after this that Rickenbacher's collision with Cox nearly cost him the race and when he was signalled to stop at the pits and change the damaged wheel, many of the spokes of which were loose, O'Donnell took the lead, passing the pits just as the Maxwell was getting out after changing the wheel. The Duesenberg lead was short lived as Rickenbacher had his Maxwell in the lead in less than 2 miles, due to O'Donnell having to stop at 116 miles, to replace a punctured tire.

O'Donnell Struggles to Keep Lead

From 116 to 126 miles there was a neck-and-neck struggle between Rickenbacher and O'Donnell, with O'Donnell leading at 120 miles with a margin of less than 2 sec. and maintaining an average of 78.5 m.p.h. Rickenbacher was able to take the lead at 126 miles and was never headed from that point. At 130 miles he had increased his lead to 16 sec.; at 140 miles it was 26 sec., the average maintained being 75.3 m.p.h. At this time the course was getting rough with dust rising in clouds on the turns. On the home stretch the best part of the track for the cars, was a narrow one, well toward the outside fence. Some of the slower cars started driving on this track and several of them had to be signalled in by the officials because that was the part of the track on which the higher speed cars should travel. Because of this trouble some of the faster cars had to pass on the wrong side, namely next to the pole. At 148 miles Rickenbacher was signalled to stop and cautioned against passing on the wrong side, and it was while he was being warned that O'Donnell came down the stretch and it looked as if he would take the lead from the Maxwell, but instead he pulled into the pits for his first stop and the Maxwell was able to maintain its lead. O'Donnell replenished with gasoline, oil and water in 10 sec.

Rickenbacher Still in Front

At 160 miles Rickenbacher was averaging 74.3 m.p.h., with his Maxwell. O'Donnell was 1 min. and 20 sec. behind him, and Alley was holding the other Duesenberg in third place 6 miles to the rear. The other positions were Orr's Maxwell, Chandler's Duesenberg, and White, Emden, Sebring, and Mulford bringing up the rear at a pace of 40 m.p.h. None of the trailers had stopped at the pits up to this time, and as there was the silver trophy for the car running the greatest distance without a stop the rivalry among these trailers was interesting. Orr surrendered his chances by stopping at 172 miles, White stopped at 192, thus letting Chandler win with his Duesenberg by making 224 miles at which time he made



Left—Rickenbacher at the wheel of his winning Maxwell after the Sioux City race

Right—O'Donnell, second in the Duesenberg at Sioux City at the finish

Rickenbacher leaving the pit at Sioux City and shaking his fist at an official who warned him to keep to the outside of the track

Dimensions and Equipment of Sioux City Winners

No.	CAR	DRIVER	BORE	STROKE	DISP.	CARBURETER	PLUGS	TIRES	OIL	WHEELS
4	Maxwell	Rickenbacher	3.75	6.75	292.2	Zenith	Bosch	Nassau	Oilzum	Houk
1	Duesenberg	O'Donnell	4.375	6.00	360.48	Schebler	Bosch	Riverside	Oilzum	R-W
3	Duesenberg	Alley	4.375	6.00	360.48	Master	Rajah	Riverside	Oilzum	R-W
11	Duesenberg	Chandler	3.98	6.00	299.00	Schebler	Rajah	Nassau	Oilzum	R-W
6	Maxwell (Six)	Orr	3.75	6.75	292.2	Master	Bosch	Nassau	Oilzum	Houk
2	White	Shrunk	4.6	5.75	447.0	White	Bosch	Silvertown	Monogram	R-W

NOTE—All cars were equipped with Bosch magnetos and carried Hartford shock absorbers and motometers.

his first stop, taking on fuel. Up to this time the Duesenberg and White had been running in the same lap the entire distance.

From this point, 160 miles, the position of the leaders remained unchanged until the end of the 300 miles. Rickenbacher led at the end of 200 miles, taking the $500 money for leadership at this point. His average was 74.5. O'Donnell's Duesenberg was 1.5 min. back.

When the finish of the 300 miles came, Rickenbacher's lead was just 2 min. and 14 sec. on the Duesenberg. The Maxwell's average was 4.1 m.p.h. slower than the time made by Rickenbacher a year ago when he won with a Duesenberg.

Mulford's Car on Fire

Ralph Mulford in his Mulford special, who had reduced his speed to about 35 m.p.h., caught fire 98 miles from the finish, the Emden and Sebring being the only other cars running at the finish.

Sioux City Track Hard on Cars

SIOUX CITY, IOWA, July 3—That a dirt speedway deals death to motor car mechanisms and that only cars of quality and stamina can withstand the terrible grind, especially if the track is not in good condition, was proved conclusively at the second annual 300-mile race at Sioux City, July 3.

Running at 75 m.p.h., it required well-made cars and good drivers to finish in the money, for every part of the machines had to come into service. Vibration was carried to the maximum, side strains on the turns were heavy, taxing the steering mechanism and the wheels greatly. It was a surprise to many of the officials and spectators that as many as six cars finished, these making a total of thirteen stops or about two stops per car for 300 miles. The entire fifteen cars made a total of sixty stops or exactly four stops per car, but this figure is brought so high mainly because of two local entries, a National and a redesigned Buick. Disregarding these two cars, which really were not fit to start in a contest, there were thirty-one stops debited to thirteen cars, an average of three stops per car.

Track in Poor Condition

In the board and brick speedway races, at Chicago and Indianapolis respectively, the high speed of the cars was mostly responsible for the pit stops, but at Sioux City, where the average speed was much lower, it was the poor condition of the track which made riding difficult, though on the whole the cars which finished in the money made a remarkable showing. The motors were taxed excessively because most of the drivers used a rear axle reduction not fit for the track. There was only one car with a 3 to 1 axle, the remainder having 2.75 and under.

The track was badly rutted and made pulling at any reasonable speed a difficult matter and in not a few cases did drivers have to shift to an intermediate speed to pull out of the bad spots. This gives one an idea of the roughness of the course and the really good performance of those cars and drivers which won prizes.

Why the Cars Went Out

The first car to abandon the race was Resta's Peugeot, which was disabled on the back stretch because of two things. The center bearing, which is of the ball type, had its outer race held in position by four bolts. One of these was broken before the car started and the remaining three were sheared allowing the bearing to turn upon its support in the crankcase. Aside from this the main oil lead became punctured allowing the lubricant to flow into the mud pan and thus become wasted. Resta went out before finishing 14 miles and it was thought by many that the driver abandoned the race because he feared the track was not safe.

The next car to leave the course was the O. C. special, driven by Shea, a local driver. He retired in his twenty-sixth mile with a complication of troubles. He had separate exhaust pipes and lost one of them, also his valves were giving trouble and the motor was firing on two cylinders only.

A National entry driven by a local man went out in its sixtieth mile with a loose connecting rod, an overheated motor, and carbureter trouble.

Rickenbacher Made Three Stops

Rickenbacher, who carries away $7,000 in prize money, which includes first and $500 each for leading at 100 and 200 miles, made three stops in all, losing a total of 2 min. and 25 sec. His first stop was made in his 66th mile when he came in with a flat right rear tire. The next stop was made in the 104th mile when he came in to change a left rear wheel which became badly damaged when it was previously struck by the Ogren's right front wheel. Advantage was taken of the stop and all tanks were filled. The tire was not blown but became defaulted because of a slow leak or puncture. Oil was also taken on. Rickenbacher's last stop was made in his 148th mile when Starter Wagner called him in for advice. Rickenbacher was passing cars on the left side instead of the right, but this was necessary apparently, because many of the slower cars in the race were piloted by men who did not know the rules. These drivers kept to the outer rail instead of the inner causing the fast cars to pass on the left side, or slow down to 50 m.p.h., with possibly dangerous complications.

O'Donnell Lost Only 1 Min. 60 Sec.

O'Donnell in a Duesenberg, who finished second, lost only 1 min. and 60 sec. during the entire race. His first stop was made in his 150th mile to fill all tanks and his second in his 218th mile for water. O'Donnell never changed a tire. His second stop would not have been necessary had not the water pump sprung a leak. It appears that a small hole became enlarged because of the excessive pressure, and water was being lost at a great rate.

Alley Made Three Stops

The Duesenberg which finished third, driven by Tom Alley, made three stops, losing a total of 4 min. 6 sec. The first of these was in the 198th mile for water and oil, the second in the 222d mile for clutch trouble. The clutch was slipping badly and after treatment with rosin it held without trouble. The third was made in his 278th mile for a right rear tire which had blown and also water and oil.

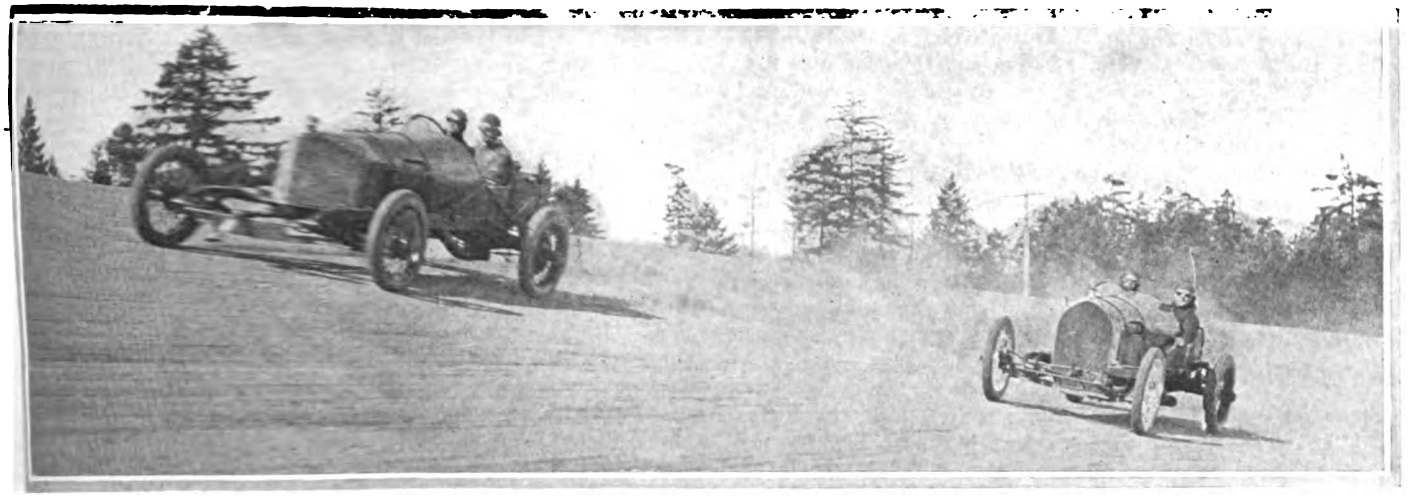
Tom Orr in a Maxwell drove a consistent race, stopping but twice, once in his 168th mile for supplies and again in his 226th mile for two new spark plugs and water and oil. In all he lost about 7½ min. at the pits.

The only local entry to finish in the money was the White six driven by Shrunk and he made two stops, the first at 180 miles for supplies and the second at 276 for water and oil and universal trouble. Shrunk was at the pits a total of 9 min. 5 sec.

Emden, Sebring and Mulford Still Running

The Emden, the Sebring and the Mulford were running when the race was called at 5.30 p. m. The first-named finished 290 miles and stopped three times, the first at 120 miles for lubricating trouble, the second at 168 miles for

Mercer Dual Winner at Tacoma



Pullen and Ruckstell, the Mercer drivers who won the Montamarathon and Potlatch races at Tacoma, making 98 m.p.h. on the newly planked speedway

supplies, and the third at 182 miles for new spark plugs. A total of 5 min. 52 sec. was lost.

The Sebring lost about 13 minutes and made seven stops at the pits, the first at 22 miles for water, the second at 56 miles to repair an oil leak, the third at 68 miles with a slipping clutch, the fourth at 80 miles with an oil pump leak, the fifth at 100 miles with clutch trouble, the sixth at 134 miles with the same trouble, and the last at 196 miles for water and oil.

Mulford, driving the same car he piloted at Chicago on June 26, made a total of eight stops, losing in all 23½ min. The first stop was at 36 miles to change all four tires from Silvertown cord to Nassau. His second stop in his 44th mile was caused by a broken radiator which caused overheating troubles until the time the race was called. Carbureter trouble also developed and because of the overheating the plugs had to be changed in the 88th mile.

In the Way of Equipment

Every car which finished in the money used a Bosch magneto and Bosch spark plugs with the exception of Tom Alley and Chandler who used a Bosch magneto and Rajah plugs. The race was won with a Zenith carbureter. Nassau tires were used by Rickenbacher, by Chandler who finished fourth, and Orr in fifth position. All cars starting used Hartford shock absorbers and Boyce motometers.

William Carlson, Maxwell driver, who was killed in the races on the Tacoma 2-mile board speedway. He was born and reared in the vicinity of Los Angeles and belonged to the later-day generation of coast drivers. He finished in ninth place in the recent Indianapolis race

Ruckstell and Pullen Win Two Leading Events—Parsons Wins Intercity for Second Time—Board Speedway Fast

Montamarathon Trophy Race 250 Miles

CAR	DRIVER	TIME	M.P.H.
Mercer	Ruckstell	2:57	84.5
Stutz	Cooper	2:58:5	84.22
Mercer	Pullen	2:58:55	84.20
Peugeot	Burman	3:08:44	79.5
Peugeot	Oldfield	3:17:58	75.8

Golden Potlatch Trophy 200-Mile Race

CAR	DRIVER	TIME	M.P.H.
Mercer	Pullen	2:21:14	85.2
Stutz	Cooper	2:21:25	85
Mercer	Ruckstell	2:31:41	79
Peugeot	Oldfield	2:32:3	78.8

Intercity Trophy Race 100 Miles

CAR	DRIVER	TIME	M.P.H.
Parsons Sp.	Parsons	1:15:27	79.5
Gordon	Elliott	1:20:28	74.7
———	Barsby	1:35:06	63.2
Studebaker	Staley	1:42:30	56.2
Ford Sp.	Erdman	—	—

Three-Race Program

TACOMA, WASH., July 5—The 2-day racing on the newly planked 2-mile speedway evolved three popular winners in the three races held in conjunction with the Montamara festival, Ruckstell, in a Mercer, winning the 250-mile event, at 84.5 m.p.h. or 11.1 m.p.h. faster than the time made by Cooper in the Stutz last year; Pullen, also in a Mercer, capturing the 200-mile race at 85.2 m.p.h., or 11 m.p.h. faster than the time made by Hughes' Maxwell in 1914; and Parsons, in the Parsons special, duplicating his feat of last year, in winning the 100-mile Intercity grind at 79.5 m.p.h., or 5.9 m.p.h. faster than the time he made last year in the Frantz. The main factor in the great increase of average speed was the plank surface of the 2-mile track

which was much more adapted to high speed and less conducive to skidding than the dirt surface over which the races were run last year.

Earl Cooper Second

Second to Ruckstell in the 250-mile Montamarathon Trophy Race, was Earl Cooper, in his Stutz, who finished at an average speed of 84.22 m.p.h. Pullen's Mercer was third at 84.20. Burman was fourth, sending his Peugeot over the course at 79.5 m.p.h., and Oldfield, also in a Peugeot, was fifth at 75.8. Cooper made the fastest of the 129 laps of the race, covering the course at an average speed of 89 m.p.h.

Thirteen cars started in the race, the five mentioned being the only ones to finish. Ruckstell led most of the way by one or two laps and from the 105th circuit was never headed, although the winners were but a few yards apart at the finish. Cooper drove a beautiful race, going to the pits once in the 103d lap and at the finish was driving carefully on worn tires rather than risk a delay at the pits in making a change.

Some Clever Driving

The eight-cylinder Romano ran steadily until the forty-third lap when it took fire and was burned. The Gordon special skidded dangerously three times in the 114th lap on a curve ahead of Cooper, but by wonderful control Elliott managed to slide clear amid the cheers of the 30,000 spectators who braved the heat to watch the speed carnival.

Carlson and Mechanic Killed

Driving on the back stretch on the sixtieth lap Carlson's Maxwell left the course, a tire blowout on a steep curve throwing it over a 30-ft. embankment and Franzen, his mechanician, was thrown onto a stump and his back broken, killing him instantly. Carlson was rushed to the hospital with crushed head and internal injuries, but died this morning without recovering consciousness.

The fate of the other cars was as follows: The Schneider special broke a piston in the seventh lap; the Marmon dropped out in the thirtieth with engine trouble; the Parsons special broke a camshaft in the thirty-third circuit, and the Stutz, driven by Lewis, burned out a bearing in the seventy-eighth, while that of Hill broke its radiator in the ninety-first. The Gordon dropped out in the 117th circuit with engine trouble. The Mercedes failed to report to the committee.

New Record for Intercity

Parsons set a new record for the 100-mile Intercity Trophy Race, covering the fifty-four laps in 1:52:27 or at an average speed of 79.5 m.p.h. Elliott, in a Gordon, was only three laps behind him, averaging 74.7, with Barsby third at 63.2, Staley's Studebaker fourth at 56.2 and Erdman's Ford special, fifth. Parsons took the lead second and was never headed, driving a consistent race without a visit to the pit.

Forbes' Buick dropped out in the tenth lap with engine trouble and the Schneider special was forced to retire in the thirty-first. Thomas' Mercer dropped out in the thirty-ninth with engine trouble followed by O'Brien's Stutz in the next lap for the same cause. The Malcom special left the race in the second lap and engine trouble stopped the career of the Tacoma special in the sixteenth circuit. Stratton's Mercer special had engine trouble and its entry was scratched.

Pullen Wins Potlatch Trophy

Pullen won the 200-mile race for the Golden Potlatch Trophy this afternoon covering the 103 laps of the 2-mile course in 2:21:14, making the highest average for the course, 85.2 m.p.h. The Mercer driver outgeneraled Cooper, in the Stutz, who took second place in 2:21:25 or an average of 85 m.p.h. Ruckstell's Mercer was given third place with a timing of 2:31:41, or an average speed of 79 m.p.h., though this was disputed by Oldfield who was officially placed fourth at 2:32:3 or 78.8 m.p.h. Ruckstell had serious engine trouble in the eighty-ninth lap and spent 8 min. at the pits. This is where the mix-up on the time occurred, Oldfield passing Ruckstell on the ninety-third lap without being properly recorded by the scorers.

Out of twenty-one entries but eight started. The 90-mile-gait Mercers soon forced the race, which resolved itself into a battle between Pullen, Cooper, Ruckstell and Oldfield. Pullen went to the pits in the twenty-first lap but made fast time in getting back in the race again and caught Cooper on the twenty-seventh circuit.

Parsons dropped out in the eighth lap with a broken camshaft and the Marmon withdrew in the twelfth with a broken connecting-rod. A slipping clutch eliminated the Gordon in the sixty-fourth circuit, the lap after Lewis' Stutz was put out by engine trouble. Cooper changed a tire in the sixty-sixth lap, this being his only stop at the pits. Oldfield made one stop in the eighty-fifth lap for a tire change.

Burman did not arrive at the course until the ninetieth lap and was refused admittance to the race by the referee. Other entrants were excused on account of engine troubles.

Weather was ideal with a brisk west wind. The track held up well, the new construction rendering better records possible than those of former years, but the officials were disappointed at the low average speed. Attendance was 15,000.

The cash prizes for the two days' racing totaled $10,500. Those for the 250-mile Montamarathon were $5,500; for the 200-mile Potlatch, $3,500, and for the Intercity Century, $1,500. The races were run under the management of the Tacoma Speedway Assn., Inc., and under the auspices of the Mountainview Automobile Club.

Maxwell Averages 91.74 at Omaha

New 1.25-Mile Speedway Opened

Winners at Omaha Speedway

CAR	DRIVER	TIME	M.P.H.
Maxwell	Rickenbacher	3:17:32.2	91.74
Duesenberg	O'Donnell	3:30:27.7	86.16
Maxwell	Orr	3:40:17.3	82.3

OMAHA, NEB., July 5—*Special Telegram*—Before a crowd of 25,000 spectators, the new 1.25-mile board speedway was opened here by a 300-mile race, which was won by Rickenbacher in a Maxwell at an average of 91.74 m.p.h., a speed which demonstrates satisfactorily the possibilities of small board speedways with high banking and which is a higher average than made at Indianapolis this year. Rickenbacher's victory coming right after his winning of the 300-mile speedway race at Sioux City Saturday, naturally stamped him as one of the serious contenders in future speedway events, to-day's race being his third important victory in a year.

Maxwell-Duesenberg Duel

To-day's race here was in every respect a duplicate of Saturday's race in Sioux City in that Rickenbacher led from start to finish and was pursued throughout the entire distance by O'Donnell in the Duesenberg. O'Donnell's average

was much slower, being 86.16 m.p.h. and who, at the finish, was almost 13 min. back of the leader. Orr landed a second Maxwell in third place, averaging 82.3 m.p.h. The only other cars of the eight starters to finish was the Emden, driven by Donaldson, which averaged 62.39 m.p.h. The Du Chesneau driven by Brown was flagged at the finish. This car did not report on the track until after the leaders had covered 100 miles.

Three cars dropped out during the race; Alley's Duesenberg was eliminated at 10 miles with a burned bearing; Cooper's Sebring went out at 95 miles with a burned bearing; and Chandler's Duesenberg was out at 112 miles with cracked cylinders.

The general consensus of opinion with regard to the 1.25-mile board track highly banked, is that this track is faster than the cars, and few of the drivers cared to climb high on the steep banking in order to pass some of the other cars, the drivers fearing that trouble would come if they blew a tire when high on the bank.

The only real excitement in the race was the brushes between Rickenbacher, O'Donnell and Orr, the race so far as leadership was concerned being a procession for Rickenbacher's Maxwell.

Few Stops by Leaders

Rickenbacher stopped twice during the 300 miles, first at 71 miles to change a tire, and second at 226 miles for supplies. O'Donnell's Duesenberg made four stops, losing in all 4 min. They were: at 35 miles spark plug trouble, at 186 miles for gasoline and oil, at 192 miles for tires, and at 215 miles for spark plug trouble. Orr, who finished third, had three stops with his Maxwell, 26 miles mechanical trouble, 105 miles tires, and 272 miles for fuel.

The day was exceedingly hot and the track was feared to some extent. The drivers expected trouble on the high-banked turns. Between 150 and 200 miles O'Donnell slid down the bank for some unknown reason and almost turned his car over when it hit the soft dirt at the bottom. He was delayed only a few seconds. In order to pass a car driving in the center of the track on the turns it was necessary to travel close to 100 m.p.h. Rickenbacher was not pushed and when he had a four-lap lead was flagged and drove easily to the finish.

Rickenbacher started into the lead at 12:40 when Starter Fred J. Wagner sent the cars away. During the first 25 miles there was a merry chase between Rickenbacher, O'Donnell, Chandler and Orr and at one time it looked as if Chandler might take the lead and hold it. The Maxwell was too fast and the driver too daring and at 25 miles the order above was maintained, the average speed being 98, time 15 minutes 18 seconds.

Maxwell Gets in Lead

O'Donnell stopped at 40 miles and Chandler at 42, which gave Rickenbacher a lead of four laps of the 1.25-mile board track. He still led at 50 miles, time 30 min. 46 sec. With this lead he slowed down during the next 25 miles and at 75 led with an average of 97.5.

Maxwell Takes Century Money

O'Donnell and Rickenbacher made things interesting at this time, each trying hard to lead at 100 miles to capture the $250 prize offered. Rickenbacher succeeded in 1:05:28, an average of 91.65 m.p.h.

The order at 100 miles was Rickenbacher, O'Donnell, Orr, J. Cooper, Donaldson, Chandler and W. Brown, who had just come on the track. The same order maintained up to 200 miles except Cooper dropped out. Rickenbacher took another $250 for leading at 200 miles; time 2 hr., 10 min., 44 sec., average 91.79. At this stage Rickenbacher was ten laps ahead of O'Donnell, who stopped at 190 miles for a tire.

The order at 200 and 250 miles was the same as at 100; except that Chandler was out after having worked on his car for 1 hr. replacing a burned connecting-rod bearing. Time for the 200 miles was 2 hr., 44 min., 52 sec., the average speed being 90.98 m.p.h. The same order was maintained at the finish with Rickenbacher about ten laps ahead of O'Donnell.

Cord Tires Lead

Rickenbacher's Maxwell used the same equipment at Sioux City on Saturday, excepting Silvertown cord tires. O'Donnell's Duesenberg also changed to Silvertown cords and used Rajah plugs. Orr's Maxwell's equipment differed from Sioux City in that it used Silvertown cords and Zenith carbureter. The other cars used practically the same equipment as at Sioux City excepting Silvertown on all but the Du Chesneau. The cord tires gave a good account of themselves to-day, only four being changed during the race, these being by Rickenbacher, O'Donnell, Orr and Donaldson.

New Magneto Industry Started in France

(*Continued from page* 52)

which was largely responsible for the great increase in electric lighting and starting sets on French cars at the 1912 Paris show.

Thirty Automobile Firms Unite

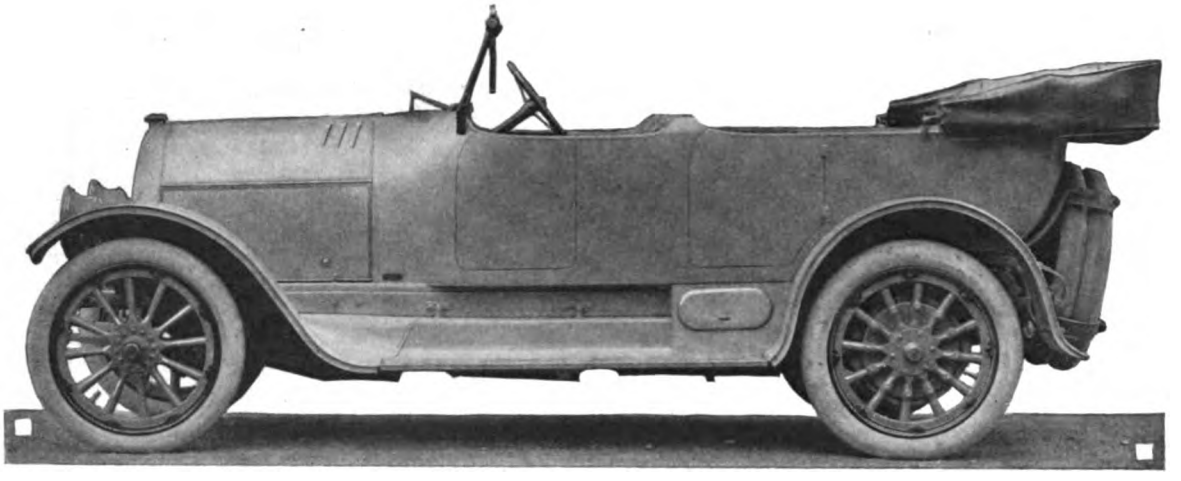
From $160,000 the capital of this company was increased to $400,000 as soon as it was decided to build magnetos on a big scale. A circular was sent to every automobile manufacturer in France, every aeroplane maker, every gas engine builder, setting forth the intention of the S. E. V. company to take up magneto construction, and inviting those firms to take up stock. It was sought to bring into this magneto company every automobile interest. The result is that instead of the nine firms originally interested in the S. E. V. company, there are more than thirty of the leading automobile manufacturers in the enlarged concern, and their combined car output is equal to three-quarters of the total of the French industry.

When the war broke out the S. E. V. company had begun the construction of a big four-story factory at Issy-les-Moulineaux, on the suburbs of Paris. All ordinary building activities had been stopped and will remain suspended until after the war. The building was finished in shorter time than under normal conditions. Machinery has been obtained from America and England and has been installed. The new factory began the work of producing S. E. V. magnetos the middle of May. With the opening of that factory France became independent of outside sources for her supply of magnetos.

As soon as peace has been signed, all German factories in France will pass into the hands of their original owners, with, in such cases as the Bosch company, a rental for their use. The German firms will be free to do business. "So far as our firm is concerned," declared the head of one of the leading French automobile factories in conversation with the writer, "we are through with German supplies." If they were questioned, such firms as Renault, Panhard, Delaunay-Belleville, Mors, Peugeot, Delahaye, Darracq, Bayard-Clement Charron, De Dion Bouton, and a score of others would make the same reply. French manufacturers are determined that the commercial war against Germany shall be as relentless as the war waged with fire and sword.

1916 Fiat Bodies of Distinctive Design

Riviera Is a Combination Five-Passenger Phaeton and Seven-Passenger Touring Car—Few Chassis Changes



The Riviera model 1916 Fiat which is mounted on either the four or six-cylinder chassis

BUT two detail changes have been made in the Fiat chassis built by the Fiat Automobile Co., Poughkeepsie, N. Y., with the introduction of the new model known as the Riviera. The body design, however, is entirely new and is a combination five-passenger phaeton and seven-passenger touring car, of modified streamline and modified double cowl. The two chassis changes are minor ones, being simply a sliding block in the universal at the forward end of the shaft which compensates for longitudinal motion of the rear axle and drive units and the front ball and socket steering connection.

Materials Carefully Selected

It is in the selection of materials that the Fiat is distinctive. One of the points which stands out above all others is in the use of hardened steel bushings against hardened steel pins, at places where only medium heavy duty is required. This applies to such parts as the valve guides, steering connections, etc. Chrome-nickel steel is used in nearly all the important forgings throughout the entire car, examples being the crankshaft, steering parts, gearset parts, and in fact all forgings which have to bear any stress of importance. The valve construction is another example of the careful use of materials being a built-up design with a nickel-steel head, carbon steel stem and a cast-iron seating ring.

Two standard models are manufactered known as type 55, four-cylinder, and 56, six-cylinder. These are identical in every respect with the exception of the motors. The four-cylinder model was added in 1912 and has been continued ever since with only the minor refinements noted. The cylinder dimensions of the four are 5.125 by 6.75 and of the six they are 4.4 by 5.9. Both have block castings and the leading feature of each is the simplicity with which the details of construction have been worked out. Referring to the transverse section, of the four-cylinder motor, illustrated herewith, it will be noted that, although block-cast, considerable waterjacket space has been allowed all around the cylinder castings.

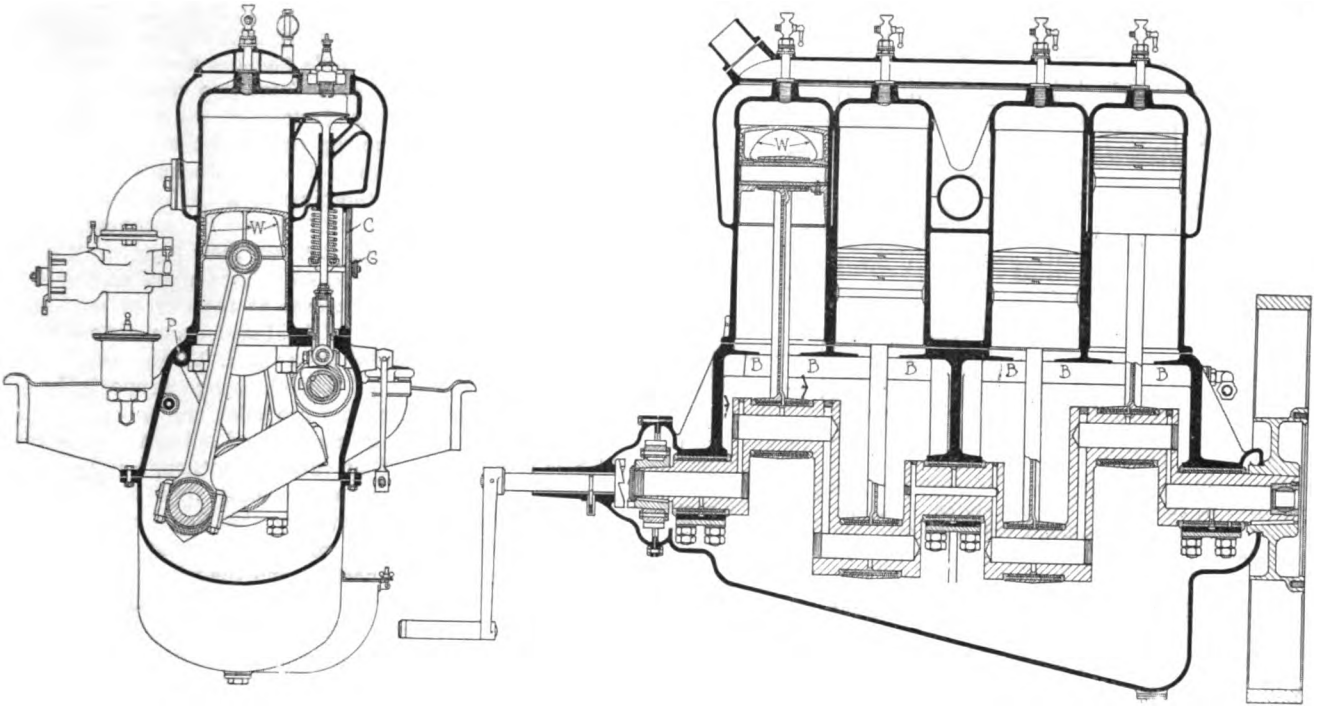
The pistons have four rings at the top and are slightly convex in shape. They are double-webbed across the head as shown at W in the transverse and longitudinal motor sections. The bearing for the piston is formed by a bushing in the upper end of the connecting-rod and this is an interesting point of where steel against steel is used. Naturally, the question of lubrication is of prime importance to avoid any tendency of seizing, and this has been specially guarded against as will be pointed out. The connecting-rods are drop-forged I-beams and the crankshaft in the four-cylinder model is carried on three main bearings. On the six, the crankshaft has four babbitt-lined main bearings.

Actuating the valves, there is a camshaft which has the cams keyed and pinned to it operating directly on a roller follower on the pushrod. This is carried within a steel bushing above which is the adjustment point for allowing clearance below the valve stem. The valve action is covered as shown at C by a substantial plate removable by the knurled nut G. A feature of the valve is that the angle of the seat is 30 degrees in place of the conventional 45, this being done to give a quicker and wider opening, for the same amount of lift.

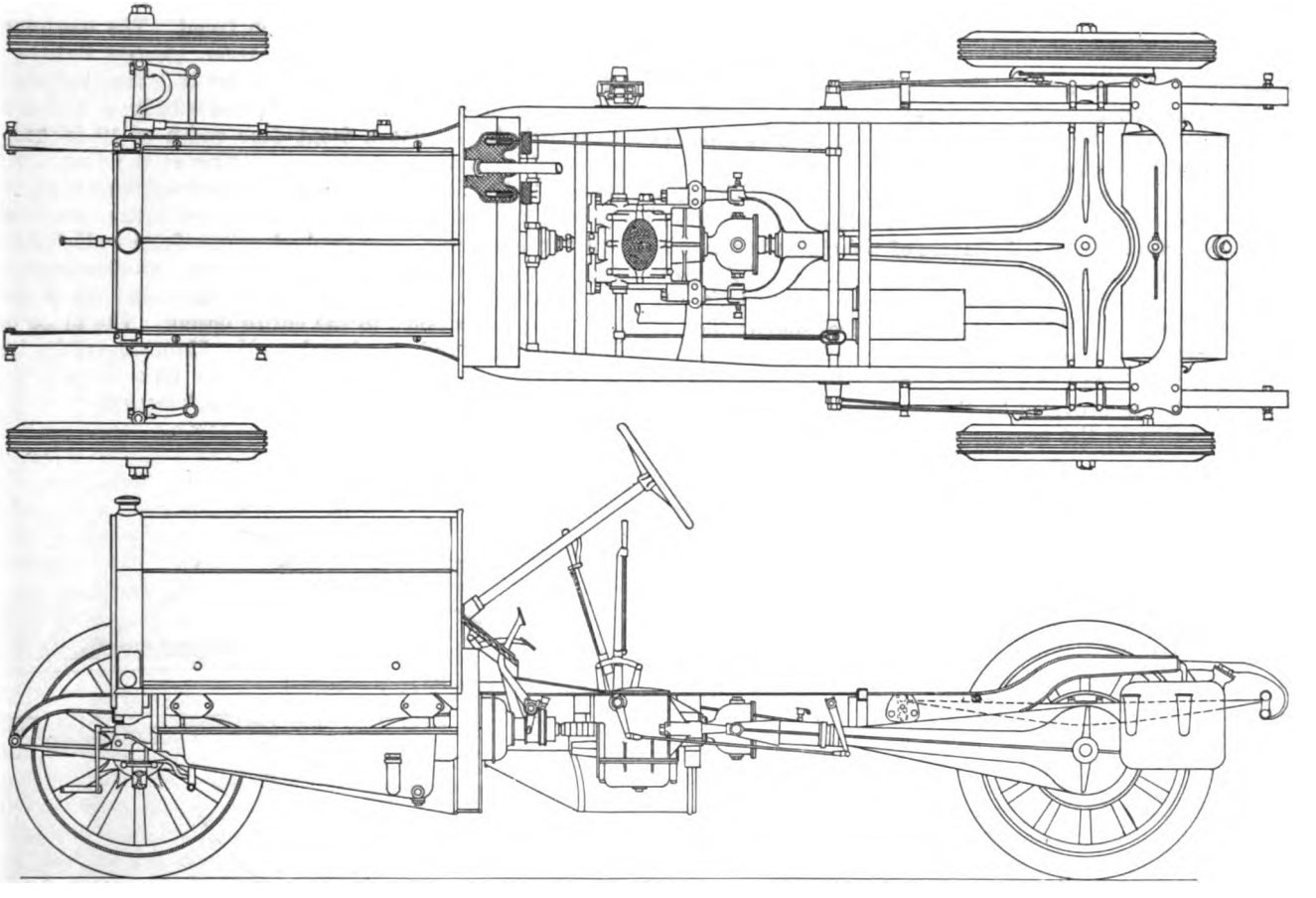
Force-Feed Oiling System

As would be expected with the use of many steel-against-steel parts, the lubrication is force-feed non-splash. The crankshaft is a hollow design both for lightness and to facilitate the pumping of oil through the center. The oil pump is a gear design operated from the rear end of the crankshaft carrying the oil from the reservoir in the bottom of the crank case to a horizontal copper pipe in the case itself. This horizontal pipe extends from one end of the case to the other and is shown in the sectional view at P. From the pipe are leads to each of the main bearings of the motor. The oil passes around the main bearings and entering the hollow crankshaft is forced along its entire length until it reaches the cranks, the cheeks of which are drilled, allowing a passage for the oil to the hollow crankpins. Here the oil under pressure reaches the lower connecting-rod bearings and in addition is forced upwards along a tube to the wristpin bearings which are oiled copiously as required by the steel pins against the steel bushings at this point. An interesting feature is the use of integral baffle plates B which prevent an excess of oil being thrown into the cylinders, thereby caus-

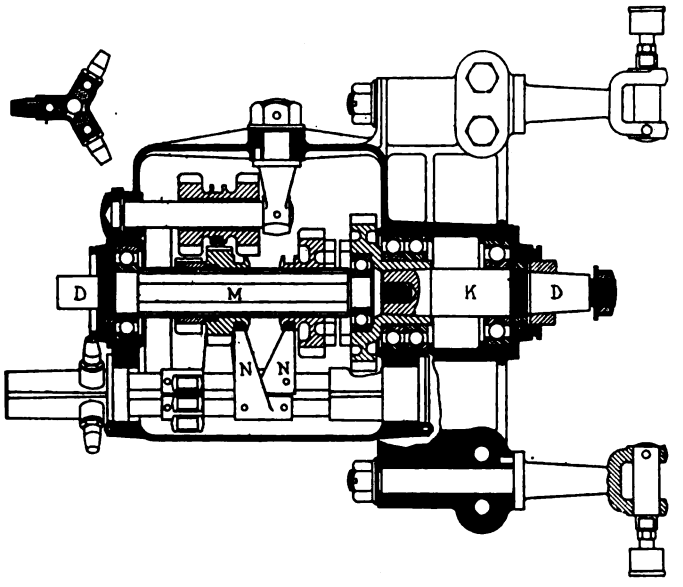
Some Details of 1916 Fiat Chassis



Side and end sections through the four-cylinder Fiat motor for 1916, *showing the use of four piston rings as indicated at W. The valve action is covered as shown at C, the plate being removable by the knurled nut G. P is the horizontal oil lead and in the side section B indicates integral baffle plates preventing excess oil being thrown into the cylinders and thereby causing carbonization and smoke*



Plan and elevation of 1916 *Fiat chassis, showing characteristic rear axle housing and torque tube construction together with the yoke and universal construction at the forward end of the propeller shaft. Detail of this yoke and the section through the gearbox appear on the following page.*



Section through the compact four speed Fiat gearset. The main shaft M connects with the clutch at D and the stub shaft K transmits the drive through the universal joint. Shifter forks are indicated at N

ing carbonization and smoke. The crankcase capacity is 5 gallons.

The water pump and magneto are driven off the opposite ends of a transverse shaft located at the forward end of the motor. The driving shaft for the two units is carried on ball bearings and is driven through spiral gears with teeth at 45 degrees. The entire drive of this shaft is inclosed and runs in a bath of lubricating oil. Flexible couplings are used in the drive.

Sixty-five-Disk Clutch

Sixty-five disks are used in the clutch, thirty-three driving and thirty-two driven. The single clutch spring introduces the pressure on the large amount of bearing surface and the whole engagement runs in oil and is contained in an oil-proof housing. There is a packing box surrounding the centrally located spring container which prevents the oil from leaking from the housing. A feature of the clutch is the provision for alignment by allowing the forward end of the carrier shaft to extend into the rear end of the crankshaft. It is there supported upon a bushing of spherical shape which is held by another bushing supported on threads in the end of the crankshaft. A ball and socket support is thus provided.

Four speeds are provided by the compact gearset which is shown in section in the accompanying illustration. The design is distinctive as the mainshaft M which connects with the clutch at the extremity D extends the length of the gearbox proper, being carried on ball bearings at either end. The stubshaft K at the rear end of the gearbox connects with the universal joint and thence transmits the drive through the propeller shaft. Chrome-nickel steel gears and shafts are used and altogether there are seven rows of ball bearings. A double row is used at the inner end of the short shaft K through which all the power is transmitted. The shaft is four-splined and carries upon it the sliding units actuated by the shifter forks N.

Distinctive Torque Tube

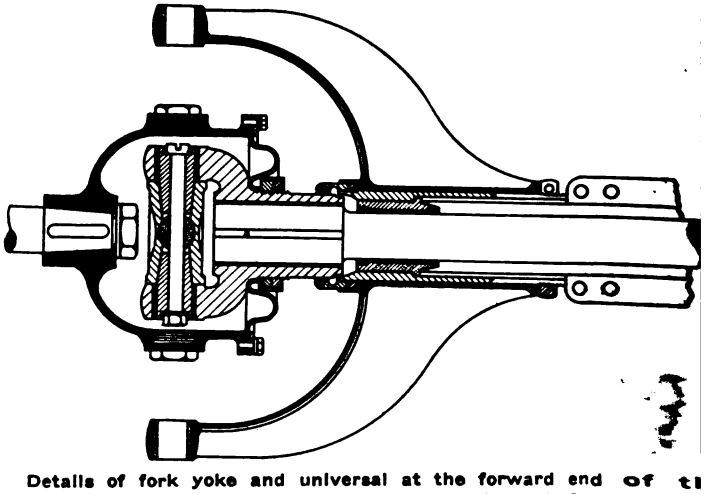
The housing for the gearset is in two parts and is made from an aluminum casting. The mainshaft is carried in the upper half of the housing and the bearings are mounted between the two parts at their junction. The top of the gearbox forms a large cover plate and all connections are milled to form a close juncture and thus prevent oil leaks. Packing boxes are located at the inner end of the main shaft M and at the rear end of the short shaft K. A heavy horizontal web is formed in the gearbox and in this are mounted the trunnion supports for carrying the forked yoke at the forward end of the propulsion tube which surrounds the propeller shaft.

The Fiat rear system is distinctive in the employment of a solid pressed steel rear axle housing and torque tube combined. The housing is made from two stampings manufactured at the Turin, Italy, factory of the Fiat organization. One stamping forms the top half and the other the bottom, and the weight of the two is close to 80 pounds combined. The material used in the stamping is a .50 carbon manganese steel, 4 millimeters or about 1-6-inch in thickness. The two halves are bolted together through their flanges by 5-16-inch cold rolled steel bolts placed 4.5 inches apart on the straight parts of the housing and closer at the curved portions surrounding the differential. The bevel drive differential and the axle shaft are caried on 4 R. I. V. annular ball bearings, and a double set of these bearings support the pinion fitted to the rear end of the propeller shaft.

The ball type steering knuckle and spindle is a refinement which is found in the Fiat cars and although it has been incorporated in both models for some time was not in the original model first put out by the Poughkeepsie concern. The wheels toe in and are so arranged that the center lines through the spindle connection and the wheel intersect at the point where the tire rests upon the ground. The ball and socket joints at the end of the tie rods also aid in providing easy steering and at the same time the car weight is carried on a ball thrust bearing beneath the upper jaw of the knuckle. These parts are lubricated by grease cups and of a design which gives great durability.

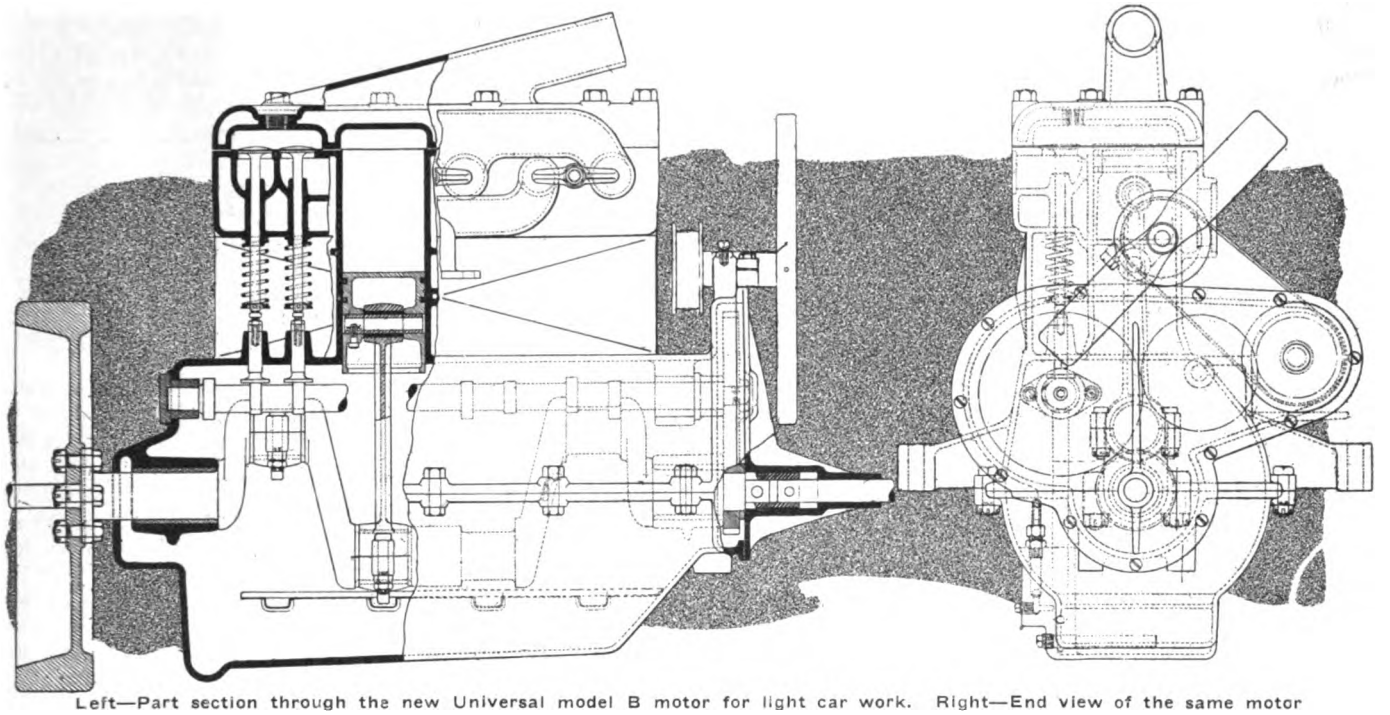
116-Inch Wheelbase

The wheelbases of both the four and six are the same, being 116 inches with standard 56-inch tread. The equipment is complete including Bosch lubrication, electric lighting and starting and a full line of accessories including speedometer, clock, demountable rims, etc. The new body as fitted to the standard chassis has a front door width of 19 inches, rear door, 22 inches, width between tufting at the front seats 43 inches and width of rear seat between tufting of 46 inches. It is a molded design with no abrupt interruption of the contour but made in a gradual sweep from radiator to the end of cowl thence to the secondary cowl sweeping back to the rear end of the tonneau with a gradual slope which lends a low, long appearance to the entire design. The price of the Riviera model fully equipped on the 55 or four-cylinder car is $4,850 f.o.b. Poughkeepsie. On the type 56, six-cylinder chassis, the price is $5,350 f.o.b. Poughkeepsie.



Details of fork yoke and universal at the forward end of the propulsion tube which surrounds the propeller shaft on the 1916 Fiat

Two Universal Motors for Light Cars



Left—Part section through the new Universal model B motor for light car work. Right—End view of the same motor

Model A is 2.5 by 3.5 Inches and Model B 2.625 by 4 —Similar in General Design

TWO motors specially designed for light car work have been brought out by the Universal Motor Co., Oshkosh, Wis. These are known as models A and B and are 2.5 by 3.5 and 2.625 by 4 inches, respectively. The two models are along very similar lines, except for their capacities. Owing to this, the smaller motor is generally used in connection with a 5 to 1 rear axle ratio, whereas the model B takes a 4 to 1. This would give a speed in r.p.m. of 2,400 for the model A at 40 miles per hour with a 5 to 1 ratio. The S. A. E. ratings are respectively 10 and 11 horsepower.

In general design, these motors are four-cylinder, four-cycle, block cast assemblies with three-point suspension. The cylinder heads are removable and carry the water header in a unit. Considering the model B motor, the pistons are a flat head type, fitted with a leak-proof ring and two 3-16-inch rings at the top. The piston pin is case-hardened and the connecting-rod is an I-beam 7.375 inches center-to-center length. The connecting-rod is bushed at the piston end and the pin is secured to the piston boss by a set screw.

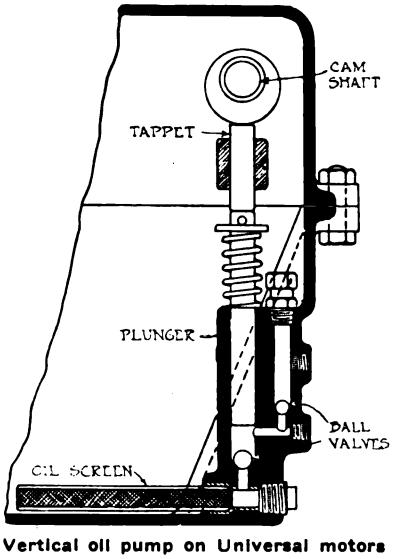
Some Dimensions

The crankshaft is 1.5 inches in diameter forged from medium carbon steel. The crank bearings as well as the main crankshaft bearings are lined with die-cast bearing metal. The crankpins are 1.5 inches in diameter and 1.75 inches in length. The main bearings, of which there are two, are 1.5 inches in diameter and 2.5 inches in length. The camshaft is a one-piece drop-forging with the cams integral and the valves are operated through mushroom valve plungers. The valve diameter is such as to give a 1.125-inch clear opening. The valves have a steel stem with cast-iron head.

Features of the design of both motors are the same, but the dimensions vary. In the smaller motor, the crankshaft is 1.25 inches in diameter, although of the same material as in the larger design. The crankpin diameter is 1.25 inch with a 1.5-inch point and the bearings are 1.25 by 2.375 inches.

Vertical Oil Pump

One of the features of the Universal motors is the vertical oil pump which has the plunger extending downward into the crankcase oil reservoir so deeply that there is no chance of its losing suction. This detail provides a safety feature as the pump need never be primed. All the Universal motors are supplied with a Mayer carbureter and Berling magneto.



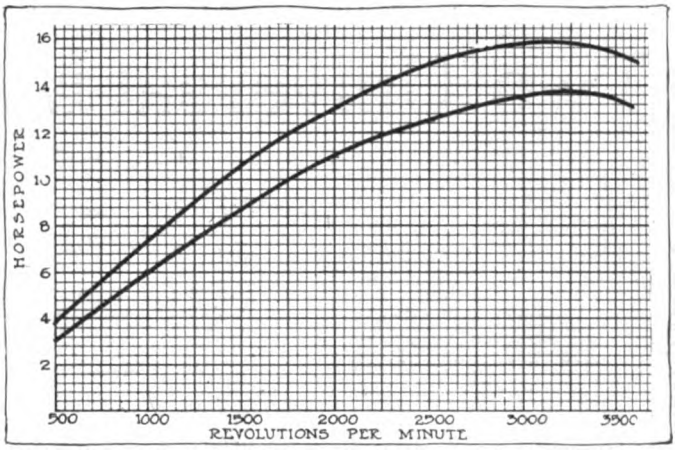
Vertical oil pump on Universal motors which never requires priming

Characteristics Similar.

As shown by the horsepower curves of the models A and B motors, these have about the same characteristics. The peaks of the curve being at 3,000 r.p.m. or more, showing that these are distinctly of high-speed design. The horsepower increase up to 2,500 r.p.m. is quite rapid and the S. A. E. horsepower developed by the model A is about 1,750 r.p.m. while that of model B is about 1,550 r.p.m.

The aim of the designers of these motors has evidently been to follow along the latest lines of high-speed, high-efficiency design. The parts throughout are of light

weight and the curves show a high rotary speed before reaching the peaks. The motors are distinctly designed to serve the needs of the cars for which they are intended, that is, cars of light weight weight and high nominal speed capacity. It is a type of design which should give good fuel economy, provided that the reduction gearing in the power transmission is properly worked out, allowing the motors to work at their best efficiency at what may be called the cruising or touring speeds.



Horsepower curves of model A and model B Universal motors

1,500-Pounder Added to Indiana Line

SPECIFICATIONS of the Indiana 1,500-pound worm-driven truck have been announced by the Harwood-Barley Mfg. Co., Marion, Ind. This truck is largely built in the factory of the Indiana concern, and it includes such features as a block motor, unit power plant, three-speed gearbox and worm drive. The worm-driven rear axle is assembled in the shop of the manufacturer and the Rutenber Motor Co. builds a special power plant for this chassis under the name of Model 20.

Three-Point Suspension

Three-point suspension is used for the 3.5 by 5-inch unit power plant, which is located under the hood. The motor is an L-head design with the valves on the left side. Standard design is used throughout the motor, cooling being by centrifugal pump through a finned tube radiator. The carbureter is a Schebler, ignition is by high-tension magneto and lubrication by pressure feed through the main bearings, camshaft and connecting-rod bearings. Splash is also employed for the cylinders and other internal motor parts. Power is transmitted through a multiple disk, dry plate clutch, to a three-speed sliding selective gearbox with shafts mounted on ball bearings. The face width of the gears and the gearset is .875 inch and the gears are of heat treated nickel steel of high tensile strength.

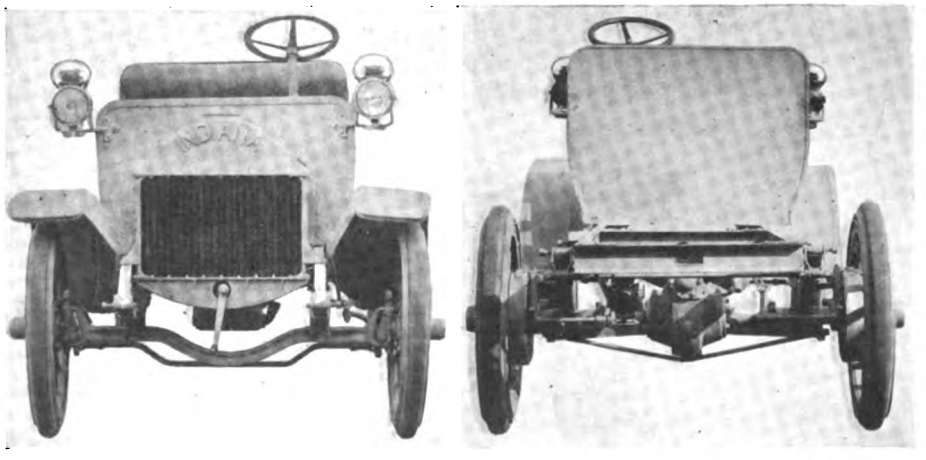
From the gearset, the drive passes through a shaft of alloy steel to the floating rear axle with its worm drive. The worm has a 2.75-inch outside diameter and the gear 2.625 inches outside diameter. The face width of the gear is 2.25 inches. The worm is mounted on S. K. F. imported annular and thrust bearings. The gear is mounted on New Departure ball bearings. A generous use of alloy steel is made in the drive members, the live shaft of the axle being 1 and 9-16 inches in diameter and of chrome-nickel steel. The housing is a steel casting and the inside diameter of the axle is 2 5-16 inches. The type of worm gear is that known as the Cleveland.

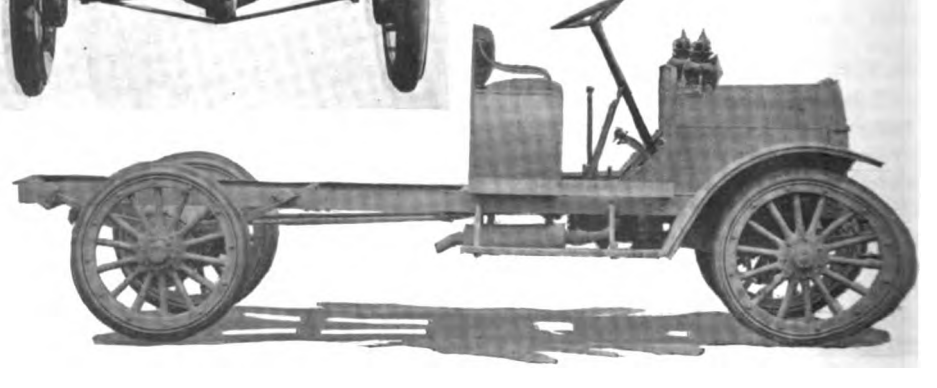
Artillery wheels 36 inches in diameter are employed. Both front and rear wheels have fourteen 1.75-inch spokes. The tires are solid 36 by 3.5 front and 36 by 4 rear. The drive is taken through a torque rod and through alloy steel springs. The front axle is a 2.5 by 1.5-inch I-beam with the spring pads integral. The chain is a channel, 4 inches in depth, weighing 5.25 pounds per running foot. It has three cross members reinforced with gusset plates.

Large Loading Space

A long wheelbase providing great loading space is given on this truck. The wheelbase is 130 inches and the loading space back of the seat is 93 inches long. The tread is a little wider than normal, being 58 inches. Full equipment is sold with the truck, a governor being fitted to limit the motor speed to 1,200 r.p.m. which corresponds to a truck speed of 25 miles per hour on high gear. The gasoline tank is located under the driver's seat and control is central with left drive steering being effected by a Lavigne gear. The price of the chassis is $1,200 and its rated capacity 1,500 to 2,000 pounds.

Throughout the entire design, the needs of the average service required by a 1,500-pound wagon have been kept in mind. The vehicle is especially suitable for the carrying of a large number of small packages of different bulks, and to fill any purpose.

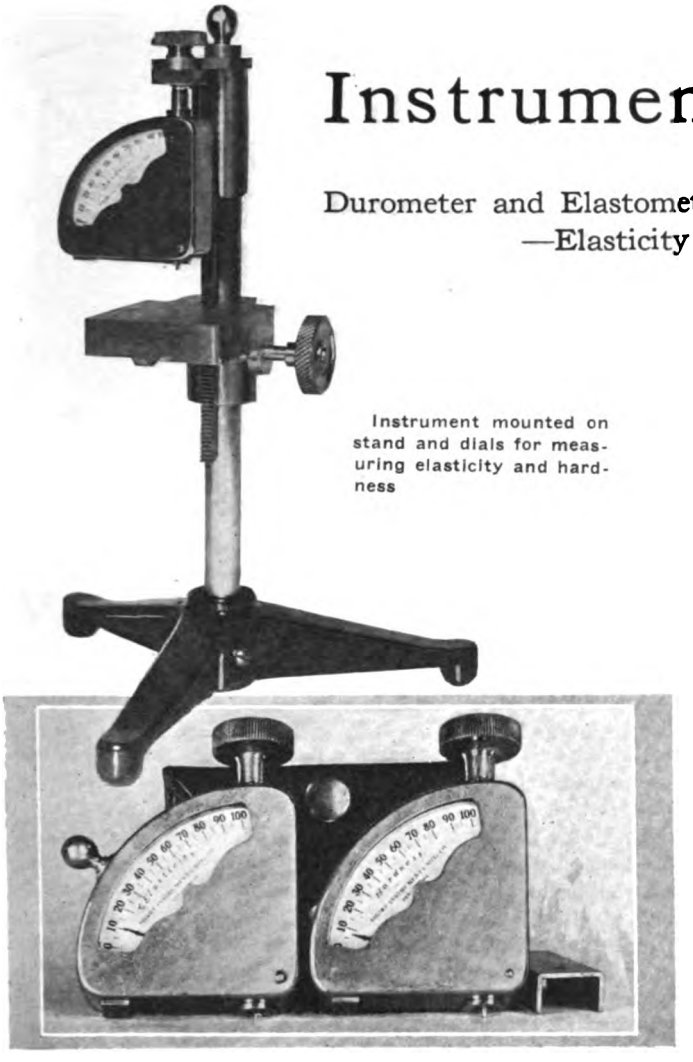




Above—Front and rear views of the Indiana 1,500-pound left-drive truck chassis. Right—Side view, showing simple, sturdy construction and large loading space

Instruments to Test Rubber

Durometer and Elastometer Measure Relative Hardness and Elasticity —Elasticity Decreases as Hardness Increases



Instrument mounted on stand and dials for measuring elasticity and hardness

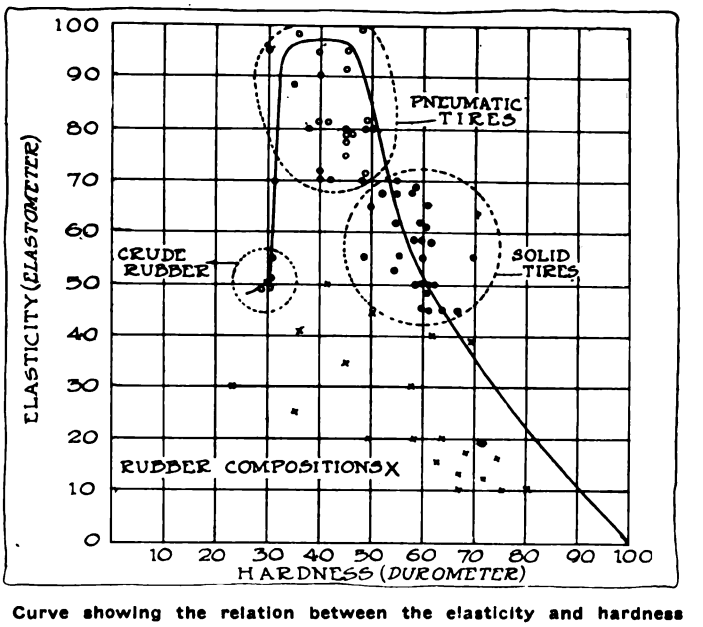
AN interesting example of the manner in which the methods of making tests on metals are spreading to other materials and industries, is that in which types of hardness machines have been adapted for rubber under the names of the durometer and elastometer. These instruments brought out by the Shore Instrument & Mfg. Co. of New York City measure the hardness of rubber in terms of resistance to depression of a plain surface by a standard spring pressing on a blunt pin; and the elasticity in terms of resistance to permanent deformation or tearing. The tests and the difference between them are clearly illustrated at the bottom of this page at *A* and *B*. At *A* the piece is undergoing the test for hardness and as will be noted the material is not torn by the pin. At *B* the test for elasticity is being made and it will be seen the pin enters the material for a considerable distance, effecting a permanent deformation.

The relation of the edge of the point and the depth it has been caused to penetrate has been carefully determined by experiments on extremely elastic rubber. If the latter is quite perfect, no tearing or permanent injury results and the point will be ejected after unlocking it. The extent of the rubber's recovery after imposing this severe stress will then indicate such percentage of elasticity as will correspond with the older form of stretch test. The new test has the advantage of being applicable to the plain surface of finished articles and practically leaves no visible mark.

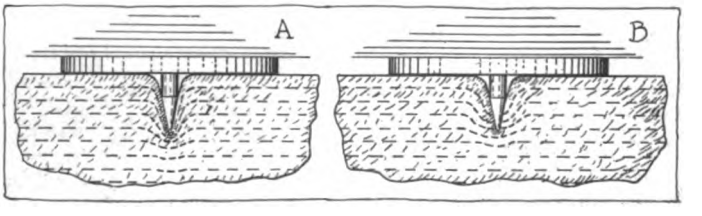
The elastometer is designed for free-hand usage and is put up in a leather pocket case. The durometer is best suited, however, for a stand as shown herewith. The instruments are used principally by manufacturers of rubber, and buyers who desire to test their product. A chart showing the results of test of these instruments and giving comparative data, bringing out the relations between the hardness and elasticity tests, is shown herewith. The importance of the measurement of the hardness and elasticity of the rubber can be well realized when it is noted that when so vulcanized that the maximum elasticity is reached, and when the hardness is yet too low for most purposes, each degree of hardness gained is done so at a sacrifice of about 3 deg. of elasticity. This is clearly brought out in the chart and so persistent is this loss of elasticity that when, for example, solid tires are hardened enough to carry the maximum loads, often so much elasticity is lost that but very little efficiency can be expected.

In the manufacture of rubber goods the process is not under such close control as is the control of metal, for instance, at the present time; but only a few years ago the treatment of metals was very much in the stage that the treatment of rubber is in at the present time. With the ever increasing demand for uniform material, it is aimed to standardize the physical properties of rubber as used in tires.

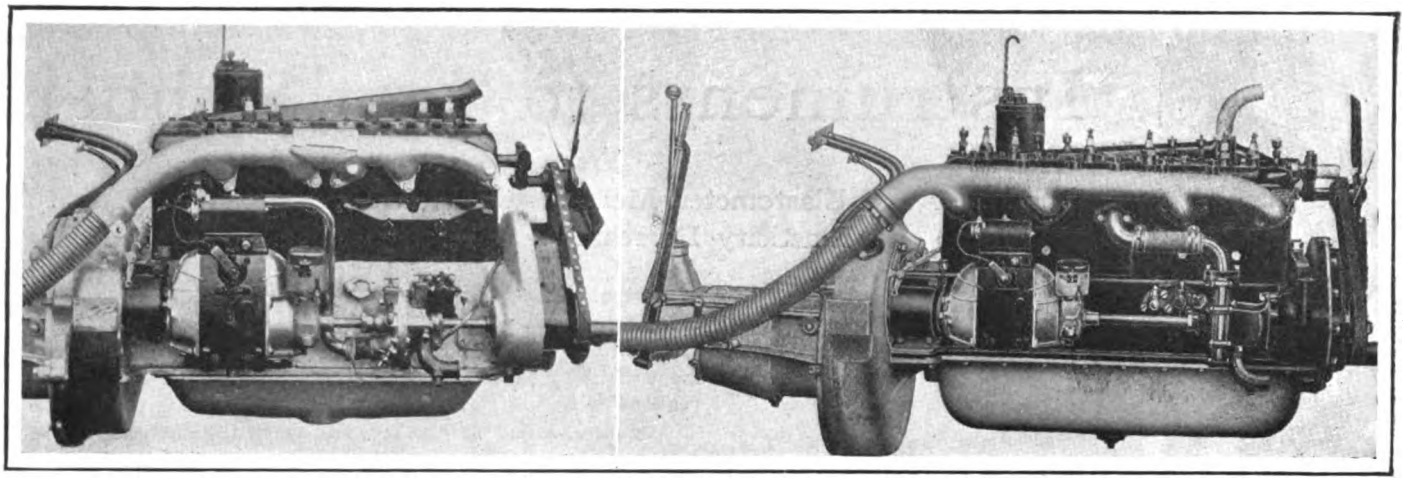
In rubber working a pure raw material does not guarantee the finest finished mattrial when subjected to a given heat treatment. Obviously then, when a fine article is produced, it is not possible to tell without destroying it just what the physical properties are which favor a given result, thus leaving the manufacturer more or less unenlightened.



Curve showing the relation between the elasticity and hardness of rubber



The test for hardness and elasticity, hardness at A and elasticity at B



Two Continental motors used in the Moon six-thirty and six-forty for 1916 showing starter mountings

Two Moon Sixes for 1916—One New

Larger Model Refined and Continued

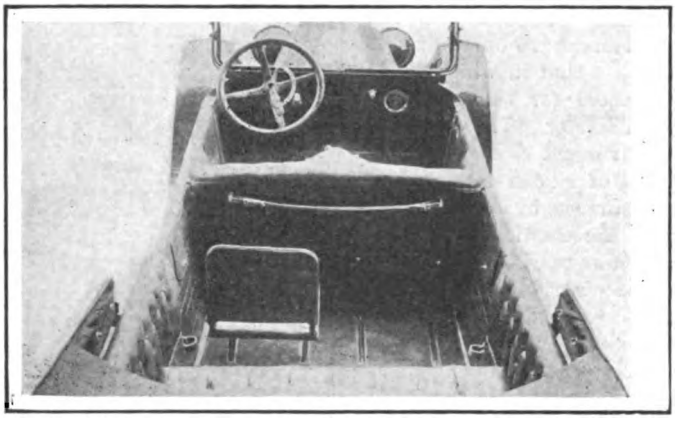
TWO sixes will make up the Moon line for 1916. One, known as the six-forty, is a continuation from last season with a number of refinements and a price reduction of $125. The other known as the six-thirty, is an entirely new model somewhat smaller than the six-forty.

The new features on the Moon model six-forty include a longer wheelbase, that dimension now being 125 inches instead of 123, a new body with the popular tumble-home design which is 2 in. wider across the rear seat and has 1 in. more leg room and 1 in. more tonneau room. These increases in space take up the 2-in. difference in wheelbase. The rear springs are longer and a new Delco starter with ammeter and combination switch on the dash has been fitted. The rear axle now has spiral-bevel drive instead of straight bevel and the equipment is improved by the addition of a motor-driven horn, non-skid tires on the rear and Spanish leather.

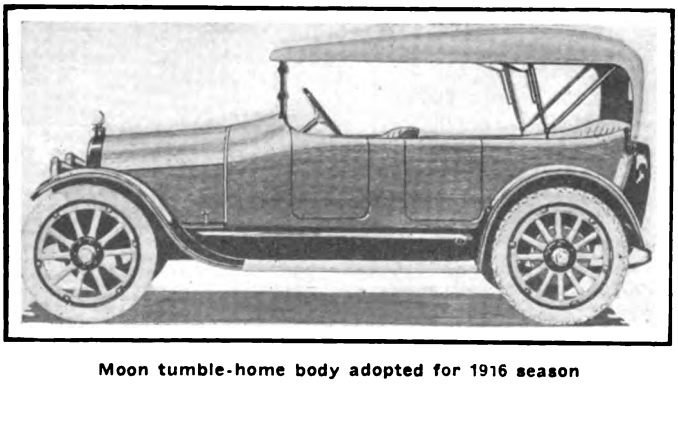
The new six-thirty sells for $1,195 and is fitted with a six-cylinder 3¼ by 4½ Continental motor with the cylinders cast in a single block. The important features of the chassis are similar to the six-forty in design although the price of this car is less than any previously produced by the Moon company. This new model is mounted on a 118-in. wheelbase, is equipped with Delco lighting and starting, has a five-passenger tumble-home body, 33 by 4 in. tires, Hotchkiss drive and full-floating axle. In exterior appearance the two models are quite similar, this being brought about by the fact that the fenders, hood, windshield and tank are identical in the two cars, one being a five-passenger and the other a seven-passenger with the relative power and dimensions proportioned.

The motor in the six-thirty differs slightly from previous Continental practice. The top half of the cylinders is removable, making a detachable cylinder head. The Delco starting outfit is built directly on the motor giving a rigid mounting for this unit and the bell housing for the clutch is a unit with the crankcase, giving a compact power plant with three-point suspension. The clutch is a dry-plate disk, the gearset a three-speed nickel-steel gear design carried on annular bearings and the rear axles floating on annular bearings carried in a pressed steel housing.

The six-forty which has been considerably modified in detail has also the Continental motor employed for 1915, its dimensions being 3½ by 5 and being fitted with Delco starting, Rayfield carbureter, Stewart vacuum feed and unit power plant crankcase with bell housing integral. Both the crankshaft and camshaft in these motors have three bearings, these bearings being contained in the upper part of the crankcase, while the lower part of the crankcase is sealed by a pressed steel oil pan. The 15-in. flywheel bolts solidly to a flange on the crankshaft. The Delco combination, ignition, starting and lighting unit is mounted on the right side of the motor and the makers claim that the starter cranks the motor at 125 r.p.m. The entire electrical system is operated at 6 volts and the battery is carried on a frame under the floor board.



Disappearing seats used in Moon seven-passenger



Moon tumble-home body adopted for 1916 season

Trends in Touring Body Designs

Three Typical Designs on Different Wheelbases Illustrated—Other Necessary Body Details

By George J. Mercer

THE touring body still retains its place as the most popular of body types for general purposes, it is used in larger quantities than other models because it comes nearer meeting all the requirements of an every-man's car and when made in quantities it can be produced at a moderate price and yet have the smart appearance of the to-order body.

The criticism of the open body is that it does not afford the protection from dust that the all-weather or closed body does, especially is this true of the occupants of the rear seat, who are subjected to the dust raised by the air currents or eddies set in motion by the irregular body side lines. The general adoption of the flush-side, streamline, torpedo body has minimized this trouble and the top serves as a shield both in its up and down positions.

Developing the Body

The name touring body is now applied in this country to the torpedo model, the older form of touring model has entirely disappeared, it survived for a time in a modified form by having the fore doors added, but is now seldom seen. The progressive steps in body development have been accompanied by very material changes in the car itself: The engine hoods are now part of the body line; the running boards and frame are lower; the dash lamps have nearly disappeared; the radiator lines have been modified; the running board shield has a blended surface from the board to the body line, the guards have easy lines and the removal of the gasoline tank from under the front seat, permits of the seat cushions being placed nearer the floor, and left drive with center control affords a better line from the body width to the hood.

The body has been amplified also by better windshields, many of which are slanted back to overcome wind pressure; the tops are mostly the one-man type, that do not require supporting irons on the front seat. The attachment for holding down the top have been improved as well as the place for attaching the side curtains. During the past year, there has been placed on the market, a method of inclosing the body for winter use with removable side windows that can be attached to any car, making it nearly as comfortable as a closed body.

The public interest in style is in the present and near-future modes and the three illustrations herewith, illustrate the most modern of the conventional types, the illustrations show three bodies of different size and design and on chassis of different length of wheelbase. Two of the controlling features in a body design are the capacity required in the body and the space provided on the chassis. Of the various dimensions required to show the chassis space, the most important is that from the back of the dash to the center of the rear wheel. The wheelbase of a car is misleading when applied with reference to body space, because two cars may have the same wheelbase, and if one is a six-cylinder and the other a four, the engine hood of one will be longer than the other and consequently the front wheel of one will be further forward of the dash not less than 6 in. than the other, and the body space of a six will be 6 in. or more inches shorter than a four and yet have the same wheelbase. This is indicated on the designs.

These illustrations serve both to show the design and to carry the dimensions in figures of the most essential sizes on all views, and all three designs have the up-to-date feature of having the top line of the seat inconspicuous. The seat cushions are closer to the floor than formerly, and to have the proper height for the seat back and still maintain the low-looking body, the cushions are tilted toward the rear so that the sitting position is partly a reclining one.

Three Typical Designs

The three designs are shown respectively on chassis with 122-, 132- and 142-in. wheelbases and the seating capacity is for four passengers on one, five on the second and six on the third.

One design has central doors, one has staggered doors and the large body has four doors.

Fig. 1 is the four-passenger body, 122-in. wheelbase chassis, having 32-in. wheels and the gasoline tank placed under the cowl. There are two doors that are placed centrally, one on each side, and the passage to the front seats is by the aisle between them. The front seat is built in from the body side top line and this line is unbroken from the cowl to the rear, terminating in the graduated upward back seat line.

The top edge of the body is rounded over from the outside with about 1-in. radius and the metal panel is fastened to the inner edge of the wood framing, the joining being covered by the trimming, which latter does not appear noticeably above the body line.

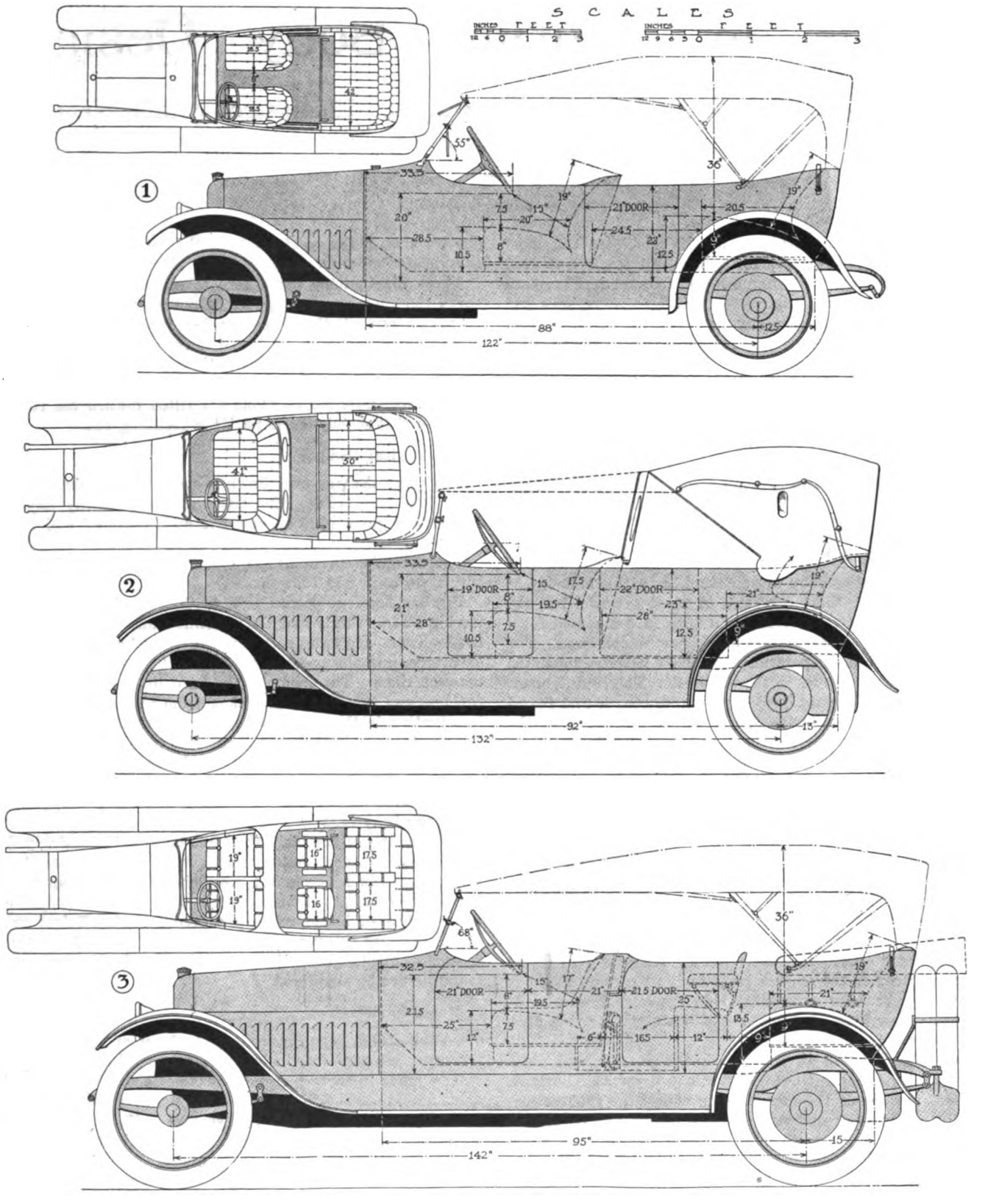
The making of the body shell has become increasingly difficult for the custom builder as the styles have advanced and the accomplished, successful acetylene welding of aluminum panels has come at a time when it is very much needed, where the quantity of bodies to be produced are of sufficient number to warrant the expense of forming the shape in molds or dies, so that steel can be used for the panels, the process of manufacture is simplified.

Features in Design

On the design here illustrated, the front of the body, from the door line forward, including the two sides and the cowl will be made in three pieces, for sake of economy in material and handling. The joints where the panels meet can be successfully welded so that the surface will be perfect for painting and have the strength of a single sheet of metal. The rear panel can be either in one or two pieces and the doors are made without moldings to cover the joints. The entire absence of moldings is one of the characteristics of modern body designing, the influence exerted by the desire to have the unbroken surface for stream line effect has been the principle reason, and, also builders for years have endeavored to have the same outward appearance to a metal body, that a wood panel body presents.

Aluminum or steel may be used for panels according to the facilities of the builder for shaping the metals.

The sides of this body are low, 22 in. only, and the cowl is



1.—Four-passenger body on a 122-in. wheelbase chassis with 32-in. wheels. Two centrally placed doors are used with the front seat built in from the body side top line

2—A five-passenger body on a 132-in. wheelbase chassis with 34-in. wheels. In this design the rear seat is wide enough for three persons and the hinged armrest folds into the trimmingwhen not in use

3—Six-passenger body mounted on a chassis of 142-in. wheelbase with 36-in. wheel. This is a four-door body and the front line is curved to avoid the bent line of the cowl as it meets the side line of the body

1½ in. higher than the rear of the body. The cushions are low and the room in front of the seats is long to compensate. The doors are 21 in. wide and open toward the rear. The steering wheel is well back from the dash and low and the distance from the dash to the center of the rear wheel is 88 in. The body space is 12½ in. more or 100½ in. There is a foot rest for the rear seat as shown on the plan and all the essential dimensions including the tilt of the windshield are indicated. The shield is in two pieces, the lower part shown inclined inwardly to ventilate.

Five-Passenger Design

Fig. 2, shows a five-passenger body mounted on a 132-in. chassis, with 34-in. wheels and the gasoline tank at the rear. The distance from the dash to center of rear wheels is 92 in. and the body space 13 in. more or 105 in. The required dimensions are registered on the two views and are self explanatory.

This design differs from the previous one in that the rear seat is wide enough for three persons and the hinged armrest, folds into the trimming at the back of the seat when not in use and when down, and forms a partition, dividing the seat into two places. Another difference is the style of top, which is a Victoria. The windshield at the rear of the front seat, is high enough to meet the top edge of the front bow of the top and so prevent the wind entering. It carries two celluloid lights and for stormy weather there is an extension, indicated by dotted lines, that is fastened with buttons to the front of the top and to the top of the front windshield. When not needed it is folded away.

The Victoria top adds a pleasing look and when used in conjunction with the shield, as illustrated, the drag effect due to wind pressure is minimized. To obtain satisfactory working results in raising and lowering the top, the covering should be some other material than leather. Leather looks by far the richest, but better knockabout results are obtained with a more flexible goods. Kaki looks well, it does not show the dust and will not crease. The shield can be covered with the same material, and the extension roof and the slip covers can be the same.

The shield is made to be stationary, and is oval shape steel rod. The frame and method of covering are identical with the practice used on carriage dashes. The two studs at the bottom engage the socket irons that project from the back of the seat, and nuts on the under side keep same in place. The celluloid lights are stitched in the same as on the top curtains.

The sides of the body are a trifle higher than Fig. 1, and the increased body width, makes the seating proportions very generous when used for four passengers, but there is ample room for the five when required. The description of the construction is generally applicable for both bodies. The doors are without moldings and the top edge of body side is rounded, the front door opens toward the front and the rear door toward the rear, all hinges and handles being concealed.

A Six-Passenger Body

Fig. 3, is a six-passenger body mounted on a 142-in. wheelbase chassis having 36-in. wheels, gasoline tank at the rear, and the distance from dash to center of rear wheel being 95 in. The body space is 15 in. more or a total of 110 in.

This design has in common with Figs. 1 and 2, doors without moldings and the top edge of body rounded as well as the graduated top line. This line blends into the cowl forming the top of the front seat back. The body sides are higher than Figs. 1 and 2, and under the cowl at the rear, the extra seats are folded when not in use. They are shown in dotted lines in this position, as well as in the position for use. Above the space required for stowing the seats, there is room for small lockers, opening outward in the tonneau.

The dimensions amply located on the two views, show without further description the capacity and size of the body. The doors are four in number and the front line is curved to avoid the bent line of the cowl as it meets the side line of the body. They are made without moldings and open in opposite directions, this is optional, as all doors can open toward the rear if desired.

Upholstery Features

The plan views show two trimming designs. Figs. 1 and 2 have a long pipe caught with buttons and Fig. 3 is a design with the turkish or arm chair upholstery. This latter is the newest style and makes a pleasing looking car and is made thick so that it is very comfortable. The leather for this trimming design must be very pliable and the straps serve the same purpose as the buttons on Figs. 1 and 2. Design 3 has also the advantage of being easily kept clean. Leather is still the most preferable material used for open body trimming, some motor cloth is used and on cheap cars the imitation leather is finding favor and is being used more than formerly.

The principle change made in trimming these styles of bodies, has been the doing away with the roll of trimming that appeared above the side line of the body and seat, in some cases it appears slightly above, but on the majority of new cars it has been lowered out of sight.

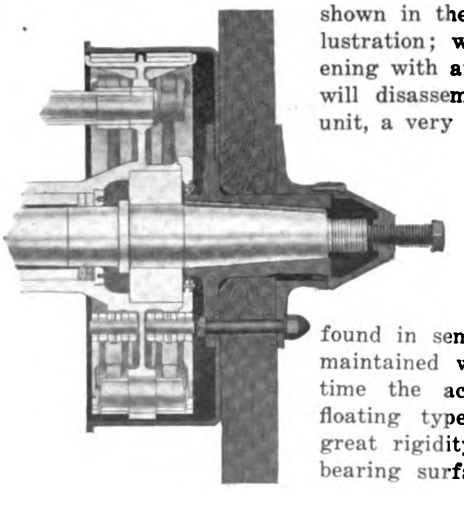
The appointments include the regulation cigar lighter and ash tray and clock, and there are pockets of the doors and robe rail and foot rests, the robe rails are mostly the flexible kind made of a strap and fastened to the rear of the front seat, and the Auster windshield at the rear of the front seat is used more than formerly.

Door handles on this type of body are all inside, and the hinges are both the concealed and the outside curved hinge, linoleum is the best material for floor covering for the toe and foot boards and running boards and leather bound carpet in the tonneau. The top material is either burbank or pantesote and the victoria top goods should be kaki or burbank, preferably kaki. The extra tires are carried at the rear on most cars and the preponderance of color designs are dark shades and blue predominating.

These illustrations are intended to serve the purpose of presenting the design of each model, amplified by dimensions in figures and the description above given is intended to supplement the above two thoughts up to this point only.

Sheldon Semi-Floating Axle

THE Sheldon Axle Co., Wilkes-Barre, Pa., has brought out a semi-floating axle in which the criticism of inaccessibility which has often been leveled at semi-floating axles cannot possibly apply. With this design all that is necessary in removing the wheel from the axle is to insert the bolt as shown in the accompanying illustration; whereupon a tightening with an ordinary wrench will disassemble the complete unit, a very simple operation.



This design is specially applicable to commercial vehicles and with it the excellent bearing surface generally found in semi-floating axles is maintained while at the same time the accessibility of the floating type is secured with great rigidity due to excellent bearing surface.

Communications

¶ The editor of the Rostrum is anxious to secure from car users and others, communications dealing with the overcoming of difficulties in making repairs and in the numberless other phases of every-day automobiling. This department is mutual and is a common ground upon which an interchange of ideas and opinions can be made as freely as in the clubroom.

The Rostrum

Inquiries

¶ The purpose of the Rostrum department is primarily to aid in the solving of motorists' problems. Readers of THE AUTOMOBILE *are requested to allow our editorial staff aid in the solution of difficulties as they arise and perhaps through this assistance reduce the cost of upkeep of their cars and gain a useful knowledge in the economical phases of the vehicles.*

Lengthening Wheelbase Spoils Steering Layout

EDITOR THE AUTOMOBILE:—Will you please advise me if the lengthening of the wheelbase of an automobile 10 in., moving the front axle forward and moving the rear axle back 10 in., will upset the steering layout and if so, how can I correct it? The original wheelbase was 90 in., and is now 110 in. after the change.

Cambridge, Mass. SUBSCRIBER.

—Lengthening the wheelbase throws the steering layout out of arrangement a considerable distance and theoretically prevents the car from turning about a fixed center as it should when the steering gear is correctly laid out. Referring to Fig. 1, the effect of altering the steering of the wheelbase becomes apparent. Assuming a car, wnich in the normal condition has its wheels at AB, the steering layout is so arranged that when the wheels are turned to any position, such as CD, the spindle axes produced should meet at a point E somewhere along the line EF or the axis of the rear axle produced. If the wheelbase is lengthened 10 in., so that the line EF is moved back to E'F' instead of intersecting at a point, the lines of the spindle produced will fall upon the line E'F' at some such point as ee'. Therefore, instead of tending to rotate about one point, the car tends to rotate about two points which is impossible and therefore sliding action results.

Soda for Cleaning Radiator

Editor THE AUTOMOBILE:—Can you tell me how to clean out my radiator? The water here is quite hard and hence scales form. What will remove it? Is it necessary to remove the rubber hose when cleaning? A. J. WHITE.

Schenectady, N. Y.

—Your radiator can be cleaned by the use of ordinary washing soda dissolved in boiling water. To a water pail full of boiling water add a couple of double handfuls of washing soda, forming about a saturated solution. This is poured into the radiator and the car operated for a short time, possibly three or four minutes, to let the soda thoroughly reach all parts of the system. It is followed up by clear water, which rinses out the soda and the matter which is loosened by its cleansing action. If this is done quite frequently, the radiator will be kept free of scale. It is not necessary to remove the rubber hose connections in doing this, as, in fact, the motor must be run in order to thoroughly reach every part of the circulating system with the soda solution.

Seems to Have Carbureter Trouble

Editor THE AUTOMOBILE:—I seem to have much trouble in starting my 1912 model E.M.F. It seems to be the ignition at times. I can start the car by cranking only at certain times, and then again I need only to press on the short circuit button. At other times, I need only to throw the switch over on the magneto and back on the battery to start the car. When it will not start by cranking, it will start by pressing the button, and sometimes, when it is not right to start by pressing the button, it will start by cranking. What would you suggest as a remedy? V. M. C.

Adrian, N. D.

—Going over the symptoms of your trouble, it would seem that it might be due to any one of four causes. These are, 1, gasoline line to carbureter clogged or float valve stuck; 2, water in gasoline, try cock on carbureter and tank; 3, carbureter adjustment too lean for starting purposes, and 4, improper carbureter dash adjustment. This should be set to choke air from the carbureter.

All of these are obvious and can be remedied readily except the last. In view of the fact that the carbureter dash adjustment is an improvement for aiding the starting of these motors, and was brought out since the production of these cars, it might be well to fit one of these in order to secure better results with the low-grade fuel at present on the market. The Studebaker parts list gives the following names and prices of the parts which you will need:

1	A-3455, carbureter air valve assembly	$0.25
1	A-3461, carbureter air valve adj. screw	.15
1	A-3463, carbureter air valve control assembly	.25
1	A-3464, carbureter air valve seat and lever sub-assembly	.35
1	A-3479, hot air throttle and tube connection wire	.05
1	A-3480, hot air throttle and tube connection assembly	1.00
1	A-6 x 2, carbureter control cotter	.01
	Total	$2.06

The handiest for you to obtain these parts would be from Mr. George Young of La Moure, N. D.

If after going through all the above possible causes, you do not locate your trouble, it is suggested that you examine for air leaks the joints of the carbureter, intake manifold, valve stem and guides and look for porous castings. All these joints should be absolutely air tight. Examine the spark timing and the strength of the spark. See that the valves are properly adjusted and seated or, in other words, that the compression is good and then see that all wiring connections are tight.

If you have gone over all the above carefully, there is no doubt but that you will locate your trouble. In inspecting for wiring difficulties you should begin at the switch, carefully examining the switch bars to make sure that a good, clean contact is being made between the segments. Also trace all wires leading from the coil to see that there are none broken beneath their insulation, or the insulation worn off, allowing them to come into contact with some metal part of the car, causing a short circuit. The wires should all be securely fastened to their respective terminals. The breakers should be examined and set at 0.025 and the distributer contact should be free from dirt and making a good positive contact. The sparkplugs should be examined for broken insulation, etc., and here also the gaps should be set at 0.025 in. If you find that the trouble is in the coil

or magneto, it would be better not to attempt to repair it yourself, but take this up with the Splitdorf Electrical Co. direct.

Suggests Source of Oiling Trouble

Editor THE AUTOMOBILE:—Noting the trouble of Mr. George F. Tuttle, with a Buick oiling system, as mentioned on page 988 of THE AUTOMOBILE for June 3, will suggest the following as a possible solution.

If oil was put in the reservoir as well as in the crankcase proper and connecting-rod bearings and burned out in ten miles, it was possibly due to pump failure.

When a system of this type is emptied out and refilled, it frequently happens that the pump becomes air-bound and can be started by lifting the discharge check and filling up with oil, noting that the vane is at its maximum height. Drop the check back in place, and the pump will start unless the suction valve is locked.

I failed to read in Mr. Tuttle's remarks any reference to the sight feed, as to whether or not the oil was being circulated.

If he is not sure as to the above, I am of the opinion that pump failure was the cause of his trouble. B.

Baltimore, Md.

Buick 43 Went 55 Miles per Hour

Editor THE AUTOMOBILE:—Would like the following information concerning the Buick 1912 model 43 touring car.

1. Revolutions of motor per minute.
2. Maximum speed of car.
3. Description of connection of clutch with transmission, and also transmission and front end of driveshaft. Can this joint be made so that it will not leak grease? If so, how? H. F. MURRAY.

Brooklyn, N. Y.

—The motor in the Buick model 43 is stated by the makers to develop 50 horsepower at about 1800 r.p.m. With 3.5 to 1 gear ratio and 36 x 4 tires, this would give a car speed of about 55 miles per hour.

2. This is answered under the above reply.

3. The connection between the clutch and the gearset was by means of a square shaft and Oldham coupling, and the connection between the gearset and driveshaft was through a Spicer universal joint, the driving flange of which was fitted to the squared end of the gearset mainshaft. This gearset was designed for the use of steam engine cylinder oil as a lubricant and oil retainers with double grooves and drain-backs into the case were fitted outside the bearings. According to the Buick company, difficulty was never experienced in keeping the cases oiltight, but no doubt heavy grease would eventually clog the oil drains and finally work its way out upon the shaft. The remedy would be, of course, to clean out the casing and to use the lubricant intended for it.

D. D. Buick the Original Designer

Editor THE AUTOMOBILE:—Who designed the first Buick engines, and when was this done?

2. When, and by whom was the Chevrolet engine designed?

3. How often should a storage battery be cleaned and refilled with liquid? H. L. B.

Hughesville, Pa.

—D. D. Buick was the original designer of the Buick type valve-in-head motor. He started to build this motor for stationary and marine purposes in 1902 in Detroit, and the year after he was joined by Walter L. Marr, who is now chief engineer of the Buick Co. Together they developed the Buick two-cylinder motor, which later became quite well known in the model F.

2. The overhead valve motor used in the Chevrolet cars of today was designed by Arthur Mason, of the Mason Motor Co., in 1912. It was perfected and put out on the market in 1913.

3. A storage battery should be tested and filled with pure water without fail once every week in summer and every two weeks in winter.

Using Too Much Fuel Under Load

Editor THE AUTOMOBILE:—I have a model 38 Overland with Remy magneto and Schebler carbureter. This car seems to choke and for some time it has been using considerable fuel on hard pulls or when speeding up to 20 miles an hour or over. When I throw out the clutch it takes several seconds before the engine will race and fire all around. Then it pulls like a tractor for a while. I sent the magneto back to the factory some time ago and I don't think it is at fault. I thought at first that the fuel line was clogged up, but found this was not the cause. Can you tell me what the probable cause of this trouble is? W. E. WADE.

Kenton, Tenn.

—Regarding the possibility of carbureter trouble, the model 38 Overland used at different times Schebler models D, E and L, which were regularly fitted to these cars. This renders it difficult to give exact information, and if you are convinced it is the carbureter it would be well to pick out the model on your motor from Fig. 2, which illustrates these three types. The exact information could then be given without trouble.

With the instrument generally employed in connection with the model 38, use was made of a spring control auxiliary valve. This valve is guided to its seat through the use of a stem on which the valve stood vertically, governing the auxiliary flow of air. When this stem or valve casting became worn to any extent, its action was likely to permit a chatter or side action. This, of course, would affect the density of gas saturation delivered to the motor and would make the motor sluggish at lower speeds. As soon as the motor, however, had maintained such speed as would keep the air valve constantly off its feet, a more uniform mixture was sent through the manifold and a more satisfactory running condition resulted.

The same condition which you have pointed out in your letter can be caused from ill seating or improperly fitting pistons and piston rings. Loss of compression is not noticeably so detrimental to the efficiency of the motor when it is running at higher speeds, and it is possible that the valves have become carbonized to the extent that they need regrinding. It would be a good idea, therefore, to have the

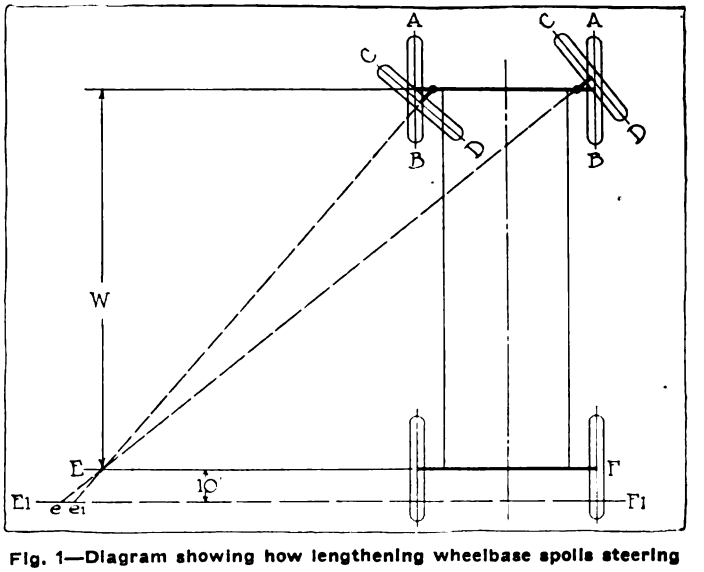


Fig. 1—Diagram showing how lengthening wheelbase spoils steering

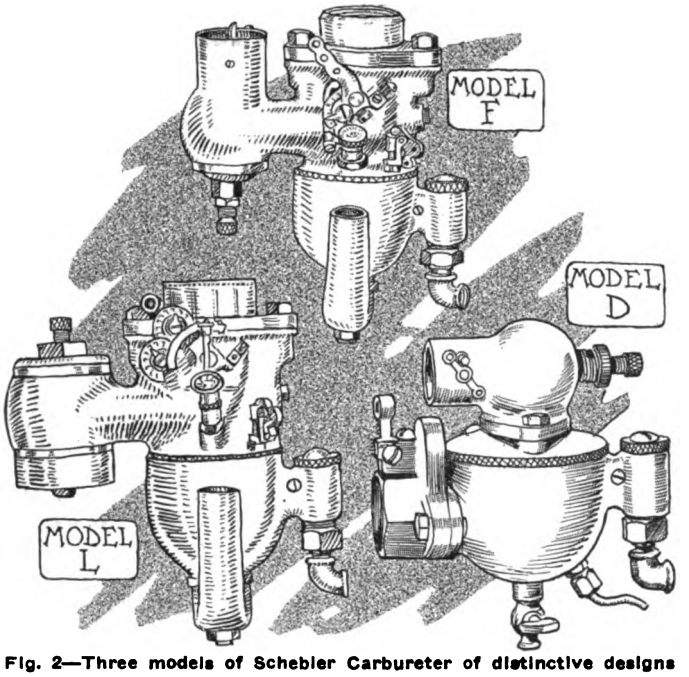


Fig. 2—Three models of Schebler Carbureter of distinctive designs

carbon removed and the valves ground to a firm seat before trying to make any further adjustment of the carbureter. One of the facts which must be realized is that this carbureter was made for a better grade of fuel than that which is at present on the market, and no doubt the heavier fuel which you are compelled to make use of is partially to blame for the trouble.

Ford Branches Equipped for Grinding

Editor THE AUTOMOBILE:—Can you tell me whether the branch plants of the Ford Co. regrind cylinders and fit pistons. What are the costs and can you recommend the nearest branch to me? C. R. ALDRICH, M.D.

Brattleboro, Vt.

—The branches of the Ford company which are equipped to rebore model T cylinders and install 1-32 oversized pistons are the followin:

Atlanta	Dallas	Milwaukee
Buffalo	Fargo	Omaha
Chicago	Houston	Oklahoma City
Cambridge	Indianapolis	Philadelphia
Cleveland	Kansas City	Pittsburgh
Cincinnati	Los Angeles	Portland
Columbus	Long Island City	San Francisco
Detroit	Minneapolis	Seattle
Denver	Memphis	St. Louis

When the cylinder is out of the car there is a labor charge of $3.00 net, covering rebabbitting, reboring and fitting of oversize pistons.

Brattleboro, Vt., is controlled by the Cambridge (Mass.) branch, and cylinders in that territory in need of reboring should be returned to Cambridge.

Gear Ratio of 1915 Oldsmobile

Editor THE AUTOMOBILE:—What is the gear ratio of the 1915 Oldsmobile model 42 on all speeds, low, second and direct?

2—At what engine speed does this car produce its highest power?

3—What is the gear ratio on all speeds of the Overland 81, Hupmobile 1915 model and Buick 27?

4—What make of engine is in the Oldsmobile model 42?

5—Is this motor made by the Northway company?

Eden, Idaho. J. LEVIN.

—The gear reductions of the Oldsmobile on all speeds are as follows:

First speed	13.4 to 1
Second Speed	7.05 to 1
Third speed	4 to 1
Reverse	17.3 to 1

2—The model 42 Oldsmobile gives its maximum horsepower at 1,900 r.p.m.

3—The gear ratios of the Overland 81 are:

First speed	3 to 1
Second speed	1.8 to 1
Third speed	3.9 to 1

Since the rear axle is geared 4 to 1, the final reductions are found by multiplying each of these reductions by 4. The reductions on the Hupmobile models are as follows:

MODEL K

First speed	14.4 to 1 and 15.5 to 1
Second speed	7.20 to 1 and 7.65 to 1
Third speed	4.0 to 1 and 4.25 to 1
Reverse speed	18.31 to 1 and 19.47 to 1

MODEL H AND HA

First speed	16 to 1 and 16.7 to 1
Second speed	8 to 1 and 8.42 to 1
Third speed	3.6 to 1 and 3.86 to 1
Reverse speed	20.34 to 1 and 21.1 to 1

The reductions on the Buick Model 27 are as follows:

First speed	11.76 to 1
Second speed	5.25 to 1
Third speed	3.50 to 1
Reverse	15.12 to 1

4 and 5—The engine is designed by the Oldsmobile company but is manufactured by the Northway Motor & Mfg. Co., which is a part of the General Motors organization.

First Welch Six Built in 1909

Editor THE AUTOMOBILE:—When did the Welch Motor Co., Pontiac, Mich., first produce their first six-cylinder motor?

Detroit, Mich. C. G.

—The first six-cylinder car turned out by the Welch Motor Co. was built in 1909. The car sold for $7,000. A 75-horsepower 4 5-8 by 5 motor was used. The radiator was a honeycomb. Other features of the car were multiple-disk clutch, and 36 by 5-inch tires. The wheelbase was 138 inches and the tread 56. The weight was 4,400 pounds.

How to Pronounce Car Names

Editor THE AUTOMOBILE:—What is the correct pronunciation of the names of the following automobiles: Delage, Mercedes, Chevrolet and Peugeot?

Taylor Ridge, Ill. A SUBSCRIBER.

—The pronunciations of the names given by you are as follows: Delage, Del-ahge; Mercedes, Mer-se-dees; Chevrolet, Shev-ro-lay, and Peugeot, Per-joh.

Liquid Carbon Removers Satisfactory

Editor THE AUTOMOBILE:—Having seen several articles in different magazines concerning the different solutions for removing carbon from motors, and wishing to know if any of these solutions have been tested and found reliable, I would like you to give me the name of any firm or dealer who handles a solution that you know to be reliable? I have never had much faith in these carbon removers because I have been unable to find any one who has tried any of them.

Thiells, N. Y. CHESTER L. ORNE.

—A number of liquid solutions for removing carbon are successful and although they cannot be listed here, any of the brands which have been on the market for some time will probably be found to do all that is claimed for them. They merely act as carbon solvents and therefore are not as quick and positive in their action as scraping or burning carbon from the cylinders. The best way to convince yourself of their efficacy is to scrape some lump carbon from the motor, place it upon a piece of cast iron and put a small portion of the carbon remover upon the carbon and watch the

action. Two points, however, must be watched with great care in using these removers, the first being that they do not attack the metal of the cylinder wall and the second that the lubricating material in the crankcase is not destroyed by the leaking of the carbon remover past the piston. After many of the removers are used, it is necessary to empty the crankcase and refill with new oil, therefore, the best time to remove the carbon is at the time when the oil itself is to be renewed.

Gear Ratios at Different Speeds

Editor THE AUTOMOBILE:—Kindly inform me the gear ratios of the following cars on their different speeds. What I desire is not the final gear reduction between the motor and rear wheels but the actual reduction in the gearbox. Stutz, Mercer, 1914; Mercer 1915; Marmon 41; Simplex and Packard 48.

N. Y. City. SUBSCRIBER.

—These gear ratios are as follows:

MERCER

Series H & O		Series J		Series M	
1st speed..	9.66 to 1	1st speed...	8.58 to 1	1st speed....	10.2 to 1
2d speed...	5.20 to 1	2d speed...	4.62 to 1	2d speed...	5.49 to 1
3d speed...	3.86 to 1	3d speed...	3.47 to 1	3d speed...	4.08 to 1
4th speed..	2.82 to 1	4th speed..	2.52 to 1	4th speed..	3.00 to 1

SIMPLEX 38 AND 50 HORSEPOWER

1st speed	4.03 to 1
2d speed	1.98 to 1
3d speed	1.32 to 1
4th speed	Direct

MARMON 1914 AND 1915 MODEL 41

	1914	1915
Countershaft drive gear	18 teeth	18 teeth
Second speed sliding gear	23 teeth	23 teeth
Low and reverse sliding gear	33 teeth	33 teeth
Countershaft constant mesh gear	33 teeth	33 teeth
Countershaft intermediate gear	28 teeth	27 teeth
Countershaft low speed gear	18 teeth	18 teeth
Countershaft reverse gear	14 teeth	14 teeth
Reverse idler gear	16 teeth	18 teeth

PACKARD MODEL 548

Motor speed at 900 revolutions per minute.
Diameter of rear wheel, 37 inches; circumference 9.686 ft.

With 28-Mile Bevel Gears

First speed, 17/39 x 23/33 x 15/53—.0859 ratio.
Second speed, 26/30 x 23/33 x 15/53—.1709 ratio.
Direct drive, 15/53—.283 ratio.
First speed, 8.5 miles per hour.
Second speed, 16.93 miles per hour.
Direct drive, 28 miles per hour.
Reverse, 8.5 miles per hour.

With 31-Mile Bevel Gears

First speed, 17/39 x 23/33 x 17/54—.0956 ratio.
Second speed, 26/30 x 23/33 x 17/54—.1901 ratio.
Direct, 17/54—.3148 ratio.
First speed, 9.47 miles per hour.
Second speed, 18.83 miles per hour.
Direct drive, 31 miles per hour.
Reverse, 9.47 miles per hour.

The Stutz ratios are not available at the present time.

The gear ratios as given here are in the same order or arrangement as given by the factories of the different companies. It will be noted that some of these are given in terms of total ratio between crankshaft and rear axle and others in reductions in the gearset. In the case of the Marmon, the number of teeth are given and in calculating any desired ratio with these, it must be remembered that the ratio of one gear wheel to another is in direct proportion to the number of teeth.

Wiring Spot Light for a Ford Car

Editor THE AUTOMOBILE:—Will you kindly let me know how to wire a spot light from the Ford magneto and battery? Also size of light to be used?

Buffalo, N. Y. R. KAYSER.

—The wiring of the spotlight from the Ford magneto and battery would require a single lamp of 16 volts or two lamps in series of 8 volts each. One wire would go to the magneto terminal, coming from the top of the gearbox cover and the other wire from any part of the metal on the car. This could not be used in conjunction with the battery as you would only get 6 or 8 volts from a battery which would not light the lamp required by the magneto.

Cid Rotary Valve Motor Still on the Market

PARIS, FRANCE—Editor THE AUTOMOBILE:—In THE AUTOMOBILE for April 1 an article entitled Rotary Valve Makes Slow Progress states that the Itala type of valve is only one now built in Europe, and that the Cid rotary valve motor never has been put on the market. This is not quite correct. The Cid motor was first shown at Paris salon in 1910, and has been on the market ever since. It is still produced at Dijon. This type of motor appears to have given satisfaction, but the output of the firm is not great. The Henriot type, as adopted by Darracq, proved a failure and has long been abandoned, although a determined attempt was made to overcome its inherent defects. The Argyll type of single sleeve motor, although not really a rotary, might be mentioned as produced by the Piccard-Pictet company, in Switzerland. Two of these cars ran in last year's French Grand Prix. The only non-poppet valve motors now built on the Continent of Europe are Knight, Itala, Argyll and Cid. Half the factories of Europe were interested in some type of non-poppet valve motor 2 years ago, but since then interest has dropped to zero. The "valveless" motor is dead as a talking point."—W. F. BRADLEY.

Sheffield Scientific School Maxwell Test

Editor THE AUTOMOBILE:—In THE AUTOMOBILE for May 13 there was a news item regarding an efficiency test on the Maxwell car which was made by the Sheffield Scientific School of Yale University. Would you kindly inform me what kind of tires were used on this test?

Indianapolis, Ind. H. H. K.

—The accompanying is a full report of the test which will give you the information you desire along with the other data secured.

Test at the Mason Laboratory of Mechanical Engineering, Sheffield Scientific School, Yale University

1. Type and model of car—Touring, model 25, 1915.
2. Owner—Biever Motor Car Co., New Haven.
3. Weight with driver—1850 + 150 = 2,000 pounds.
4. Wheelbase—103 inches.
5. Cylinders—Four, 3⅝ x 4½ inches.
6. Gear ratio, direct, measured—3.55 : 1.
7. Tires, size—30 x 3½ inches.
8. Tires, make United States—Chain, inflated to 65 pounds.
9. Carburetor—K. D.
10. Ignition—Sims magneto.
11. Starter—Sims-Huff, electric.
12. Wind resisting area, measured—4.5 x 4.5 = 20 sq. ft.
13. Rolling resistance by dynam.—36 pounds.
14. Gasoline from Mason Lab.—Specific gravity 0.724 at 69 deg.

POWER AND FUEL MEASUREMENTS

Speed, miles, per hour	Drawbar pull, pounds	Horse-power at rear tires	Grade, per cent.	Mileage, miles per gallon	Fuel, pounds per h.p. per hour	
10.2	42	1.2	0	33.8	1.57	level
19.8	60	3.2	0	33.2	1.13	level
30.1	90	7.2	0	23.2	1.08	level
40	132	14.1	0	19.3	0.88	level
				Av. 27.4	Av. 1.16	level
10.6	249	7.0	10.3	9.5	0.95	full load
20.6	254	14.0	9.7	11.3	0.78	full load
30.7	209	17.1	6.0	13.2	0.82	full load
40.3	160	17.2	1.3	14.	1.01	full load
				Av. 12.0	Av. 0.89	full load

Tests made April 30, 1915, under direction of E. H. Lockwood and F. Q. Boyer.

Gas Brake vs. Mechanical Friction Brake

Using a motor brake as a service brake is said to economize considerably on wear of solid rubber tires, on the principle of obviating the blocking of wheels. Any similar resistance effected by gases should have the same result and might also be available for regulating the speed of coasting and for otherwise moderating the driving speed more conveniently than by lowest throttling and slipping of the clutch.

ACCESSORIES

Atlas Gasoline Improver on Test

A FLUID for the purpose of increasing the effectiveness of fuel is on the market. It is put up in packages containing five small phials of the material, each phial being sufficient to treat 5 gallons of gasoline. It is claimed that the material will increase the mileage per gallon and also increase the speed for a given throttle opening.

The material is said to be composed of a compressed mixture of hydrogen gas, gasoline and a very small amount of water. The exact composition is a secret, but an analysis shows that it does not contain any of the common constituents used for doctoring fuel. A test by an analytical chemist showed that there was no ethyl ether, picric acid or camphor in the solution. These are the three components which are generally found in so-called fuel improvers.

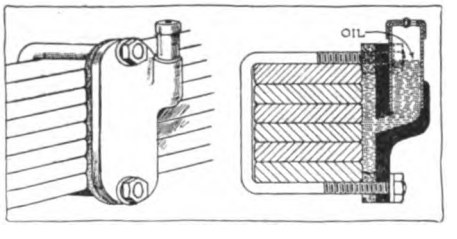
Used by Fire Department

The material is said to be used by the fire department of Chicago for use in patrol work. It has been tested out by others in Chicago during the past 4 or 5 years and at the request of the Eastern distributors the test was made upon the substance by a representative of THE AUTOMOBILE. The run was carried out on a level stretch of road near Coney Island, known as Ocean Parkway. A Ford car was used in the experiment and after the tanks had been drained and the motor allowed to run until it came to a stop a quart of measured untreated fuel was poured in. The throttle opening was fixed to a definite point and locked in this position and the spark also fixed. On the quart of plain gasoline, the car ran 6.5 miles at an average speed of 17.1 miles per hour.

At the completion of the first run after the motor had come to a stop, the car was brought back to the starting point and a quart of the treated gasoline placed in the tanks which were emptied in the same manner as previously. Under the same conditions of spark and throttle setting the distance traveled by the car was 7.3 miles and the average speed 20 miles per hour. This gives a comparative mileage per gallon of 26 with standard gasoline and over 29 with the treated material. Furthermore, the average speed was increased for a corresponding throttle setting approximately 3 miles per hour. The improver sells for 25 cents a package and enough is contained in each package to treat 25 gallons of gasoline. The distance measurements were made with a Jones speedometer which was not checked for accuracy, but since the measurements for both treated and untreated fuel were made with the same speedometer, any differences should offset themselves.—Atlas Gasoline Improver Co., Chicago, Ill.

Leaf Spring Oiler

A leaf spring oiler made in six sizes to fit all size springs has recently been brought out which is said to work the oil between the leaves while the car is operating. The device is so arranged that when oil is placed in the oil cup on the side of the device, as illustrated, it is led down along the sides of the spring and the motion of the spring permits the oil to work its way in between the leaves, keeping them lubricated. The device is also made in another and cheaper style without the oil cup, but with an oil hole. A special set of four of the cheaper style is put up for Ford cars at a price of $1.60. The regular price is 50 cents apiece for the style without the oil cup and 75 cents apiece for the style with the oil cup.—Grus Leaf Spring Oiler Co., Chicago, Ill.



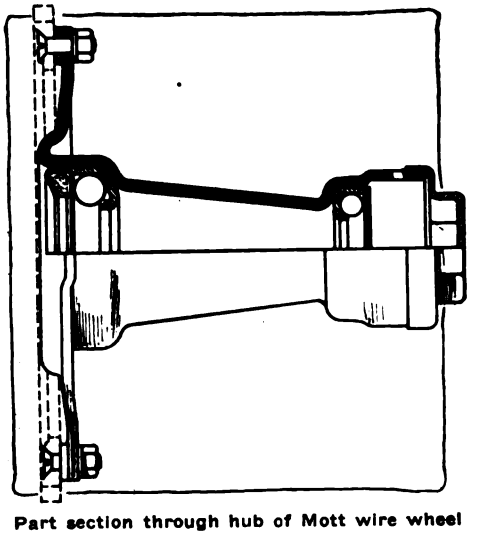
Grus leaf spring oiler clamped against side of spring

Graphonoil Lubricant

A new graphite and oil lubricant has been introduced in which a thin film of graphite is stated to be spread over all the working and bearing parts with which the lubricant comes in contact. The material which is called Graphonoil is stated by the manufacturers to have effected a change in the graphite which makes it mingle with the oil and not be suspended in it. It is stated that with its use there cannot be any precipitation of the graphite and the entire constituency will pass through a mechanical filter. It is claimed not to carbonize and to effect a saving as the feed can be reduced with it.—The Winslow Lubricating Co., Buffalo, N. Y.

Dry Battery Car Lamp

For automobiles without electric lighting sets when a moderate illumination is required now and then for short periods, there is a great deal in favor of dry batteries as a source of current, as they are less trouble to look after than oil lamps. The Wireless Autolight is a well-made case supplied with a lamp and reflector, glazed in white, green or red. It takes a standard No. 6 cell and three lamps complete cost $10.—Peck Engineering and Mfg. Co., Rochester, N. Y.



Part section through hub of Mott wire wheel for Ford cars

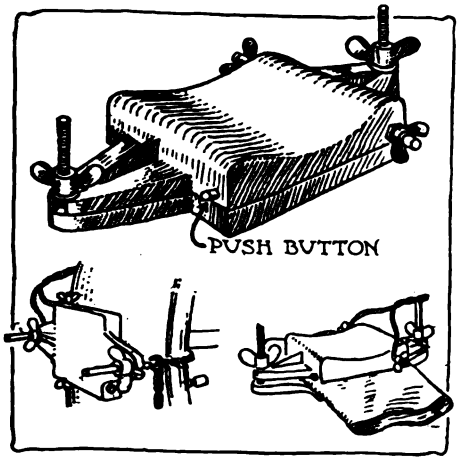
Air Shock Absorber

This device is not a supplementary spring, but a main spring damper. It is attached to the axle and to the frame of the car, the connecting pins being parts of small universal joints so that the action is not interfered with by side sway or irregular action of the main spring. A bronze piston is normally located about the middle of a bronze cylinder, both ends of which are closed. From one end to the other there is a minute passage so that air can pass from top to bottom and *vice versa*, but only quite slowly. Thus when the cars runs over a bump the piston moves down the cylinder and forces air through the by-pass to the upper end, to damp the recoil following the bump, this air has to return to the bottom of the cylinder again, so the absorber is double acting. There is an adjustment which sets the size of the passage and so enables the action to be made easy or stiff according to requirements. Prices vary from $75 up to $120 according to size, per set of four.—Air Shock Absorber Co., Boston, Mass.

Premier Electric Vulcanizer

An electric vulcanizer weighing but 2 pounds is shown in the accompanying illustration. This device operates from

the 6-volt storage battery usually carried in the car and is provided with a thermostat which automatically cuts off the current as soon as the vulcanizer attains the correct heat for vulcanizing the repair on shoe or inner tube. It will take any size tire up to 5 in. diameter. The vulcanizer may be used either in a garage or on the road, being simply clamped to the tube or casing, two wires being connected to the battery and contact applied through a button. The simplicity of operation of the device is said to render it of value in quickly healing up small cuts in casings as soon as discovered, thereby preventing moisture from working in and rotting the fabric. The device sells for $3.50 complete with repair gum and 10 ft. of wire cable.—Premier Electric Co., Chicago, Ill.



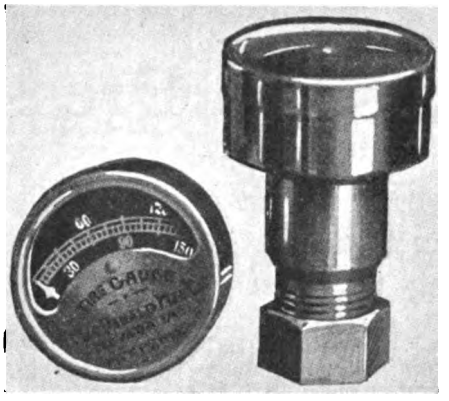
Premier electric vulcanizer at work

Valve Seating—A very complete outfit for repair shops with a wide range of cutter for truing valve seats is among the most interesting New Era products. Described in the same leaflet is a small tool for dealing with the valves themselves.—New Era Spring and Specialty Co., Detroit, Mich.

Automatic Vulcanizer

A vulcanizer which is automatic in that after gasoline enough to saturate a wick has been poured in, no further attention need be paid to it, has recently been put on the market under the name of the Worcester automatic vulcanizer. The principle upon which the device operates is the same as for other gasoline vulcanizers, except that it contains a wick and does not allow the gasoline to remain free in an open chamber.

With the wick arrangement it is possible to apply the vulcanizer to the wheel for work on the casing as the gasoline cannot pour out, while for work on tubes it is used in the same way as other gasoline vulcanizers. In operating the vulcanizer, on a casing the cut is cleaned as much as possible with sand or emery paper and washed with gasoline enough uncured rubber to make a smooth surface is added and cleaned with gasoline after



MacDonald's tire gage valve-cap

which it is applied to the casing and the vulcanizer applied with a piece of paper between the metal of the vulcanizer and the prepared rubber. The asbestos working is unsaturated with gasoline and ignited and allowed to burn until the flame goes out. After this the vulcanizer is allowed to remain in place for 5 min.

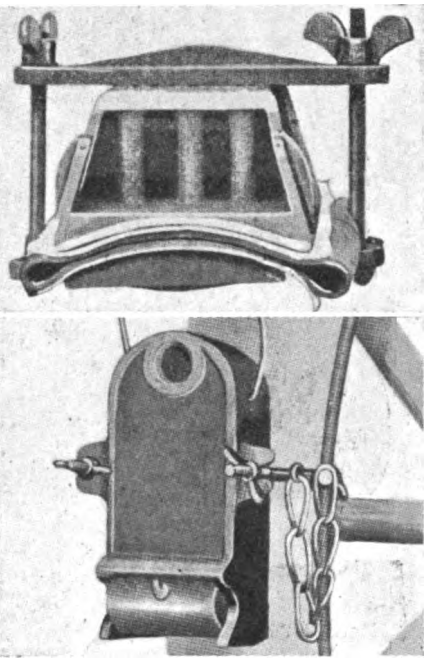
For inner tubes the same process applies, only enough rubber being used to cover the puncture. The heat radiated through the vulcanizer due to the burning of gasoline has been gauged to maintain the vulcanizer at the proper temperature. The vulcanizer weighs 4.5 lb. and its price is $3.50 f.o.b. Worcester.—Worcester Mfg. Co., Worcester, Mass.

Ford Wire Wheels

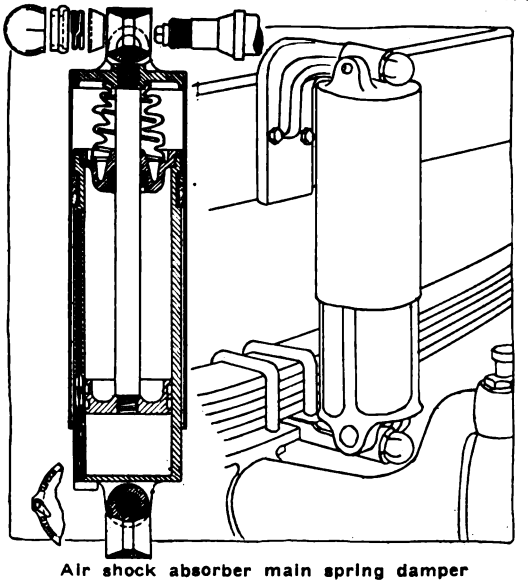
Those who wish to fit their Ford with a set of wire wheels can do so very easily with the set supplied by the Mott company, as these can be put on without any alterations to the axles. It is necessary merely to remove the old wheels, clean the axle ends and put the wire set in place. The Mott wheel has a demountable rim and one spare is included with the outfit. The drawing shows the fitting of a front wheel, the ball cups and balls coming with the wheel. Special lugs are provided on the right front wheel for the attachment of the speedometer drive. The change can be quickly made by an amateur without trouble.—Mott Wheel Works, Utica, N. Y.

MacDonald's Tire Gage

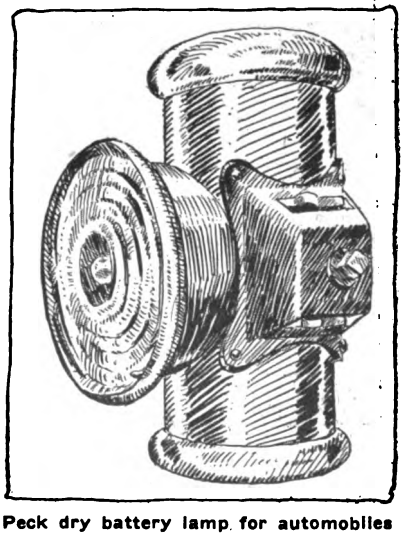
A valve cap which is a perpetual pressure indicator has been brought out recently and should merit the attention of owners who desire to keep a careful check on the inflation pressures of their tires. This gage displaces the ordinary cap and acts itself as an air seal. With this tire gage leaky valves are eliminated because the valve itself is held wide open by the gage cap and the gage itself is air tight. The device is shown in the accompanying illustration and as will be noted, has a dial which at all times indicates the pressure in the tire. The price for a set of four of these is $6.50.—J. F. MacDonald Mfg. Co., Nevada, Iowa.



Worcester automatic vulcanizer for tubes and casings



Air shock absorber main spring damper

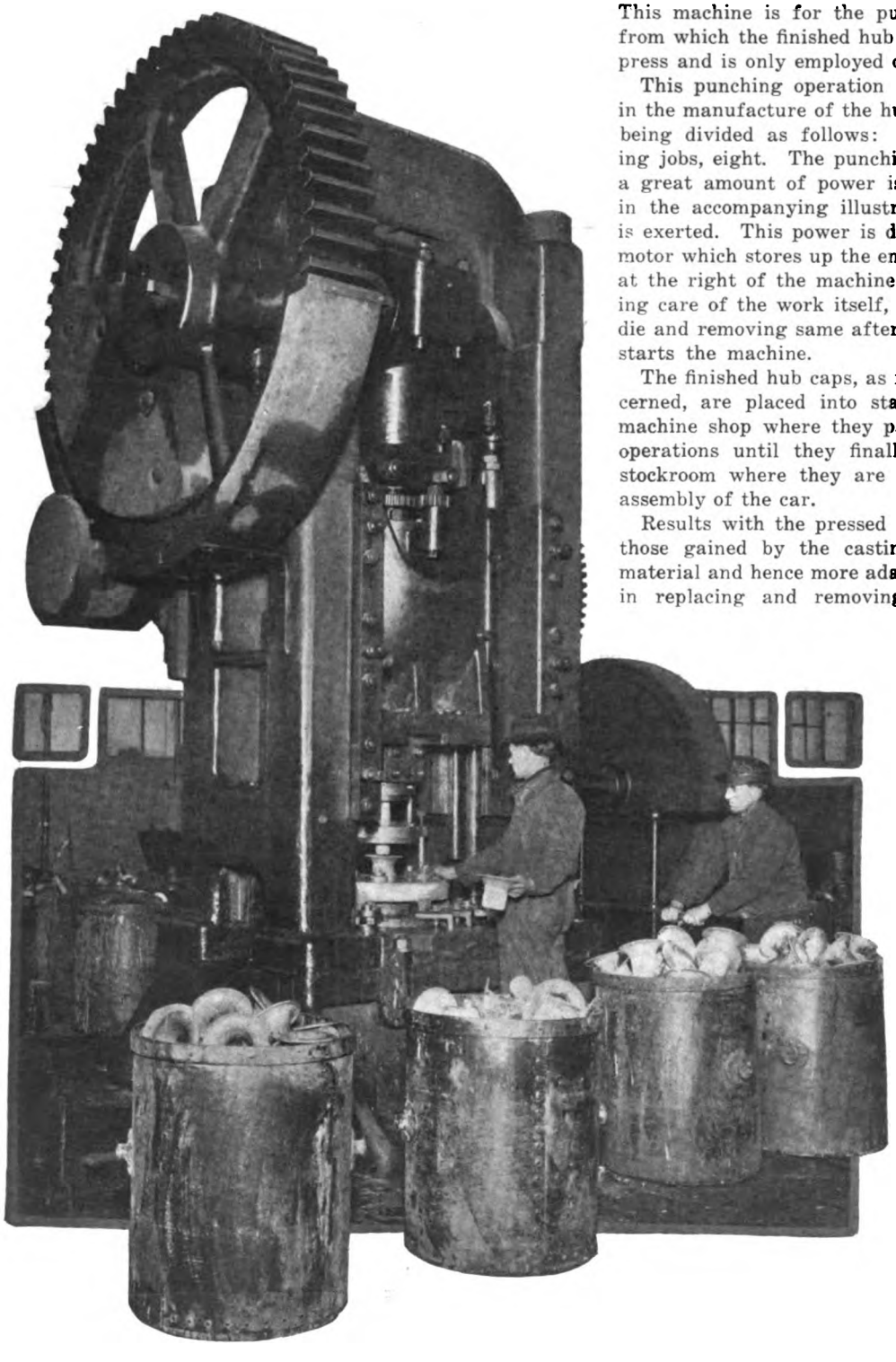


Peck dry battery lamp for automobiles

Dodge Uses 750-Ton Press for Hub Caps

Seventeen Operations to Complete a Hub Cap—Big Press Makes 2,500 Stampings a Day or More Than Four a Minute—Pressed Cap Said to Be Superior to Cast Owing to Finer Grain of the Resulting Metal

Illustrating the large press used by the Dodge Bros. In turning out the stampings from which the finished hub caps are made for the Dodge cars. Note the standard shop cans in which the finished stampings are placed after they are removed from the machine



SEVENTEEN operations are necessary to complete the work on a hub cap, and in order to cut the time to the limit on this work the Dodge Bros. have installed a machine in their Detroit plant which has a capacity of 2,500 hub caps a day. This machine is for the purpose of forming the rough shape from which the finished hub caps are made. It is a huge punch press and is only employed on the hub cap for the front wheels.

This punching operation is the only punching job necessary in the manufacture of the hub caps, the other sixteen operations being divided as follows: Drawing operations, eight; machining jobs, eight. The punching work is, of course, one in which a great amount of power is required and on the press shown in the accompanying illustration a pressure of over 750 tons is exerted. This power is derived from an independent electric motor which stores up the energy in an enormous flywheel shown at the right of the machine. The men work in pairs, one taking care of the work itself, that is, placing the stock under the die and removing same after pressing, while the other stops and starts the machine.

The finished hub caps, as far as the pressing operation is concerned, are placed into standard cans and forwarded to the machine shop where they pass through a series of progressive operations until they finally make their way into the parts stockroom where they are drawn upon for work in the final assembly of the car.

Results with the pressed hub cap are much better than with those gained by the casting method, being of finer grained material and hence more adaptable to the stresses put upon them in replacing and removing. With this large machine 250 stampings can be made every hour. This is, therefore, an operation in which the skill of the workman, in placing the raw material under the die and removing it quickly while inserting the next, is of great importance. The illustration shows the continuity of the work, the operator placing one stamping into the cans while the next one is undergoing the operation by the die. The speed at which this work is done can be realized when it is known that the machine turns out more than four a minute. The actual operation including the time of stopping and starting the machine taking less than 15 seconds for each stamping.

The cans into which the finished stampings are placed can be readily transported from the punch press to the machines upon which the other operations are performed. They can be placed upon small hand trucks with but little effort and wheeled into position.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, July 8, 1915 No. 2

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
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Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Service Convention

SCARCELY anything in connection with the automobile industry has been more abused than the term service, with the possible exception of salesmen trying to sell cars entirely on high-gear performances on hills. The high-gear evil is pretty strongly entrenched, so is the service one, but the meeting of service managers for two days last week points to an early elimination of a few of the more impossible evils of service as interpreted by salesmen and short-sighted dealers, as well as a few injudicious makers.

Makers, dealers and owners are slowly but surely coming to the conclusion that service does not mean giving something for nothing, or, getting something for nothing. The concern building on such a foundation has only troubles ahead. Service has been better defined as making it easier to own and maintain an automobile, not that you get presents from the maker or dealer in the form of free inspections, free adjustments, free replacements, and cuts in your repair bills; but rather service is prompt attention, courteous treatment and accurate workmanship with reasonable charges.

When we travel across the country on a limited train we expect service, but this does not mean getting our ticket at a reduced rate; getting free exchange of an upper for a lower berth; or having a discount on all dining-car meals; rather service, there, means attention when it is needed, prompt dining-room service; clean cars, clean berth linen, traveling on schedule and many other details that go to making your trip easy and pleasant.

In our modern hotels we expect service, service which we unquestionably pay for in the daily hotel rate or in dining-room charges. In this connection service might be defined as getting what we pay for and getting it without asking and having to go to considerable trouble to obtain.

Service managers first have to remove the beam from the eyes of their own selling forces before trying to extract the mote from the eyes of automobile purchasers. The evil has largely started with the seller, not the buyer.

Whither?

WHILE we are talking about finality in design and the complete standardization of automobiles, it is noticeable that there is a growing feeling of doubt among the engineers and the manufacturers who have been responsible for development up to the present time. This questioning attitude was very much apparent on the S. A. E. lake trip even in the tone of general discussion, while it was much more pronounced when a few men talked quietly together.

The truth of the matter is that few manufacturers are quite so satisfied with their cars as they would like to be; they are much less satisfied than they expected to be when looking forward to 1915 from a couple of years ago. Yet just what this lack of content is would be difficult to say in a few words.

Uppermost in the minds of many is the idea so well brought out in the discussion in A. L. Brush's paper dealing with motor design, namely that in obtaining wonderful high-gear performance, by using a large engine and a low gear ratio, the correlative disadvantages of rapid wear of motor parts and poor economy of fuel have been introduced. That the American public demands so much greater high-gear power than the user of cars in any other country is largely the fault of the manufacturers, who have for many years done almost all they could to discourage gear shifting. It seems that some of them are realizing that their action has digged a pit and the industry is now at the bottom of it.

The whole situation is indefinite, but it is unquestionable that there has been a great change in the mental attitude of the industry during the last 12 months. It may presage nothing or it may forecast illimitable things.

At the moment it would be altogether too speculative to attempt to sum up the general trend of thought, but one thing stands out clearly and this is that we are to see many attempts to give the same performance by virtue of lighter weights and smaller motors. Weight is the great cry just now, and many an engineer is deep in consideration of what his chassis can do without. But it is thought that this is only a stage, and there are reasons for the belief that instead of being at the end of automobile development we are merely about to enter upon a new phase that may be more interesting and more important than any which have gone before.

U. S. Tire Passes Dividend

Quarterly Dividend of 1 1-2 Per Cent on Common Stock Passed—Stock Drops

NEW YORK CITY, July 3—Much speculation has been caused by the fact that the United States Rubber Co. passed its usual quarterly dividend of 1½ per cent on common stock this week. Since 1911 dividends have been paid on the common stock, of which there is outstanding $36,000,000. In 1911, 1 per cent dividend was paid; in 1912, 4 per cent, and since 1913, a quarterly dividend of 1½ per cent. Some difficulties were anticipated by stockholders when the stock dropped 13 points recently and at this time it was rumored that the usual dividend might not be forthcoming. Stock quotations dropped somewhat as a result.

The only reasons given by the company for passing the dividend are those contained in a statement from President Samuel P. Colt. He says that the net earnings so far this year are substantially the same as last year, but that the unexpected continuation of the war has made it necessary to maintain an unusually strong financial position, and that the war also makes it necessary to carry a larger supply of crude rubber than would be carried at normal periods.

In connection with the crude rubber situation, it is known that the United States Rubber Co. owns some rubber plantations in Sumatra, and it is rumored in rubber circles that crude has been costing the United States company more than some other companies, no allusion to which, however, is made by President Colt. It is understood that earnings were taken from the quick capital to care for these plantations.

Winton Will Stick to Sixes

CLEVELAND, O., July 3—The Winton Co. states that a new model of the 48 six will be brought out shortly before the New York show; there will be no reduction in the price, which is $3,250. The 33 hp. "New-size" six at $2,285 will be manufactured without change until next year. The Winton company expresses its intention of continuing to build sixes exclusively.

New Cole Six at $2,385

INDIANAPOLIS, IND., July 3—The Cole Motor Car Co., has brought out an improved new large six-cylinder car known as model 666. It is a seven-passenger design on a 136-in. wheelbase and includes many refinements which make for comfort and easy riding. It is fitted with deep upholstery and is handsomely finished.

It is in the body work that this car is most distinctive. It has a straight line effect with flat cowl and rounded radiator and long straight hood. The two extra seats are more than usually comfortable due to the additional foot room made by providing space under the front seats. There is a center cowl between the front and rear compartments, and in this there are two lockers for gloves, goggles, etc. A tonneau light is provided, a dash and service lamp and a Waltham clock. While the eight is still the leader of the Cole line, this six is provided for those who prefer this type of motor. The car is mounted on practically the same chassis as this year, the motor being a 4¼ by 5¼, L-head design with the cylinders in pairs. The price is $2,385 f.o.b. factory.

Chalmers Continues Three Models —Prices Lower

DETROIT, MICH., July 6—For 1916 the Chalmers Motor Co. will continue its present models, excepting that they will be greatly improved in many directions and will all sell at lower prices.

There will be three models, the 6-40, at $1,275, being the improved model 32 of this year, which sold at $1,400; the 6-48 at $1,550 which is the continuation of the light six which this season sold at $1,725 and the Master Six, reduced to $2,175, or $225 less than this year.

All of these models are continued because the Chalmers company found that they had met with an ever-increasing demand, and believes that by continuing them with even better and more refined bodies and many other minor improvements and by greatly increasing the production, thus making a reduction in price well possible, that it will best serve both the public and itself.

All Chalmers dealers were consulted as to the 1916 models to be, and 90 per cent expressed the wish that this year's models be continued with improvements wherever possible.

Stutz Adds a New Model

INDIANAPOLIS, IND., July 6—Under the name of the Bulldog Special the Stutz company has added a new model to its line. This is a four-passenger design like the Bulldog which has been described in THE AUTOMOBILE, but whereas the former model has a wheelbase of 120 in. the new model has 130. It differs from the shorter car also in that the front seats are not divided. There is a center cowl and in the back of this there is room for storage in compartments provided. Thermos bottles are furnished as regular equipment. The car is manufactured for the four-cylinder chassis, the motor being 4¾ by 5½.

Franklin Makes $200 Price Cut

Aluminum Substituted for Iron Reduces Weight 75 Pounds Below Last Year

SYRACUSE, N. Y., July 6—The new Franklin series which has just been brought out while showing a number of detail changes, does not make any departures from what has come to be accepted as standard Franklin practice. Such fundamental details as air cooling, laminated wood frames and full elliptic springs both front and rear are features which have come to be looked for year after year in Franklin practice.

The new model does show one radical change, however, which is in the substantial drop in prices. Instead of being $2,150, the new car sells for $1,950 or $200 lower. In both the body and chassis a number of small refinements will be noted. The Franklin claim of lightness has been accentuated to the extent of 75 lb. by the use of aluminum instead of steel in several of the important parts of the power plant and running gear. The fenders are now aluminum as are the air jackets around the cylinders and the valve housing. The gear shifter lever has been moved forward 4 in. in order to allow passengers entering from the left to step behind it. The tire pump mounting has been changed and instead of driving directly from the generator shaft as for the last model it is now connected by reduction gearing. This was done because the generator is geared up to such an extent that the motor had to be run very slowly in order to afford proper pump action. It can now be run at its normal speed without any danger to the pump.

The body is now made without striping or molding and its simplicity is accentuated by placing the horn under the hood. One of the comfort features is the setting of the seats more deeply and, for beauty of design, greater cleanness has been secured by removing the handle from the hood and attaining a form which corresponds more closely to the streamline. The standard color is green with russet wheels.

The Franklin motor is a 3⅝ by 4 valve-in-head design with the cylinders cast singly. It is featured by its seven-bearing crankshaft, helically-driven camshaft, single ignition with Eisemann magneto and Dyneto starting and lighting. The clutch is a disk, the gearset a three-speed selective mounted amidships and the final reduction 3.7 to 1 in the rear axle. The wheelbase is 120 inches, the tires 34 by 4½ and the wheels, wood. Throughout the entire car, lightness of design has been made a feature.

Simplex Takes Over Crane Co.

Will Build Crane-Simplex Model and Continue Others—Crane Second V. P.

NEW YORK CITY, July 7—The Simplex Automobile Co., of New Brunswick, N. J., has bought out the entire plant, assets and good will of the Crane Motor Car Co., Bayonne, N. J., according to reports given out to-day. Henry M. Crane, former president of the Crane Motor Car Co., is now second vice-president of the Simplex company, and is taking direct charge of the engineering work at the New Brunswick plant with R. B. Wasson as factory manager.

The Simplex company will continue the models made for 1915 but will build in addition a new model which is practically identical with the Crane model 4. This will be known as the Crane model Simplex and is intended for those who desire extremely careful workmanship, regardless of the price of the car. The exact price has not as yet been fixed. The car will be built with a wheelbase of 143½ in. and a body space of 112½ in. The tire equipment will be 36 by 4½ forward and 37 by 5 rear. The motor is a six with 4⅜ bore and 6¼ stroke with the cylinders cast in two blocks of three. A rigid crankshaft 2¾ in. in diameter is one of the features of the motor. The carbureter is a Newcomb-Crane and the camshaft, magneto, starting motor, lighting generator, water and tire pump are all operated through silent chains. Steering is left with center control.

The Crane Motor Car Co. has been known to motorists in the East as a concern devoted to the building of high-priced cars, largely to order, although the car was made in standard models. The model 4, chassis alone, listed at $8,000, and it was built with a view of providing the last word in automobile luxury and finish. The bodies for this chassis were generally made by the large body makers to suit the special requirements of the purchaser with the result that the finished cars were among the highest-priced products in America.

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Hendee May Buy Pope Plant

HARTFORD, CONN., July 2—It is stated here on good authority that the Hendee Mfg. Co. of Springfield, Mass., is considering the purchase of the Westfield, Mass. plant of the Pope Mfg. Co. now operated under a receivership. If the property is not disposed of before July 20 it will be sold at public auction by the Pope receivers at the Westfield offices of the company. Every bidder will be required to deposit a certified check for $25,000 on some national bank in New York before the opening of the sale. The Pope company has been ordered by the United States district court at Boston to dispose of the property for a price not less than $725,000. This amount has been offered by H. Preston Cousens who represents a New York syndicate. Acquisition by the Hendee interests is taken to imply resumption of operations at Westfield on a larger scale than ever.

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Jackson Will Have Two Eights and a Four for 1916

JACKSON, MICH., July 7—While full specifications have not as yet been decided upon, the Jackson Automobile Co. of this city, is bringing out two eight-cylinder models which will soon be passing through the plant in active production. The four-cylinder car will be continued.

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Elgin to Make Van Speedometer

ELGIN, ILL., July 7—The Elgin National Watch Co., of this city, one of the large watch makers, has just closed negotiations with the Van Sicklen Co., Aurora, Ill., to manufacture the Van speedometer which has been on the market for more than a year, and which is now used on seven cars as standard equipment. The Van Sicklen Co. has been under the direction of N. H. Van Sicklen, Sr., who for years was publisher of *Motor Age*, Chicago.

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Auburn Markets Four and Six

AUBURN, IND., July 2—Two models, a T-head four and an L-head six, are being marketed by the Auburn Automobile Co., this city, for 1916. Both motors have the cylinders cast in a single block with unit power plant arrangement of the clutch and gearset. Three-point suspension is also employed.

The six is a 3½ by 5 with a cone clutch, three-speed gearset, floating axle and a 126-in. wheelbase. The tires are the 34 by 4 Goodrich straight side and the body a full seven-passenger design with four full U doors with invisible hinges. The auxiliary seats in the tonneau fold into the backs of the front seats. A roomy three-passenger roadster is also provided. The price with either body is $1,550.

The four-cylinder 3⅞ by 5 design follows closely along the lines of the six, except that the motor is a T-head as stated. The clutch is a cone, the gearset provides three speeds and the rear axle is floating. The bodies on this car are a five-passenger touring and a roomy three-passenger roadster. The price with either of the two bodies is $985.

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Bower Increases Stock

DETROIT, MICH., July 3—The capital stock of the Bower Roller Co. has been increased from $225,000 to $300,000.

Two-Speed Axle Decision

Court of Appeals Says Cadillac Infringed Austin Patent—Austin's Renewal Granted

CINCINNATI, OHIO, July 1—The decision granted Walter S. Austin of the Austin Automobile Co., Grand Rapids, Mich., last January, against the Cadillac Motor Car Co., Detroit, for infringement of Austin's two-speed rear axle patents by the Cadillac company in the United States district court, has been confirmed by the United States Circuit Court of Appeals, Sixth Circuit in this State, the court holding that Austin's patent No. 1,091,618 covering a two-speed rear axle construction has been infringed by the Cadillac company in the axle design used on its regular cars during the season of 1914.

It is shown in the review of the case by the court that Cadillac in its negotiations with the Austin company received a two-speed Austin axle which it later returned to the Austin factory and after which time the Cadillac company brought out its own design of two-speed axle, which was used in its cars and which design has been declared an infringement. The court after minutely describing the Austin axle and the infringing Cadillac axle declares that while some of the details of design differ yet the basic features are the same and that Cadillac infringes claim No. 10 of the Austin patent.

The Cadillac defense insisted that according to this claim the Austin device referred to an arrangement of bevels, gears and clutching devices in the axle, and that it was limited to this particular method of clutching, but the court held otherwise and decided, "We shall not read into one claim elements which expressly characterize another, by which alone the two substantially differ and which are not necessary to make it operative; and that if Austin's only real invention resided in his peculiar clutch mechanisms claim 10 would be void, because broader than the invention."

This part of the court decision refers to the fact that in the Cadillac design the two pinions on the continuation of the propeller shaft are both mounted on sleeves loose on the shaft but capable of being clutched thereto, whereas in the Austin axle while the arrangement of the pinions is the same the smaller pinion on the rear end of the shaft is solid to the shaft and the forward one capable of being clutched to the shaft. In this connection the court has held that Austin's patent is broader than one covering any particular type or scheme of clutching and that the inventive feature of his

device is in the arrangement of a double pair of bevel pinions and gears, the higher gear ratios being outside in the group and the lower gear ratios inside. In the Cadillac the two large bevels are bolted together, whereas in the Austin axle they are separate gears capable of being separately clutched to the shaft, but yet this difference of detail working out of the scheme does not conflict with the basic features of Austin's claims.

In this connection the court held that Cadillac had a legitimate right to develop any design of two-speed axle, using whatever clutching schemes may be deemed best providing it does not infringe the Austin claim of relative arrangement of the two sets of pinions and bevels coupled with clutching devices.

The court held that previous examples of multi-speed axles did not conflict with the Austin patent because the cases cited were not in the precise field filled by the Austin patent. The Minerva patent is cited, but it is shown that its scope was that of combining a gearbox with a rear axle and that the several speeds were for this purpose, whereas in the Austin patent the two-speed axle was intended to be used with a conventional gearbox as used on motor cars to-day.

Austin's Combination

The court holds that in spite of earlier efforts along perhaps closely allied lines, that Austin's efforts involve inventive genius as compared with Minerva, which is looked upon as probably an impractical construction. In this connection the court says: "It is true that each of these missing elements can be found in some one of the prior patents; but this is not enough to negative invention. If the selection of elements from existing machines into a complete combination has, for the first time, produced, from a practical and commercial aspect, a new result, invention may well be predicated thereon; and if producing more of a woven fabric within a stated time was a 'new result' within the meaning of this familiar rule (Higgins vs. Loom Co.), so must be the additional mileage per gallon of gasoline, the saving of wear and the additional ease of riding, all of which the Cadillac company so strongly attributed to the two-speed axle."

Austin's Renewal

In referring to that part of the argument between Austin and Cadillac in which Austin was expecting to get broader claims on his axle after it had been shown to the Cadillac company, and the possibility of obtaining such claims was discounted by the Cadillac company the court holds:

"There is no doubt that Austin at first regarded his relative arrangement of gears and clutches as characteristic of his invention, both according to the specifications and claims allowed on his original invention. The idea of one fixed member and one clutch member upon the shaft and one of each on the axle was inherent in all these. . . . The defendant's device does not infringe these claims. . . . Austin took further counsel, abandoned his application and filed another in renewal and on this new application he secured claim 10. . . . Very likely the necessity for these new claims was brought to Austin's mind by his dealings with Cadillac; and by observing the Cadillac design. . . . Austin's original failure to claim a certain gear arrangement in connection with his clutching scheme, ought not on any principle prevent him from claiming it as soon as the propriety of doing so occurred to him. . . . The fact that this feature (high-gear ratio set of pinion and bevel out of the low-gear ratio set of pinion and bevel) was regarded by Austin as his chief advance and that he so presented it to Cadillac, and that Austin notified Cadillac that he expected to get better claims in this respect."

The amount of damages which Austin will collect, in the event a rehearing is not granted cannot be determined until the usual routine of accounting has been carried out.

Empire Six Price $1095

Motor Develops 46 Hp. at 2200 R.P.M.—Unit Power Plant and Floating Rear Axle

INDIANAPOLIS, IND., July 3.—Closely following the announcement that the Empire Automobile Co. would move its factory from Connersville to Indianapolis, comes the announcement of the latest addition to the Empire line. This is a six to sell at $1095 and marks the entrance into this field of a concern which has heretofore confined its efforts to fours.

The chassis includes a unit powerplant with cone clutch, three-speed gearbox and floating axle. The wheelbase is 120 in.

The 3 by 5-in. block model motor is said to develop 46 hp. at 2200 r.p.m.. The crankshaft is carried on three bearings lined with babbitt in bronze shells. The camshaft runs in oil. The main lubricating system consists of a constant-level splash outfit in which the oil is circulated by a plunger pump. The water pump is a centrifugal design and cooling is assisted by a pressed steel fan mounted on ball bearings.

The Stewart vacuum system is used for feeding gasoline to a Schebler carbureter. Ignition is by a battery system, employing the Connecticut automatic distributor. The electric starting and lighting is provided by an Auto-Lite outfit, working through a Bendix drive and employing a Willard 12-volt battery.

The cone clutch is housed in a bell extension of the crankcase to which the three-speed gearbox is attached. The gearset shafts are carried on New Departure ball bearings and the drive is taken from the gearset to Hartford universal joint and propeller shaft to the floating axle. Alloy steel gears and shafts are employed in this axle and the housing is pressed steel with a removable inspection cap at the rear.

The brake drums are carried on the rear wheels, which are artillery type and fitted for 34 by 4-in. tires. The brakes are equalized and are provided with simple adjustments. The wheels are fitted with either Firestone or Goodyear tires of standard equipment, nonskid being provided on the rear and an extra demountable rim being part of the standard equipment. The holder for the extra rim with its inflated tire is built integrally with the chassis upon an extension at the rear of the frame, and but one felloe band is required to carry two tires. No straps are employed.

The body incorporates a long cowl and convex sides. The front seats are divided and the doors are large. The engine hood merges into the body line without a break, tapering back from the high racing-type radiator. The upholstery is genuine leather and equipment including a Fabricoid top is complete.

Production on this car will be carried on in the Indianapolis plant of the Empire company. In this building there are 150,000 sq. ft. of floor space available for manufacturing. It is estimated that 250 skilled workmen will be employed at the time the plant is opened on July 6.

Morse Announces 1916 Car

PITTSBURGH, PA., July 3—Under the name of the Morse light car the Morse Cyclecar Co., of this city has announced its 1916 product. This is a two-cylinder V-type design with a two-speed gearbox and a tandem seating arrangement adapted for two people. The wheelbase is 105 in. and the tread 36 in. The tires are studded 28 by 3 in. and the wheels wire. The car is driven through the front axle by means of a chain from the change-speed mechanism just back of the motor which is mounted in the customary position under a hood. The price with standard equipment is $350.

Kalamazoo Co. Changes Name

KALAMAZOO, MICH., July 2—The name of the Kalamazoo Motor Vehicle Co. has been changed to that of Columbia Motor Truck & Trailer Co.

Ford Co. to Make Its Own Tires

1917 Cars Will Be Equipped with First of Annual Product of 2,000,000 Casings

DETROIT, MICH., July 6—The Ford Motor Co., according to an announcement by Henry Ford, will begin manufacturing its own tires which should be ready for the 1917 cars. The new tire plant will be a part of the new manufacturing center to be built for the Ford tractor. The output of tires is placed at 2,000,000 for the first year, and the $5 per day schedule will apply to all workers at the new plant, it being estimated that by 1917, 50,000 to 60,000 men will be employed by the Ford company.

Jones Six Continued for 1916

WICHITA, KAN., July 5—The Jones Motor Car Co., this city, has brought out its 1916 product which is in the form of a six-cylinder assembled car containing such well-known units as the Rutenber motor, Stromberg carbureter, Warner steering gear, Detroit gearset, Warner vacuum feed, etc. Starting and lighting equipment is furnished by Gray & Davis, Inc.

The price of the car has not as yet been stated but some of the specifications of importance include an L-head block 3 by 5 motor of six cylinders and three bearing crankshaft. The wheelbase is 118 in.

Fostoria Light Car Co. Formed

FOSTORIA, OHIO, July 2—The Fostoria Light Car Co., has been incorporated with $100,000 capital stock. The company will bring out a light car at a popular price. The incorporators of the company are: R. J. Ridgway, J. H. Jones, Ira Cadwallader, Charles Ash, of Fostoria, and A. C. George of Lima.

Packard, Advance-Toledo Pump Equipped

NEW YORK CITY, July 3—The Packard Motor Car Co. will equip its cars with the Advance-Toledo motor driven tire pump. The Monarch Motor Car Co. recently added this pump to its equipment on its eight.

Every Sixth Family in Kansas an Automobile Owner

TOPEKA, KAN., July 3—There is an automobile for every sixth family in Kansas, according to J. T. Botkin, Secretary of State. When the license books were closed there were 59,477 automobile licenses in the State. This is one for every 28.3 persons. The ordinary average is five persons to a family so that every sixth family in the entire State has an automobile under population figures. The estimated cost of the cars is around $60,000,000.

Kansas spent over $20,000,000 for cars last year. There were 39,889 cars licensed in June, 1914. The increase has been almost 20,000 cars in the twelve months.

100-M.P.H. Record for 5 Miles

OMAHA, NEB., July 7—*Special Telegram*—Orr, in his Maxwell, made 5 miles in 3 min., or 100 m.p.h., in the 300-mile race held on the new 1¼-mile board speedway here Monday, thus establishing a new mark for that distance, the best previous record having been made by Bragg in a Fiat on the Los Angeles board track, in 3:11.75, May 5, 1912.

Buick's Record Payroll

FLINT, MICH., July 3—For the last two weeks the pay-roll of the Buick Motor Co. was in excess of $223,000, which established a new record for this time of the season.

Studebaker Insures Employees

DETROIT, MICH., July 6—An arrangement was completed a few days ago between the Studebaker Corp. and the Equitable Life Insurance Society of the United States, New York, whereby 6500 of the 13,000 workmen now employed by the corporation are insured for life while the remainder will also be insured in the same way within a short time. No matter how long the Studebaker workman has been with the concern, through the deal with the insurance company he will have the benefit of a life insurance.

Packard Gets Prize at Fair

SAN FRANCISCO, CAL., July 2—The Grand Prize of the Panama-Pacific Exposition for excellence in the field of automobile manufacture has been awarded the Packard Motor Car Co., of Detroit. Fifteen gold medals were distributed in the transportation division and among those who received prizes were Pierce, Cadillac, Ford and Rolls-Royce.

McClurg Rubber Elects Officers

COSHOCTON, OHIO, July 3—The McClurg Rubber Co., recently organized to manufacture tires, has elected the following directors: J. S. McClurg, C. M. Christenson, H. T. Forrest, J. L. McClurg and W. Z. Davis. The directors then elected the following officers: President and general manager, J. S. McClurg; vice-president, C. M. Christenson; and secretary and treasurer, H. T. Forrest. The company expects to be operating by July 1.

Overland Builds in St. Paul

Contract for $250,000 Building Closed for Combined Service Station and Warehouse

ST. PAUL, MINN., July 6—A contract for several acres of land has been closed in this city for the erection of a $250,000 warehouse by the Willys-Overland Co. The plant will combine the facilities of a warehouse and an assembling station, according to present indications. St. Paul is considered as an excellent distributing point for the northwestern territory as the shipping facilities by rail and water are unsurpassed.

Overland Plant in Minneapolis?

MINNEAPOLIS, MINN., July 3—The Willys-Overland Co. has been negotiating for the purchase of a 18-acre site in this city for the purpose, it is said, of establishing a plant in the future.

Allen Dealers Convene

FOSTORIA, OHIO, July 1—Tuesday and Wednesday of last week the distributors of the Allen Motor Co., makers of the Allen cars, held a convention and general get-together party. The 1916 Allen car was exhibited to the dealers who attended a general meeting Tuesday afternoon, when the new car was lectured upon by the factory officers and engineers. Tuesday night the guests of the factory were banqueted and Wednesday the party was taken to Bucyrus, where the factory making the motors and gearsets for the cars was visited.

Hans Co. Now National Gauge & Equipment Co.

LA CROSSE, WIS., July 3—The Hans Motor Equipment Co., Las Crosse, has been reincorporated with a capital of $200,000 under the name of the National Gauge & Equipment Co., by D. G. MacMillan, P. M. Gelatt and J. M. La Vaque. The new company is issuing a new advance bulletin which gives a brief description of the complete line of pressure gauges which it manufactures.

2-Mile Board Track for Kansas City

CHICAGO, ILL., July 3—Twenty residents of Kansas City, Mo., who are engaged in the promotion of a company to build a speedway in their city, were in Chicago recently to witness the 500-mile race and study the construction of the local board track. The expedition was under the auspices of the mid-continent expedition association which plans to build a 2-mile automobile track of

wood at the official stopping place of the transcontinental balloon races and at a strategic point on the national old trails highway.

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Erskine Slated for Studebaker Head

NEW YORK CITY, July 7—A. R. Erskine is slated for the Studebaker Corp. presidency, the election to take place tomorrow at a meeting of the directors in this city. The stockholders met to-day in Jersey City and elected the directors to act on a provision for the classification of the directors into five classes of equal number and for the election of one of said classes in each year hereafter.

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Hayes Wheel Enlarges

ALBION, MICH., July 3—The Hayes Wheel Co. of this city, which makes the hubs for the wheels made by the parent plant, the Hayes Wheel Co., in Jackson, will erect a new plant to be ready for occupancy September 1. When completed the company will employ 200 men here, or double its present working force, and the production will be more than doubled. Machinery valued at $15,000 has already been purchased and by the time the new building is ready it is expected that from $50,000 to $60,000 will have been spent.

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English Motor Works Burned

LONDON, ENGLAND, June 29—Fire recently did $500,000 damage to the motor works of Brian Hughes & Strachan at Park Royal. The buildings covered 3 acres and contained 100 Red Cross motor ambulances and 200 army motor vans. The vehicles, which were ready for delivery to the government, were destroyed.

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McNaull Tire Opens Branch

ST. LOUIS, MO., July 3—The McNaull Auto Tire Co., Toledo, O., has opened a branch here at 5032 Delmar boulevard. The local office has been organized as the McNaull Tire Co. of St. Louis.

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Automobiles for Topeka R. F. D.

TOPEKA, KAN., July 3—Motor service has been installed on two rural routes out of Topeka. Two men who owned automobiles were appointed to be the first mail carriers using motor cars in Topeka.

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Apco Accessory Prices Reduced

PROVIDENCE, R. I., July 3—The Auto Parts Co., Providence, R. I., manufacturer of the Apco line of specialties for the Ford car, announces a reduction in the list price of its muffler cut-out and valve stem adjusters. The last named now retail for 20 cents the set and the muffler cut-out at 45 cents each.

New Kissel 1,000 lb. Truck

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Is Shaft Driven—Capacities of Line Readjusted—1 1-2 Tonner Reduced $100

HARTFORD, WIS., July 1—Shaft drive has been extended in the product of the Kissel Motor Car Co., Hartford, Wis., to embrace one more capacity in its line of ½, 1½, 2, 3, 4, and 6-ton vehicles, just announced. The capacities of the Kissel model have been somewhat readjusted, the 1000-lb. vehicle being a new model which has been promised for some months. The 1-ton model rated at ¾ for 1 ton is the 1500-pounder announced for 1915. The 1½-ton model is the 1 tonner of 1915 rated for 1916 at 1 to 1½ tons. The 2-tonner, rated at 1½ to 2 tons, takes the place of the discontinued chain-driven 1½-ton. The 1915 2½-tonner is continued with chain drive with a rating of 2½ to 3 tons. The 3½-tonner has 3½ to 4 tons and the 6-tonner without change.

Structurally the new 1000-pounder does not differ from the other shaft-driven models except that the final drive is through bevel gears instead of worm gears. It is designed for pneumatic tires as are the 1 and 1½-ton models and lists at $950 for the chassis. The ¾ to 1-tonner lists at $1,500; the 1 to 1½-tonner has been reduced from $1,850 to $1,750; the new worm-driven 1½ to 2-tonner is priced at $2,100, the same as the 1½-ton chain-driven model. No other changes in price have been made. The 2½ to 3-tonner listing at $2,750, the 3½ to 4 at $3,350 and the 6-ton model at $4,350. All Kissel trucks have pressed steel frames and motors located under conventional hoods. All shaft-driven models have unit power plants, those with chain drive having the gearset incorporated with the jackshaft. Left steer and center control are employed on all models. The characteristic cellular radiator is used throughout the line. Only the chain-driven models are fitted with a differential lock. Timken and Timken-David Brown axle equipment is a consistent feature of the line.

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McKinney with Champion Plug

NEW YORK CITY, July 3—E. C. McKinney, formerly with Splitdorf, has joined the sales force of the Champion Spark Plug Co., Toledo, and will represent it in Texas, Louisiana, Arkansas and New Mexico.

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Mich. Buggy Refuses $50,000 Offer

KALAMAZOO, MICH., July 3—An offer for $50,000 for the plant of the former Michigan Buggy Co.'s plant and property has been turned down by the Michigan Mfg. Realty Co. which wants $60,000. The offer was made by Attorney C. A. Burras, of Chicago, acting for those interested in a new automobile manufacturing concern now being organized. It was stated that the men behind the new enterprise have plenty of capital and that the company will be finally organized and incorporated in the state in which the plant will be located. The matter of a plant has now been taken up with the Cleveland Chamber of Commerce.

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Sheldon Men to Convene

WILKES-BARRE, PA., July 6—Beginning July 14 and continuing for several days, the salesmen of the Sheldon Axle & Spring Co. will be in convention at the plant in this city. Men from both the spring and axle departments will attend. In addition to important redistricting of certain territories, addresses on selling and merchandising and the effect of advertising on the marketing of an output will be made by men who are in close touch with the rapid advance of the Sheldon company in the parts field.

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Motorette Debts Not All Paid

HARTFORD, CONN., July 2—L. A Howard as receiver for the C. W. Kelsey Mfg. Co. of Hartford, which made three wheeled vehicles called Motorettes want money with which to pay the bills of th concern and accordingly appeared befor Judge Thomas in the United States cou with a motion for authority to assess th stockholders for funds to pay the co cern's obligations which amount to mo than $20,000 above the assets. A hearin will be given on the motion in t autumn.

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Walpole Petition Denied

BOSTON, MASS., July 3—Judge Dod in the United States District Court y terday denied the petition of Maurice Sollers, a stockholder in the Walp Tire & Rubber Co. asking leave to int vene in the case in order that he mig appeal from the court's decree orderi the sale of the company's assets and c firming the sale. The petitioner sta that he desired to appeal in behalf himself and a group of stockholders.

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Dixie Light Car Makes Début

VINCENNES, IND., July 1—The ini product of the Dixie Fiscal Co., V cennes, Ind., has put in an appeara It is a light car styled the Dixie and be made in three models, roadster, t ing and speedster. The two former have standard tread though the sp ster will have 36-in. tread. A fea of the car is the use of coil springs.

Service Heads Want Standard Policy

2-Day Detroit Convention of Service Managers Votes to Draft Standard Service Policy—Different Systems for Trucks and Passenger Cars—Salesmen Injure Service—Better Control of Spare Parts to Dealers

DETROIT, MICH., June 30—Further impetus to the movement for a standard service policy was given by the Service Managers' Convention which was in session at the Hotel Statler here today and yesterday. Service men and other officials of motor car and truck plants from all parts of the country were in attendance. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, who presided, said that a wonderful amount of good must undoubtedly come from the gathering, and that it was one of the best of its kind he has ever attended.

To Get Service Policy

A committee was voted to formulate into a standard policy the ideas of the convention as to what should constitute the service the dealer should render the purchaser of a car. It was also voted to recommend to the N. A. C. C. that it start an advertising campaign to aid in telling the owner what he should expect in the way of free service, and also to get to the various local trade organizations along this line.

It was the majority attitude that general repair shops should not be given discounts on parts, this being against the ethics for dealer protection.

Different service policies for passenger cars and trucks were deemed necessary due to the diverging conditions entering into the work of the two classes of vehicles. The need for censoring dealers' parts orders was brought out, this applying especially to the small dealer, whose experience would not make him so good a judge of what parts he should carry as the manufacturer is.

Much discussion of the C.O.D. method of payment for parts ordered was discussed, and most agreed that though it has its drawbacks, it is the best policy to pursue, taken from all angles.

Standard Policy Backbone

That there is need for some form of standard policy on the matter of service which the car owner gets free from the dealer, there was little doubt. As Mr. Reeves put it, a standard policy would be a printed backbone in the hands of the dealer. It would cut out the cut-throat competition on service which is now doing much to ruin dealers' business. In fact, the matter of a service policy was the real cause of the convention, for it was desired to get some expression on the subject from the service men.

Service Pointers

A standard service policy would be a printed backbone in the hands of the dealer. Alfred Reeves, General Manager N. A. C. C.

Four essentials in dealers' service are: Parts, repairs, supervised instruction regarding the car, and cooperation with the owner. Charles Gould, Maxwell.

The hint of buying a new car is often the bait which makes the dealer do more than he should for a car owner. E. W. Cotton, McFarlan.

Installing a vehicle properly after the sale is a legitimate part of the service. J. V. Coy, Peerless.

Road repairmen disrupt organizations, cost money, and make it too easy for customers to get service to which they are not entitled. E. T. Klee, Stutz.

Service does not mean giving something for nothing. A. B. Hanson, Chalmers.

Service is providing all the necessary means for keeping a car running. A. B. Cumner, Autocar.

Dealers' service is often a cut-throat business done to sell cars. H. H. Carpenter, Saxon.

Macauley Favors It

Alvan Macauley, vice-president and general manager of the Packard company, thinks that service and a standard policy are the vital things of the business now. Whether or not the manufacturers get this service matter down to a reasonable basis and hold it there, will largely govern their staying in the business, he said. Dealers have to contend with all sorts of customers, such as women, men trading on their name, etc., and most of these are good bargainers who will get all they can for nothing. As this gratis treatment often eats up the dealer profit, all must get together and have an understanding of what constitutes the service to which the customer is entitled.

A. B. Cumner, service manager Autocar company, believes the time is ripe for such educational campaigns as will acquaint the public as to what service should and would consist of. Mr. Reeves explained that the prime reason for a standard policy is that nearly every dealer handles several makes of cars, and if there is not some standardization in the service he is to render all buyers, he is apt to hold the manufacturer with the best policy up as an example to the others.

E. W. Cotton, secretary McFarlin company, used the words "coerced service" to describe the kind of service which the dealer often is obliged to give under the present conditions. The hint of buying a new car often is the bait which makes a dealer do more than he should for a car owner.

Four Essentials

In establishing what he thinks constitutes service to the owner, Charles Gould, manager of service for the Maxwell company, laid down four main points to which the dealer should pay special attention:

1. Parts; 2. Repairs; 3. Supervised instruction regarding the car; 4. Cooperation with the owner.

In connection with the first of these, a sufficient supply of parts located so as to get them to the customer quickly is very important. Accidents, the lack of oil and grease in the machine, driving and temperamental differences between owner and dealer are not points which should come under the definition of free service. The owner ought to know exactly what gratis service he will get, and before any repairing is done, he ought to be told how much it will cost, if it is possible to tell him. The manufacturer should really be the umpire between the dealer and the owner in the matter of disputes, Mr. Gould believes.

J. B. Coy, technical and service department, Peerless company, said that there should be little variation in the opinions of the delegates on this service matter. Installing a vehicle properly after sale was emphasized by him as a part of service, and further than that the manufacturer should stand on whatever he feels morally obligated to deliver.

The Spoiled Customer

W. H. Doddridge, service manager, the Winton company, pointed out that the

customer has been spoiled in most cases until he expects everything he can get now. Any standardization will have to be flexible, he thinks, so long as owners have different ideas. Much of the imposing on dealers is due to the overworking of such words as booster and big man. These are used by persons trying to get something for nothing from the dealer. Salesmen are also responsible for a lot of service evil, for when selling cars, they imply a great many things that the dealer is unable to do free. They use another overworked phrase, "Leave it to me."

E. T. Klee, service manager, Stutz company, is against the practice of having road repair men, as they disrupt organizations, cost money and make it too easy for the customer to get a lot of service free which he is not entitled to. The dealer should not have a territory so large that he cannot send a repair man at small expense from his own shop.

Salesmen Bad Offenders

Much of the service trouble begins in the sales department in the opinion of A. J. Banta, Chicago branch, Locomobile company, who says that more is given away by the service department in making good the extravagant promises of the sales department than in any other way. Service means everything for nothing with the salesmen.

That the salesman should keep service as far in the background as possible is the view of G. E. Drawe, assistant secretary and treasurer, Pathfinder company, who emphasized the fact that the car buyer is usually a better salesman than the car salesman, else he would not have the money to buy a car. Thus, he sells the car salesman for whatever he wants in the way of free service.

A. B. Hanson, Chalmers service manager, quoted the printed text of his company's idea of service. It is that service does not mean giving something for nothing. It means giving prompt attention at the least possible cost.

Service Defined

Mr. Cumner offered two good definitions. Service, he said, is the providing of all necessary means of keeping a car running, while free service is the taking care of mistakes and conducting an educational campaign.

Educational Service

H. W. Drew, service department Marmon company, pointed out that service is doing as much as possible for the owner at the least possible expense. He thinks a lesson might be drawn from the service rendered by certain of the parts makers, such as storage battery people, electrical equipment makers, etc. Service should be more educational and less individual, Mr. Drew aptly put it. If better information were put into instruction books, and if letters were sent to owners from time to time on the care of various parts of the car, much could be accomplished.

Dealers' Service

The question of whether or not the dealer's service policy should go farther than the manufacturer's warranty was generally answered in the affirmative, it being considered that this warranty refers specially to defective material and workmanship. Then, the dealer's policy refers to a special field and it varies.

It is a ticklish question and one that is hard for the manufacturer to dictate, Mr. Drew said. The successful dealer has devised special methods which apply to his community, and he is naturally more familiar with his clientele than is the manufacturer, and he naturally should radiate on the manufacturer's guarantee. The small and weak dealers are the ones who need an educational campaign the most.

H. H. Carpenter, service manager, Saxon company, thinks the service given by dealers is a cut-throat proposition which is done to sell cars, promising anything to make the deal. He agrees with an educational campaign to make a common ground for all to work upon.

Wants Definite Service

On the other hand, Percy Owen, Chalmers general sales manager, believes in definitely stating what the dealer should do in the way of service. He outlined the policy which his concern is operating upon, explaining the distinction which is made between what is termed t chnical service and shop service or full repair work. The technical service, which takes in thorough inspection and adjustment of the car, is what the dealer is instructed to render free for a stated period. The dealer also absorbs the labor cost on replacement parts which the manufacturer sends free, this within reasonable limits, of course.

Truck salesmen are superior to passenger car salesmen in the opinion of L. L. Virgil, service manager, the Jeffery company, who says that he has no special trouble through salesmen promising more than the factory can do. Before anything can be done on the matter of starting an educational campaign on service, the committee will have to decide on what policy is to be followed, and then this will have to be approved by the head officials of the various companies through the N. A. C. C., Mr. Reeves explained.

Trucks and Cars

Up to a certain point, service policies for passenger cars and trucks can be the same, but the work they have to do and the attitude of the owners are so different that it seems advisable to lay down separate policies for the service treatment of the two classes of cars. This was the gist of the paper which Mr. Macauley read on the subject.

For either class the warranty work is the same. This means the repair work which the manufacturer does gratis for moral reasons. Good-will advertising, conditions of service and requirements dictate separate policies beyond this point. Truck drivers do not have time during business hours to stop and make repairs, while passenger car drivers and chauffeurs have time. Trucks are relatively slow-moving vehicles, and it therefore takes a comparatively longer time to bring them to a service station than it would a passenger car. Further, they are less under the owner's supervision than a passenger car, and they also operate on solid tires. All of these things make the service problem different. The particular policy for service which is laid down is not important. It is the placing of something definite in the salesman's hands that is important, Mr. Macauley said. Let the owner know exactly what to expect.

Representatives of White, Reo, and others who make both cars and trucks said that their policies for the two classes of vehicles differ, generally more leniency being exercised with the trucks.

Censoring Parts Orders

The problems of how the manufacturers can assist in preventing dealers from overstocking and being obliged to return obsolete parts was well handled by C. W. Matheson, director of service for Dodge Brothers, who said that parts orders should be carefully looked into to prevent unnecessary investment and loss to manufacturers through having to redeem obsolete parts later. When a maker contemplates a change, dealers should be advised so as not to put in orders for parts soon to be superseded. He advocates a card ledger system, crediting and debiting it as parts are added or taken out. This is for the dealer By taking into account the average selling rate of cars in any territory, it is easy to arrive at the average consumption rate of parts, and this procedure should be carried out in connection with orders. Mr. Matheson believes in giving a dealer a time limit of 1 year, after which is becomes optional with the manufacturer to redeem obsolete parts.

R. E. Winans, service manager Paige company, suggested taking the experience of other dealers in suggesting to new dealers how many parts to carry in proportion to the number of cars.

Obsolete Parts

Summing up the discussion on the topic, is was agreed that the main obje

is to supply the consumer, so that nothing should be done that would curtail the quick service on repair parts. There was some sentiment for penalizing the dealer for the lateness of return of superseded parts. That is, discounting them after a certain time. It was also recognized that geographical conditions might make one part more important in one locality than another. It was considered a good thing to use a maximum and minimum scheme, whereby the dealer is required to order more of each part when the number on hand falls to a set minimum. In this case, he requisitions for sufficient to bring the stock of that part up to the pre-determined maximum. He has no choice in the matter. It did not seem necessary for a dealer to carry parts for cars older than two years, such parts coming from the stock at the factory.

Standardized Account

It was brought out by A. H. Ransen, manager parts order department, Studebaker, that inasmuch as the parts order department is a business within itself, there should be a standardized plan for handling the parts accounts with dealers. Among the features should be a deposit to guarantee parts accounts, and a cash discount for prompt settlement. It is primarily a matter of dealer education, also.

Mr. Owen is strongly in favor of a deposit per car order on parts, and believes that a standard form of accounting would assist dealers. He thinks the C.O.D. system a fixture. The keynote was struck by W. D. Smith, Cole service manager, who said that it is particularly essential, since dealers handle different lines of cars.

General Repair Shops

J. A. Harris, Jr., advertising manager, the White company, took the stand in dealing with the subject, Should Manufacturers Encourage General Repair Shops by Selling Them Parts, that the matter of repairing and overhauling will soon become so great in certain localities that the dealer will not be able to handle it all, and therefore outside shops will have to be established. Then care should be taken in shop selection to make sure that they can do the work properly and as quickly as the parent shop.

C. J. Boilon, service manager, Kelly-Springfield truck company, thinks it inadvisable to have repair shops where there is a dealer, as this creates friction. J. F. Plummer, Locomobile company, also believes that dealers should be protected, and therefore is not in favor of discounts to local repair shops in territories covered by dealers. Where there are no dealers, then establishments on a parts selling basis are advisable for the convenience of owners. Several others were practically of this same opinion.

Owner Protection on Replacement

There was little discussion of the paper, How Can the Manufacturer Satisfy Himself That the Dealer Who Receives a Credit Installs the Part in the Customer's Car Without Charge, which was read by Mr. Klee. He outlined a method of having the owner sign a tag which is attached to the part sent back to the factory for replacement. On credit being issued to the dealer, the owner who signed the tag is notified. Several modifications of this method were explained, but they were all along the same line of advising the car owner.

Service Coupons

The matter of issuing service coupon books to customers was brought up, and there was some discussion. Several individual dealers' schemes independent of factories were explained, in addition to a description of the Federal, Chalmers and other factory coupon book plans. It is evident that the scheme admits of many ramifications.

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Muncie Plants Running to Capacity

MUNCIE, IND., July 1—The automobile concerns here are crowded to capacity and some of the companies are turning down orders because of rush business.

The Warner Gear Co. has 1000 men at work in its plant proper and has smaller forces at work in two other factory buildings. The Muncie Gear Co., has all the business it can handle and is employing a large force. All other gear and parts concerns as well as the Inter-State automobile factory are running practically at capacity. All are hunting for additional workmen.

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Federal Tire Repairs Free

MILWAUKEE, WIS., July 3—The Federal Rubber Mfg. Co. of Milwaukee, with works at Cudahy, Milwaukee county, has established a factory branch and service station in the city of Milwaukee, occupying a store and warehouse at 509 Broadway. The announcement signed by H. A. Githens, vice-president, is somewhat unusual with regard to the extent of the service the station will give. It says: "The object of this service station is to provide free service to users of Federal tires. By free service we mean free; that is, removing and applying Federal tires without charge; repairing punctures in Federal tires and tubes without charge, and repairing cuts on Federal tires without charge. This station will be open from 7 a. m. to 11 p. m. daily and Sunday, and free air will be furnished during these hours." The new Federal service does not change the list of jobbers and retailers of Federal goods in Milwaukee.

Briggs Assets Are $751,999.33

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Scheduled List Places Liabilities at $556,424.83—Creditors to Meet July 15

DETROIT, MICH., July 1—The Briggs-Detroiter Co. which was declared bankrupt June 28, to-day filed its schedule of liabilities and assets. The former totaled $556,424.83 and the latter $751,999.33.

The liabilities include $4,452.33 due to shop and office workers; $158,048.56 due to three creditors holding securities and consisting of the Dime Savings Bank, Detroit, $109,857.80, the People's National Bank, Jackson, Mich., $31,140.76 and the Gray estate, Detroit, $17,050.

Listed Liabilities

The unsecured claims total $391,925.37. Among the several hundred creditors coming under this section, the following are the biggest: Capitol Body Co., Indianapolis, Ind. $29,429.34; Griswold Motor & Body Co., Detroit, $20,714.52; Brown-Lipe-Chapin Co., Syracuse, N. Y., $14,838.52; Bearing Co. of America, New York, $4,367.74; A. B. C. Castings Co. Cleveland, Ohio, $4,929.92; B. F. Goodrich Rubber Co., Detroit, $15,996.74; Kelsey Wheel Co., Detroit, $23,316.23; Long Mfg. Co., Detroit, $6,853.44; New Departure Mfg. Co., Bristol, Conn., $11,487.64; Muncie Foundry & Machine Co., Muncie, Ind., $4,468.05; Penn Spring Works, Baldwinsville, Pa., $6,417.25; Ackerman & McNamara, Detroit, car painting and trimming, $30,010.42; Remy Electric Co., Anderson, Ind., $12,843.37; Massnick-Phipps Mfg. Co., Detroit, $28,585.31; Sheldon Axle Co., Wilkes-Barre, Pa., $9,252.67; J. C. Wilson Co., Detroit, $11,929.17; Willard Storage Battery Co., Cleveland, Ohio, $5,258.27; Royal Equipment Co., Detroit, $7,525.37; Victor Lamp Co., Cincinnati, Ohio, $4,418.27.

There also appears an item of $109,857.80 under the heading of Liabilities on notes or bills discounted which ought to be paid by the drawers, makers, acceptors or endorsers.

Assets Scheduled

Among the items mentioned in the assets schedule are the following: Real estate, $89,111.36; cash, $111.86; bills, notes, securities, etc., $114,991.10; stock in trade, $227,696.36; machinery, tools, etc., $86,062.65; debts due to petitioner, $84,826.60; patents, copyrights, etc., $150,000.

The first meeting of the creditors has been called for July 15.

The Detroit Trust Co., receiver, will not have its report on the assets and liabilities of the Briggs-Detroiter Co. ready for several days.

$1,328,000 More in Rubber

Nine Rubber Concerns Increase Capitals This Much—Goodrich Is Leader

AKRON, OHIO, July 3.—The nine big rubber factories of Summit county, Ohio, will swell the personal property valuation to the extent of $27,338,000 this year. Returns from the various rubber companies just received by the district tax assessors, show increases in personal property holdings of $1,528,000 over last year, and one decrease of $200,000, or a net increase of $1,328,000.

Real estate valuations for the rubber concerns will be the same as the 1914 original valuation, on which the rubber men agreed early last year, but which failed to go on the tax duplicate owing to the reversion to the 1913 duplicate. The realty for the Goodrich alone totals $5,000,000.

Effect of Rubber Embargo

All the rubber factories increased their personal business during the year except Goodyear, which showed a falling off of $200,000 in stock and raw material. The appraisal is based on monthly averages for the past year, and the decrease at the Goodyear is blamed on the rubber embargo placed by England, seriously interfering with the factory's accumulation of raw rubber.

The greatest increases over last year are shown by the reports of Goodrich, with $1,000,000 more than 1914; Kelly-Springfield, with a growth of $166,000, and Firestone, with $100,000.

Remarkable growth in the business of the two rubber concerns at Cuyahoga Falls is shown, the Marathon increasing its stock by $69,000 and the Falls Rubber having an increase of $66,000.

The personal returns of the various rubber companies and their increases over 1914 are given herewith:

Goodrich—$16,000,000, increase $1,000,000; total return with realty, $21,000,000, with $18,000,000 in Akron and $3,000,000 in Kenmore.

Goodyear — $4,944,000; decrease of $200,000.

Firestone — $4,130,000; increase, $100,000.

Kelly-Springfield—$848,000; increase $166,000.

Miller—$685,000; increase $40,000.

Swinehart—$310,000; increase $71,000.

Portage, Barberton — $177,000; increase $16,000.

Marathon—$184,000; increase $69,000.

Falls Rubber — $134,000; increase $66,000.

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Market Prices Steady

NEW YORK CITY, July 5—Market prices this week were steadier, there being few changes. Tin featured the metal markets with a $2.72 drop on a 100-pound basis. This was due to the heavy importations and the increase in tin afloat to this country.

Aside from this change there was no other of any importance. There was little activity in the other metal prices. The demand for copper during the past week was of small proportions. The demand for aluminum is limited, with prices being quoted at 30 cents a pound. Fine Up-River Para rubber remained strong at 63 cents. The oils and lubricants markets were unchanged and steady.

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Trucks Gain 4346 in New York State Over 1914

NEW YORK CITY, July 7—Between Feb. 1 and June 15, 18,981 commercial motor vehicles were registered in New York State, 4346 more than for the same period in the year 1914. Of the total of 18,981 motor trucks registered this year, 11,784, or 61 per cent, were registered at the branch automobile registration bureau in this city. This latter figure is 2246 machines in advance of the registration of motor trucks during the corresponding period in 1914, so far as this city and its neighborhood are concerned.

The statistics are contained in a report recently issued by the automobile bureau of the Secretary of State's office. Similar statistics for the same period in the year 1914 were 14,635 motor trucks registered for the entire State and 9538 for this city and vicinity, showing substantial progress is being made in the use of motor-driven commercial vehicles.

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Chandler Dividend of 77½ Per Cent on Common

CLEVELAND, OHIO, July 1—The directors of the Chandler Motor Co. have declared a cash dividend of 77½ per cent on the $225,000 common stock, in addition to the regular quarterly dividend of 1¾ per cent on the $200,000 preferred.

The 77½ per cent on the common makes a total of 100 per cent on that issue since dividends were commenced just one year ago.

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Prest-O-Lite Buying Up Bonds

NEW YORK CITY, July 2—The Prest-O-Lite Co. is calling for payment at 110 August 1 on the remainder of its ten-year 7 per cent debenture bonds outstanding.

There were originally issued of the debentures $2,000,000. Up to the close of last January the company had redeemed and canceled or held in the treasury for sinking fund purposes, $1,382,500 of the bonds, so that there were outstanding at that time $617,500. The indenture securing the bonds is dated June 23, 1913, and the company within two years is ready to retire the entire $2,000,000 issue which is not due until 1923.

The annual report for the year ended Jan. 31, 1915, showed net earnings of $1,338,696 after interest charges, and during the year it bought $1,039,000 of bonds for the sinking fund. In the last fiscal year the company's gross sales were $4,699,377, or $209,516 more than the preceding year, and its net earnings were equivalent to about $17 a share on the stock. For the 3 previous years net earnings averaged $1,000,000 yearly.

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Locomobile Gets War Order

NEW YORK CITY, July 1—The Locomobile Co. of America, Bridgeport, Conn., which is building a large addition to its plant, recently took an order for 500 trucks and several hundred officers' pleasure cars, for Russia and Great Britain. The company also has a large order for France.

At the plant there are three British, three French and the same number of Russian officers inspecting every car that is turned out for their countries.

The company is working on an order

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.30	.30	.30	.30	.30	.30	.....
Antimony	.36	.36	.36	.36	.36	.36	.....
Beams and Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer steel, ton	19.00	19.00	19.00	19.00	19.00	19.00	.....
Copper, elec., lb.	.20	.20	.20	.20	.20	.20	.....
Copper, lake, lb.	.21	.21	.21	.21	.21	.21	.....
Cottonseed oil, bbl.	6.10	6.20	6.17	6.10	6.12	6.12	+0.02
Cyanide potash, lb.	.24	.24	.24	.24	.24	.24	.....
Fish oil, menhaden, brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	5.75	5.75	5.75	5.75	5.75	5.75	.....
Linseed oil	.62	.62	.62	.62	.62	.62	.....
Open-Hearth steel, ton	19.50	19.50	19.50	19.50	19.50	19.50	.....
Petroleum, bbl., Kans., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed oil, refined	.85	.85	.85	.85	.85	.85	.....
Rubber, fine up-river, Para	.63	.63	.63	.63	.63	.63	.....
Silk, raw, Ital.	3.75	.....	3.75	.....	.....	.....	—0.10
Silk, raw, Japan	3.37½	.....	3.20	.....	.....	.....	—0.17½
Sulphuric acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	41.50	40.50	40.50	41.00	38.78	38.78	—2.72
Tire scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

for forty trucks which will be fitted up as soup-kitchens for Russia. These are simply chassis with the drivers' seats, and will be fitted in Russia. The company is taking on additional help all the time.

A car de luxe for Grand Duke Nicholas of the Russian army was recently finished by the company.

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Republic Tire Receives $500,000 Foreign Order

YOUNGSTOWN, OHIO, July 1—The Republic Rubber Co., this city, has been advised by cable of an order for $500,000 worth of solid rubber tires from abroad. The name of the purchaser is withheld, but it is supposed to be the British Government. This company is now completing a contract for $250,000 worth of similar tires, and will ship the last of this lot this week. The order calls for the delivery of 10,000 tires per month. They are built on special steel rims and are intended for use on trucks at the front.

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Bright Outlook for Electrics in Norway

CHRISTIANIA, NORWAY, June 14—That the sale of electric automobiles in Norway has a bright outlook is claimed in consular reports recently made out in Christiania. Although the country is composed of many hills, it is claimed that that type of car could be used to advantage there.

Electric power plants are not far apart in Norway, thus rendering it possible for a car to travel practically all over the country and be recharged whenever needful.

Security Changes Small

Tire Issues Lower—Changes Range from One to Five Points

NEW YORK CITY, July 5—The securities markets were in a sensitive condition throughout last week as a result of the passing of the U. S. Rubber dividend on Thursday. The markets were weak and dull. Gains were few and small, ranging up to 4 points. Losses were also small, ranging up to 5½ points.

Tire issues last week were somewhat lower, Goodrich, Goodyear and Miller Rubber issues being the only ones to show increases. Firestone after reaching a record quotation of 503 a week ago, dropped to 500 last week. Studebaker preferred managed to show a 1½ point gain. General Motors common was the only other automobile stock to show a gain, that being 4 points.

The Detroit issues were normal, the gains ranging from a fraction to 2¼ points. In the inactive stock, the Canadian Ford stock gained 275 points.

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War Orders Increase International Motor Earnings

NEW YORK CITY, July 1—The net earnings of the International Motor Co. in the month of May are understood to have amounted to over $90,000 after deducting all interest charges. Earnings for the 5 months ending May were over $160,000, and on the present basis of business, earnings for the full year may aggregate $700,000.

This is equivalent to 19 per cent on the $3,600,000 7 per cent cumulative preferred stock, on which no dividends have been paid since September, 1912. The company has outstanding $5,628,125 common stock.

The war has been the cause of part of the improvement in business of the company, as its factories are working to capacity to turn out Saurer trucks for shipment to England, France, and indirectly to Belgium.

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Syndicate Sells Its Stewart-Warner Stock

NEW YORK CITY, July 3—The syndicate headed by White, Weld & Co. and Hornblower & Weeks, which purchased 40,000 shares of Stewart-Warner Speedometer common stock from J. K. Stewart, president of the company, has sold all the stock, the offering price being 67.

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U. S. L. Property Brings $1,000,000

BUFFALO, N. Y., July 1—At the receivers' sale of the U. S. Light & Heating Co. held at Niagara Falls, the stockholders' protective committee bought the property for $1,000,000.

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Federal Truck Pays $50,000 Dividend

DETROIT, MICH., July 2—The Federal Motor Truck Co. has declared a 10 per cent dividend, aggregating $50,000.

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Goodyear Record 15,447 Tires

AKRON, OHIO, July 3—The Goodyear Tire & Rubber Co. has broken its daily production record of 11,032 tires, having recently produced 15,447.

Automobile Securities on New York and Detroit Exchanges

	Bid 1914	Asked 1914	Bid 1915	Asked 1915	Wk's Ch'ge
Aus-Grieb Rubber Co. com	200	..	300	..	..
Aus-Grieb Rubber Co. pfd	98	..	101	110	..
Aluminum Castings pfd	98	100	98	100	..
J. I. Case pfd	81	86	70	79	..
Chalmers Motor Co. com	101	104	91	92¾	—1
Chalmers Motor Co. pfd	94	97	95	98	..
Electric Storage Battery Co.	51	52	53	53½	+1
Firestone Tire & Rubber Co. com	299	304	500	506	—3
Firestone Tire & Rubber Co. pfd	108½	110	109	111	—2
General Motors Co. com	93	94	156	157	+4
General Motors Co. pfd	92	93	101	102	..
B. F. Goodrich Co. com	23	24	53	54½	+1½
B. F. Goodrich Co. pfd	87½	88	103	105	+2
Goodyear Tire & Rubber Co. com	166	172	269	272	+4
Goodyear Tire & Rubber Co. pfd	96	98	106	107	+1
Gray & Davis, Inc., pfd	98	102	..	..	..
International Motor Co. com	..	3	13	14	—1
International Motor Co. pfd	3	9	32	36	—5
Kelly-Springfield Tire Co. com	56	58	159	162	..
Kelly-Springfield Tire Co. 1st pfd	76	80	85½	86½	— ½
Kelly-Springfield Tire Co. 2d pfd	94	100	160	165	..
Maxwell Motor Co. com	14	15	35	35½	—4
Maxwell Motor Co. 1st pfd	41	42½	82	83	—2
Maxwell Motor Co. 2d pfd	17	18	31½	33	—2½
Miller Rubber Co. com	..	..	190	192	+3
Miller Rubber Co. pfd	..	..	103	105	—1
New Departure Mfg. Co. com	125	127	..	..	..
New Departure Mfg. Co. pfd	105	108	..	..	..
Packard Motor Car Co. com	103	..	109	..	..
Packard Motor Car Co. pfd	97	100	96½	101	—3½
Peerless Motor Car Co. com	..	17	67	70	..
Peerless Motor Car Co. pfd	..	50	94	96	..
Portage Rubber Co. com	..	30	35	38	—4
Portage Rubber Co. pfd	..	90	92	95	—1
Reo Motor Truck Co.	11½	12½	15	16	— ¾
Reo Motor Car Co.	17¾	18½	29¾	30	—1¾
Splitdorf Electric Co. pfd	40	50	..	..	..
Stewart-Warner Speed. Corp. com	51	52	67½	68¼	— ½
Stewart-Warner Speed. Corp. pfd	98	99	104	107	—1
Studebaker Corporation com	29	30	76	78	—2
Studebaker Corporation pfd	80	84½	100	100½	+1½
Swinehart Tire & Rubber Co.	85	87	77	78	..
Texas Company	142	143	127	128	+3
U. S. Rubber Co. com	59	59½	45½	47	—5½
U. S. Rubber Co. 1st pfd	102⅜	103	105	106	—1
Vacuum Oil Co.	218	221	195	198	—2
White Company pfd	107	110	103	108	..
Willys-Overland Co. com	88	92	126	128	—2
Willys-Overland Co. pfd	93	95	102	103½	— ½

*Par value $10; all others $100 par value.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid 1914	Asked 1914	Bid 1915	Asked 1915	Wk's Ch'ge
ACTIVE STOCKS					
Chalmers Motor Co. com	101	103	..	95	..
Chalmers Motor Co. pfd	..	96	96	99	+2¼
Continental Motor Co. com	..	180	185	..	+5
Continental Motor Co. pfd	..	75	82	86	..
General Motors Co. com	90	92	153	156	+2¼
General Motors Co. pfd	91	94	101½	103½	..
Maxwell Motor Co. com	13¾	14½	38	41	—1
Maxwell Motor Co. 1st pfd	40½	42½	83½	86	—1
Maxwell Motor Co. 2d pfd	16½	18	34	37	—1
Packard Motor Car Co. com	103	112	..	112½	..
Packard Motor Car Co. pfd	97	100	96¼	100	—1
*Reo Motor Car Co.	18	18¾	30	31	+ ½
*Reo Motor Truck Co.	11⅝	12¼	15⅜	16⅛	+ ⅜
Studebaker Corporation com	..	..	76	78	—2
Studebaker Corporation pfd	..	..	98½	100½	..
INACTIVE STOCKS					
*Atlas Drop Forge Co.	19	..	..	26	..
Ford Motor Co. of Canada	..	555	1275	..	+275
Kelsey Wheel Co.	185	..	205	..	+5
*W. K. Pruden Co.	..	20½	19½	21	..
Regal Motor Car Co. pfd	20	..	..	25	..
BONDS					
General Motors, notes, 6s, 1915	101	102	..	..	..
Packard Motor Co. 5s, 1916	95	98½	98¼	..	..

*Par value $10; all others $100 par value.

Georgia $5 Tax Enjoined

State and Cities Will Regulate Cars—Case Will Be Appealed

SAVANNAH, GA., July—Granting an injunction restraining the State from collecting $5 registration fee from owners of automobiles and motorcycles in Chatham County, Judge Charlton in the Supreme Court held that the city and State had a right to regulate them, but that the provision that the proceeds be distributed among counties for roads in accordance with the number of miles of rural route is invalid.

It is considered certain that the case will be appealed by the State and city. If the findings of the lower court are sustained they will next be heard by a jury, when it will be determined whether permanent injunctions shall be issued.

Judge Charlton held that in effect the law virtually double taxes owners of automobiles.

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Licensing of Chauffeurs in Ohio Unconstitutional

COLUMBUS, OHIO, July 3—Judge Dillon in Common Pleas Court, has declared the Ohio law providing for the licensing of chauffeurs by the Secretary of State unconstitutional in the case of Joseph Dayton, charged with operating a car without a license. The case came up originally in the police court, where the law was held unconstitutional by Judge Osborn.

The court held that since the law does not fix a standard of qualification for chauffeurs it is not valid as it depends on the arbitrary wish or caprice of the Secretary of State. The case will likely be appealed to the Ohio Supreme Court for final adjudication.

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Wisconsin Law Protects Dealers

MILWAUKEE, WIS., July 2—Wisconsin automobile dealers who sell cars on credit—and most of them do—have obtained the protection so long desired by the passage of a law by the Wisconsin Legislature, and now in effect, which makes the use of false statements to obtain property on credit a penal offense.

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Ill. Wheel Tax a Law

SPRINGFIELD, ILL., July 3—Illinois cities now have the privilege of affixing a wheel tax to all automobiles and other vehicles if they see fit. The supreme court set aside the previous law, declaring it unconstitutional on a case appealed from Lincoln. Owing to the importance of this tax to Chicago and the larger cities, the legislature changed the law to meet the objections of the courts. The revised bill became a law when Governor Dunne signed it this week. The tax in Chicago on automobiles is $10 to $20, in accordance with the horsepower.

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Wisconsin Licenses 77,160 Cars in 1914

MADISON, WIS., July 2—During the fiscal year of the State of Wisconsin ending June 30, 1915, a total of 77,160 licenses were issued for automobiles owned by private owners, compared with 49,625 issued during the preceding fiscal year. It is interesting to note, however, that the total 1915 registration on June 28 was 69,116, compared with 53,161 issued during the whole of 1914. On this basis the 1915 registration will exceed 75,000, the figure set at the beginning of the year, and probably run well above that. In 1914 more than 8000 cars were registered between July 1 and Dec. 31, and figuring along these lines, the 1915 total will be approximately 78,000.

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137,383 Cars in California

SAN FRANCISCO, CAL., July 3—There are 137,383 automobiles in California. Los Angeles leads the fifty-eight counties with 46,447. San Francisco is second with 14,714 and Alameda, third, with 9417.

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Nearly 30,000 Automobiles in Conn.

HARTFORD, CONN., July 2—There are nearly 30,000 registered automobiles in the State of Connecticut according to the new motor vehicle register which has just been issued by a private concern in Hartford. The new publication covers registrations up to June 19. Within the past 3 months 3000 cars have been registered as jitneys. This type of conveyance is said by railroad officials to be the cause of curtailment of train service throughout the State. The business of the Secretary of State's office in car registrations will be at least one-half million dollars this season.

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Kentucky Fees $98,586

LOUISVILLE, KY., July 3—Kentucky automobile licenses collected since Jan. 1 amount to $98,586.29. January, $9,883.39; February, $12,826.60; March, $16,107.37; April, $14,556.27; May, $9,305.65, and June, $36,406.99. The law making all licenses to expire Jan. 1 went into effect last June, and so this year all licenses as they are renewed are prorated for the time until Jan. 1, 1916. Consequently the amounts of renewals are not as large by several thousands of dollars as they would be had they been for the full period of twelve months.

77,339 Cars in Canada

Commercial Cars Number 68,320—Pleasure Cars 1,155 and Dealers 1,120

TORONTO, ONT., July 3—The following figures herewith indicate the number of automobiles in Canada to date which runs over 70,000.

Province	Commercial Cars	Pleasure Cars	Dealers	Motor Cycles
Ontario	31,724	Inc.	260	3,633
Quebec	6,824	384	137	205
Nova Scotia	1,194	7	20	96
New Brunswick	1,940	25	20	70
Prince Edward I.	44	...	2	3
Manitoba	6,600	275	360	940
Saskatchewan	8,963	Inc.	124	461
Alberta	4,630	98	86	387
British Columbia	6,370	363	109	944
Yukon	31	3	2	7
Total	68,320	1,155	1,120	6,746

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Missouri Registrations Increase 20 Per Cent Over 1914

JEFFERSON CITY, MO., July 1—An increase of about 20 per cent in the number of automobiles registered in the State of Missouri during the first five months of the current year over the same months last year is indicated in a statement issued by the Secretary of State here to-day.

The report shows that 66,061 automobiles were registered between February 6, the beginning of the registration year, and June 30. This is an increase of 11,563 over the figures for a similar period in 1914. In view of these figures, State officials predict that a total of more than 75,000 cars will be registered during the present year.

St. Louis and Kansas City respectively lead in the number of high-priced cars registered.

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Indiana Has 81,608 Cars

INDIANAPOLIS, IND., July 3—There are 81,608 automobiles registered in Indiana, a gain of 26,608, compared with the number of registrations issued the first six months of last year, and 15,108 higher than the entire year of 1914. The receipts of the State department for the six months was $535,049. There are 650 retail automobile dealers in the State.

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$600,000 Invested in Oregon Cars

PORTLAND, ORE., July 3—During the month ending June 15 the Oregon registrations show that, at an average of $750 per car the people of that State have invested $600,000 in machines. Nearly $20,000 a day, which is much larger than the amount expended during former years. There were 1,377 new registrations for the month. The Ford outstripped all other makes with 464.

Indianapolis Speed Amazes French

Thought Record Would Stand for Another Year—So Kept Out of Race

PARIS, June 18—Owing to the war, result of Indianapolis 500-mile race reached Paris after a delay of one week. Rene Thomas, last year's winner, is delighted at the speed attained, his only regret being that he was unable to be present.

"I am glad to hear Ralph De Palma has broken my record, and I want to congratulate him on what must have been a wonderful race. Manufacturers over here seemed to think the record would stand for another year, and on that account were not disposed to send cars. This is a lesson to them that in the racing game, progress must be constant. France had the cars and she had a few good drivers free from military service; she ought to have sent those men across, instead of being satisfied to live in the false hope that the old record would remain untouched."

As a race driver Rene Thomas was interested in the weather conditions and the make of tires used by the winner. Translated into American, Thomas's expression was, "De Palma certainly had no bum tires on his car to average nearly 90 miles an hour for such a distance."

Louis Delage, while expressing admiration at the result, appeared to be surprised and disappointed that the record of 1914 had been cut by such a big margin. The Delage chief engineer, M. Michelat, stated that if the new Delage cars had gone out they would have been sent with the intention of taking a big slice out of Thomas's old record, but he did not know enough of the track conditions at Indianapolis to predict the highest speed they could hope to make.

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Chevrolet Cars on Indiana Tracks

INDIANAPOLIS, IND., July 3—The William Small Co., distributor for the Chevrolet car in the State of Indiana, has received two specially constructed race cars from the Chevrolet factory that will be used in State fair dirt track races throughout the State this summer. William Brown of Fort Wayne, Ind., will pilot one of the cars and the other will be driven by William Doughty of Bluffton, Ind.

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Spokane Speedway Assn. Formed

SPOKANE, WASH., July 2—The Spokane Speedway Assn. has been organized and incorporated by a group of Spokane sportsmen. The officers of the association are A. E. Terrelle, E. F. Guerske, W. E. Camp, H. A. Holland and E. W. Stutes.

It is planned to build a two-mile speedway close enough to the center of Spokane so that it may be reached by street railways. The association has been incorporated for $100,000, with which amount it is intended to purchase the ground and construct the track. Negotiations are now pending for the property.

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Indianapolis Show Sept. 6

INDIANAPOLIS, IND., July 5—The Indianapolis Automobile Trade Assn. will be the first organization to stage an exposition of 1916 automobiles. At a meeting held at the Hoosier Motor Club it was practically decided to hold another show at the Indiana State Fair the week of September 6.

The show will be held in a large tent covering approximately 30,000 square feet, for which a charge of 10 cents per square foot will be made members of the trade association and 20 cents will be charged those not members.

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Wichita Show Oct. 4-14

WICHITA, KAN., July 2—The local automobile dealers will hold an automobile show in connection with the International wheat show, Oct. 4 to 14. Practically every inch of the 8800 sq. ft. of floor space was sold at a dinner given to the automobile men by the exposition committee. The exhibit will be held in a special building.

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More Time Given Exposition Motorists

SAN DIEGO, CAL., July 1—The Panama-California Exposition officials are becoming more lenient to motorists. Automobiles are now allowed inside the fair grounds after 6 p. m.

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Boston Races July 10

BOSTON, MASS., July 5—The automobile races scheduled to be held at the Readville track here to-day under the auspices of the Matty Matthews Racing Assn. had to be postponed because of heavy rains during the forenoon. They will be run off next Saturday afternoon.

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Automobiles for St. Louis Mail Service

ST. LOUIS, MO., July 1—Automobiles replaced collection wagons in the complete reorganization of the mail service here to-day. On instructions from Washington the local postmaster put into the discard all but four of the wagon outfits and substituted therefor twenty-four light and fast automobiles. The few horse-drawn vehicles will be put in outlying districts when roads are bad.

Yellowstone Plans Completed

Regulations Governing Use of Cars in Park Not Yet Public

WASHINGTON, D. C., July 2—The plans for opening the Yellowstone National Park to automobiles Aug. 1 is now complete, but the regulations governing the use of machines in the park will not be made public for some time until they have been criticised by some of the officials in charge of the park. An elaborate set of rules governing the operation of cars has been compiled and while these regulations are strenuous they are considered necessary at the start. It may be several seasons before the mountain horses used in the park will be accustomed to motor traffic, and so modifications will be necessary from year to year in these regulations. The object of the stringent regulations is to guard against accidents due to the use of motor vehicles which would mar the opening of the park to automobiles.

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Twin City Eliminations August 28-31

MINNEAPOLIS, MINN., July 3—Entry blanks are being issued by the Twin City Motor Speedway Co. for its 500-mile race in Sept. 4. The race will be under A. A. A. sanction the eliminations Aug. 28-31, with 80 m.p.h. speed for one lap of the two-mile track as the minimum. First prize is $20,000 and the remainder of the $50,000 is divided into eleven prizes from $10,000 down to $650. The three-mile fence around the grounds is erected, footings are placed for the seven grand stands and the bleachers. The grading will be completed July 15. Concrete laying began July 6 and will be completed in thirty days. Six inches of cement will be placed over 18 in. of concrete. Three hundred and fifty men are employed in the work, which is progressing rapidly.

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Damaged Road—Fined $25

BALTIMORE, MD., July 3—The first case in Maryland of a man being charged with operating a motor vehicle without due regard for wear upon the highway was tried in Baltimore yesterday. Clarence Thornburg, a chauffeur for the Pierce-Arrow Co., was fined $25 and costs. He ran a motor truck over the asphalt of one of the main thoroughfares. Two of the wheels were without tires and the flanges cut into the paving, causing damage amounting to about $100.

Indiana S. A. E. To Study 12's

Section Will Meet September 17 —Paper by J. G. Vincent —Growth Planned

INDIANAPOLIS, IND., July 3—Thorough discussion of the twelve cylinder motor, with a paper on the subject by J. G. Vincent, vice-president and chief engineer of the Packard Motor Car Co., will feature the opening meeting of the Indiana section of the Society of Automobile Engineers, which will be held here Friday evening, Sept. 17.

Mr. Vincent is the designer of the twin-six, the first twelve-cylinder car marketed in this country, and it is of special interest to have him present a paper on that subject.

W. G. Wall, of the National Motor Vehicle Co., chairman of the committee on papers, who is also the designer of a twelve-cylinder motor, announces that he expects a large number of engineers from the various Indiana plants to be present and take active part in the discussion. Since two Indianapolis firms have already announced twelve-cylinder models, it is expected that the September meeting will be one of the most interesting that the Indiana section has ever held.

There are no meetings of the section during the summer months and the gathering in September will be the start of the regular fall and winter meetings.

The Indiana section of the society expects to expand greatly during the next few months and only recently adopted a new constitution which provided for the election of associates to the Section. This associate membership entitles the holder to all privileges of the Section, but does not make him a regular member of the national Society of Automobile Engineers.

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Detachable Disk Wheel

PARIS, FRANCE, June 29—Michelin, the French tire manufacturer, has placed on the market a detachable disk wheel for touring car use. Owing to the war, delivery is not being made on a big scale, but a certain number of sets has been supplied for military cars and the Michelin company's touring cars and light delivery vehicles have been using these wheels for several months.

Advantages claimed for the wheel are ease of attachment and detachment, lower weight than the artillery type wheel, additional strength compared with a wood wheel, and a decided gain in the ease of cleaning compared with either wood or wire wheels. Details regarding the structure of the wheel have not been given out. It is a pressed steel type, deeply dished, and welded to the rim. It is attached by six bolts secured to the fixed hub and passing through the wheel felloe. Six nuts hold each wheel in position. Threads are cut left and right on the opposite sides of the car, so that the tendency is for the nuts to tighten up as the wheel revolves, and avoiding the use of lock washers. The Michelin bolt valve is used with the wheel, no safety lugs being employed. The valve projects on one side of the disk, thus avoiding cutting a hole in this latter. Easy washing is a feature.

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Tires Shipped by Parcel Post

WASHINGTON, D. C., July 2—Postmaster Otto Praeger has put in a plan whereby Washington motorists when on tour can ship their tires back to Washington for repairs by parcel post. The plan was launched a week ago as an experiment and proved such a success that it has been made a permanent feature of the parcel post plan. Tires weighing 11 pounds are carried for 10 cents in the local zone, in an 8-mile radius and 15 cents for the first and second zones; the 14-pound tire takes a 12 and 18-cent rate; 17-pound, 13 and 21 cents; 21-pound, 15 and 25 cents; 22-pound, 16 and 26 cents; 30-pound, 20 and 34 cents, and 35-pound, 23 and 39 cents.

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American Cars in Demand in British Market

LONDON, ENGLAND, June 24—The war has opened the field for American automobiles in England, where they were never able to break into the market in peace times. Now that the English government has taken over all English automobile factories, a great demand has been created for the high-priced American touring car.

An agent in this city has sold 1500 of the high-priced cars within the last 30 days and could have sold 3500 more if he could have filled the orders. He attributed it to the fact that many persons who never before have been able to afford cars are now making large sums of money from the government contracts and are spending their new wealth on automobiles and other luxuries.

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Snyder Promoted

DETROIT, MICH., July 3—C. Snyder, who was with Chalmers for 14 years, and who was efficiency man for the National Cash Register Co., Dayton, Ohio, has been promoted to the position of superintendent of manufacturing.

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Lazelle Marion State Sales Mgr.

JACKSON, MICH., July 3—U. E. Lazelle has been appointed State sales manager by the Marion Motor Co.

Gasoline Prices in S.W. Unsettled

Gallon Costs from 11 to 20 Cents in Western Texas— Claim Overcharge

AUSTIN, TEXAS, July 3—Inquiry among automobile tourists who have traveled through Oklahoma, Texas and New Mexico during the last few weeks reveals a remarkable lack of uniformity in gasoline prices, which cannot be accounted for by the difference in freight charges on the product, as applied to the various points. It is found that in some of the towns of western Texas as much as five cents difference in the price per gallon exists between local dealers. It is claimed by overland travelers that it is not infrequently the case that dealers take advantage of the tourist by charging an exorbitant price for gasoline and that this condition is also true of some of the garage and repair men. The price of gasoline in Texas ranges all the way from 11 cents to 20 cents per gallon. In western Texas 13 cents to 15 cents are the prevailing prices, although it is not unusual for as much as 20 cents to be charged. In New Mexico the situation is about the same as in western Texas. As an evidence of the unstability of the local markets it may be noted that one town may announce a raise of the price a cent or two per gallon to-day and perhaps another town not far away may declare a reduction. In Oklahoma the prices also show a fluctuation and a lack of uniformity which is not based on the wholesale prices or the freight rates.

The cost of gasoline is an important item to the long distance tourists and many of them object to being made the victims of exorbitant charges. What is true as to gasoline prices is also the case as to lubricating oil. A difference of as much as 25 cents per gallon in the same brand of oil in the original package is found in towns which have the same freight rate.

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1916 Abbott 8-80 on the Market

DETROIT, MICH., July 3—The 1916 Abbott-Detroit, 8-80, an eight-cylinder, seven-passenger design manufactured by the Consolidated Car Co. of this city, has been announced and shipments are now being made. The motor is the Herschell-Spillman unit power plant, its dimensions being 3¼ by 5 with the cylinders in blocks and using the single camshaft scheme with sixteen integral cams. The cylinder blocks on this motor are staggered and instead of the forked connecting-rod, a side-by-side arrangement is employed. The crankshaft is carried on three main bearings. While

the S. A. E. rating is 33.8 hp., it is claimed by the makers that 80 can be developed on the block and a speed of 70 m.p.h. on high can be reached.

Other specifications include a Stewart vacuum feed, Duplex carbureter, Auto-Lite electric system with Remy battery ignition, disk clutch, worm and wheel steering, left drive and center control. The springs are underslung, semi-elliptic front and three-quarter elliptic rear with the perches swiveled at the axle. The final drive is through spiral type bevel gears and floating rear axle mounted on Timken axles at the differential and annular bearings at the wheels. Special attention has been given to the body which is of somewhat foreign appearance, a suggestion that is enhanced by the sloping windshield. A new one-man top is included in the equipment as is a full set of instruments on the walnut dash, German silver clock and 35 by 4½ tires, non-skid in rear. The wheelbase is 121 in. and the standard color Brewster green. The price is given as $1,950.

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To Sell Wilcox-McKim

SAGINAW, MICH., July 3—Efforts to refinance and re-organize the Wilcox-McKim Co., which made automobile steering gears, piston rings and other parts and light machinery, having failed, the plant and its equipment will be sold, by order of the United States district court. Full particulars may be obtained from E. D. Church, trustee in bankruptcy in Saginaw.

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New Sparton Hand Horn

JACKSON, MICH., July 3—The Sparks-Withington Co. is delivering a new hand-operated horn, Model G, which is a third larger than any other hand-operated horn. The diaphragm-vibrating mechanism is similar to that used in other hand-operated Spartons and the operating lever is pushed forward to sound the horn. The diaphragm is hand-hammered. A rigid bracket is supplied which can be screwed to any part of the car, only a screwdriver being required to put the horn in place. It lists at $7.

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Hassler Shock Absorber Expands

INDIANAPOLIS, IND., July 3—Robert H. Hassler, Inc., the manufacturer of the Hassler shock absorber for Ford cars has fitted up a plant with complete machinery, in the Prest-O-Lite Building, 227 East South Street, this city, with a capacity of 500 per day.

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Oakland Changes in Detroit

DETROIT, MICH., July 3—Beginning this month, the Standard Auto Co. becomes the Oakland distributor in Detroit, also Wayne, Monroe, and part of Macomb counties.

A Field for Cars Under $500

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War Cripples Will Want Many —Hand Control a Desirable Feature

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By H. D. Van Sant
American Consul

DUNFERMLINE, SCOTLAND, June 17—In view of the constant arrival of disabled officers and soldiers from the front, including the many with frost bitten feet and the thousands of invalids and crippled civilians in the United Kingdom, the need for a small motor or motor tricar—a good hill-climber for Scotland—at a comparatively low cost, is more apparent in this district and Scotland than ever. Something that will be safe to handle and inexpensive to run and at a cost not to exceed $500 would meet with ready sale in the near future, especially as no such machine has thus far been perfected, at least as far as the writer has been able to observe in this district. An objection to the tricar type is the added danger of skidding and overturning at sudden corners or down steep streets or hills, so frequently met with in this territory.

Hand Control a Factor

If a machine propelled without the need of foot action or guided and controlled entirely by hand could be constructed at a price within the range of the middle class or the coming pensioner, it would find an unprecedented sale in the British market in the near future.

Already several inquiries have been made at this Consulate as to whether such a motor car is being made in America and also if catalog or other information regarding one is obtainable. Recently one or two British makers have been approached on the subject and have plans under consideration for the introduction of such a machine.

If an American-made machine of the desired pattern is introduced the demand for it is likely to prove beyond the ordinary. As the war progresses, the probability of a market for such cars has been estimated at from 10,000 to 20,000 the first year.

Cars and Trucks Show Wear

Already the many motor cars and trucks in this district requisitioned by the military is beginning to show signs of wear, and the sight of machines being repaired along the roads and at the garage is more frequently noticed, a number apparently being much worse for constant use, resulting in a number of inquiries at this office for new American cars. The low priced American machines appear to be holding their own with some of the higher-priced British made cars, notwithstanding their constant use day and night since the outbreak of the war, though it is apparent that the lighter woodwork and painting and varnish of the American car suffers in comparison with the higher priced British and French makes. But in the machine itself, the average American car is holding its own, and a further market for these cheaper cars will likely increase before another year, if the stock is renewed among dealers and agents throughout this district and Scotland.

Competition Keen

The competition between the sale of British, French and American cars has been so keen that agents here have declined to accept the agency for American cars other than those already represented, until at least after the beginning of the new year, and several American makers endeavoring to enter the field with the regular dealers have been told they would have to wait another year before their claims for representation would be considered. While the demand for cars is not likely to diminish the competition is keen and spirited, with a natural loyalty and inclination for the home product when all else is equal.

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Scarcity of Motor Transport Drivers in England

PORTSMOUTH, ENGLAND, June 24—The Hampshire Automobile Club has received a letter from a motor transport examining officer of the Army Service corps, drawing attention to the urgent need for an immediate increase in the number of drivers enlisting.

The supply of heavy car drivers is quite, and of commercial vehicles nearly exhausted, and the services of every private car driver are being asked for. The pay is $1.50 a day.

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Thomas Making $4,000 Six

BUFFALO, N. Y., July 5—Under the model name of series MF, the E. R. Thomas Motor Car Co. is putting out a six-cylinder car selling for $4,000. The motor has its cylinders cast in pairs and with a bore of 4¼ and a stroke of 5½ in. is rated at 43.3 hp. by the S. A. E. rating. Other specifications include a three-speed gearset, floating rear axle with spiral type bevel gears, 37 by 5 tires, 12-volt starting, five wire wheels and full accessory equipment.

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Walton Master Carbureter Sales Mgr.

DETROIT, MICH., July 1—A. B. Walton, who has been with the Master Carbureter Corp. since last October, has been appointed sales manager.

Make Gasoline from Natural Gas

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Bureau of Mines Bulletin Treats of Preventing Waste of Gas in Oil Mining

NEW YORK CITY, July 2—Condensation of gasoline from natural gas is the title of a bulletin recently issued by the Bureau of Mines treating of a method of preventing the waste of natural gas incidental to oil mining. The bulletin points out that condensation methods may be made use of which offer the oil operator and others a profitable means of using some of the oil well gas now being wasted. The most desired constituent of crude oil is obtained, the production of oil is not hindered, and the gas, after the extraction of gasoline, can be returned to the leased area to drive pumps or to be put into pipe lines for uses to which natural gas is generally put. It is stated that the fuel value of the gas so returned is very little affected by the extraction of the gasoline product by means of the condensation process.

The authors of the bulletin, which is No. 88, are George A. Burrell, Frank M. Seibert and G. G. Oberfell. In this document they state that gas may be found in a sand separate from the oil; it may be found in more than one sand separate from the oil or the gas sand may be just above and in contact with the oil sand. A given sand may produce oil and gas in one place and in another part of the territory produce gas only.

Gas from Oil Sand

Gas may come from the same sand as the oil itself. It is this manner of occurrence of gas and oil that the authors desire to emphasize, for under these conditions the gas is frequently mixed with enough of the gasoline constituents of the oil to warrant the erection of a plant for the purpose of condensing the gasoline. The gas usually finds its way to the atmosphere through the space between the casing of the well and the tubing inserted for the removal of the oil. This gas is the so-called casing for the removal of the oil. This gas is the so-called "casing-head gas." At the beginning of an oil flow when the flow is natural, a large quantity of gas escapes to the air through the same tubing as the oil. Where the gas finds its exit to the atmosphere apart from the oil at the casing head it is a simple matter to make pipe connections between the casing head and any desired point where the gas is to be utilized. This is frequently done when the supply of casing-head gas is sufficient to warrant its utilization, but frequently, when the supply exceeds the small demands of the lease, the excess is wasted.

When a well is first drilled, the quantity of gas escaping with the oil from the tubing is frequently enormous, being 10,000,000 to 15,000,000 feet or more at times. As this gas is wasted, the flow in time diminishes.

When gas comes with the oil in the flow pipe, the two are often separated by means of a gas trap. The oil, entering the top of a drum, settles to the bottom and is withdrawn, and the gas flows off at the top. Many of the plants in California utilize gas that flows with the oil for condensing gasoline. One gasoline plant in the Cushing field, Oklahoma, also uses trap gas. A new type of trap for saving gas from gushers and separating the gasoline is described in this report.

Oil wells that have passed the flowing stage and are being pumped may still continue to give off much gas at the casing head. The quantity may vary from little or nothing at some wells to 500,000 cubic feet or more at others. When enough of the gas is available, it is used for pumping on the lease, the excess being wasted. A steam pumping engine of 50 horsepower requires about 25,000 cubic feet of gas for 10 hours' operation. From 12 to 15 cubic feet of natural gas is needed per horsepower-hour for gas engines that are used on leases for pumping oil wells. If there is not enough of the gas available for working pumps, it is all allowed to go to waste, or perhaps some is used for heating and lighting a few scattered houses on the lease.

The efficient utilization of the wasting casing-head gas ordinarily is a difficult problem. The many miles of pipe that would have to be laid to transport it from a field would usually be an unwarranted expense. However, some towns, among which may be mentioned Warren, Pa., and Sistersville, W. Va., are lighted and heated largely with casing-head gas.

In general, however, the oil man considers casing-head gas as waste gas and its escape necessary in oil-well operations, to permit the maximum flow of oil into the well from the surrounding strata.

The bulletin also treats of the effect of drilling neighboring wells; the effect of formation of waxy sediment; the history of the making of gasoline from natural gas; the chemistry of natural gas, and many other matters of interest along these lines.

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Wis. Sleigh-Tread Law Repealed

MILWAUKEE, WIS., July 3—The Wisconsin Legislature has repealed the 1913 statute known as the "wide sleigh" law, providing that no sleigh could be manufactured or sold in Wisconsin after Jan. 1, 1914, unless the gage of the tread was 56 in., the gage of practically all wheeled vehicles in Wisconsin. The repeal was not opposed by motoring organizations, the belief being that no law is necessary for the use of wide sleighs. The argument in favor of the repeal was that it caused much confusion in the sleigh manufacturing trade, which has been obliged to make a special tread for Wisconsin buyers. The general opinion is that inasmuch as the advantages of the wide tread have been convincingly pointed out by two winters' use among farmers, they will not go back to the narrow tread. The repeal of the law makes the tread optional.

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Thirty-two Louisville Jitneys Under One $5,000 Bond

LOUISVILLE, KY., July 5—Following a period of several weeks of idleness, thirty-two jitney buses have arranged for one $5000 bond, under which all will operate. This interpretation of the ordinance makes it appear that one bond serves for all thirty-two vehicles, any action against any one of the thirty-two being protected by the bond. In case of accidents or other damages, the jitneys will have to secure another bond before they can begin operations. The individual chauffeurs' licenses have all been paid in the thirty-two cases.

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3½-Cent Jitney Rides

CPOKAN, WASH., July 3—Three-and-one-half-cent-fare automobiles began operating on the Spokane streets yesterday. The cars seat ten passengers. Books containing tickets for 100 rides are being sold for $3.50.

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Bowser Receives Exposition Award

SOUTH BEND, IND., July 3—The International jury of awards of the Panama-Pacific International Exposition awarded to S. F. Bowser & Co., Fort Wayne, the grand prize, and also a gold medal on the company's self-measuring pumps and storage tanks.

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Stoops Manages Vanguard

DETROIT, MICH., July 3—H. J. Stoops has been appointed general manager of the Vanguard Manufacturing Co., manufacturer of windshields. Mr. Stoops was formerly with the Trumbull Cyclecar Co., and the Detroit agency of Emil Grossman.

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Thomas Resigns from Dauch

SANDUSKY, OHIO, July 3—F. W. Thomas has resigned as chief engineer with the Dauch Mfg. Co., to take the position of chief engineer and factory manager with Clark Engine & Boiler Co., Kalamazoo, Mich.

Factory Miscellany

Perry Top Moves—The Perry Auto Top Co., Columbus, Ohio, has removed to a large factory at 220 North Third Street.

Mogul Truck Builds—The Mogul Truck Co., 6100 Maple avenue, St. Louis, Mo., has bought a site 125 by 187 feet and will erect a plant for the manufacture of trucks.

Leather Co. to Build—The Lackawanna Leather Co., Hackettstown, N. J., manufacturer of automobile and carriage leathers, will build a two-story addition to its plant.

Detroit Steel Adds—The Detroit Pressed Steel Co., Detroit, Mich., will spend about $25,000 for the erection of a two-story office addition, 56 by 130 feet, and a one-story steel frame factory addition, 57 by 185 feet.

Ford Lets Contract for L. I. Plant—Ford Motor Co., Detroit, has let a contract for an eight-story, 200 by 325-foot assembling plant in Long Island City, N. Y., plant having been under contemplation for some time.

Fisk Rubber Adds—The Fisk Rubber Co., Chicopee Falls, Mass., has awarded the contract for the construction of a 50 by 160 ft. office building, a 110 by 310 ft. storehouse and a 60 by 100 ft. garage. The estimated cost is $400,000.

Standard Four Tire to Move Plant—The Standard Four Tire Co., Marion, Ind., will remove its plant to Keokuk, Iowa, where $20,000 has been subscribed to secure the business. A factory will be constructed with an annual capacity of 60,000 tires.

Hamilton-Beach to Add—The Hamilton-Beach Mfg. Co., Racine, Wis., a large manufacturer of small electrical appliances, specialties and novelties, is having plans made for an important factory addition, to be 3 stories high, 50 by 250 feet in size, and cost about $30,000.

Louisville Ford Plant to Move—The Ford Motor Co. will move into its new assembly plant, Third and Railroad Crossing, Louisville, Ky., about Oct. 1. The present salesroom, now located at 931 Third Street will be vacated and the office force and show room transferred to the new building.

To Make Trailers—The Mountain Trailer Co., Spokane, Wash., has been organized by J. O. Mountain of the Diamond Carriage Co., A. H. Herta of the Signal Truck Co. and M. D. Hawkins of the Hawkins Motor Car Co. to construct a plant in Spokane to manufacture a patented trailer to hook onto an automobile.

To Manufacture Tires—The plant of the former Swift Automobile Co., Wayne, Mich., has been purchased for $13,000, it is stated, by the Automobile League of America, Detroit. The factory building is to be equipped for the purpose of manufacturing tires which are to be sold exclusively to the members of the league.

Hayes Wheel Enlarges.—The Hayes Wheel Co., Albion, Mich., which makes the hubs for the wheels made by the parent plant, the Hayes Wheel Co., in Jackson, will erect a new plant to be ready for occupancy Sept. 1. When completed the company will employ 200 men here, or double its present working force, and the production will be more than doubled. Machinery valued at $15,000 has already been purchased and by the time the new building is ready it is expected that from $50,000 to $60,000 will have been spent.

Four Wheel Drive Adds to Shop—Work is well under way on a large shop addition to the works of the Four Wheel Drive Automobile Co., Clintonville, Wis., which is working on large war orders for its quadruple drive trucks. The company is so busy turning out army cars that its domestic demand can hardly be met, and no orders are being taken for quantities until the trucks purchased by the Imperial Russian government and other European nations are delivered.

Trained Help Hard to Get—The Kissel Motor Car Co., Hartford, Wis., in common with other industries in the automobile and allied metal working trades, is experiencing difficulty in getting sufficient trained help to meet its needs. The company is advertising in the metropolitan papers for experienced machinists for milling machines, universal grinders and drill presses. All around machine hands are preferred. There is a scarcity of skilled workmen in many lines.

Will Enlarge Plant—The Empire Rubber & Tire Co., Trenton, N. J., is to inaugurate alterations and extensions in its plant with the idea of increasing production and of improving the facilities for handling it. One new building is in the course of erection at the present time. A siding is also being run from the tracks of the Pennsylvania Railroad direct to the shipping room. Changes and improvements to be made in the shipping room will mean a big facilitation in delivery. The need of extra room is demonstrated by the fact that in the tire building department the men are being worked in three 8-hour shifts.

The Automobile Calendar

July 9	Burlington, Ia., 100-Mile Track Race; Tri-State Fair.
Aug.	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21	Elgin, Ill., Road Races.
Aug. 30	Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept.	Indianapolis, Ind., Fall Show, Indiana State Fair.
Sept.	Peoria, Ill., Second Northwestern Road Congress.
Sept. 6	Providence, R. I., Speedway Race; F. E. Perkins.
Sept. 6	Detroit, Mich., Speedway Race; Detroit Speedway Club.
Sept. 6	Indianapolis, Ind., Show, Indiana State Fair.
Sept. 8-11	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13	Oakland, Cal., Pan-American Road Congress.
Sept. 17-18	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Sept. 18-25	Los Angeles, Cal., Show, Shrine Auditorium.
Oct.	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 1	Minneapolis, Minn., Track Race, Twin City Motor Speedway Co.
Oct. 1-2	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2	New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9	Chicago, Ill., 300-Mile Race.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Nov. 18	Arizona 150-mile Grand Prix.
Dec. 31	New York City, Show; Grand Central Palace.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Nelke Takes on Oakland—A. W. Nelke, who handled the Overland in Western Maine for some years, has given it up and he now has the agency for all Maine for the Oakland. He is making his headquarters at Lewiston.

Peck Resigns—W. V. Peck, formerly Chicago representative of the Pittsburgh Model Engine Co., Pittsburgh, Pa., is no longer connected with the company. Hereafter the sales in Chicago and vicinity will be handled direct from the plant.

Caten Makes a Change—E. L. Caten, who was identified with the Buick in Worcester, Mass., for some years has taken over the agency for the Paige Detroit in that city, and a company has been formed with J. H. and W. A. Stratton as partners.

Sommerville General Mgr.—A. G. Sommerville has bought the controlling interest in the Argonaut Motors Co., San Francisco, Cal., and will hereafter act as the general manager. This concern distributes the Stearns and Pathfinder in Northern California.

Parker Heads Hartford Olds.—Representation of the Oldsmobile is now vested in the Parker Oldsmobile Co., Hartford. F. R. Parker of New Haven, is the head of the concern. W. G. Murray, formerly with the sales department of the Palace Auto Service Co., has joined the Parker company.

Morrison Heads Louisville Co.—The Louisville Speedometer Co. has opened a service station for Stewart speedometers and Warner autometers at 935 Third Street, Louisville, Ky. J. H. Morrison, head of the concern, formerly was manager of the service department of the Stewart-Warner Indianapolis branch.

Banks Ford Louisville Manager—Clarence Banks, assistant manager of the Louisville branch of the Ford Motor Co. for several years, has been appointed manager, succeeding F. H. Peabody. Mr. Banks formerly had the Ford agency in Louisville, but became associated with the Ford company's Kentucky branch when it was established in 1911.

Stockwell Heads Power Gas Co.—The Power Gas Products Co., capitalized at $125,000, has been reorganized. A branch is in Detroit, Mich. The company makes automobile chemicals. Officers are: President, S. A. Stockwell; vice-president, E. H. Sherwin; secretary, C. F. Heberle; treasurer, J. S. Calder; directors, T. O. Ofstun of Glenwood, Minn.; A. J. Edwards, and George Wollman, sales manager at Detroit.

Motor Men in New Roles

DeVoe Chevrolet Pacific Representative—N. DeVoe, formerly well-known and associated with the trade in Portland, Ore., is now Pacific Coast representative for the Chevrolet.

Snow in Charge—R. H. Snow is now in charge of the truck department for the Western Motors Co., Spokane, representatives of Stewart trucks.

Bury Makes Change—F. J. Bury, formerly connected with the Packard Motor Car Co.'s service department at Detroit, is the new assistant manager of the Southern Motors Co., Louisville, Ky.

Cotton Joins Saxon—Clifford C. Cotton has been appointed special city sales representative of the Saxon car in Toledo, Ohio. He was formerly connected with the Stalker Advertising Agency.

Cronkhite with Philadelphia Oakland.—W. D. Cronkhite has been appointed district representative with headquarters in Philadelphia by the Oakland Motor Co. He was at one time connected with the Buick company.

Huntley Succeeds Histed—R. D. Huntley has succeeded J. R. Histed as manager of the J. I. Case branch in New York City. Huntley was formerly in charge of the Peoria, Ill. branch. A. G. Kellam has succeeded Huntley at Peoria.

Gargett Cleveland Mgr.—R. B. Gargett, formerly connected with the Motor Tire & Supply Co., Cleveland, has been made manager of the Electric Equipment Co., Cleveland distributor for Ohio for Westinghouse starting and lighting apparatus.

Gogarn Takes on Mitchell—J. W. Gogarn, who was identified with the Reo in New York for some years and has been agent for Ajax tires in New Haven, Conn., for more than a year, has branched out and taken on the agency there for the Mitchell line.

Selleck Joins Strauss Service—G. K. Selleck has been added to the forces of the Strauss Service Systems in Indianapolis, Ind. Mr. Selleck will have charge of the rim department of the Strauss company, and will be manager of the rim department.

Newsum Tire Service in Louisville—Thornton Newsum, of Memphis, Tenn., who operates a string of ten tire establishments in a number of large cities, has entered the Louisville field and opened a store, known as Quick Tire Service, at the Northwest corner of Third Street and Broadway. Mr. Newsum is president, C. T. Ballard, Jr., secretary, and R. E. McCaugh manager.

Irwin Goes to Portland—J. H. Irwin, formerly of Seattle, will take charge of the sale of Kelly-Springfield tires in Portland, Ore., which are handled by the Oregon Motor Car Co. M. L. Gallagher has been promoted to the position of sales manager for the Oregon Motor Car Co., succeeding D. C. Warren.

Kessler Joins Brooklyn Packard.—S. W. Kessler, who has been for several years sales manager for the I. S. Remson Automobile Co., Abbott-Detroit, and Westcott distributor in Brooklyn, N. Y., has joined the sales force of the Brooklyn branch of the Packard Motor Car Co. of New York. He will be a special sales representative.

De Vaux Takes Chevrolet Agency—Norman de Vaux, for many years past head of the Reo Pacific Co., California distributor of the Reo line, is no longer distributor of the Lansing car in San Francisco. He has taken over the coast agency of the Chevrolet car. He will change the style of his firm to the Chevrolet Car of California. De Vaux has taken with him most of his agents that handled the Reo line.

Teague Makes Milwaukee Connection—R. N. Teague, for eight years associated with agencies in Milwaukee, has purchased an important interest in the Milwaukee Motor Sales Co, Milwaukee, Wis., and upon its reorganization was elected secretary, treasurer, and general manager. The company is State agent for the Lewis VI and was recently named general agent for Milwaukee County for the Oakland. The garage and offices are at 239-241 Wisconsin Street.

Bush Resigns from Velie.—R. R Bush, who joined the Velie Motor Vehicle Co., Moline, last August, as sales manager, and was later made general manager of the company, has resigned his position and will leave shortly for Kansas City where he will engage in the automobile business for himself Mr. Bush has associated with him in his new venture W. H. Morgan, who came to the Velie company with Mr Bush and was appointed local territory sales manager. The new Kansas City firm will be known as the Bush-Morgan Motor Co., Inc., and quarters at 152 Grand Avenue, have been secured. Mr Morgan has been succeeded by H. J Daniels. The successor to Mr. Bush has not been decided on as yet.

VOL. XXXIII NEW YORK—THURSDAY, JULY 15, 1915—CHICAGO No. 3

The AUTOMOBILE

Willys Starts New Knight Régime

Elyria Plant Builds All Knight Motors—Chassis Assembled in Toledo—Four-Cylinder Car at $1,095—One Chassis and Four Body Types

FOR the first time in the history of the automobile industry, a car with a non-poppet-valve engine is to be produced in quantity. It has remained for John N. Willys, the mainspring of the Willys-Overland Co., Toledo, Ohio, to see the possibilities of the Knight sleeve-valve motor as a production proposition, and his plan to popularize it is revealed in the new Willys-Knight car at $1,095.

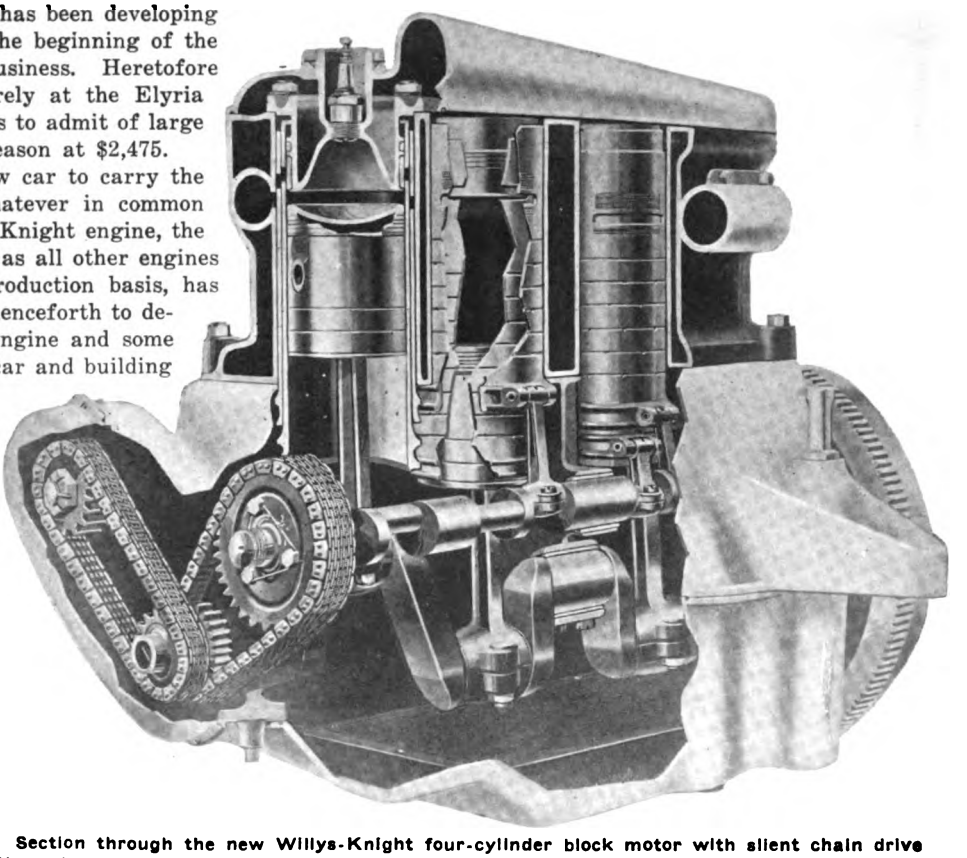
Although this is not the first sleeve-valve car to be built by the Willys organization, which really has been developing the Knight motor since 1913, it marks the beginning of the type as a big factor in the Overland business. Heretofore the Willys-Knight cars were built entirely at the Elyria factory, and their design was not such as to admit of large quantity output. They were sold last season at $2,475.

But all this is changed now. The new car to carry the name of Willys-Knight has nothing whatever in common with former cars of that name. A new Knight engine, the same in basic construction and principle as all other engines of the type, but brought down to a production basis, has been developed, and the Elyria plant is henceforth to devote its entire energies to making the engine and some of the parts with the assembling of the car and building of the chassis to be done in Toledo.

Nor do the present rather extensive production plans represent a finality as to the sleeve-valve car output as a part of the factory's production. In fact, the coming season's activities with the Knight-motored car are regarded as merely the beginning of this model with the Willys organization. A separate branch of the factory, known as the Willys-Knight division, has been formed, and it will handle the affairs of the sleeve-valve car separately.

The connection of the Willys-Overland Co. with the Knight engine goes back to 1912 and 1913 when Mr. Willys met Charles Y. Knight. Mr. Willys was skeptical of its merits, and it was not until after he had taken a trip through Europe in a Knight-motored car that he became convinced of its value.

The new Willys-Knight engine, one of the lightest sleeve-valve types yet produced, is 4⅛ by 4½. The rating given is 40 hp. and the power curve shows this obtained at 1400 r.p.m. With no falling off in power, the power curve is



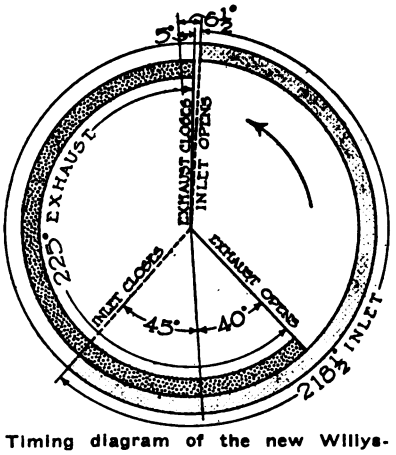
Section through the new Willys-Knight four-cylinder block motor with silent chain drive through the eccentric shaft. This motor gives 50 hp. at 2000 r.p.m. The bore is 4⅛ and the stroke 4½ in.

practically straight reaching 50 hp. at 2000 r.p.m., and at 1000, delivering 29. The precision method of valve actuation has much to do with the steady increase. The cold compression of the engine is 75 lb. per sq. in.

Cylinders Block Cast

In outward appearance it is not unlike many of the clean-cut poppet types now being built. The cylinders are cast in a block and are carried on a two-part aluminum crankcase. In Knight engine building, this is the third design to be made with the cylinders in block, and the production advantages are at once apparent. Thermo-syphon cooling is used and here again there is only one other example. There is a separate aluminum plate covering the top of the cylinder block, forming the top of the waterjacket of the heads and the outlet to the radiator. It is held in place by four nuts which screw down on the tops of the cups in which the spark plugs are placed.

By the method of using the plate as the top of the waterjacket, it is possible to have the waterjackets around the cylinders communicate with the heads of the cylinders, which are individually detachable, as in all Knight engines. In many of the designs, the heads are jacketed separately, and external piping is used to communicate between the two portions holding water. By the Willys construction, water circulates all around the spark plug seat and entirely around the domed cylinder head.



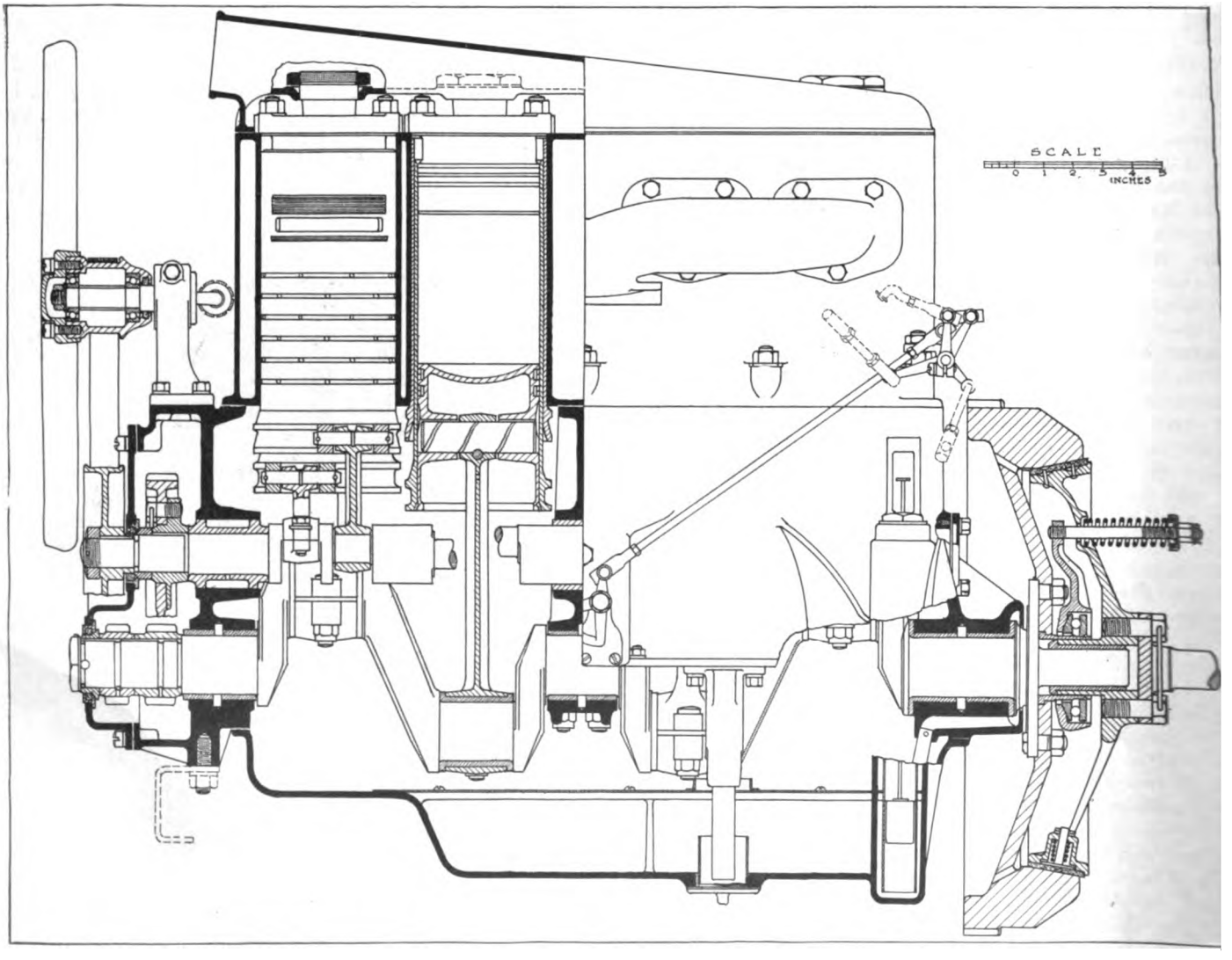
Timing diagram of the new Willys-Knight block motor

In designing the cooling system, one other point stands out of special importance, and that is the provision for draining the cylinder heads. The head is so shaped that the water syphons from it when the system is emptied. This operation is automatic, and obviates the necessity of removing the heads to get rid of the water when necessary.

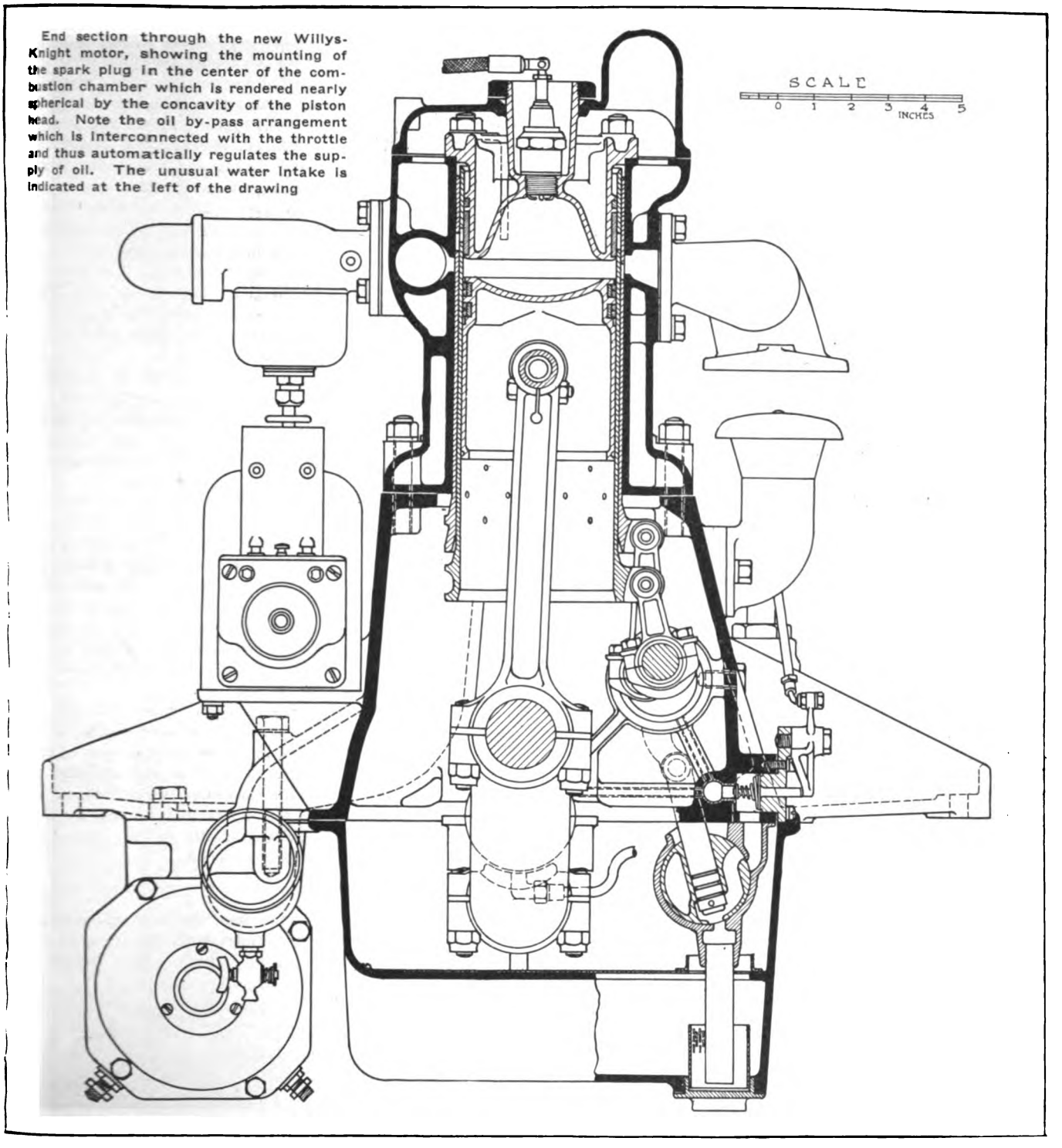
The water inlet connection is also unusual in that the inlet pipe from the bottom of the radiator attaches to the lower part of the right side of the upper half of the crankcase. An integral passage in the case leads the water vertically upward to an opening in the bottom of the cylinder casting. The water is thus introduced to the cylinders at the mid-point of the block length, making for equal distribution in either direction, and allowing for the complete surrounding of the cylinders with water throughout their entire length.

Arrangement of Ports

There is nothing unusual in the working out of the details of the two sliding sleeves and their actuation from an eccentric shaft through the intermediary of short connecting-rods.



Part transverse section through the new Willys-Knight motor, showing layout of crankshaft and also a sectional view through the cl



End section through the new Willys-Knight motor, showing the mounting of the spark plug in the center of the combustion chamber which is rendered nearly spherical by the concavity of the piston head. Note the oil by-pass arrangement which is interconnected with the throttle and thus automatically regulates the supply of oil. The unusual water intake is indicated at the left of the drawing

between the piston and the cylinder wall there are two sleeves, one within the other.

Near the top of each sleeve there are rectangular ports extending part way around the circumference and on opposite sides. In the side of the cylinder there are corresponding slots, that on the left communicating with the exhaust manifold, and on the right with the intake. When, in the slow up and down movement of the sleeves, the slots on the right side of the sleeves register with the opening in the cylinder wall, the intake port is open and there is a clear passage from the manifold to the inside of the cylinder, through the two sleeves. Thus, the three slots in the right side of the cylinder block and sleeves form the intake port, and when they come together the action is the same as when the valve of a poppet motor is raised by the cam.

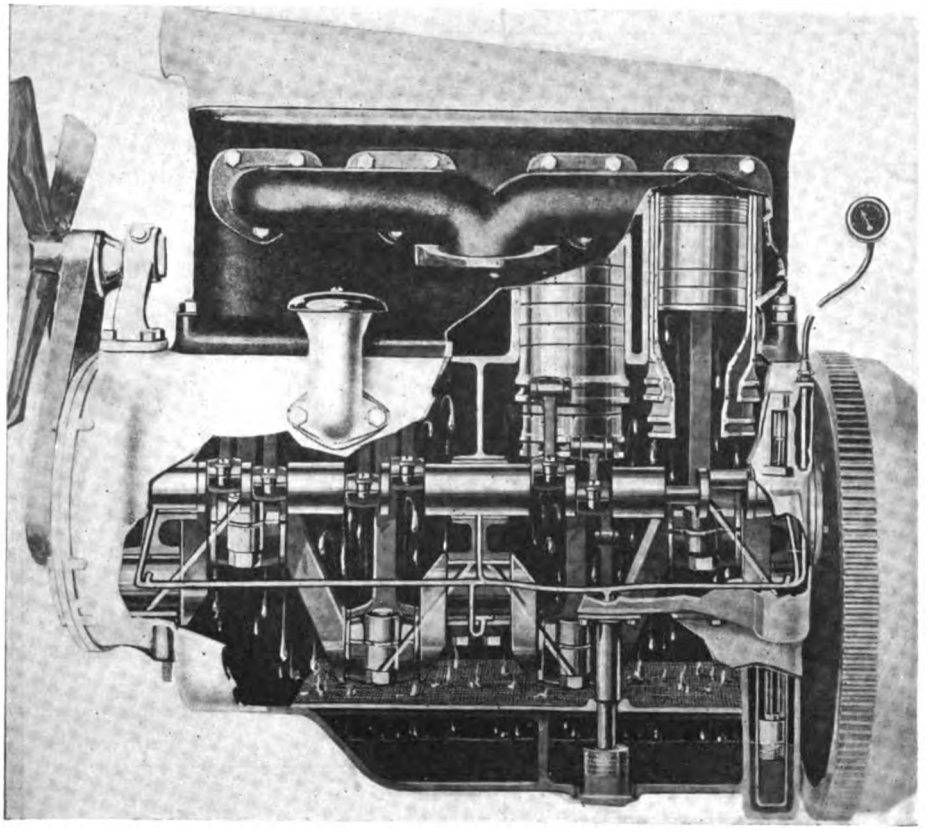
The area of the intake port measures 1.372 sq. in. Its circumferential length is 4 in. and its width is 0.393 in.

The exhaust port is 3¾ in. long circumferentially and 0.410 in. wide, giving an area of 1.5875 sq. in., the exhaust port being larger to give free outlet for the burned gases.

Sleeve Travel

The sleeves travel 1 in. at one-half the motor speed. Since the piston stroke is 4½ in., this means that the sleeves travel at only one-ninth of the piston speed, in other words, if the motor is running at 900 r.p.m., the sleeves are only traveling at a rate at which the pistons would travel when the engine is turning over at 100 r.p.m.

The eccentric shaft is driven at one-half the speed of the crankshaft by a silent chain at the front from the crankshaft and from the foregoing it is shown that the opening and closing of the valves cannot vary, but they are operated



Details of lubricating system. Note that the usual splash troughs under the cylinders are absent. The sleeves are grooved and also drilled with 1-8-in. holes at intervals to insure lubrication. Intake vacuum suction tends to lift the oil up between the sleeves

entirely mechanically, differing from the poppet valve which is closed by a spring. Therefore, no matter what the speed of the engine, there is no chance for the sleeves to get out of time, once they have been properly set. This is one of the strong claims of the Knight design, namely, that at speeds running well up over 2000 r.p.m. a proper mixture is obtained, due to the positive opening and closing of the ports in fixed relation to the movement of the pistons.

The exhaust opens 40 deg. before lower dead center, and closes 5 deg. after upper dead center.

The intake opens 6½ deg. after upper dead center, and it is closed 45 deg. after lower dead center. The diagram shows this timing, and indicates the long duration of the valve opening. The exhaust valve is open for 225 deg. of the revolution, and the intake is open for 218½ deg.

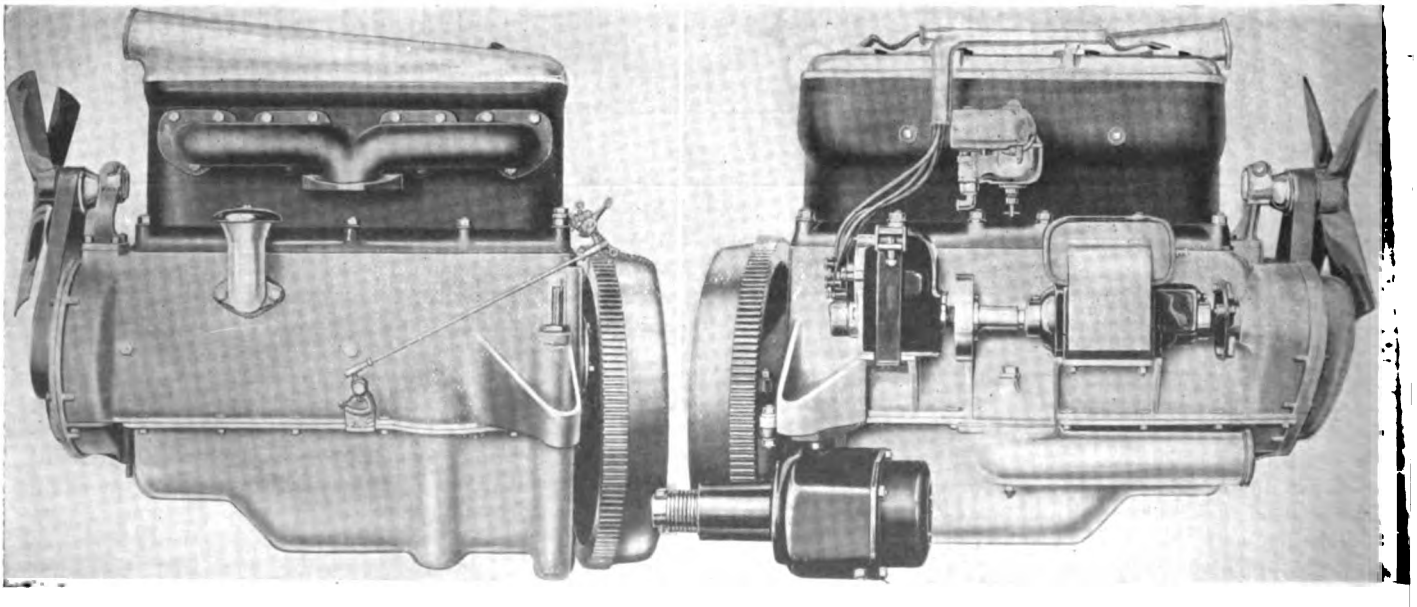
In the design of the sleeves and the rest of the moving parts there is little to distinguish this engine from other Knight types. There are junk rings, so called, between the removable cylinder heads and the inner sleeves so as to prevent the loss of compression through leakage between these two contact surfaces. The sleeve slots are unobstructed, making a free passage for the gases. The compression is held by the junk ring pressing against the inner sleeve and is in no way dependent upon the fit of the sleeves.

From the standpoint of assembling and dismantling, the method of holding the pins used for attaching the connecting-rods to the sleeves is of interest. A small spring ring is fitted to the pin, and when it is slipped through the sleeve bosses and the head of the rod, this ring springs into a groove in the inner surface of the top of the rod end. This groove is open at the top, so that in order to take the pin out, all that is necessary is to use a screwdriver or similar tool to press down on the spring ring until it clears the rod slot, when the pin can be slipped out.

The crankshaft is carried on three main bearings and is of conventional type. Pistons have concave heads, so that a nearly spherical combustion chamber results, due to the piston head shape and the domed form of the cylinder heads. The spherical chamber is the theoretically perfect shape, and the Knight motor affords an opportunity of coming close to it. The spark plug is placed directly in the center of the head, and in a cup already mentioned.

Individual Exhaust Outlets

The exhaust manifold is a separate casting with an individual outlet from each cylinder with the idea of getting rid of the gases as quickly as possible. The intake mani-



Exterior views of both sides of Willys-Knight motor, showing extreme neatness and simplicity of design

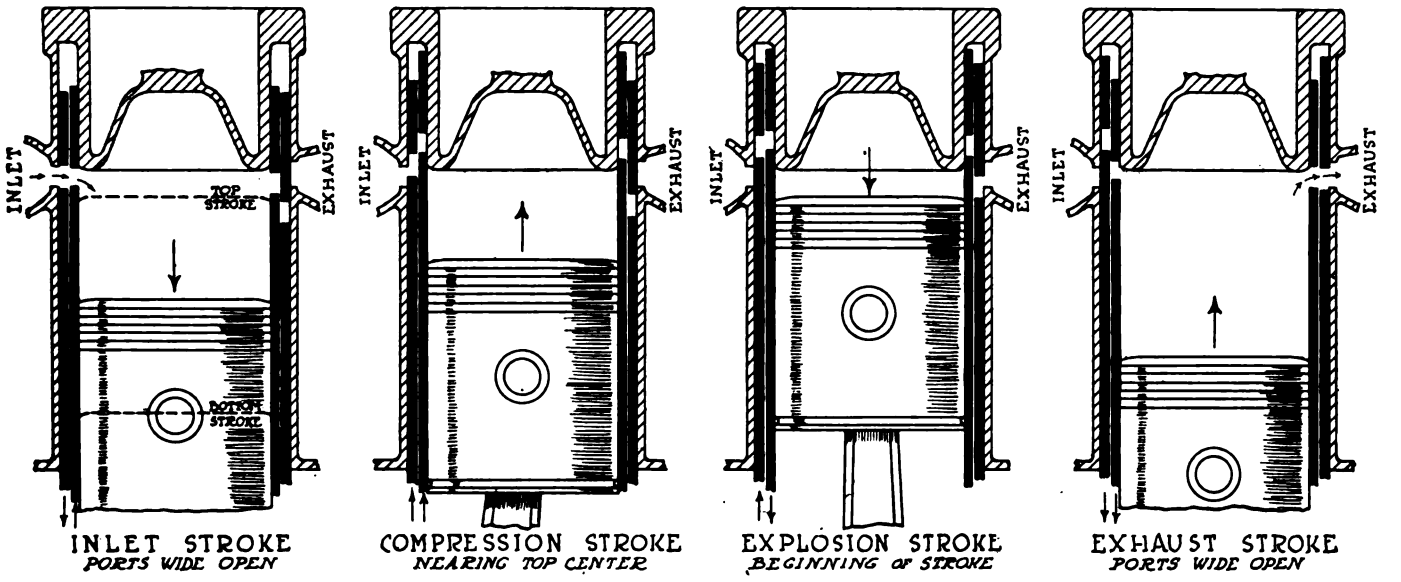


Diagram of sleeve operation at different points of the cycle on the new Willys-Knight four-cylinder block motor

fold is within the cylinder block, no part of it being exposed, the carbureter bolting directly to the casting. Its position is quite high on the block, almost opposite the valves, and this is possible due to the use of the Stewart vacuum fuel feed arrangement.

Lubrication System Simple

Simplicity has been the aim in the designing of the lubricating system. It is called a force feed and splash arrangement. The oil is drawn up from the oil reservoir at the bottom of the crankcase by a unique pump operated from the eccentric shaft and is forced through oil pipes to the crankshaft main bearings, eccentric shaft bearings and chains at the front. The crankshaft webs are drilled, conveying it to the lower rod bearings and the overflow from these is thrown into the sleeves and pistons. Thrown against the skirt of the sleeves, it is carried up between the sleeves through their own action. Circular grooves cut in the outside of each sleeve catch the oil and lift it up, distributing it as the sleeves travel up and down.

Sleeves Drilled for Oiling

The sleeves are drilled with ⅛-in. holes at certain intervals, allowing the oil spray below the piston to pass through the inner sleeve to aid lubrication between the sleeves, and also to pass through the outer sleeve to aid in lubricating the contact surface between outer sleeve and cylinder wall. Suction caused by the intake vacuum tends to lift the oil up between the sleeves, doing its part in assisting the oiling.

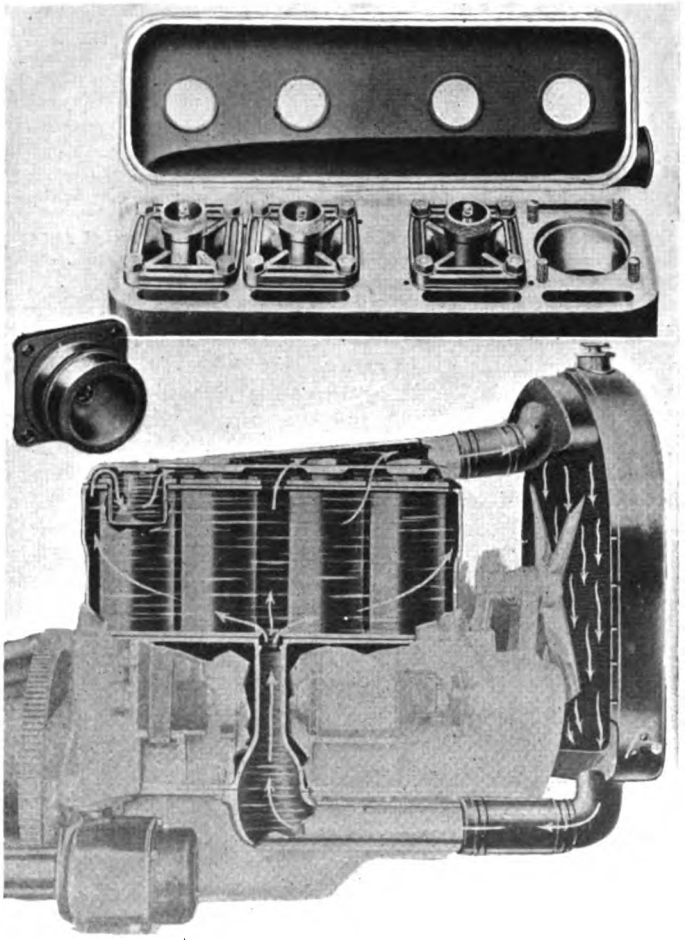
Throttle Regulates Oil Supply

The flow of oil is automatically taken care of by interconnection of an oil by-pass with the throttle. Thus the amount of oil supplied is in proportion to the throttle opening. The pump is so constructed that its entire barrel oscillates as it pumps. This oscillation is taken advantage of to uncover intake and outlet passages, so that no valves are required in the pump, making a simple and efficient device.

The Electric Equipment

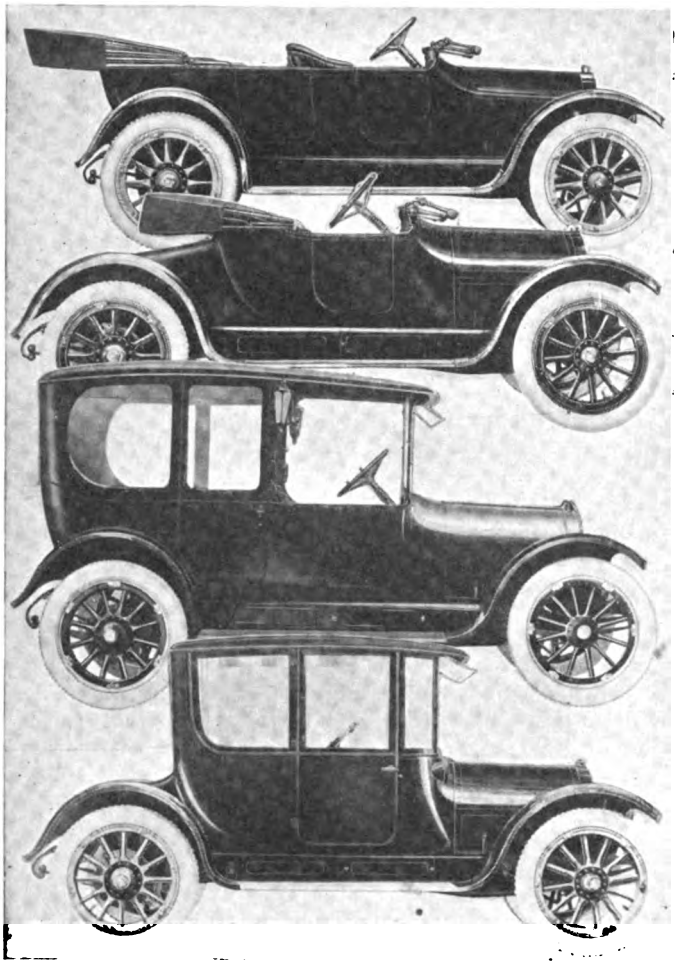
On the right side of the engine are the three electrical units, providing for ignition, starting and lighting. A silent chain, outside of the eccentric-shaft chain, drives the generator shaft at engine speed, and back of the generator is the magneto, both resting on brackets on the crankcase. The starting motor is hung below the right rear supporting arm, and it drives the flywheel through the Bendix connection, which is applied similarly to the other Overland model.

Throughout the chassis and bodies standard Overland practice as used on the six is followed. The drive is through a cone clutch and three-speed gearset to a floating rear axle. The drive shaft, fitted with a universal at the front end, is inclosed within a torsion tube which attaches at its rear



Upper—Illustrating the detachable cylinder head construction of the new Willys-Knight motor and also showing the upper part of the spherical combustion chamber formed by the detachable cylinder head. The cover plate acts as the top of the waterjacket

Lower—Phantom view through the new Willys-Knight engine showing the operation of the water-circulating system



Top—The new Willys-Knight five-passenger touring car selling for $1,095
Upper middle—Roadster on the same chassis which lists at $1,065
Lower middle—Seven-passenger limousine priced at $1,750
Bottom—Coupé model marketed for $1,500

end to the gearbox. The latter is attached to the rear axle which is a characteristic of cars of this make.

The rear suspension is by three-quarter elliptic springs which are underslung from the axle tubes. These springs measure 48 by 2 in., while the front half-elliptics are 36 by 1¾ in. Brakes have plenty of power for the car, the drums having a 14-in. diameter with a width of 2¼ in.

Principal Bearing Dimensions

	PISTON	INNER SLEEVE	OUTER SLEEVE
Length connecting rod bearings (center to center)	10	2 3/16	3¾
	FRONT	CENTER	REAR
Length crankshaft bearings	2½	2½	3 11/16
Diameter crankshaft bearings	2	2	2
Length eccentric shaft bearings	2¾	2⅛	2⅛
Diameter eccentric shaft bearings	1⅝	2	2

One Chassis—Four Body Types

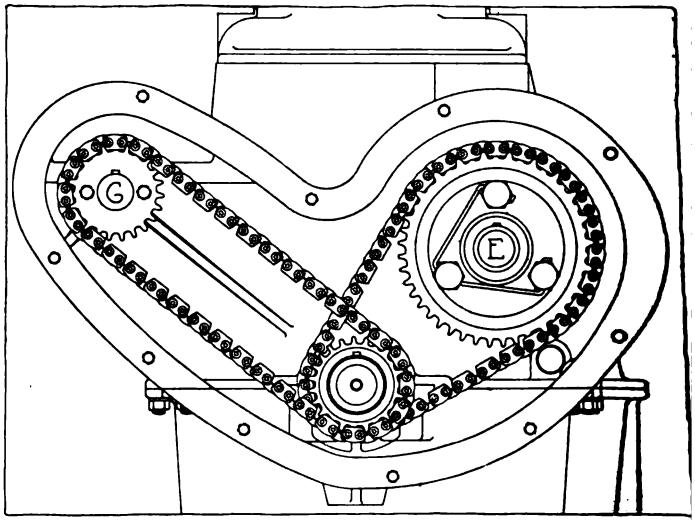
All four of the body types, namely, touring car, roadster, coupé and limousine, are fitted to the one chassis, whose wheelbase is 114 in. Bodies follow out the same general lines as others of this make. The upholstering is of leather, and doors are made wide and fit well into their panels. The fenders are crowned, which is always a point that adds to appearance. For the finish, royal blue with ivory striping has been decided upon as standard. Wheels are gray with fenders and trimmings of black enamel.

The touring car is the only one of the types which sells for $1,095. The roadster is still less, priced at $1,065, while the coupé is $1,500 and the limousine, a seven-passenger design, is $1,750. Needless to say, each car carries complete equipment with the open models fitted with 34 by 4 tires, non-skids in the rear, and the closed cars mounted on 35 by 4½'s, non-skid all around.

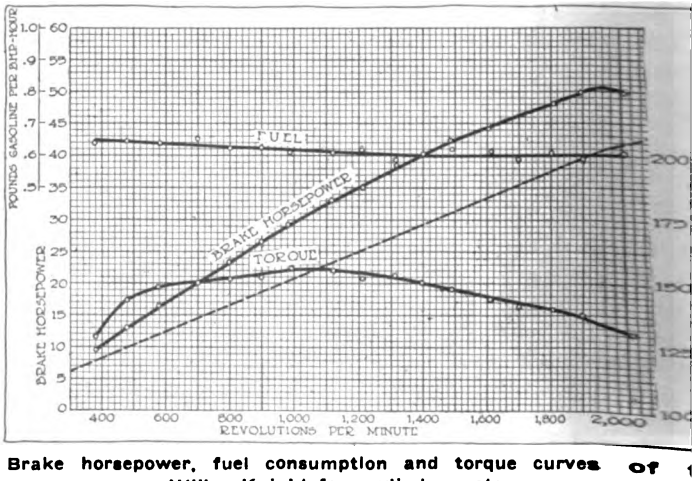
To Issue Circular on Rubber Testing

WASHINGTON, D. C., July 10—The Bureau of Standards, Department of Commerce, is about to issue the third edition of a circular on the testing of rubber goods. This publication, which has been very much enlarged, is fully illustrated, and describes in detail the method of procedure in conducting physical and chemical tests of rubber. The testing machines and apparatus developed at the bureau greatly facilitate the testing of rubber, and the object of this circular is to assist manufacturers and consumers in establishing standard specifications and standard methods of test. The subject matter proper is introduced by a brief outline of the processes through which rubber passes before reaching the factory, followed by a short description of the usual processes of manufacture, which include washing, drying, compounding, "making up" various articles, and vulcanizing. The physical tests most commonly employed are explained very thoroughly. These include tests for tensile strength, ultimate elongation, and elasticity. Conditions affecting the results of tests are discussed at some length and experimental data are given to show the necessity of a standard procedure in testing.

A general discussion of the chemistry of rubber is followed by a brief explanation of the object of each of the analytical determinations that are commonly made. After this are given the methods in use at the bureau.



Layout of the silent chain drive at the front of the new Willys Knight motor. E is the eccentric and G the generator shaft



Brake horsepower, fuel consumption and torque curves of Willys-Knight four-cylinder motor

Packard Twelve Makes 72.7 M.P.H. on Chicago Speedway

First Manufacturer's Test on New Board Track Shows 13.3 M.P.G. for Twin-Six in 50-Mile Economy Test—69.8 M.P.H. with Seven Passengers and Top Up

CHICAGO, ILL., July 10—The first use of the Chicago 2-mile board speedway for testing by manufacturers took place to-day when the Packard Motor Car Co. tested its new twelve for economy, speed and other factors, the test being made under the supervision of the American Automobile Assn. with its officials, timers and starters.

The first test to be made was for economy. In a 50-mile run, with top down and windshield up, carrying five passengers, the new Packard twin-six consumed 3 gal., 95½ oz. of gasoline, averaging for the 50 miles, 13.3 miles per gal. The weight of the car with the passengers was 5400 lb.

72.7 M.P.H. for 10 Miles

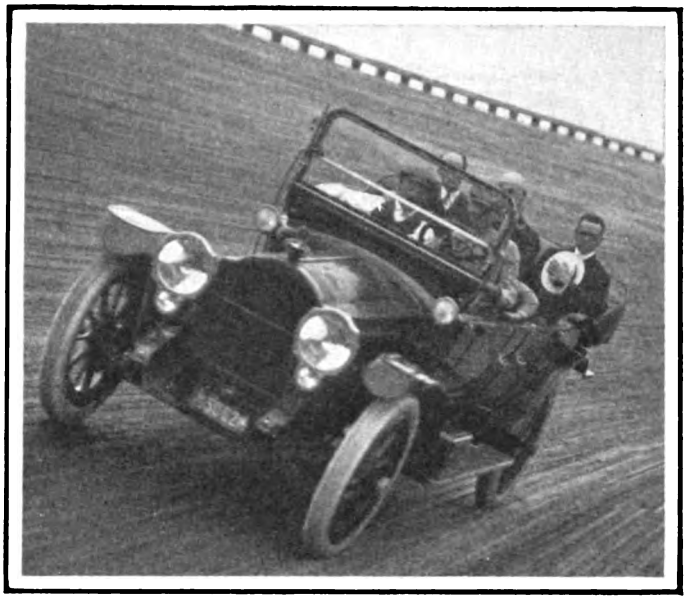
Next, Ralph De Palma, with one passenger, made a 10-mile run, with top down and windshield up, covering the distance in 8 min. and 15 sec., an average of 72.7 m.p.h. Although for a much shorter distance, this betters the record set by the Packard at last year's test by more than 2 m.p.h.

The last test of the day was a 10-mile run with Ralph De Palma driving. He carried six others in the car with him, had the top and windshield up and averaged 69.8 m.p.h. The lap time, as checked by officials on this run was:

Lap. No.	Time
1	1:43.8
2	1:44.2
3	1:43.8
4	1:43.3
5	1:43.3
Total	8:38.4

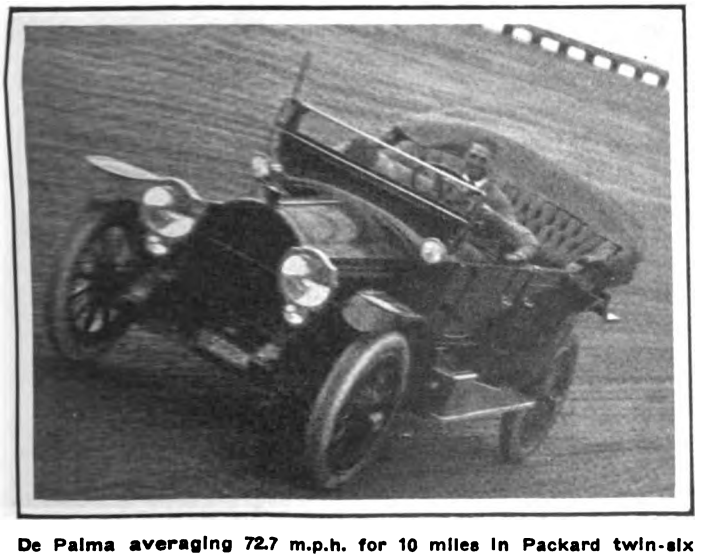
Average 69.8 m.p.h.

Both cars were in full touring trim in the trials. Wind resistance proved quite a factor with the top up and undoubtedly the lower average in the latter test as compared with the Indianapolis test last year is accounted for by the fact that in the previous trial in the Hoosier metropolis, the top was down.

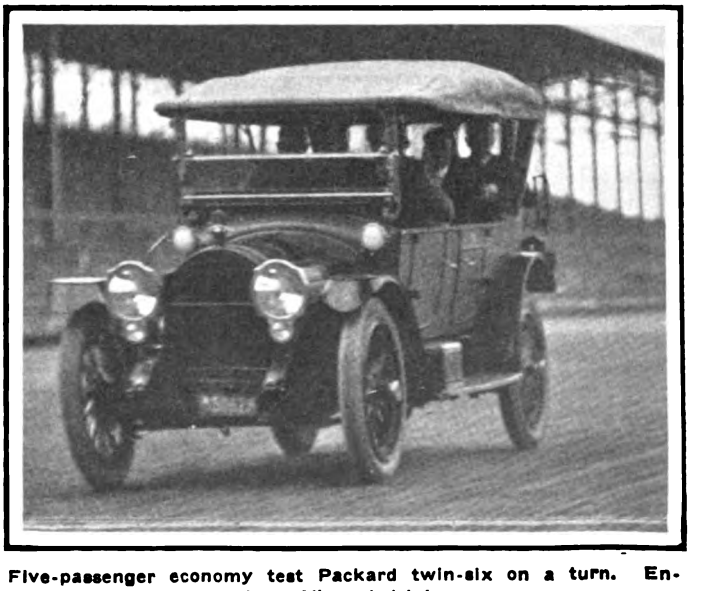


Finish of 10-mile speed test. De Palma driving at 69.8 m.p.h.

One of the cars was shipped direct from the Packard factory at Detroit yesterday, and never had been given any tryout. The other was the twin-six President Joy of the Lincoln Highway Association drove to the Pacific Coast recently. Both carried regulation touring car equipment, including extra tires, and no changes were made in the cars. In other words they were exact duplicates of the cars of this type to be seen in daily use throughout the country.



De Palma averaging 72.7 m.p.h. for 10 miles in Packard twin-six on Chicago speedway



Five-passenger economy test Packard twin-six on a turn. Engineer Vincent driving

Owen Magnetic Makes Progress

Entz Transmission in Chassis Shows Great Improvement Over Original Design—A New Sort of Motoring

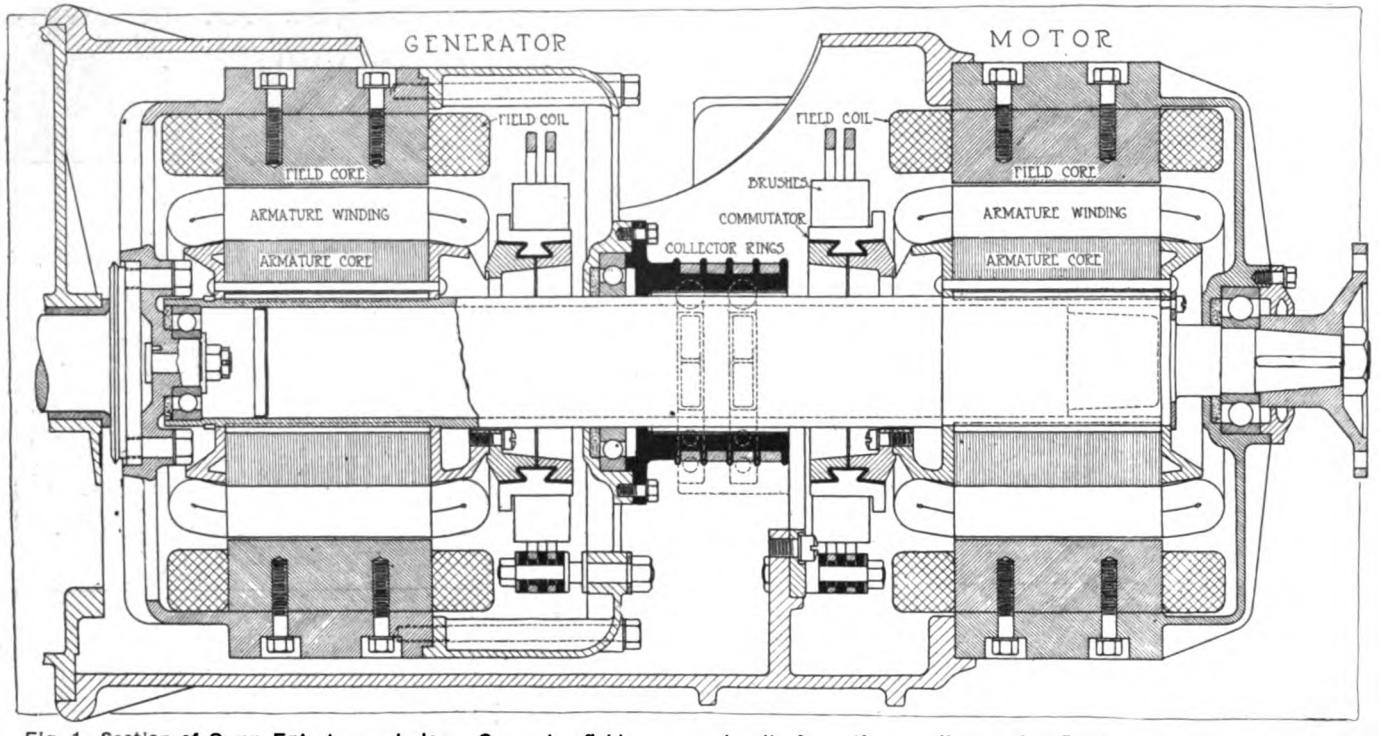


Fig. 1—Section of Owen-Entz transmission. Generator field cores and coils form the gasoline engine flywheel and the collector rings shown are for the purpose of connecting the field current of the generator to the various circuits. The brushes of the generator revolve with the field. The two armatures are identical and both are keyed to the hollow shaft which is attached to the propeller shaft and has no connection with the engine

IN the Owen magnetic transmission car there is never any positive gear connection between the motor and the rear road wheels.

Quite what this means is appreciated, once it is experienced, but to describe in words the effect, from the viewpoint of the ordinary passenger in the car is extremely difficult. If the reader has ever ridden in a wind wagon or a wheeled vehicle driven by an aeroplane motor and aeroplane propeller, he will have some idea of how the Owen car feels to ride in. Or if he has not this experience an idea may be obtained by imagining an immense rubber shaft which is twisted at one end by the motor and drives the axle by untwisting at the other. That is to say there is a perpetually soft cushion between the source of power and the wheel, it is impossible for shock of any sort to be carried from one to the other as the intermediary mechanism forms a sort of energy reservoir always prepared softly to absorb excess power or to give out again extra torque to the axle.

Perhaps it might be said that the magnetic transmission is to the chassis what the pneumatic tire is to the wheel. It does not add so much to the comfort of motoring as does the pneumatic tire compared with a steel tire, but the utter absence of all sense of hardness is very similar to that given by the pneumatic.

The Dual Control

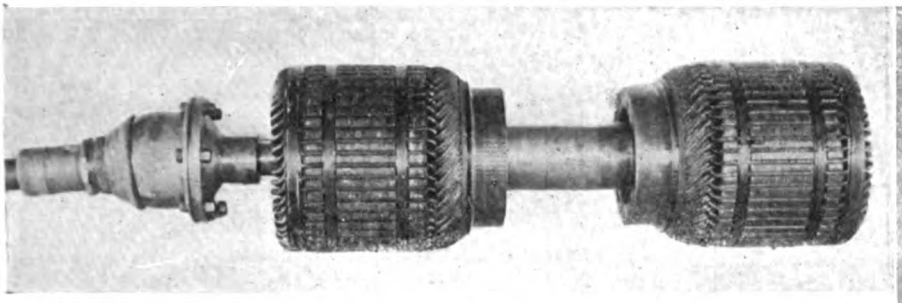
The car handles more as though it had only one speed. There is a throttle pedal which operates normally, and above the steering wheel is a lever very much like the usual throttle lever. If opening up on the accelerator pedal is not enough to meet the road conditions of traffic or gradient, then the lever is pushed along an inch or two, and the car gathers way just as though a second gas feed had been put into commission or a few more cylinders added to the motor.

An Ever Slipping Clutch

The principle of operation is really that of the clutch. The Entz transmission is an electro-magnetic clutch which is always slipping, sometimes a great deal, sometimes a very little; and the energy dissipated by the slip is caught, to be used up again later on. If a car had a clutch made of some material which could not be burnt nor worn out it would be possible to arrange a transmission by a purely mechanical device for tightening or loosening the grip of the clutch, but if this were done, the instant the clutch began to slip energy would begin to be thrown away in the form of heat. This could not be recovered, and also the more we wanted to use the slip so as to give the effect of a lowered gear ratio the greater the proportion of the power that would be wasted.

The magnetic transmission is a clutch that can be tightened magnetically, but the slip creates electricity instead of heat, and the electricity is used to drive the car. We take the high-speed energy from the motor and apply low-speed energy direct to the axle without any connection save a few stout wires.

Naturally enough, a thing so different from the ordinary creates fear in the mind of the prospective purchaser; he wonders what peculiar tricks it may have that he will not be able to understand, and the electrical part awes him with its bright commutator bars and big brushes. Perhaps the



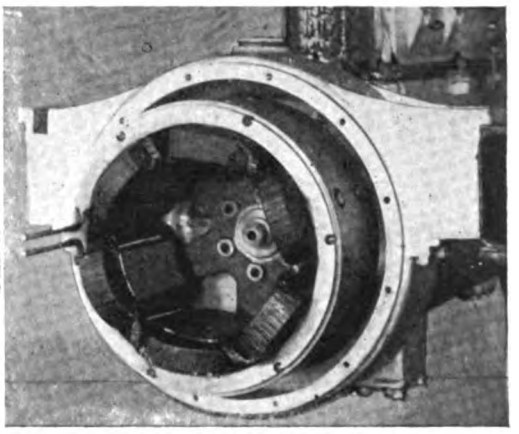


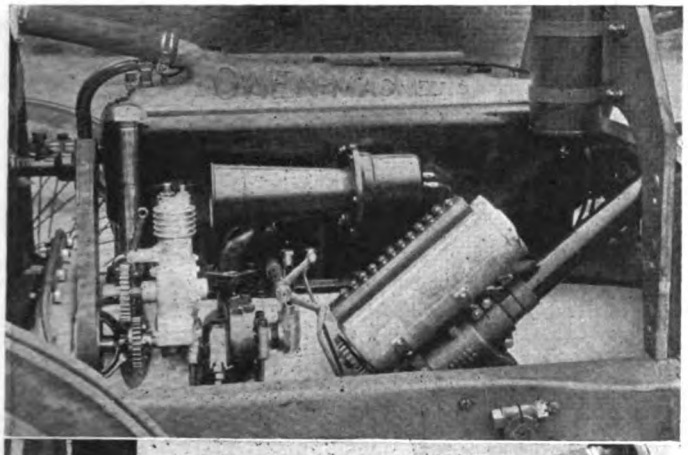
Fig. 2—Left—Armatures of motor and generator attached to propeller shaft
Fig. 3—Right—Field coils, etc., forming flywheel of gasoline motor

simplest way of tackling this point of view is to say that the essentials of the electrical transmission are units of electrical machinery that central station work of nearly two generations has proved good. Added to this is the extremely important point that the brushes and commutator bars which are the only parts of an electric generator that can possibly wear are hardly ever used anything like so hard as they would be in lighting service.

Like all other cars the Owen magnetic does most of its work on high gear and the difference in speed between the electrical moving parts is then only from 60 to 100 r.p.m., as compared with several hundreds of revolutions for a central station dynamo or several thousand for an automobile lighting generator. Obviously so slow a rubbing speed of brush on commutator as this can produce but very little wear indeed so the life of the parts ought to be very great.

Process of Driving

To start the car all there is to do is to pull the lever on the steering wheel into the starting position, which turns the motor over at a high speed, owing to the size and power of the electrical machines available. Then, without touching the accelerator pedal it is possible to go forward or backward by merely moving the lever on the steering wheel to and fro.



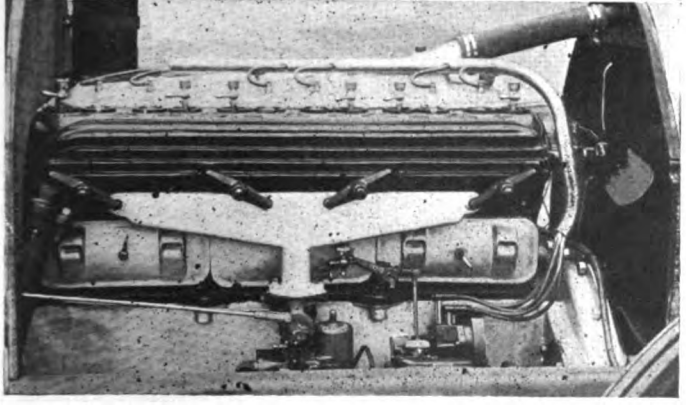


Fig. 4—Upper—Controller box at base of steering column, showing gear connection. This box contains all switches and resistance coils
Fig. 5—Lower—Buda motor in Owen Magnetic chassis

Flexibility Illustrated

One of the most curious effects is that the motor can be used to hold the car on a grade by letting it turn over at an idling speed and putting the lever in a position which allows the maximum slip in the transmission short of complete freedom. A favorite demonstration with the car in order to show the flexibility of the transmission is to drive the car to the middle of a ramp with fairly steep gradient, set the hand lever in a position where the motor can hold the weight of the car against gravity and then go slowly forward or backward by gently opening or closing the throttle. It is not suggested that this ability to use the motor to play with the car on a grade is of much utility, but it is a good way of showing how the transmission is the equivalent of a clutch that can be tightened or loosened by varying the magnetic grip.

Stages of Grip

Turning to the diagram, Fig. 1, the field magnets and coils of the *generator* form the flywheel of the engine. Neglecting the *motor* part of the transmission, the armature of the generator is on a shaft running free on a spigot ball bearing in the flywheel and attached at the other end to the drive shaft and so to the bevel pinion of the rear axle.

Thus the field of the generator runs always at engine speed while the armature of the generator runs always at propeller shaft speed.

The effect of running the engine and so spinning the field magnets of the generator is to induce currents in the armature which make a magetic attraction between the armature and the field. This is equivalent to tightening the fields upon the armature if we follow the clutch analogy, so the armature tries to turn with the field and will do so if the resistance to motion of the car as a whole is not too great. This means that part of the energy in the flywheel of the engine goes to the creation of electric currents in the armature coils, and part to the direct mechanical work of turning the armature and so driving the car.

Now this current that is created in the armature of the generator is taken to the second part of the transmission which is an electric motor. This is also shown in Fig. 1 and its field magnets are fixed stationary while the armature is keyed to the same shaft as the armature of the generator. Thus whatever else happens the two armatures are always running at the same speed and that speed is the speed of the propeller shaft.

Circuits One by One

On the foot of the steering column there is an aluminum case containing sundry resistance coils and a switch or two.

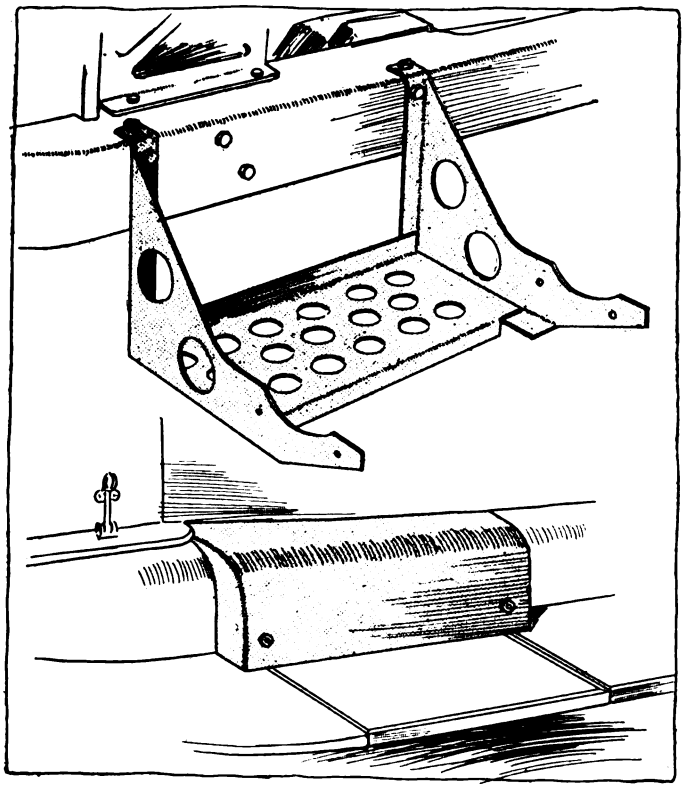


Fig. 6—Upper—Steel cradle attached to chassis side member for support of battery

Fig. 7—Lower—An instance of the neatness of the car. The battery cover on the running board. This is attached by two nuts and a portion of the board slides out if it is desired to remove the battery completely

The parts are of robust size and comprise the whole of the control. In the following the effect of moving the lever on the wheel is described in electrical terms and the description should be read with continuous reference to Fig. 1, remembering all the while that:

a—The generator field runs at engine speed.

b—The motor field is stationary.

c—Both armatures revolve together at drive shaft speed.

Neutral Position

All circuits are open and there is no current being generated or used. The battery is idle unless in use on the lamp circuit at night.

Cranking Position

Current from the battery is switched into the generator causing the latter to behave as a motor and spin the engine.

Charging Position

Small boosting charge taken from generator and put into battery, only used if battery is accidentally low.

First Car Motion

Generator field windings connected through resistance thus causes gentle excitation and prepares the generator for larger current demands.

Second Position Equals Lowest Gear

The generator field is short circuited so that maximum current is produced. This causes the field to grip the armature and also sends current from the generator to the motor part of transmission where it assists to drive car. Battery is totally out of use.

Third Position

Resistance is switched into the field coils of *motor*, so throwing a greater load on the generator which is equivalent to tightening the magnetic grip on the armature.

Fourth Position

It is similar to last only more resistance is put into the motor field. Successive positions act in the same way till we come to the seventh and last.

High-Gear Position

As in the first-speed position the generator field is shorted, but instead of current being sent to the motor none is switched into any outside circuit whatever. This gives the greatest possible grip because all the current generated is used to attract the armature and drag it around. This high-gear position is paradoxial to some extent because the effect of the grip caused by the current is to reduce the current. That this is so can be seen when it is remembered that the amount of current is proportional to the relative speeds of the generator fields and the generator armature. When these are, say, 1060 and 1000 r.p.m., the relative motion is only 60 r.p.m. and the current generated very small, but just enough to maintain the grip. If we now strike a road resistance like a grade the relative motion increases, the current increases and the grip increases so the clutch tightens itself up automatically to suit the road conditions.

In the high-gear position we have explained that no current is sent to the motor; on the contrary, a special small shunt winding on the motor field is switched into circuit and thenceforward the motor delivers a charging current to the battery.

Electric Brake

An accidental feature of the transmission is to provide an extremely powerful electric brake which automatically releases as the car slows down. It cannot be used for stopping the car altogether because its power depends upon motion of the vehicle, but it is very effective when the car is traveling fast. If the lever be put into the neutral position when the car is running the heavy current induced by the motion of the car in the series winding of the electric motor is turned into the resistance coil employed in the charging position which is used for boosting the battery, as explained above. On a steep grade this electric brake will keep

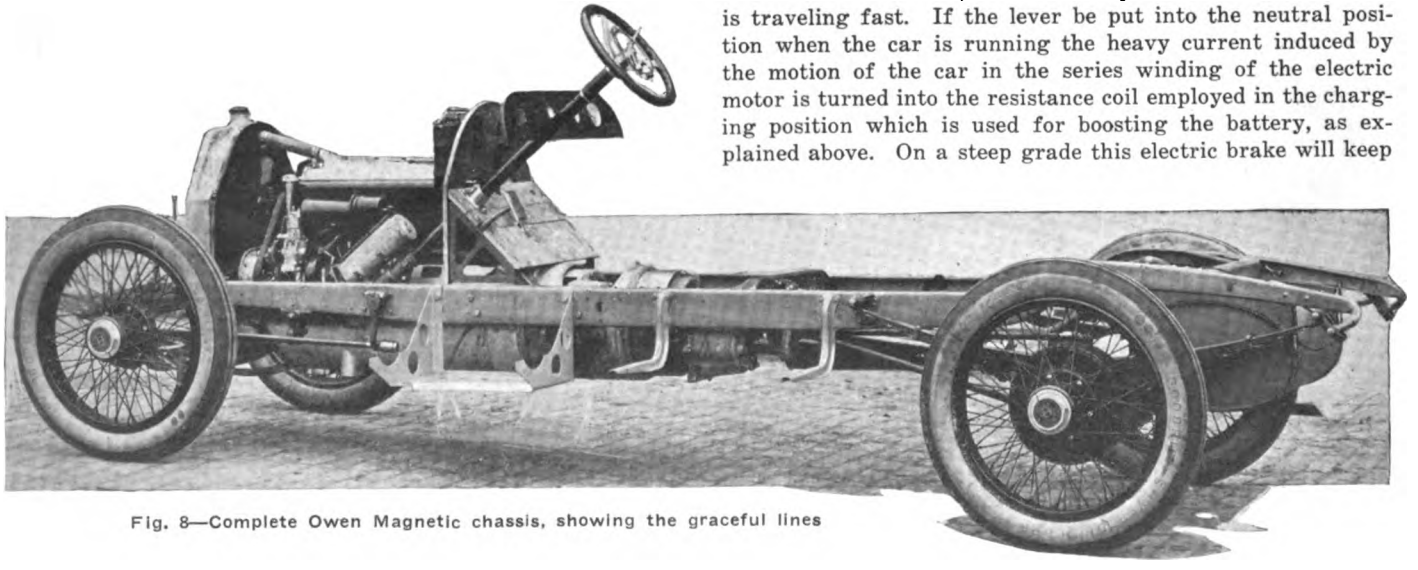


Fig. 8—Complete Owen Magnetic chassis, showing the graceful lines

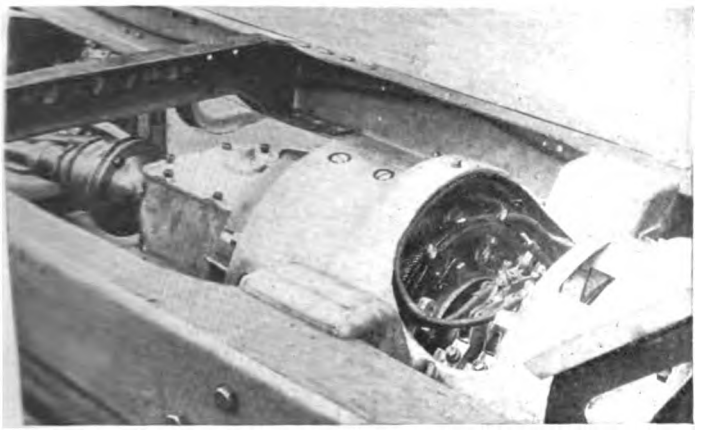


Fig. 9—Complete transmission in place in the chassis, showing accessibility of brush gear

down the speed of the car to 15 or 20 miles an hour, and as it is very useful. Of course it has no wearing parts.

So much for the electrical system; the description is sufficient for anyone who knows a little electrical science and no amount of description will make the detail operation clear to a man who has no electrical knowledge whatever.

Made from Good Components

Desiring to give the transmission the very best opportunity to exhibit its advantages in the hands of users accustomed to the best sorts of automobiles, the Owen company selected for the chassis the parts which it thought would be reliable. For the motor a six-cylinder Buda is used, tested twice by its makers and delivered under a contract that provides for a class of finish usually reserved for exhibitions, and a final inspection after all ordinary inspecting processes are over. Magneto ignition is used, not because the electric energy of the battery could not be employed, but because the magneto makes the motor a separate unit complete in itself.

The rear axle is made by the American Ball Bearing Co., with spiral-bevel drive and very large brakes of the expanding type, totally enclosed. Steering gear and front axle are similarly good and every detail fitting is of the very best quality. In the design of the springs the engineers of the Perfection Spring Co. were given a free hand and the result is remarkably easy suspension with semi-elliptics all around. In designing the radiator the honeycomb, pointed type used for years by Mercedes and Austro-Daimler has been kept in mind, and the bodies are costly hand-made jobs with lines that are in keeping with the chassis.

The engine and the aluminum-housed transmission together make a unit power plant, and connection to the rear axle is through an open-type propeller shaft with two universals. On some of the cars which are intended for long-distance touring a two-speed gear transmission has been added to the rear axle so that the whole electrical range of speeds may be available with either a high or a low axle ratio. Normally a bevel ratio of about 3.5 to 1 suffices and the Pennsylvania mountain roads have been tackled on this gear.

Since the transmission was described in THE AUTOMOBILE a little more than a year ago it has not been changed in principle, but the car has been changed a good deal. Instead of being an experimental vehicle with the noticeable crudities of experimental jobs, it is a handsome car with a well-designed and proportioned chassis.

Thus described the chassis sounds simple enough, as it certainly is. There is no mystery about the action of the transmission whatever. What cannot be put into words is the really remarkable difference between driving a car with this transmission and an ordinary car. One most curious effect is that if the foot is taken off the accelerator pedal the effect is equivalent to releasing the clutch of an ordinary car. The motor is totally disconnected as soon as the magnetic grip lets go and this it practically does as soon as it gets down to idling speed. Downhill, then, the car coasts freely and in pulling up on the level the throttle can be shut much further from the place where it is desired to stop, since there is no frictional resistance offered by the motor as it slows to idling speed.

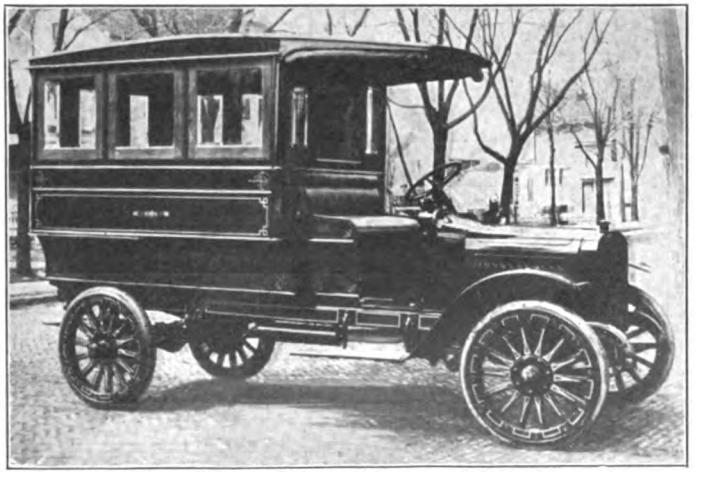
While all ordinary hills can be taken without touching the control, the wide range of speeds allows a very rapid acceleration up hill if starting on the grade because the engine can be allowed to run up to 1000 revolutions or so and then the control slowly pushed forward. As step by step it passes the engine speed holds more or less constant at its power peak position and the car gathers speed.

To handle this car is an experience that would be enjoyed immensely by any driver of experience because it provides a really new sensation. Though easy to handle there are many little things which can be learned and which help to get the very best out of the car and there is a great fascination in controlling with a touch of the finger instead of with combined action of hand, foot and eye.

Beck Jitney Bus Has Steel Body

A vehicle which is suitable for either hotel bus or jitney work with a body having a passenger capacity of ten or twelve has been brought out by Beck & Son, of Cedar Rapids, Iowa. It has a rated capacity of 2,000 pounds and is an assembled design throughout with a special body built of steel. As shown in the accompanying illustration, this is a drop-window design with a rear step. It is upholstered throughout in leather and is weather-proof.

The power plant is a Continental, 3.5 by 5 design with the four cylinders cast in a single block. Other specifications of the motor include a three-bearing crankshaft, splash lubricating system and thermo-syphon cooling. The power is delivered through a twelve-plate disk clutch to a three-speed gearset. Throughout, the drive is standard, being taken through two universal joints to an internal gear rear axle having a ratio of 6.5 to 1. The wheelbase is 124 inches, the tread standard and the tires are solid 35 by 3 front and 35 by 3.5 rear. Pneumatics 35 by 5 will be furnished at an extra cost of $50. The car is fully equipped for electric lighting having a 100-ampere hour storage battery.



Combination jitney and hotel bus brought out by Beck & Sons, Cedar Rapids, Iowa. It has a capacity of 2,000 lbs.

The Engineers' Forum

American-Built Motors of Recent Design Compare Favorably with European Products—Both Develop Over 12 Horsepower Per Liter Displacement

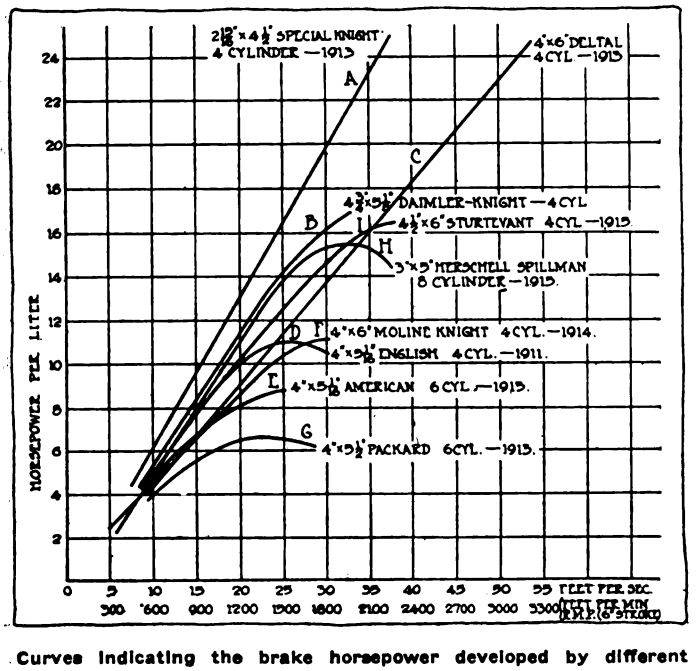
By Chester S. Ricker, M. E.

INDIANAPOLIS, Ind.—Editor THE AUTOMOBILE:—The first article by S. Gerster on Europe's High-Efficiency Motor in THE AUTOMOBILE for April 15 is exceedingly interesting as it brings up some very pertinent questions in regard to motor speeds. Mr. Gerster gives racing motors an average piston speed of 59 to 65 feet per second and touring car motors 46 to 52 feet per second in the paragraphs which apply to this factor in motor efficiency.

It is very interesting to compare some curves which were published under Mr. Charles Y. Knight's name in THE AUTOMOBILE for December 4, 1913, with curves of some later motors, such as have been brought out during the past year. One of these motors is an eight, the other a four-cylinder. It is particularly interesting to make these comparisons after reading Mr. Gerster's article because it gives one a concrete answer to the question, "How near do American motors approach the best European practice?"

Power Per Liter Displacement

The only way that the writer knows by which motors of varying sizes and strokes may be directly compared is to plot curves between piston speed and horsepower per liter. While it would seem more logical in this country to use cubic inches per horsepower as one of the units, it is more convenient to employ the liter displacement unit in order to make direct comparisons with European figures. In Mr. Knight's power curves r.p.m., instead of piston speed, is made the abscissae, but that is hardly fair to either long or short stroke motors, so his curves, A, B, C, D, E in the accompanying plot have been corrected to read feet per second instead of r.p.m. Otherwise no changes have been made in his curves and in addition curves, F, G, H, I have been added.



Curves indicating the brake horsepower developed by different motors under test

Official Tests of Eight and Four

Curves F and G are particularly interesting as they are the official test results obtained from the Automobile Club of America tests on the two motors in question. The curves, H and I are equally interesting because they are representative of two entirely new developments in commercial motor design. The first one is that of the new Herschell-Spillman eight-cylinder V motor, while the second curve is that of a four cylinder T-head motor with four valves per cylinder. The latter motor has been in hard service for over a year in quite a number of motor boats, one in particular being the U. S. Navy record-breaking Hydroplane. In this service it runs normally at 75 per cent. of its maximum power, yet at that speed it delivers 12.3 horsepower per liter of displacement, which is considered very high.

Consideration of the Curves

Curve A. This curve was made by a small special Silent Knight motor having 126 cubic inches displacement, 2.016 liters and developing 50 horsepower at 3,000 r.p.m. The bore and stroke of the motor were 75 by 114 millimeters. Its maximum piston speed was, therefore, 37.5 feet per second. It also raises the question in the writer's mind as to how much more power this motor would have developed had it been carried up to 50 or 60 feet per second, as Mr. Gerster states can be done in racing practice. Suffice it to say, that the Knight motor performance has the characteristics towards which all other motor builders are striving. But this curve represents a motor which is not commercial so we must turn to one which is.

Curve B. This is much more nearly a standard of Knight practice in commercial motors, but Mr. Knight states that the maximum efficiency of this motor, 16.75 horsepower per liter, was obtained at 2,200 r.p.m. and that two carbureters were used, two Zenith carbureters being the only non-standard feature of the motor.

Eight Develops 70 H.P. at 2,380 R.P.M.

Curve H. The third highest curve is that of the Herschell-Spillman eight-cylinder motor. This motor developed a maximum horsepower of 70 at 2,380 r.p.m. at which point its efficiency of performance was 15.5 horsepower per liter of displacement. The cylinders have 3-inch bore and 5-inch stroke, giving a displacement of 282.4 cubic inches or 4.518 liters. The test was made with the motor equipped with

Westinghouse ignition and Zenith eight-cylinder type of carbureter. The latter was fitted with No. 21 Venturi tube, No. 120 jet, No. 115 compensator and No. 50 well. It is very interesting to note how closely this curve parallels that of the standard Knight curve, B. It shows that this motor runs just a little faster in order to accomplish the same results. If the valves were only a bit larger this motor would probably duplicate the Knight performance.

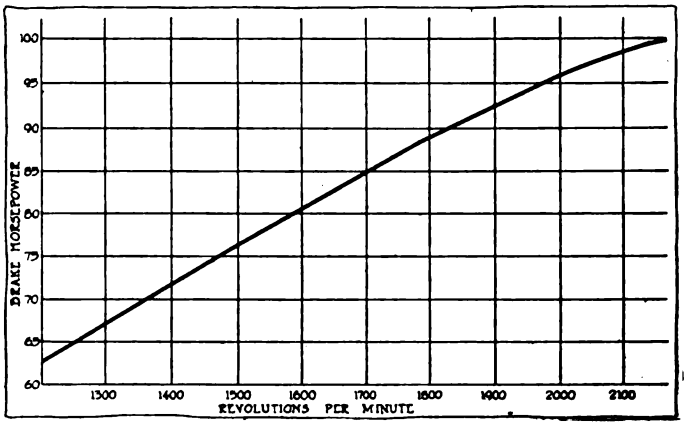
Curve I. The Sturtevant motor seems to be a continuation of the Curve D which was taken from some anonymous English motor. It does not show such a rapid increase in efficiency as the eight but reaches a bit higher output, the best performance of this motor being reached at 2,150 r.p.m. when it develops 100.5 horsepower or 16.4 horsepower per liter. But this motor is designed to run normally at an output of 12.5 horsepower per liter and does it. The next best efficiency for long running is found in the Moline-Knight Curve F, which has a maximum output of 11.1 horsepower per liter, at 28.6 feet per second. During the 300-hour test at the Automobile Club of America it developed only 7.94 horsepower per liter when running at an average speed of 18.6 feet per second for the whole test.

Curves D, E, F, and G are used merely for comparison.

Some Details of Sturtevant Motor

The Sturtevant motor has a T-head cylinder like that shown in Fig. 6, of Mr. Gerster's article only the valves have vertical stems instead of inclined ones. The bore and stroke are 4.5 by 6 inches, respectively, the displacement being 381.6 cubic inches, or 6.105 liters. At 1,475 r.p.m. or 24.6 feet per second piston speed, this motor develops 75 horsepower, or 12.3 horsepower per liter. At 2,150 r.p.m. or 35.9 feet per second it develops 100.5 horsepower or 16.4 horsepower per liter.

The motor is not freakish in construction and surprisingly light for a marine engine. It weighs only 650 pounds, including the reversing gear mechanism, clutch and elevated starting crank. The valve diameter, clear, port opening, is 1 13-16 inches. All the valves have a 7-16-inch lift and a 45-degree seat. The valve timing is not unusual except that

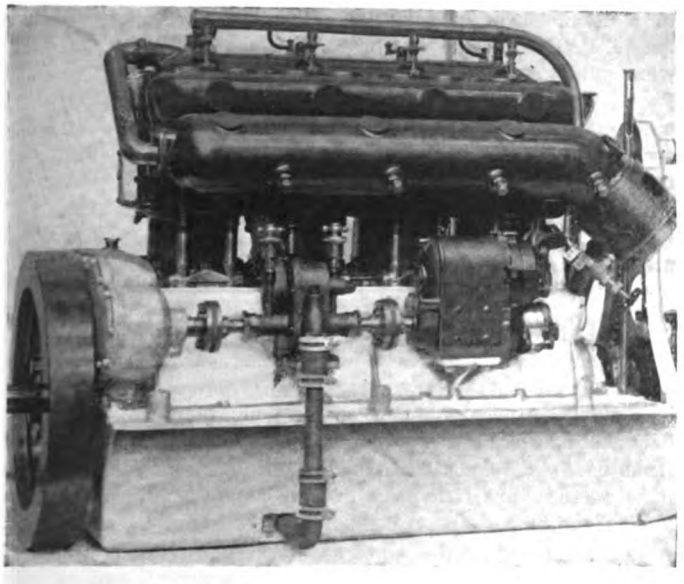


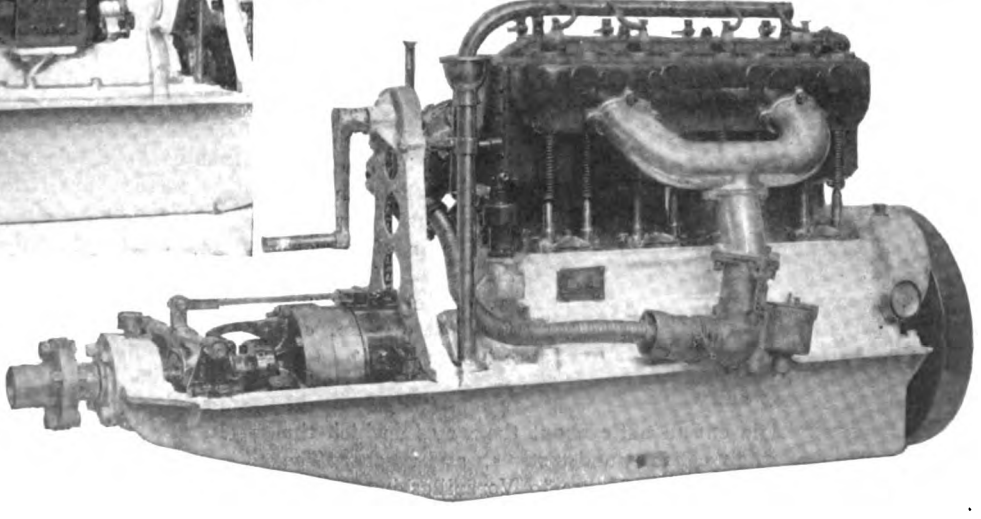
Brake horsepower curve of the four-cylinder Sturtevant marine motor model E-4

the inlet and exhaust valves are overlapped. This, however, has been practiced on T-head motors for a long time. The exhaust valves open 45 degrees ahead of bottom center and close 10 degrees after top center. The inlet valves open on top center, thus overlapping the exhaust 10 degrees, and close 30 degrees past bottom center. The compression ratio is 4.5 to 1. All of these motors are equipped with a standard 2-inch Zenith carbureter, this size having been found to give the maximum performance. The reciprocating parts are especially light, considering that the pistons have three rings and are made of cast iron. The piston pins turn in the piston bosses which are bushed with bronze. Still the pistons, with rings and piston pin, weigh 1,150 grams or 2.54 pounds and the connecting-rods weigh 1,180 grams or 2.6 pounds. The total weight of reciprocating parts, therefore, is only 3.84 pounds. These tests were made with Bosch ZR magneto and only one set of spark plugs over the intake valves. It is quite possible that this motor would have developed more power if two spark plugs had been used.

Conclusions

From the above, it seems that we are building motors in this country that show up very well with European commercial products, although both of these motors only have a maximum speed of about 37.5 feet per second and a normal running speed of about 25 feet per second. Both of these motors can develop better than 12 horsepower per liter displacement, which seems from this data to be the average towards which we ought to strive—this power output to be obtained at not over 25 feet per second piston speed. It will be noted that the eight-cylinder motor develops nearly 14 horsepower per liter at this speed.—CHESTER S. RICKER, M. E.





Above—Exhaust side of four-cylinder Sturtevant marine motor, showing mounting of magneto and pump. Right—Intake side of the same power plant. Carbureter is mounted at an angle to allow for the slant of the motor when in a boat. Note large manifold and hot air connection

A Jeffery quad hauling a Krupp gun belonging to the Belgian army through northern France

War Trucks and Tractors Well Tested

Organization Excellent—Guns on Four-Wheel Drive Chassis

By W. F. Bradley,
European Representative of THE AUTOMOBILE.

PARIS, June 21—After several months spent in France and Belgium in the respective interests of the Jeffery and the Knox companies, Messrs. H. C. Hill and H. F. Blanchard will sail from Bordeaux for New York next Saturday. Mr. Blanchard has demonstrated the Knox tractor to the French army authorities, and after tests on gradients officially certified to have 12, 16 and 19.7 per cent, has convinced the authorities of the value of his vehicle and has been given the desired contract. Mr. Hill is leaving behind in France about 2,000 Jeffery quads and trucks and fifty Jeffery quads in Belgium. In addition, England has 100 and Russia 400 quads.

French Army Trucks Well Manned

"Before coming over here," said Mr. Blanchard to THE AUTOMOBILE representative, "I was filled with stories about disorganization in the French army. According to these reports all the men who knew anything about automobiles had been sent into the trenches and green men were being broken in to handle trucks. It was stated that everywhere there was a square peg in a round hole. Well, I have seen something of French military matters, and I want to say that they have some organization. Everywhere I have been the officers and men have been leading engineers from good factories such as the Delaunay-Belleville, Panhard, De Dion Bouton, Delage and Peugeot, who know everything there is to be known about an automobile. Up at Havre the man who receives and tests American trucks is Adjutant Lemale, a clever Delaunay-Belleville engineer and inventor of a wonderful gasoline turbine used in French torpedoes. His assistant was attached to the Darracq factory. The chief French buyer is Lieutenant Lumet, who holds the post of chief engineer at the Automobile Club of France laboratory."

Tested in Ditches and Over Hills

Mr. Blanchard is enthusiastic about the way in which the French organize their convoys and test men and trucks. The American trucks come from Havre to Versailles in convoys of forty. In Versailles they are individually examined and fitted out, two drivers are put on each truck or tractor and they are sent where required at the front in convoys of twenty. Each convoy is in charge of a lieutenant on a touring car, and one of the trucks is equipped as a repair shop, and another carries the cooking stove for the men. Mr. Blanchard says that he had the good luck to be present at the final test of a dozen convoys of all-drive tractors, comprising Jeffery quads, Panhard, Renault and Latil four-wheel drivers. They were taken over the hilliest and roughest country around Paris. The Jefferys had to go through a ditch so deep that when the nose of the first machine was down the starting crank was broken off. The crank was fastened up and each machine went through the ditch with a clearance at the front when the rear was elevated of not more than a couple of inches. This test was for the benefit of drivers as well as machines, and no green man could possibly get through it without detection.

75-Mm. Guns on Jeffery Quads

The French government has formed twelve batteries of 75 mm. guns on Jeffery quads. The gun, which weighs 2 tons, has a special mounting on the truck platform, and when it is about to be fired the chassis is raised by means of special jacks so as to take all the load off the springs. The system is so perfect that if a piece of note paper is laid on the top of the supplementary coil springs it will not be shaken off when the gun is fired. The gun kicks back against a special hydraulic brake, the nature of which is a secret, and returns to its original position without varying a thousandth of an inch. There are four guns in each battery, or forty-eight guns mounted in this way. In addition, each gun-bearing automobile is attended by a second Jeffery quad carrying ammunition.

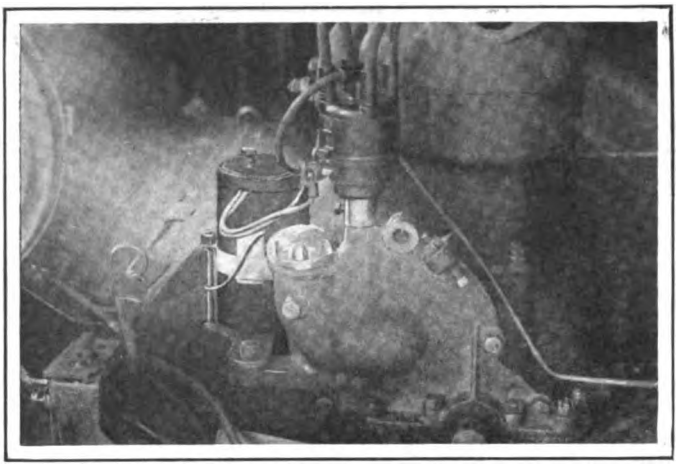
In addition to France, Mr. Hill has transacted business with the Belgian government. Practical tests, in which the Jeffery quad had to haul a heavy Krupp gun, were made in rough

Connecticut Battery Ignition for Fords

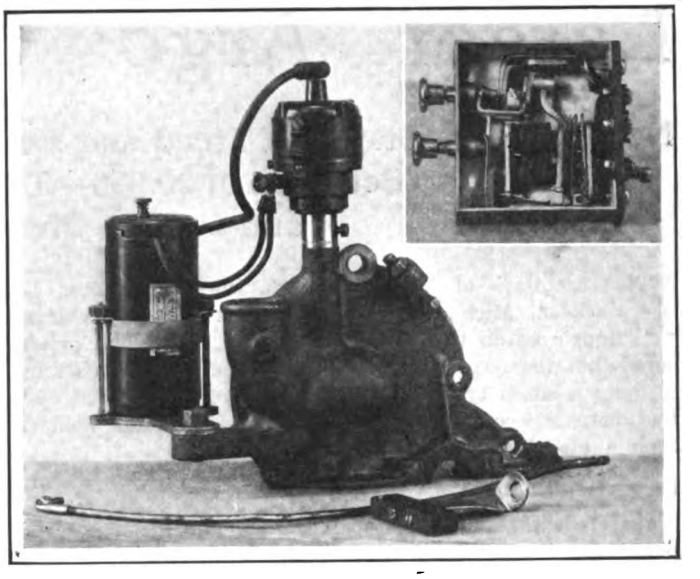
System Mounted on Interchangeable Timing Gear Cover Plate

MERIDEN, CONN., July 10—The Connecticut Telephone & Electric Co., this city, has brought out an edition of the Connecticut ignition system especially adapted to Ford cars. The complete outfit, including wiring and everything except the battery, sells for $28.50 and one of the features of its construction is that it can be quickly installed upon any Ford car. As shown in the accompanying illustration, the plate which fits over the timing gears of the Ford at the upper front portion of the crankcase is replaced by another which is interchangeable with it but which contains the vertical shaft for the timer distributer together with the bevel gear drive necessary for operating it. On a bracket, integral with this same plate, the single unit coil, which is a high-tension, non-vibrating design, is also mounted and connected to the timer distributer by short wires.

The remaining unit is a switch which includes the Connecticut feature of disconnecting the battery, should the switch be left in the on position with the motor not running. The automatic release is effected by a small rheostat which becomes heated from the continuous current passing through it from the battery and bends over, making contact with a small buzzer coil arrangement which in turn kicks the switch out of contact. It is thus impossible to run down the battery by accidentally leaving the switch turned on.



The system as it appears mounted on a Ford motor



Units of Connecticut Ford system. Insert—Flush dash switch

Switch Flush with Dash

Another feature of the switch is that it sets flush with the dash, having only the control buttons on their metal plate visible on the driver's side. The coil being mounted on the new timing gear cover plate which replaces the old one does away with an awkward mounting on the dash of this instrument, thereby permitting a neat layout which can be easily installed with the tools in the ordinary kit.

The Connecticut system operates on the open circuit scheme, the interrupter being so constructed that the primary circuit of the coil is completely saturated before the breaking point is reached in order to produce a spark of maximum intensity upon the interruption of the circuit.

It is claimed that with this system, both electrical and mechanical lag have been eliminated throughout the entire range of motor speed. The breaker mechanism consists of an arm carrying one contact piece, a stationary block carrying the other, an insulated roller carried upon the arm and a cam mounted upon the driving shaft. On the driving cam there are four high spots for the Ford outfit, each of them being 90 deg. from the next. This allows a period for maximum saturation.

Synchronism of ignition, or that quality which allows the spark to occur at the same relative part of the stroke, is obtained by the elimination of the electrical lag due to the intensity of the induced current. In other words, for all practical purposes, the spark occurs at the same position as regards piston travel regardless of the speed of the engine.

The wiring of the system is very simple and by following the directions with the outfit, even an amateur motorist will have no trouble in installing the outfit. The current is taken from the coil lead to the central point of the distributer mechanism and from there carried by means of a brush, to the high-tension terminals from where the current is taken on the high-tension lead directly to the spark plug.

A. J. Picard & Co., New York City, are the exclusive distributors for the new system.

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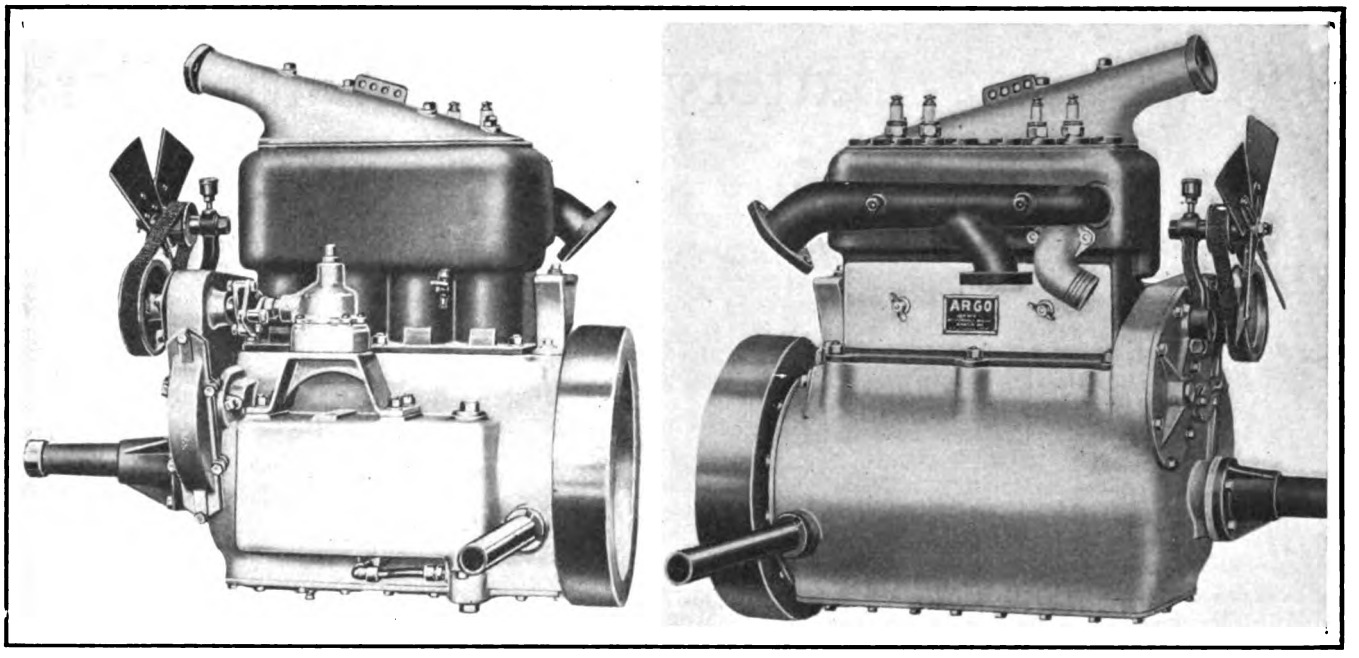
country between Calais and Dunkirk. These guns were supplied by Krupp to the Belgian army some time before the war. They were found to be most efficient weapons, but when the ammunition which had been furnished by the German firm was exhausted no more was available. This difficulty has been overcome by making special shells for these guns in the French factories. The Krupp gun was dragged into difficult positions by five teams of four horses each and had to be got out by one tractor. This was accomplished in every case, and the Belgian army has now secured fifty quads, all of which are used for hauling guns.

In addition to the quads, Jeffery has delivered 1,000 ¾-ton trucks to the French government for ambulance work. These chassis have pneumatic tires, twins at the rear and singles at the front, and bodies are fitted in France to meet various requirements in this field of military work.



Both sides of the Argo four-cylinder 2 3-4 by 4 1-2 in. block motor. Note the steel tubing rear support

Larger Argo Chassis for 1916

New Car Has Standard Tread and 2¾ by 4½ Four-Cylinder Motor—Production Schedule of 20,000—To Sell for $385 as Roadster and $435 as Five-Passenger Touring

IN these days of low-priced cars, the Argo Motor Co., Jackson, Mich., still is conspicuous for the moderate figure set on the cars of its make. It will be remembered that the Argo company was formed several years ago to build a small type of roadster with 44-in. tread at $295, Benjamin Briscoe and his associates realizing the field for such a moderate-priced machine.

Large Output Planned

Just recently, however, the Argo company brought out a new chassis with standard tread which incorporates a number of improvements and differences over the first model. The new roadster is a very nicely designed car of the lighter type and is built to sell at $385, while on the same chassis, a neat five-passenger body is fitted, the price in this form being $435. Plans are well under way, it is said, for a large output of these two cars for the coming season, some 20,000 of them being on the schedule. This at once gives one good reason why the price can be made so low, for the size of output is one of the biggest price-controlling factors.

The car throughout has been designed for quickness of assembly and simplicity of construction, so as to bring the per car cost reduction to what the Argo concern believes to be very near the minimum.

The specifications include a 2¾ by 4½-in. motor, wheelbase of 96 in., cone clutch, Atwater Kent ignition, left steering, semi-floating rear axle fitted with the Bailey differential, elliptic spring suspension, two-speed gearset and 28 by 3 tires.

Lightness a Leading Feature

In the general makeup of the Argo, lightness of weight has been a paramount consideration, and just how well the designers have succeeded in this is brought out by the fact that the roadster tips the scale at about 1000 lb., with the touring car weighing only 200 lb. more.

The motor is a conventionally-designed four, with the cylinders cast in block, and with the valves all on the right and inclosed by a plate. The cylinder block is separate from the crankcase to which it bolts in the regular way. The case is of aluminum and of the barrel shape with a large plate at the bottom for getting at the crankshaft bearings. To disassemble the crankshaft a large plate at the rear end of the case admits of its being pulled out through this end.

This construction of the crankcase makes a rigid engine, and the arrangement has been employed on a number of other engines with good results. The motor really develops a very creditable amount of power for its size. On brake test it shows about 17.5 hp. at normal operative speed, whereas the S. A. E. formula rates it at 12.1 hp.

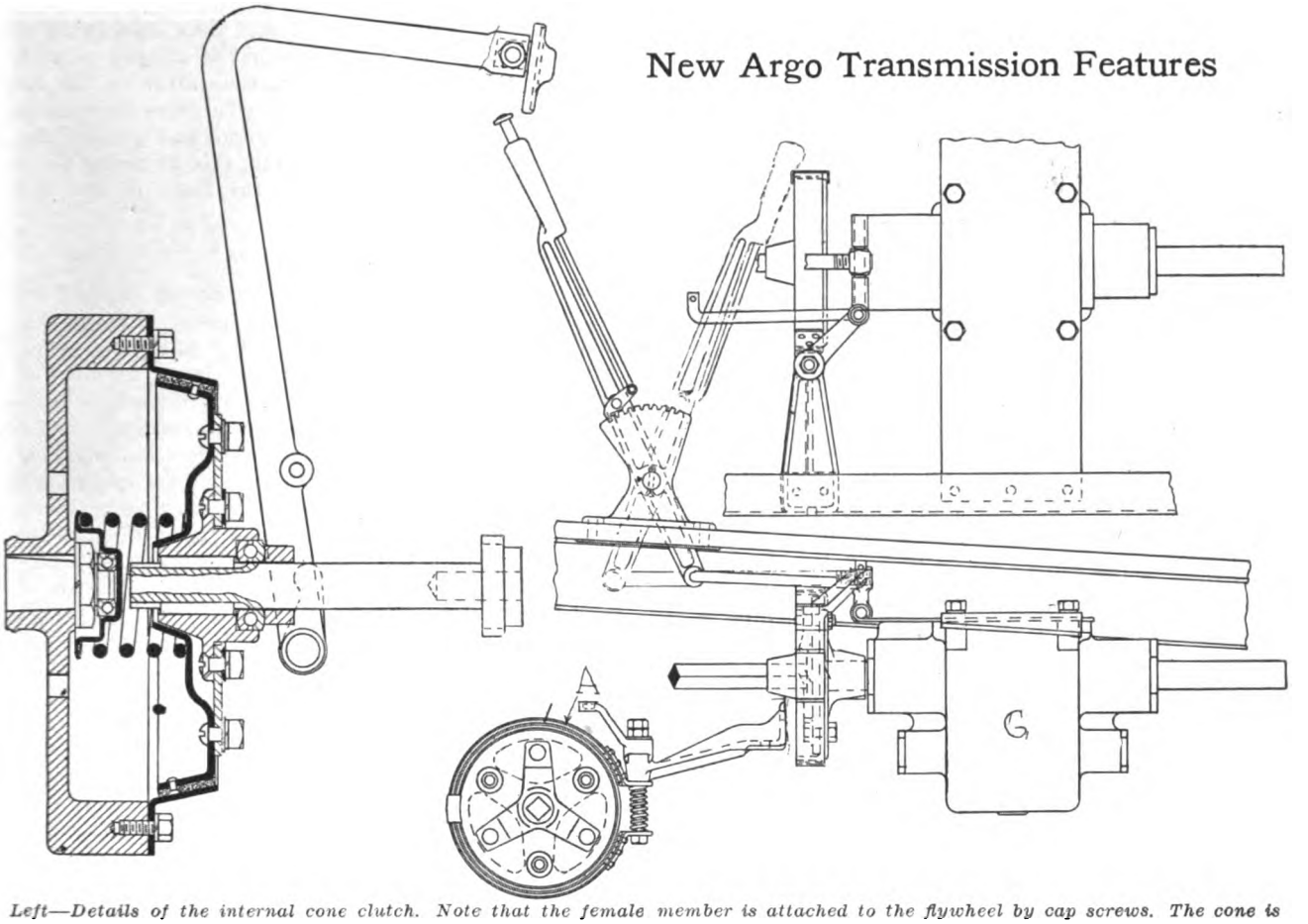
Three-Point Motor Suspension

The suspension of the engine is at three points, due to the resting of the front center on a cross-member and the use of a bar of steel tubing at the rear, this taking the place of the ordinarily-used integral aluminum crankcase arms. Such a means of support makes a strong and light design without taking up a great deal of room.

Standard practice is adhered to throughout the working parts of the engine. The crankcase is a two-bearing type, and from it the camshaft is driven by gear, with the drive for the fan pulley and distributer by another gear in connection with this cam gear. These gears are all very neatly housed, and they are made readily accessible by conveniently-placed plates.

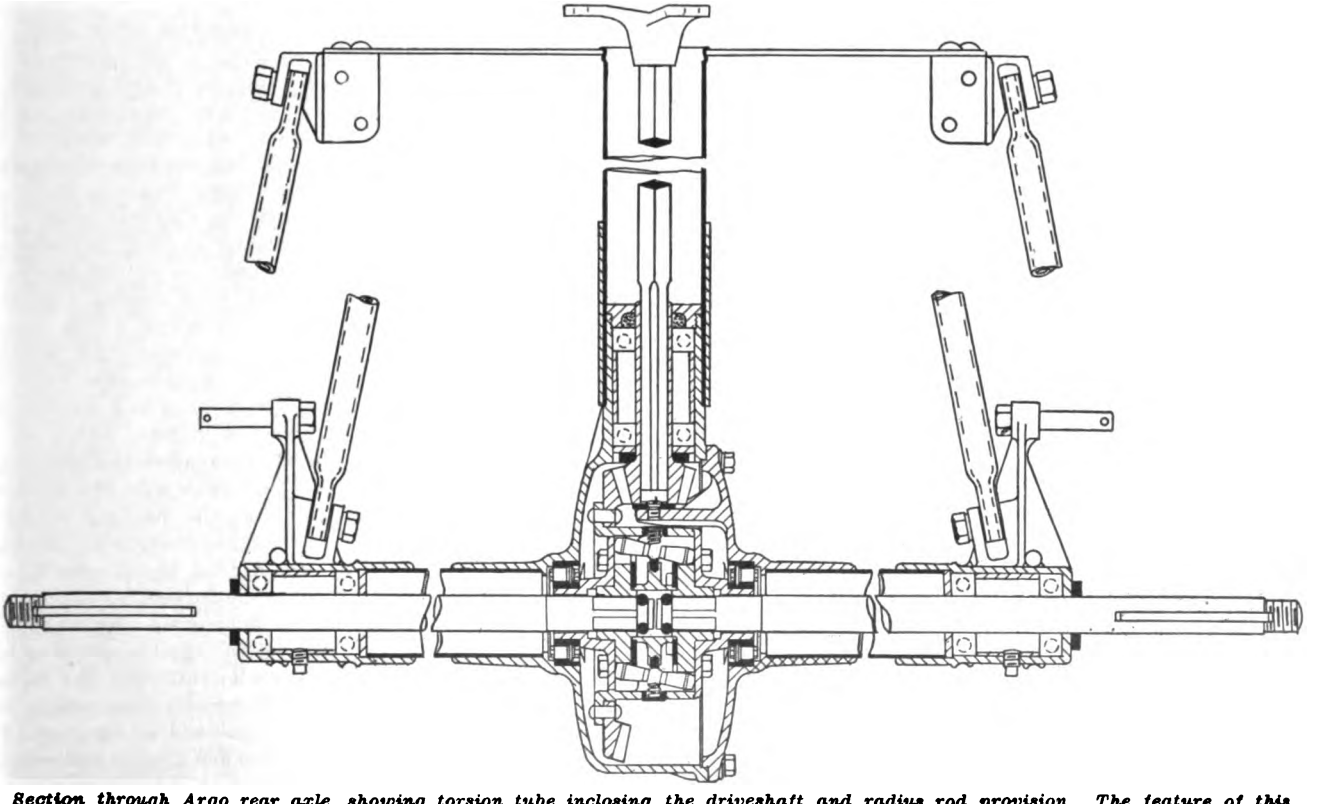
The distributer shaft is on the left and drives the vertically-mounted Atwater Kent instrument by bevel-gear connection. Cooling is effected by thermo-syphon, with large

New Argo Transmission Features

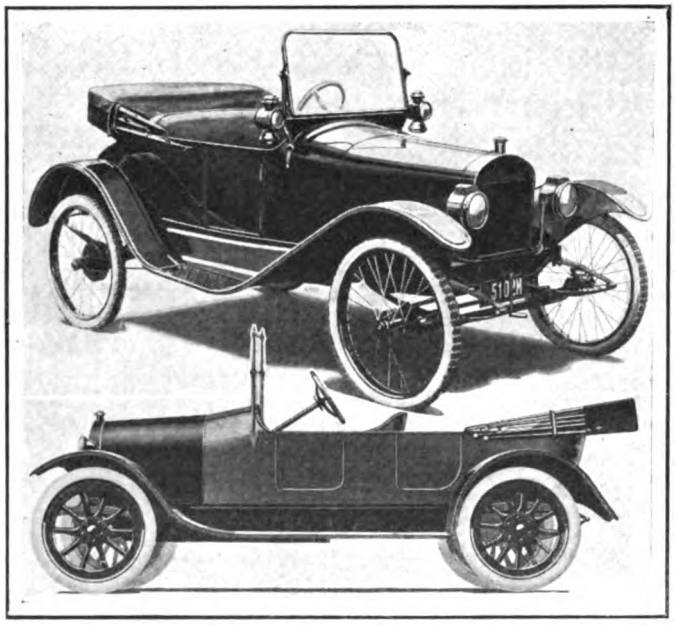


Left—Details of the internal cone clutch. Note that the female member is attached to the flywheel by cap screws. The cone is composition faced and two bearings take the thrust

Right—Mounting of gearbox G and details of combined universal joint and transmission brake A placed between the clutch and the gearbox. As indicated, this brake is operated by the emergency brake lever, giving a very direct and powerful application



Section through Argo rear axle, showing torsion tube inclosing the driveshaft and radius rod provision. The feature of this axle is that it employs the Bailey gearless differential comprising pawls, driving sectors and ratchets to secure a positive drive while at the same time giving the necessary differential action between the two wheels



Above—New Argo roadster selling for $385. Lower—Five-passenger touring car listing at $435

water outlet extending practically across the top of the cylinder block. Adjustment for the belt-driven cooling fan is made in the bracket which supports it. This may be swung toward or away from the driving pulley to vary the center distance.

Splash oiling is used. There is a connecting-rod trough under each cylinder, and the oil is thrown by the rod ends. The reservoir which keeps the troughs supplied at a constant level is an integral part of the left side of the crankcase, its location making it very easy to put in the oil—a point which is so often overlooked.

In the chassis design there is a liberal use of chrome-vanadium steel, not only in the driving members, but other parts taking strain. The drive from the engine is taken through an internal cone clutch, the female portion being attached to the flywheel by cap screws. The cone is composition faced, and the thrust is taken by two Gurney bearings.

Back of the clutch there is a universal joint of special construction. It is really a transmission brake and universal all in one. The outer part of the joint takes the form of a drum, and a band is fitted around it. Operation of the emergency brake lever contracts this band, thus braking the car through the drive. The band is supported on a bracket which is attached to the side member of the frame.

Back of this two-fold unit the two-speed gearbox is located. It is hung from a rather wide frame cross-member by four bolts. Back of this the driveshaft is inclosed within a torsion tube, and there are radius rods running back to the ends of the axle tubes.

Bailey Gearless Differential

Instead of using the conventional bevel gear differential in the rear axle, the Bailey gearless type is fitted. This construction makes use of pawls, driving sectors and ratchets to form a positive driving connection between the driveshaft and the axle shafts, at the same time allowing for the necessary differential action between the two wheels. The Bailey differential has been described before, and is more or less familiar to the public. There are two ratchets, one attached to each axle shaft, and these are free of the driving sectors which surround them, and which are both fixed to the bevel ring gear. To make a driving connection between these sectors and the axle ratchets, pawls are used, these engaging teeth in the ratchets and also being directly in contact with the contact faces of the driving sectors.

This drives both wheels forward positively. When either of the driven ratchets revolves faster than its driving sector, due to turning a corner, the ratchet is shaped to push the end of the pawl out of its tooth, thus allowing the ratchet to have a free movement forward. To drive backwards, the sector moves in the reverse direction and pushes the end of the pawl out of the ratchet tooth, this throwing the opposite end of the pawl down into the tooth of the opposite ratchet.

Brake and Clutch on Same Pedal

The service brake system is very simply worked out by attaching the brake to the same pedal that works the clutch, bringing the brakes into play after the pedal has disengaged the clutch. The equalizer is up forward at the pedal, and rods run outside of the frame back to a unique mounting on the front end of the rear springs. The front hinge of the spring is used therefore as a mounting of the brake rod in addition to its function in the spring. From here a shorter rod goes back to the contracting brake band.

There is a surprising amount of room in the touring body, considering the chassis length. Of pressed steel construction throughout, this body gives room for three in the back seat with sufficient leg length.

In either the touring car or roadster, the front seat is adjustable for height and leg room. It can be moved forward or back 3 in., and the same amount up and down.

For $60 additional, the cars are fitted with a single-unit Disco electric starting and lighting system. This attaches to the right side of the engine and is connected to the crankshaft just forward of the flywheel by a silent chain.

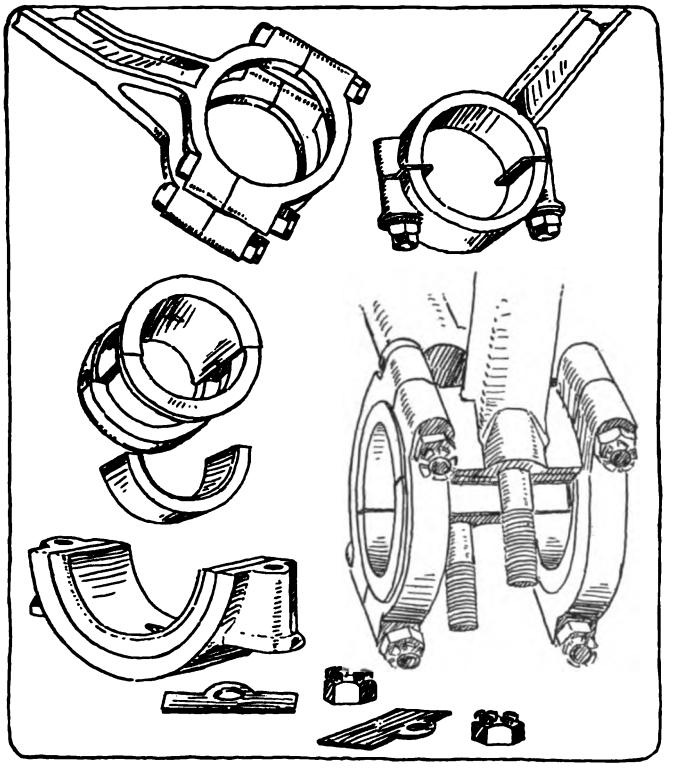
The standard equipment includes top and windshield, top cover, tools, tire pump, horn, gas headlights, and oil side and rear lamps.

Westinghouse Has Two Starting Motors

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will make two types of starter for next season. One has a Bendix type of drive called the automatic screw shift. In this the pinion is drawn into mesh by a quick-pitch thread on the starter shaft, the pinion being connected to the shaft through the medium of a spring. This spring serves to allow the pinion to turn relatively to the armature shaft of the motor so, if the pinion teeth should happen to meet the ends of the flywheel teeth, the spring simply twists a little and lets the pinion slip into mesh with the flywheel gear. The spring at all times makes an elastic cushion between the pinion and the flywheel, so that there is no tendency for the pinion to slip partly out of mesh when coming over each successive compression stage, while cranking a big four.

The other form of motor uses a magnetic shift and the teeth of the pinion and flywheel are in this case cut to a slight angle. They are helical teeth of small inclination. Switching on the current energizes a magnet which draws the pinion along splines on the shaft, against the tension of the release spring. This pulls it into mesh with the flywheel, and the current flowing all the time the starting motor is working is sufficient to keep the magnet energized. As soon as the engine fires the motor speed runs up, of course, and this has the effect of cutting down the current flowing in the starter circuit. Reducing the current causes the magnet to fall off in strength so that the release spring operates and disengages the pinion. This magnetic shift has the advantage that it requires only a small switch. Generators will be made having the ignition unit combined or separate, but the voltage controller and the cut-out are usually mounted in a separate case on the dash. The form of regulation adopted is the vibrator which gives constant voltage direct and not indirectly as in constant current types of generator.

Watson V-Rod Provides Adjustment



Disassembled perspective views of Watson connecting-rod

A CONNECTING-ROD for V motors has been brought out by John W. Watson, president of the American Bronze Co., Berwyn, Pa., which is designed to have the combined advantages of great bearing area and easy adjustability. In other words, this connecting-rod is intended to provide practically the full crankpin bearing area for each of the two rods, and at the same time have the feature of adjustability for any worn part without in any way altering the adjustment of any other part.

Easy Adjustment for Wear

With the Watson type of rod, the repairman can, by dropping the lower half of the crankcase, take up the wear on the crankpin bearings in exactly the same manner as he can with the conventional vertical motor. The cap is removed from the rod and by removing shims, the proper fit is given and the cap then bolted back into place. By the construction of the rod, arrangements are so made that either the forked portion, or that part between the arms of the fork, can be adjusted without disturbing any other part.

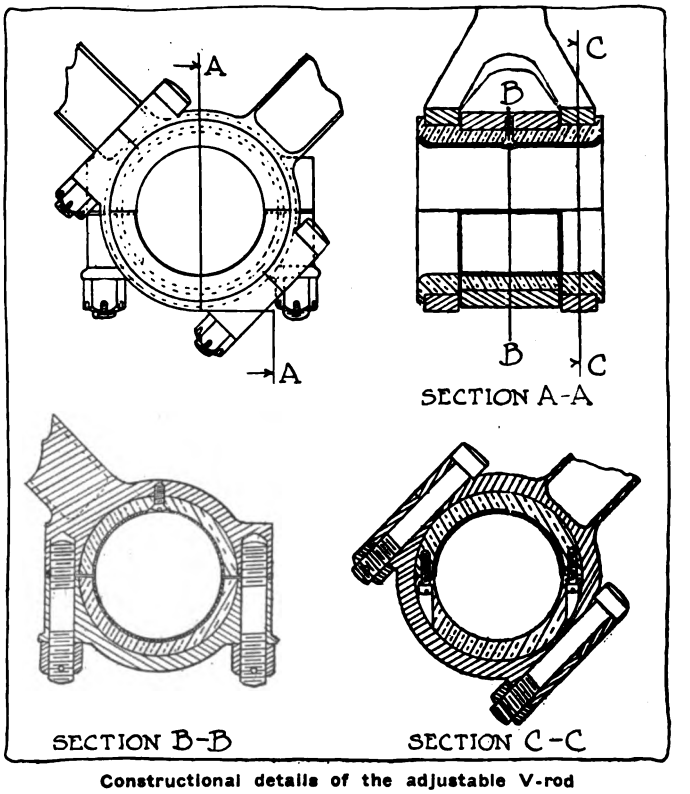
The design of this rod is also arranged to minimize wear between the forked rod and the bearing upon which it works. This provision has been made by having the projected area of the forked rod bearing surface about two and a half times that of the projected area of the piston pin bushing, and at the same time inherent motor conditions provide an ample supply of lubricant for this oscillating joint as it is located at the bottom of the rod with the pressure upon the entire bearing equal to that at the wristpin.

Good Bearing Surface

The rod is designed to replace types which either have good bearing surface and no adjustability, or adjustability without good bearing area. By combining both features it is necessary to make some special provisions of construction, and it is this feature which is the subject of the patent on the new rod. In laying out the bearing surface of the new rod it is considered that the bearing stresses on the eight- and twelve-cylinder motors are generally less than on other types because the cylinder dimensions are smaller, and in order to obtain advantage of the lower stresses, the construction of this rod provides practically full crankpin bearing area for each cylinder. The bearing bushing is continuous across the entire top of the bearing with the adjustable features on the lower portions. In other words, an explosion in either of two opposite cylinders will work against a bearing which is the full width of the crankpin.

The rod shown in the accompanying illustration was designed for an eight-cylinder motor with cylinders at 90 deg. For a twelve-cylinder motor with the cylinders set at 60 deg., the main rod would incline at an angle of 30 deg. from the vertical instead of at 45 deg. as shown here. The assembly of the rods in the manner in which the adjustments are made are shown very clearly in the accompanying illustration. The shim adjustments can be seen by referring to the constructional and disassembled views. The bearing surfaces of the forked rod when bearing against bronze should be hardened, referring to the oscillating joint. A less expensive and, according to the maker, an equally satisfactory method will be found in leaving the forked rod unhardened and having the back of the bronze shell upon which the rod bears faced with babbitt. Owing to the greater radius of this bearing circle the area of the bearing is such that the babbitt will readily endure the stresses.

The rod was shown to members of the Society of Automobile Engineers, during the recent cruise on the Great Lakes, and attracted attention from those on board who were interested in the design of V-type motors. It is stated that negotiations are under way at the present time with several concerns. The manufacturer states that the cost of the rod will about equal that of present types.



Constructional details of the adjustable V-rod

The Rostrum

Cadillac Eight Geared 4.42 to 1 Direct

EDITOR THE AUTOMOBILE:—Which gear ratio would you recommend for a Cadillac eight? It is desired to make the performance of the car as good as possible considering reduction of wear, avoidance of extreme speed, and as little gear changing as possible. The car is to be driven at an average speed of about 15 to 25 m.p.h. on roads of the kind to be found about New York City within a radius of 100 miles. The car would carry the usual load of five people, two spare tires, tools and kit, and the gear ratios I am considering are 4 to 1, 4.5 to 1, 4.75 to 1 or 5 to 1.

This query is in line with a determination to secure the utmost life of the car in good condition and with its maximum power. At the same time it is desired to have a car which does most of the work on high and which can run at high speed if necessary without the great engine speed which is now necessary.

2—Does the oversize tire 37 by 5 as against 36 by 4½ really return the value in increased wear? What is the effect on the speed and power of the car oversize equipped?

Mt. Vernon, N. Y. L. M. S.

—The Cadillac eight uses a gear reduction of 4.42 to 1 which is designed to meet just the requirements which you mention. When the engineering department of a concern selects a definite gear ratio, all the requirements which you have mentioned as well as a great many others are carefully considered. Therefore, you need not worry that the gear reduction will not be correct for the roads which you will find within a radius of 100 miles of New York City. The motor of the Cadillac car is designed for high speeds and with the even torque and good balance, should run several thousand miles before any adjustment is needed and before any drop in power is noted. When it is, it can be restored to its normal condition by valve grinding and bearing adjustments the same as any other car.

2—The oversize tire generally returns to the purchaser in added mileage more than the difference in cost between that and the straight size tire. The effect on the power and speed with a motor of the power of the Cadillac eight is unnoticeable.

Racing Car Gasoline Mileage Is Low

Editor THE AUTOMOBILE:—Will you kindly advise me as to the number of miles the average racing car goes to the gallon of gasoline?

Greenville, S. C. E. B. S.

—The number of miles per gallon varies so greatly, that any fixed figure cannot be taken as applicable to all sets of conditions. The reason for this is that in speedway racing such as at Chicago, speeds are so much higher than they are in road racing for instance, that the gasoline consumption for the same cars would be much different were the consumptions measured first on the track and then on the road. The piston displacement also varies to such an extent that a fixed figure could not possibly apply to all sizes of cars. With these circumstances in view, it is impossible to give a broad average fuel consumption figure for all gasoline cars, because if such a figure were taken based upon all races, it would mean absolutely nothing. In such races, as are held at Indianapolis and Chicago, where the piston displacements are limited to 300 cu. in., the gasoline consumption is somewhere around 6 miles to the gallon.

Holley 1-In. Carbureter on Flanders 20

Editor THE AUTOMOBILE:—Can you tell me of a carbureter which will work well on a Flanders model 20. If so, would I have to get a new intake manifold?

2—Would you advise placing a larger carbureter on. If so, what size?

Browns Valley, Ind. C. S. W.

—The carbureter used on the Flanders 20 is the Holley 1-in. and this gives perfect satisfaction, if it is in good condition, in connection with the special design of manifold used on this model. It is therefore unnecessary to change either the carbureter or manifold.

2—If you put a larger carbureter on your Flanders you would not get any satisfaction at all, for too large a carbureter results in an impossibility of proper adjustment, and hence in very imperfect performance.

Two Sets of Brakes Are Necessary

Editor THE AUTOMOBILE:—We would like information concerning brakes for automobiles. As all automobiles are supplied with two sets of brakes, one called the service brake and the other the emergency, both of which act on the hind wheels, why is it necessary to have both? If the service brake will hold the wheels securely from revolving if necessary, surely the additional use of the emergency brake could do no more, and if so, why have both?

Beacon, N. Y. M. P. B.

—Either brake should be sufficient to lock the wheels and

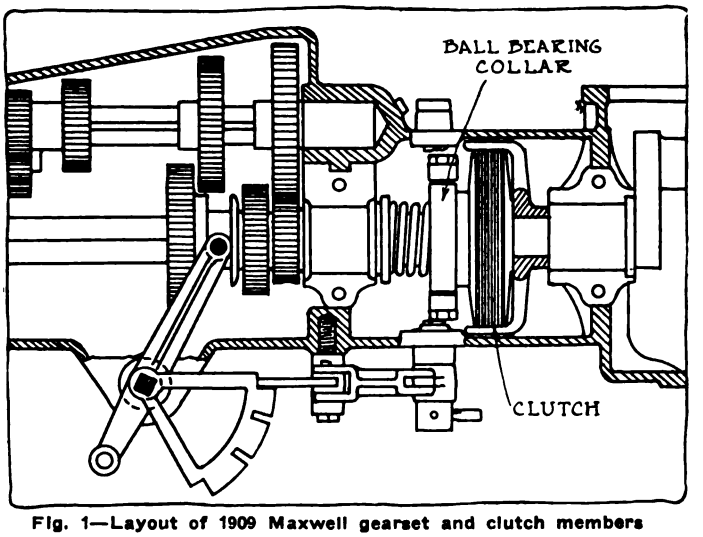


Fig. 1—Layout of 1909 Maxwell gearset and clutch members

hence, as you say the additional use of the emergency brake could do no more. An emergency brake is necessary however, because it is equipped with a ratchet which holds it on when the car is stationary and if the car is stopped on a hill, it is necessary to have such a brake on the car. Furthermore, should the service brake ever be in bad condition, so that it cannot operate, it is a safety precaution to have another brake on the car. The additional use of the emergency brake in stopping is not ordinarily necessary when the service brake is in working condition.

Motor Can Be Repaired at Low Cost

Editor THE AUTOMOBILE:—I have long been an admirer of the American underslung cars and would like to know if that concern sold their business to some other manufacturer as I have heard, and if so, is the American Tourist being manufactured under another name?

It has been said that the engine is of very poor quality. Is this so? What motor was used in the American Tourist 1911? What would be the best motor to put in this model when I desire to change it, considering horsepower, ease of installing, and at the least expense, etc.

Brockton, Mass. W. BREWSTER.

—The American Motors Co. has been discharged from bankruptcy. Whether or not the stockholders will endeavor to reproduce the car and to get it back into the manufacturing business is impossible to state at this time. The car referred to by you has a Teetor motor and this motor has given uniform satisfaction and is perfectly reliable. Therefore if you desire to put a new motor in, it would be one of the same make. There is no reason why you should place a new motor in the car however, as the one you have can no doubt be repaired for much less than it would cost you to put in a new one, and it would be advisable to take this matter up with the V. A. Longaker Co., 706 Merchants' Bank Bldg., Indianapolis.

Clutch Parts Are Probably Worn

Editor THE AUTOMOBILE:—I have a 1909 model D. A. Maxwell car with a multiple disk clutch that runs in oil and is giving me some trouble. When I engage the clutch it sounds and acts as if it would tear the car all to pieces. I have drained the clutch and washed it out thoroughly with kerosene and supplied new cylinder oil but it does not do any good. Can you tell me what to do.

West Liberty, Iowa. E. G. W.

—In all probability your trouble is due to the clutch shifter ball cup and cone which has become worn. These two parts form a bearing in the clutch containing twenty-seven ⅜-in. steel balls and whenever the ball cup or cone becomes worn a trifle, the ball bearing will tend to make the clutch itself rattle and slip. It would be well for you to have a competent mechanic to take this clutch apart to see just what parts are worn. A diagram giving an idea of the clutch is shown in Fig. 1.

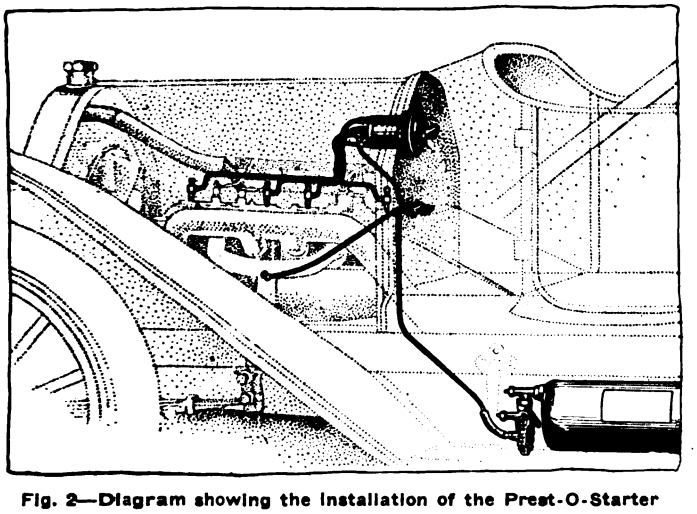


Fig. 2—Diagram showing the installation of the Prest-O-Starter

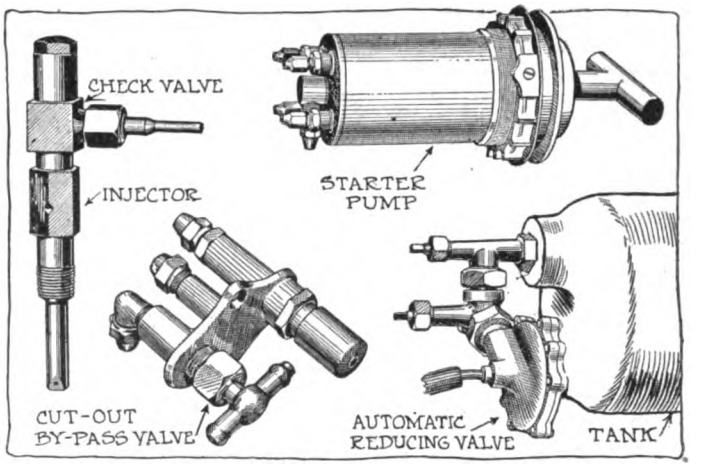


Fig. 3—Parts of the Prest-O-Lite acetylene starting apparatus

Rough Contact May Cause Trouble

Editor THE AUTOMOBILE:—Kindly give me information relative to a Ford engine as per the folowing:

When I short-circuit 1, 2 and 3 vibrating coils in the 1913 model, 4 vibrating coil seems to spark for each cylinder, though irregularly. If I change the position of the units, it makes no difference. I separated the wires, took out the timer and cleaned same. I tested out all the wires separately and found all the connections to be soldered and tight. Also put in a new wire from No. 4 coil to No. 4 on the timer and cannot see a change of any kind.

The vibrator No. 4 seems to work well when the dry cells are used, but when the magneto is used it vibrates about 6 to 10 times a second and causes the engine to miss. The plugs are all good, for I transferred them several times and can note no difference. The No. 4 contact in the timer is rough or wavy. Would that be the cause. A. J. B.

Balston, Pa.

—The symptoms you give for your trouble are rather indefinite, but if the contact in the commutator is rough or wavy, as you state, trouble is sure to develop and it is advisable to replace the commutator case. It would also be well to go over the wiring very carefully and make sure that the coil units in the dash coil are properly adjusted and in good condition.

Speed Depends on Varying Factors

Editor THE AUTOMOBILE:—Can you tell me which company makes the Sandbo starter? It is a hand starter operated from the seat. Can it be attached to a Studebaker model 20? Please give me diagram of same and price.

2—What speed can be gotten out of a Studebaker model 25, 1912 model if the wind resistance is reduced by putting on a racing body?

3—How much more speed can be gotten from a car by putting ether in the gasoline, and how much should be used?

4—How do the compressed air and Prest-O-Lite gas starters work? Can you give me a diagram of the latter?

Sterling City, Cal. ELMER MARION.

—The Sandbo starter is made by the Modern Specialty Co., Racine, Wis. This starter could probably be adapted to the Studebaker 20. A diagram of the starter as installed on the Ford is given in Fig. 4.

2—We have no records of anyone having made a racing car out of this model Studebaker and hence cannot predict the speed which can be made if this were done. Of course,

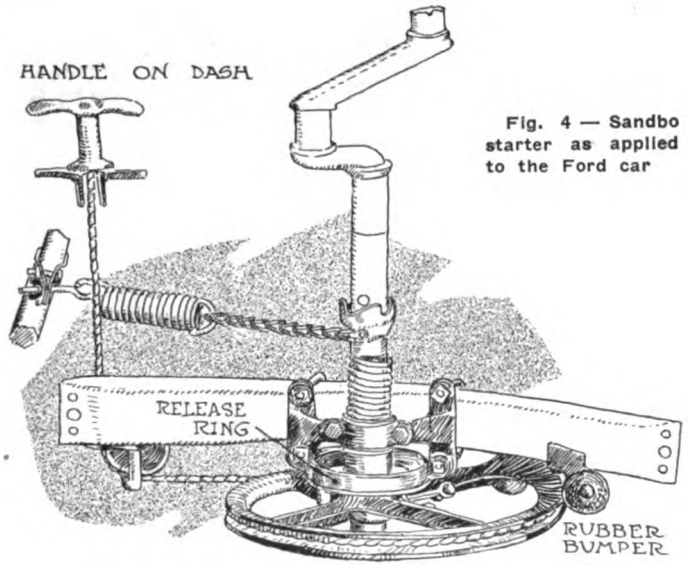


Fig. 4 — Sandbo starter as applied to the Ford car

the speed would depend upon the condition of the motor, the gear ratio provided, the weight, etc., and would vary with each of these factors.

3—THE AUTOMOBILE does not recommend the use of ether added to the fuel.

4—A Prest-O-Lite gas starter operates by injecting a charge of acetylene into the cylinder and then exploding this with a spark which starts the motor. Compressed air starters operate non-explosively by forcing a charge of compressed air into the cylinder in firing position allowing expansion of this air to rotate the motor and cause it to start. A diagram of the Prest-O-Lite gas starter is given in Figs. 2 and 3.

Secret Compounds Used for Float Covering

Editor THE AUTOMOBILE:—Would you please tell me what is used for covering or coating cork floats to keep them from getting gasoline or water logged. I believe that there is something better than shellac as was formerly used. The shellac forms in little blisters or air bubbles over the cork and then it allows the gasoline to get inside which makes them too heavy.

Laconia, N. H. W. E.

—Some of the carbureter companies are now using a secret compound for covering their cork floats. You can however, make a very satisfactory job with shellac by dipping the float instead of attempting to paint it on. The shellac is thinned with alcohol so that it will lie uniformly over the entire surface.

Wants History of Twelve-Cylinder Motor

Editor THE AUTOMOBILE:—Would you kindly give me a brief outline of the development of the twelve-cylinder motor, stating a few facts in connection with the history of the same? J. E. S.

New York City.

—The Packard and National twelves are the first commercial automobile engines of this number of cylinders to be built in the world. The National is mentioned along with Packard because its announcement came out at the same time. The twelve must, therefore, be regarded as an untried proposition so far as the stock automobile is concerned.

However, these motors are not the first to be used in automobiles, as, from the best information gathered, the twelve-cylinder Sunbeam racing car was really the pioneer twelve. This Sunbeam, which is an English car, is regarded as one of the fastest cars in existence to-day. This car has made a name for itself on the Brookland's track in England. The cylinders are cast in sets of three, two sets in a row and these two rows at a 60 deg. angle to each one, as in the new Packard. The cylinders are 3⅛ by 5⅞. This Sunbeam has shown it is able to go as fast as its tires will allow and has the one-hour world's record on the Brookland's track, covering 107 miles and 1672 yards. This record will probably stand for some time.

As is known, the Continental concern is about ready with three different sizes of twelve-cylinder motors and the Pathfinder and Davis concerns have already announced twelve-cylinder cars in addition to Packard and National.

The twelve-cylinder motor has been used in aeroplane work for some time, and there are several examples of the V-type as used by Packard and the rest. The most prominent of the aeroplane motors of twelve cylinders are as follows:

Renault	60 deg.	V
Sunbeam-Coatalen	60 deg.	V
Rausenberger	60 deg.	V
Johnson	90 deg.	V (two-cycle)

The last two mentioned are American makes. You can see from the above that the twelve-cylinder motor is really not a new construction, although it is new to motor car use.

The engineers who have adopted the twelve claim great advantages for it, and for more information you are referred to the article which appeared in the May 20 issue of THE AUTOMOBILE on page 888.

Noise Denotes Worn Clutch Parts or Gears

Editor THE AUTOMOBILE:—I have a 1912 Michigan model 33 car on which I would very much appreciate a little information. There is a noise which I think comes from the clutch, but I would like to know what it is exactly before I tear it apart. It sounds very much like the cogs breaking off, or a sort of a ratchet sound when you engage the clutch on low or second gear, no matter how slowly the clutch is left in. It does not do this on high gear; only a sort of grinding sound is heard. When this occurs on first starting out you can feel the vibration coming through the clutch pedal as if it was catching on something. It will also occur when you speed up on low or second gear and pull very hard with the clutch engaged. The engine is in good condition, but the transmission and rear axle are a little worn.

The clutch has had all kinds of lubrication from none at all to heavy oils and hard grease. Can you tell me exactly what oil it should have, and how much? The noise referred to only started to-day, but it is so loud and has so much effect upon the car that I know it must be attended to immediately.

Newport, Pa. J. F. DAVIS.

—From the information you give, it is not possible to state definitely where the trouble is, but it is very probably due to a worn clutch collar or a stripped or broken gear. Non-fluid oil should make a good lubricant with these bearings.

Rawhide Gear Would Quiet Old Car

Editor THE AUTOMOBILE:—On my 1909 Hispano-Suiza speedster the timing gears have recently and quite suddenly become noisy. The motor is a T-head 10 cm. bore and 12 cm. stroke (4 by 4¾). The crankshaft gear and the intermediate are steel, the two camshaft gears are bronze. All of them are intact, but have developed a little play. Would you think it proper to put in a rawhide intermediate gear?

San Juan, P. R. A. F. W. H.

—You could have a rawhide intermediate gear placed in position between the crankshaft and camshaft gears, and this would no doubt eliminate the noise which is troubling you at present.

Air Leakage Probably Causes Trouble

Editor THE AUTOMBILE:—What do you think is the trouble with my car judging from the following:

It will run well a couple of miles after starting, but will begin to miss fire on one of the cylinders so soon as the engine gets warm and will miss every time, unless I prime it.

Then it will run well for about one dozen revolutions and start to miss again.

2—Why will not some cars start without first putting gasoline in the priming cups?

3—Which is the best way to stop the engine, that is, so that it will start easily when again wanting to start it?

4—Are the Marathon engines, used in the Marathon cars, made by the Marathon Motor Car Co., Nashville, Tenn.? If not, where?

5—What is the horsepower of the Marathon car according to the S. A. E. rating? It is a four-cylinder, 4½ by 5⅛.

6—Which clutch is best on a car, the cone or the disk?

Carver, Minn. READER.

—Apparently there is an air leak in the cylinder which misses. You should examine this carefully, going over all connections of manifold to the cylinder and also going around the threads of the spark plugs and priming cup. With a rich starting mixture it is possible that an air leak does not have the effect of causing a miss, but as soon as the motor begins to run, expansion due to the heat in the cylinder, causes the leakage to increase and hence a misfire. Another possibility, is that the fuel line is clogged supplying only enough to start and then as soon as the motor is running, the excess is used up and the motor will not have sufficient fuel to run upon. A third possibility is that one of the valves of this cylinder either needs grinding or does not seat properly. This also should be examined and when looking for leaks you should not fail to inspect the bushings surrounding the valve stem.

2—The reason that some cars will not start without first priming, is that a sufficiently rich mixture is not being supplied at the start. This is sometimes due to carbureter adjustment and other times to manifold design, etc.

3—In stopping the motor to secure a rich mixture for starting, the throttle should be opened wide causing the motor to speed up and then the ignition cut off. If you have a dash priming arrangement on your car, if you will operate this on cutting off the ignition, a very rich mixture will be drawn into the cylinders.

4—The Marathon motors are manufactured in the Marathon factory, Nashville, Tenn., where extra motors can be purchased if desired.

5—The S. A. E. rating of the Champion model Marathon, 4½ by 5⅛ is 32.4 hp.

6—Neither clutch has any claim to superiority over the other as both are used in all grades of cars from the lowest price to the highest.

Testing Cylinders for Roundness and Wear

Editor THE AUTOMOBILE:—If cylinders and pistons are removed from the motor by what method can you determine that the cylinders are so worn that you would need to install new ones or have old ones rebored?

By what method can one determine as to whether or not the piston rings are worn or have lost their resiliency, needing new ones installed?

Dubuque, Iowa. W. E. C.

—The method which is easiest for determining whether or not cylinders are out of round, is to take a piece of wood or board and cut it so that two of the edges make an exact right angle. The length is made equal to the bore and the flat edge put up against one of the walls of the cylinder, the length being carefully cut off so that the wood will just fit into the cylinder. It is then turned around to different parts of the cylinders and if the clearance at the end varies, the cylinder is not round. A sketch showing this method is given in Fig. 5.

Another way in which the test can be made is by taking strips of brass shim metal of which the thickness is known and placing them at several points around the piston, note if the clearance between the cylinder wall and pistons is equal at all points.

Still another method is to take ordinary inside calipers and calibrate in several directions across the cylinder walls at right angles to the axis of the cylinder. If the width of bore is the same in all directions, the cylinders are round.

To determine whether or not, a cylinder can be properly rebored, it is necessary to know the thickness of the wall and the cost of having oversized pistons made. If the walls are thin, and the oversized pistons not easily procurable, it might be cheaper to buy new cylinders.

To determine the necessity of purchasing new rings, it is only necessary to examine the ring to see if it is worn thin and to spring it into the cylinder to note if the ends of the ring come closely together. The ends should be tight with perhaps clearance enough for the insertion of a sheet of paper between the ends.

Highest Priced Car Not Definitely Known

Editor THE AUTOMOBILE:—Who owns the Jay-Eye-See car and where was it built?

2—Who owns the Simplex Zip and where was it built?

3—Who are considered the best three body builders in America, and where are they located?

4—Are the Rothschild and Kimball bodies made in America, and if so, where?

5—What is the highest priced American automobile made?

6—What is the highest priced European automobile made, and what is the price?

7—Where is the factory of the H. W. Johns-Manville Co., located?

Reading, Pa. F. A. K.

—J. I. C. was built at the Case factory and according to the records we have at present is the property of Louis Disbrow.

2—The Simplex Zip was built at the Simplex factory and is at present according to what information we have on hand, the property of the Simplex Automobile Co.

3—We have never had any authoritative statements as to who the three best body builders are in this country. This must naturally be a matter of personal opinion.

4—The Kimball body is built by C. T. Kimball & Co., Chicago, Ill. The Rothschild bodies are made in Paris. France.

5—We have no record of what the highest priced car is in this country for the reason that some of the prices quoted are for chassis alone, and it would depend upon what body was put upon the car before the price of the entire car would be known. We have records of chassis such as the Crane selling for $8,000 for the chassis alone, but whether this is the highest or not we have no definite information.

6—We have no record of this.

7—The Johns-Manville factory is in New York City.

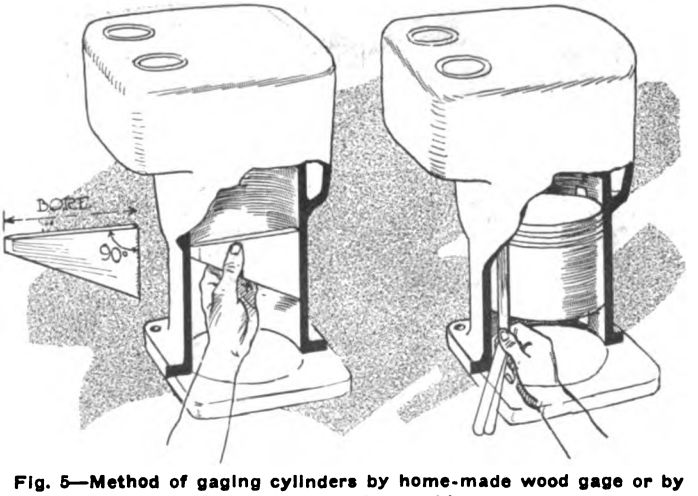


Fig. 5—Method of gaging cylinders by home-made wood gage or by feeler gage or brass shims

Chase Water-Cooled and Worm-Driven

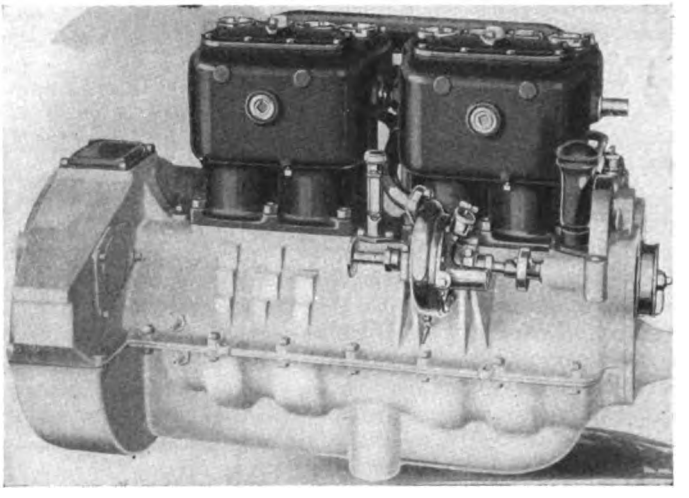
Three Models Ranging from 1500 to 7000 Lb. Designed to Meet Requirements of a Broad Field

ANNOUNCEMENTS of Chase motor trucks have been out for some time and show a complete revision of the line of the Chase Motor Truck Co., Syracuse, N. Y. In place of the air-cooled, chain-driven product a line of worm-driven designs with Continental L-head water-cooled motors has been substituted. All three cars which are being marketed under the names of Models T, R and O are of similar design, although of respectively ¾, 2 and 3½ tons capacity. With this line it is thought that the company will supply a truck for any demand whether it is of light, medium or heavy duty between the limits of 1500 and 7000 lb. The prices for the three trucks are respectively $1,500, $2,200 and $3,300.

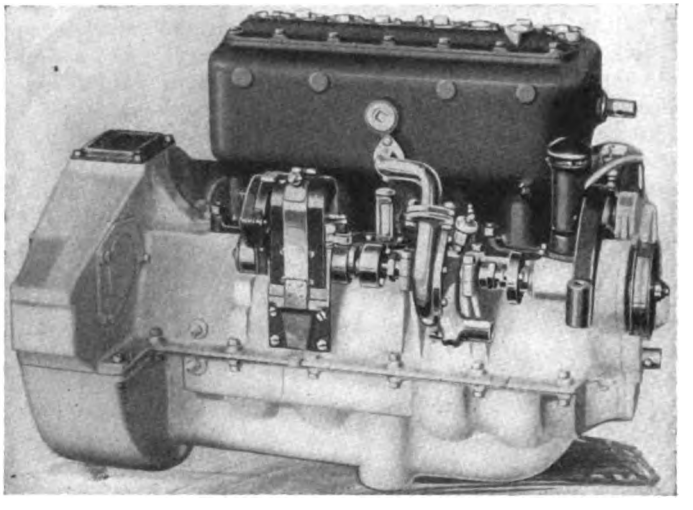
A Well-Balanced Line

From an engineering standpoint, the Chase company has put out a well-balanced line of standardized design which can at the same time fill the requirements of low price and mechanical efficiency. The same make of parts is used in every portion of the vehicle for all three models, although of necessity varying in dimensions for different capacities. At the same time, however, the use of the similar design has allowed the manufacturer to duplicate on many parts where the greatest capacity does not have a direct influence on the dimensions. For instance, the front axles of models R and O are the same and this duplication is carried through in many of the less important parts of the three cars.

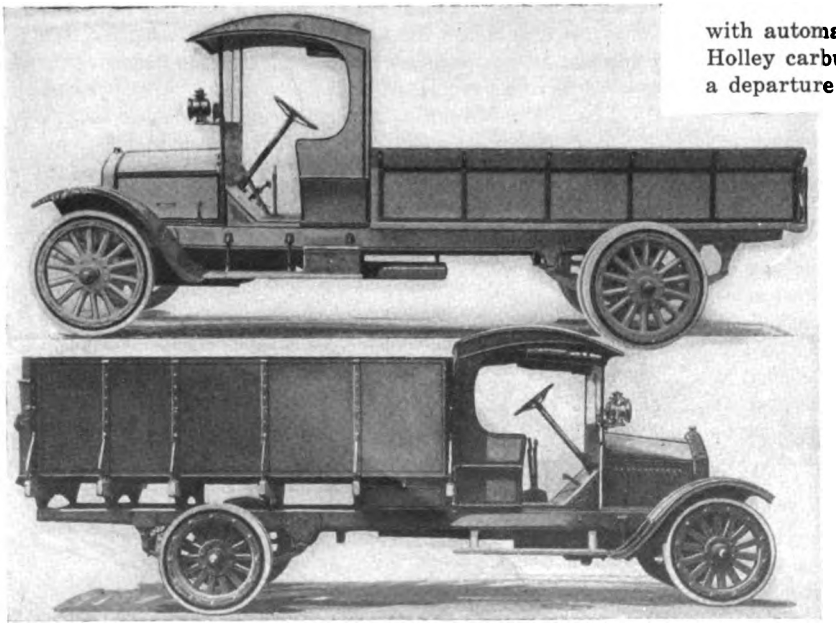
The ¾-ton truck model T has a four-cylinder 3.5 by 5 motor giving an S. A. E. rating of 19.6 hp. Model R 2-ton truck has the same design motor but the dimensions are 4⅛ by 5¼ in. The model O 3½-ton has a 4½ by 5½ motor. The S. A. E. ratings of the two larger types are 22.5 and 32.4 hp., respectively. All the parts of these motors are of standard Continental design with cast aluminum crankcases and three-point suspension features having the main frame arms at the rear and the trunnion part at the front. They are all fitted with automatic motor governors used in connection with the Holley carbureter. The radiators are the fin and tube type, a departure from standard design being made in the case of model O, which has a cast top bottom and side sections with fin and tube center core.



Continental motor used on Chase worm-drive trucks



Block-cast Continental motor for new Chase truck



Two representative styles of bodies supplied with the Chase water-cooled product

This radiator is mounted on springs to avoid twisting strains. On the T and R cars the radiators are built-up designs with the fin and tube core mounted on a pressed steel cross-member in front of the motor. The radiator mounting is cushioned to prevent jar.

All models are provided with Bosch high-tension magneto ignition. The gasoline systems are gravity and the tank capacities for T, R and O are, respectively, 16, 23 and 25 gal. The oil tank capacities are 1.75, 2 and 2.5 gal. The motor controls are standard.

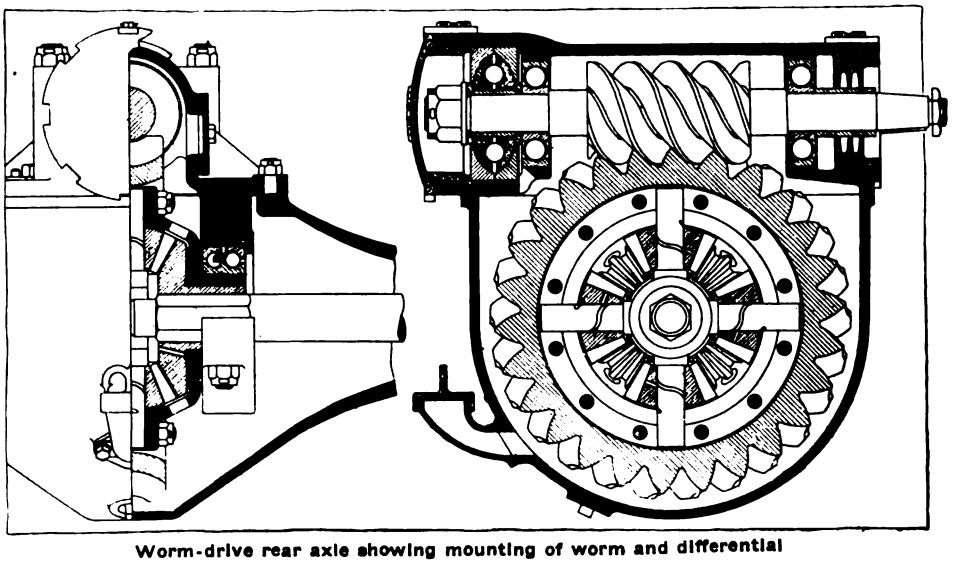
Dry Plate Clutch Used

In all three models the multiple disk dry plate clutch is used. These clutches are faced with asbestos and operate against saw steel. The power is transmitted through sliding gear-sets provided with center control, the bearings

in the gearset are Timken rollers and the gearboxes are mounted in a unit case with the motor. This insures a dust-proof connection between the two units. The gearsets are made by the Brown-Lipe Gear Co.

The New Worm Drive

Sheldon rear axles are used and in these are employed the new worm drive which has been adopted throughout this year's model. The worm and gear is a David-Brown type and is shown in the accompanying illustration. The differential mechanism is mounted in the worm gear and the whole assembly is carried on annular bearings with thrust bearings provided on the worm shaft and on the differential. The front axles are a design which is the product of the Chase engineering staff and are I-beam section, drop-forged with spring pads integral. The centers are dropped in a slight curve between the spring pads and high tensile strength gear steel is used for the spindles, which are heat treated and ground to take the wheel bearing.

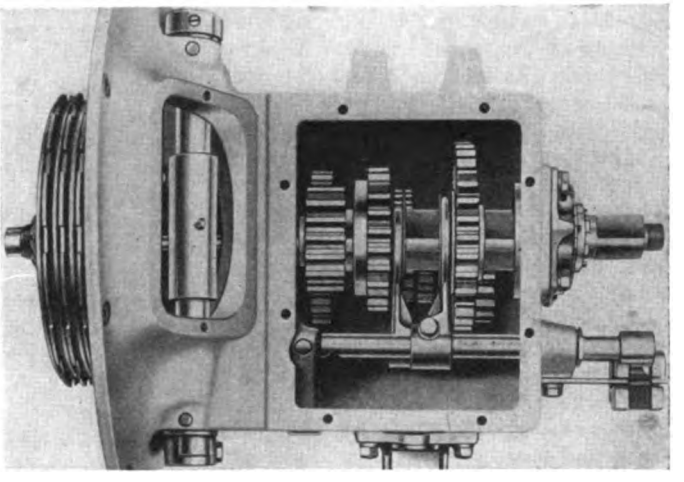


Worm-drive rear axle showing mounting of worm and differential

Semi-elliptic springs are used all around on all three models. These are all Sheldon products of alloy steel with the spring eyes bronze bushed. The spring bolts are hardened and ground and have large grease cups. The sizes of the springs vary for each model as follows:

Model	Front	Rear	Model	Front	Rear
T	2 by 36	2 by 48	R	2.5 by 38	2.5 by 52
O	3 by 38	3 by 54	Note:—Dimensions in inches.		

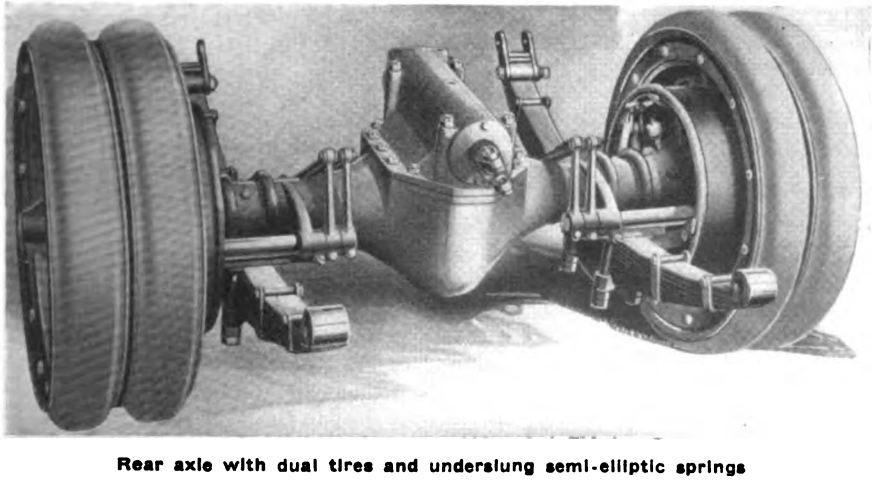
Hydraulic cold-pressed steel frames are employed and these are toed in at the front end to provide a short turning radius. The wheels on the three models are the same in diameter, being 36 in. The tire diameter, however, differs, as would be expected, for the different capacities. On the model T ¾-ton car, they are 2½-in. front and 3½-in. rear single. On the model R they are 3½-in. front and rear with the rear dual. The model O has 5-in. tires front and rear with dual rears. The wheelbases of the three trucks are respectively 135 in., 160 and 146 in.; and 175 and 148 in. The percentage of load on the rear axle as regards the weight of the vehicle itself for the models T, R and O are respectively 53, 59 and 63 per cent. The pay loads on the rear axle are respectively 82, 72 and 83 per cent.



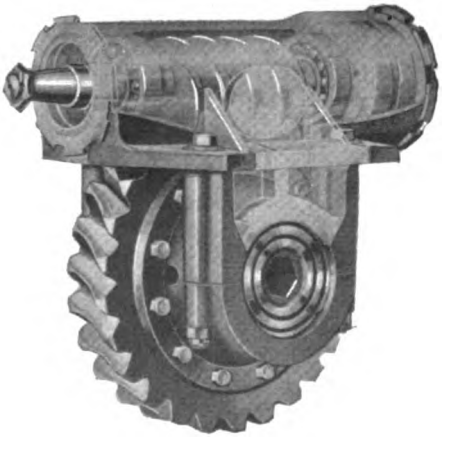
Clutch and gearset used on Chase trucks

Special Bodies to Order

Special tops and bodies are built to order to suit the requirements of any trade. The bodies are built in the Chase shops and in this manner special requirements of any concern can be met. For standardized work, however, there are standardized bodies some of which are shown in the accompanying illustrations. The cab and fenders are of substantial construction, the cabs having cast aluminum floors. The large models have standard cabs with curved tops, all fitted with windshields. Lamp brackets on these trucks are on the windshield frame. The feature of the largest is a tool box on the frame, on the right side, just back of the seat. These bodies, however, are subject to changes in order to meet the requirements of a given line of work.



Rear axle with dual tires and underslung semi-elliptic springs



Phantom of worm-drive

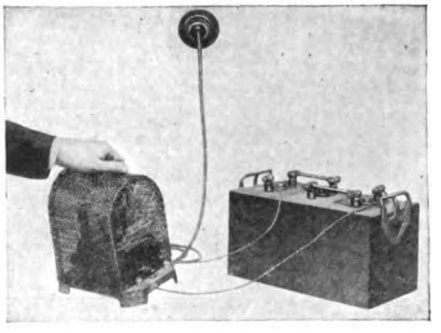
ACCESSORIES

G. E. Small Battery Rectifier

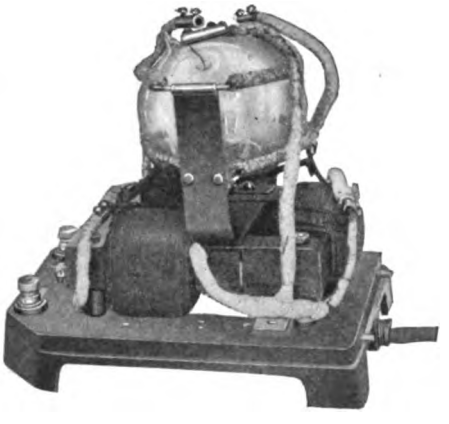
TO fill the wants of those desiring to charge small batteries from the current supplied by the municipal lines, which as a rule have alternating current, the General Electric Co. has brought out a small mercury arc rectifier selling at a price which is comparatively low for these instruments. The exact price of the instrument depends on the current cycles, that for the 60-cycle, 110-volt outfit being $22.50.

With this equipment the owner of a car fitted with electric lighting and starting is equipped to do his own charging. The rectifier is sold under the model name of S4K and is a compact unit with the coils and vapor tube mounted on a metallic base over which fits a perforated metal cap or casing. The entire 60-cycle unit weighs about 15 lb. and this fact together with the small size, 6½ by 9½ by 11 in., makes it readily portable.

The charging rate from the standard 110-volt supply is about 6 amp. The rectifier is put into operation by screwing a plug into any standard electric light socket and then attaching the negative and positive wires from the rectifier to their corresponding binding posts on the storage battery. The current is then turned on and the rectifier tipped sufficiently to complete the circuit in the mercury tube. After this no attention is required until charging is complete. The cost of charging is said to be about 25 per cent of the ordinary garage charge of 50 cents for a 6-volt battery. —General Electric Co., Schenectady, N. Y.



New G.E. rectifier for charging small batteries from alternating current



The new G.E. rectifier for small battery charging as it appears with the cover removed

Presto Electric Lantern

A two-cell hand lantern has been brought out recently, equipped with a 3-volt bulb and a 3-inch bull's-eye lens. It is a complete unit inclosed in a black enamel case 7 inches high, as illustrated. Some of the features of this light are that it can be turned on or off instantaneously and may be used either continuously or intermittently. It is supplied with a revolving head pivoting on the supporting bracket, so that it may be rotated to throw the light in any direction, either straight up or straight down, thereby being useful in such positions as directly beneath a car or for reading or writing. The lamp uses two ordinary 6-volt dry cells of cylindrical shape and is fitted with Edison Mazda bulb with a tungsten filament. The price of the lamp without batteries is $1.75.—Metal Specialties Mfg. Co., Chicago, Ill.

Presto electric hand type of lantern using two dry cells and having a 3-volt bulb and a 3-in. bull's eye lens

Ford Lamps, Brackets and Fenders

A new system for attaching the ordinary oil lamps to the 1915 Ford car consists of the use of a set of three malleable iron brackets, two for the side lamps and one for the tail lamp. They bolt to the projecting flange from the windshield, the side lamp brackets being made up in rights and lefts and taking the ordinary flat lamp bracket prop-holder. With these brackets any make of lamp can be used, a bolt-on type not being required. The brackets sell for $1.50 per set of three pieces.

A specially designed bolt-on electric side and tail lamp for Ford cars, having a screw and nut arrangement forming a support and part of the lamps and fitting into the flange bracket projecting from the windshield, has been put on the market by the same company. These lamps are finished in black and brass or black and nickel as desired. Side lamps list at $4.50 per pair and the tail lamp $1.20.

The same concern has also brought out a set of bolt-on type round oil lamps consisting of two side lamps and a tail lamp of new Ford type.

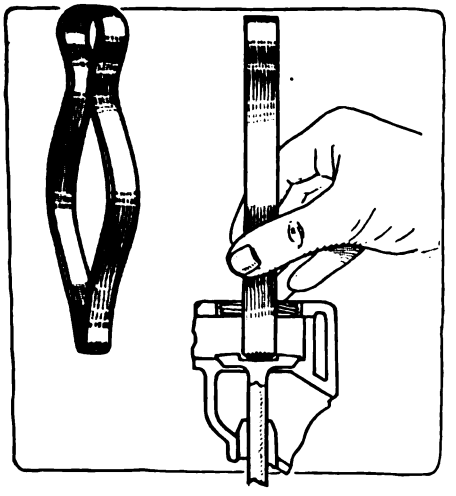
Rear fenders for Ford commercial cars made up in pairs complete with irons may be attached to any kind of delivery body. Fenders have the latest designed curve as in the 1915 Ford touring car fenders and are made of extra heavy steel. Fenders are finished in a triple coat of baked black enamel and are furnished with an inside flash apron. Packed in crates for shipment they sell at $9.90 per pair.—Superior Lamp Mfg. Co., New York City.

Handy Valve Lifter

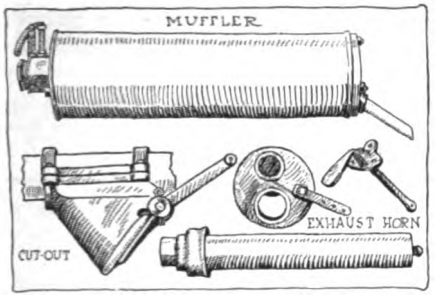
For removing valves after grinding a simple tool has been brought out under the name of the Handy valve lifter. It is in the form of a bent piece of spring steel shaped as in the illustration. When this is inserted in the slot in the top of the valve a pressure on the sides of the instrument expands the knurled tips and secures a grip on the slot of the valve, allowing it to be pulled directly from the cylinder. In some motors it is difficult to remove a valve by merely pushing up on the stem and should a quick push be used the valve will often strike some metal part of the motor or fall to the floor and become dented, thereby damaging its seat. With this tool the work of removing the valve can be quickly done and there is no danger of damaging the valve by allowing it to fall against some hard object. The price of the tool is 75 cents.—Fulton Co., Milwaukee, Wis.

Cutout and Muffler

The Gray cutout is designed to clamp directly to the exhaust pipe in which the proper size of opening has been cut to fit the opening in the cutout, which is turned downward and backward at an angle of 30 degrees to prevent the exhaust from striking the ground and raising dust. It comes in a number of sizes to fit the exact outside diameter of the exhaust pipe, and is made for a tight fit without the use of packing. A torsion spring on the valve holds the outlet door on its seat, and an extra coil spring is



Handy valve lifter for removing valves after grinding. Lifter is illustrated at left and method of operating at right



Top—Gray muffler for Fords with safety valve at front end. Lower left—Gray 30-deg. muffler cutout. Lower right—Gray Autochime exhaust horn

furnished with each cutout to be used when cars have an unsually strong exhaust.

The Gray muffler has outer drums of steel which are asbestos-lined, lock-seamed and riveted, while the heads are packed with asbestos wicking dipped in a special cement to make them gas tight. The front end of the muffler is fitted with a safety valve which remains closed under normal conditions but opens should an explosion occur within, and thus saves the muffler from severe strain. This muffler is now made in a special size to fit the brackets on a Ford car and furnished either with or without a cutout.

The same company manufactures several types of exhaust horn known as the Autochime. This is made to attach to the muffler pipe and exhaust pressure causes it to give out a powerful musical tone. It is furnished with fittings for attachment and an operating pedal.—Gray Hawley Mfg. Co., Detroit, Mich.

Noe Safety Tire Gage

The necessity for proper attention to the tires in order to obtain a maximum service and particularly proper inflation has long been recognized. As a result of this necessity the Noe maximum pressure safety inflating tire gage has been put on the market, the primary object being to provide a device which will positively prevent underinflation and which will insure the exact air pressure which a pneumatic tire is designed to carry and to automatically indicate at all times the maximum pressure within the tire.

The gage shown in the accompanying illustration, can be attached to any inner tube, inserted through the felloe of a wheel and inflated in the same manner aos the present inflating stem, remaining on the inner tube until replacement of the tube is desired, in which case the gage is removed and applied to the new or repaired inner tube. The gage is so hermetically connected to the inner tube that no leak is possible. It is water, tamper and trouble proof.—Seaman P. Noe, Asbury Park, N. J.

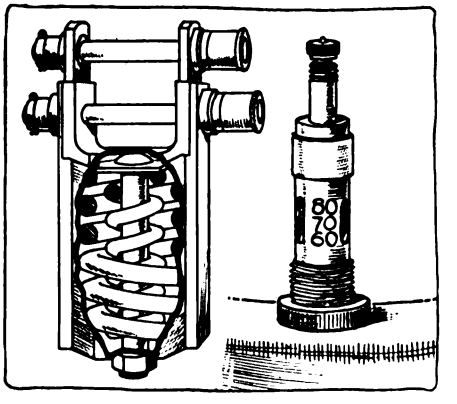
New Era Shock Absorber

This is a simple pattern of coil spring damper having two concentric springs of vanadium steel and an easily accessible adjusting nut, a long bearing is provided on the spring guides and lubrication is taken care of by large grease cups on the spring shackles. No castings are used in the construction, even the outer portion being cold drawn steel. The bushings are arranged so that the absorbers will fit practically any car without any difficulty and each set carries a *permanent* guarantee against defects. Prices vary according to size, the smallest costing $10 per pair and the largest $15.—Puritan Machine Co., Detroit, Mich.

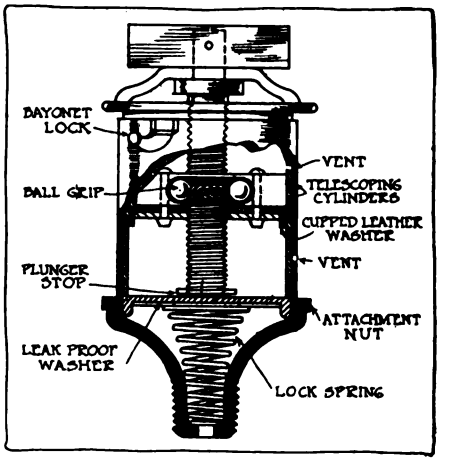
Bailey Grease Cup

An improved grease cup is one of the new C. B. specialties. A few of its features are an improved bayonet lock which cannot jar off and which permits quick filling; operates with thumb and finger only, no pliers or wrenches being needed; the plunger design prevents lubricant passing it; vent holes make ease of operation and prevent grease from returning to the cup; a ball grip prevents the plunger from turning; and the grease is forced into the bearing, a a leak-proof washer solving the problem of cleanliness.

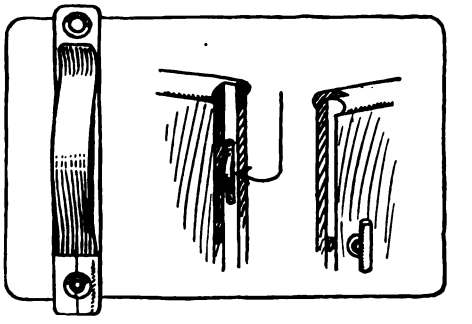
This cup is made in four sizes: ⅝-in., ¾-in., ⅞-in., and 1 in. diameter. Standard ⅛-in. and ¼-in. pipe thread, and 5-16-32 S. A. E. are supplied. The cups which are made only in brass, polished or nickel plated, range in price from 30 cents for the ⅝-in. polished brass to 45 cents for 1-in. in the same metal and from 35 cents for ⅝-in. nickel plated to 50 cents for 1-in. of the same metal.



Left—New Era coil spring shock absorber. Right—Noe safety tire gage



Section through C.B. bayonet lock grease cup which is designed to prevent jarring off and to permit of quick filling

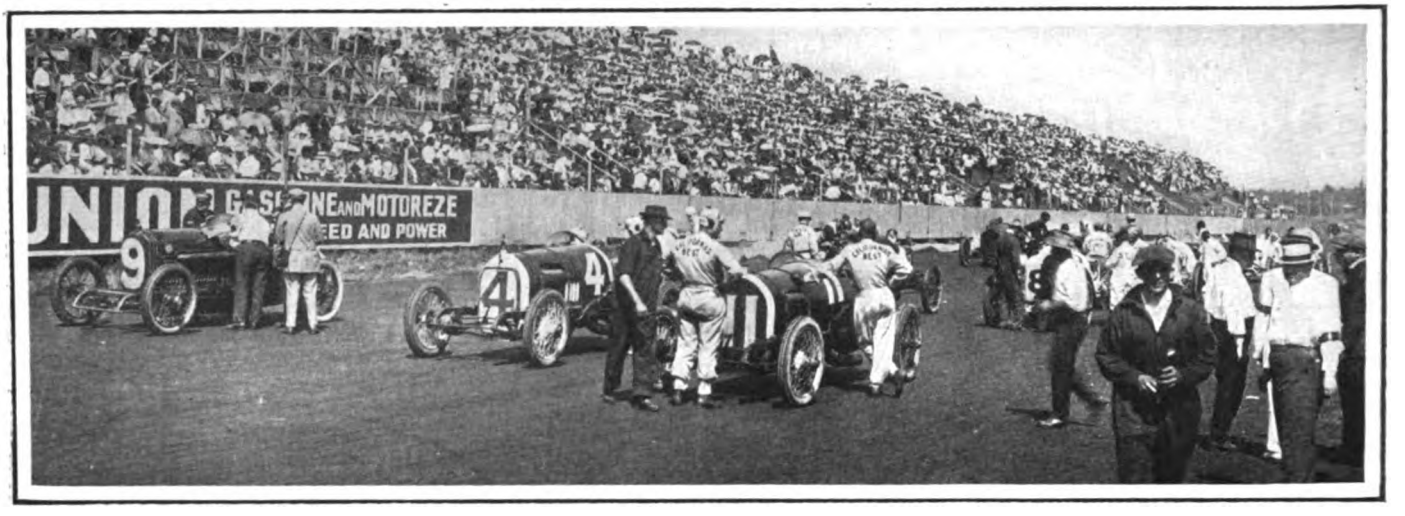


C.B. device for preventing car doors from rattling and to throw them open when unlatched

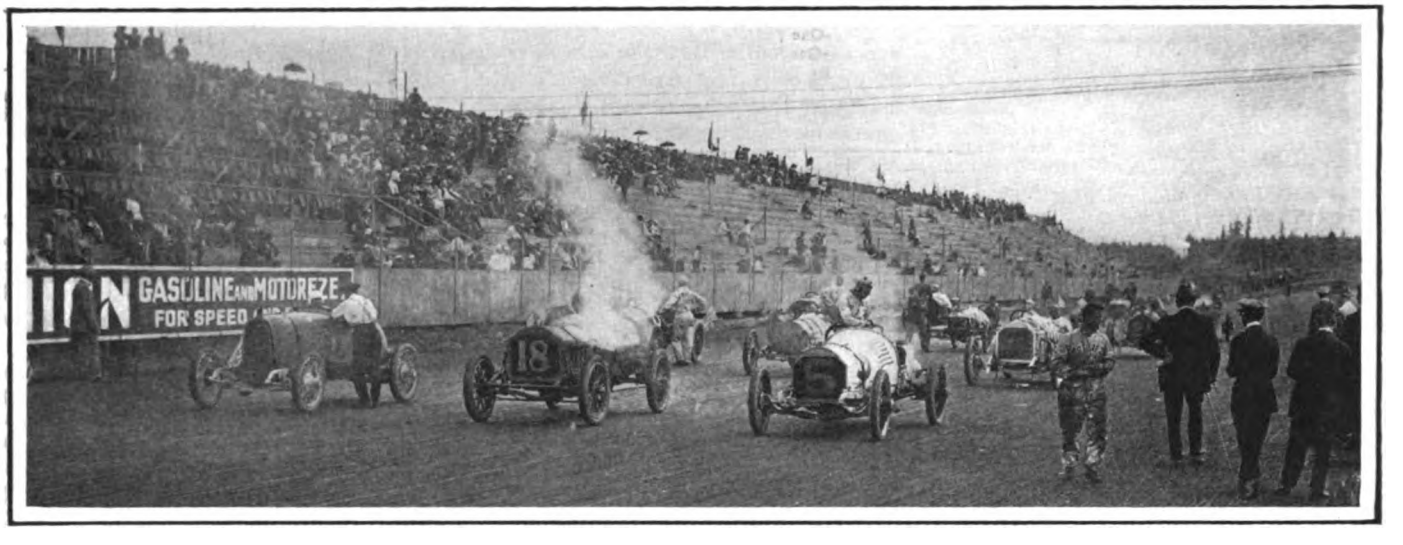
A device for eliminating rattle on the doors of cars is one of the new C. B. products. This device consists of a strip of high-grade clock spring steel attached in a minute to the door-stop with two small screws and which serves as spring and a dampener of noise when the door of the car is closed. It not only allows easy closing of the doors without noise but also throws open the door when unlatched. The price, including the screws, is 25 cents.

Another anti-rattler made especially for use on Ford and other cars not having wood angle stops is included in the C. B. products. This is of the coil design and is made of high-grade piano wire. A small disk attached to the door strikes the coiled spring when the door is closed the spring in turn acting as a dampener of noise by its reaction on the disk. The spring tension also throws open the door when unlatched. Both anti-rattlers are guaranteed for the life of the car. The price of the latter variety, including the screws, is 20 cents.—Wm. J. Bailey, Newark, N. J.

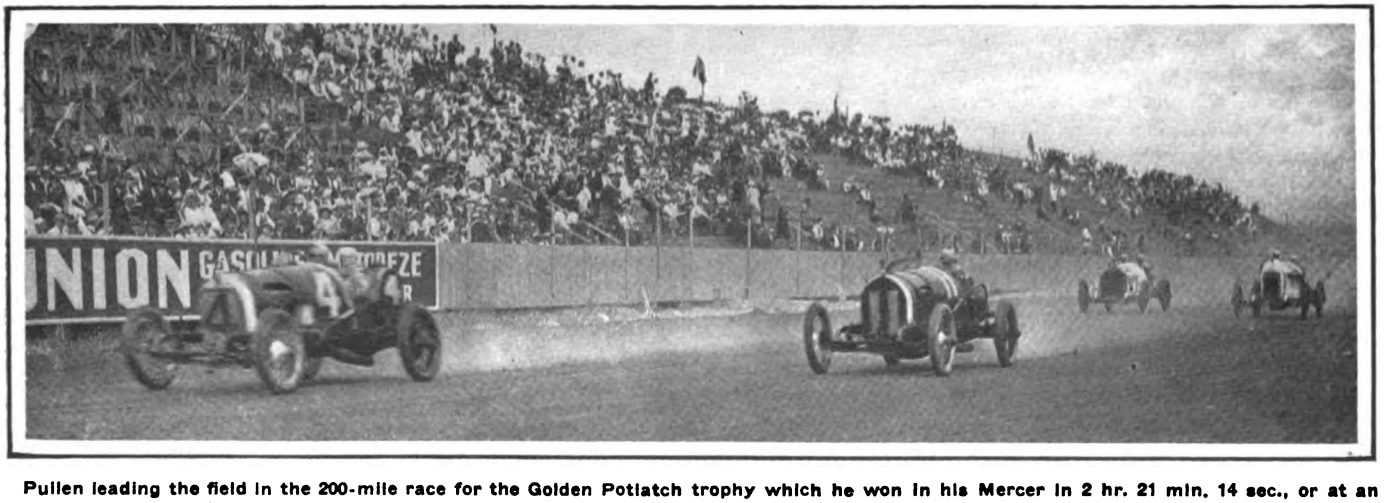
Glimpses of the Tacoma Races



Making ready for the flying start in one of the races held on Tacoma's new 2-mile board speedway over the Fourth of July holidays. The main feature of these races was the greatly increased average speed of the winners over that of former years, due to the new plank surface being more adapted to high speeds and less conducive to skidding than the old dirt surface



Start of the Montamarathon 250-mile race on the Tacoma speedway which was won by Ruckstell in a Mercer in 2 hr. 57 min., or at an average speed of 84.5 m.p.h., which was 11.1 m.p.h. faster than the time made by Cooper, who won this race in the Stutz last year. This year Cooper was second, again in the Stutz, covering the 250 miles in 2 hr. 58 min. 5 sec., or at 84.22 m.p.h.



Pullen leading the field in the 200-mile race for the Golden Potlatch trophy which he won in his Mercer in 2 hr. 21 min. 14 sec., or at an average speed of 85.2 m.p.h., 11 m.p.h. faster than the time made by Hughes' Maxwell in 1914. Cooper in the Stutz was second in this event as well as in the Montamarathon, his average being 85 m.p.h., while Ruckstell was third in the Mercer with 79 m.p.h.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, July 15, 1915 No. 3

THE CLASS JOURNAL COMPANY
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Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Cylinder Question

UP to the present nearly all car makers have aimed at one goal, namely, making cars with the same number of cylinders irrespective of the size of the car and the total piston displacement of the motor. First the four set the pace and all small cars, one by one, dropped the single and two-cylinder design and got into the four-cylinder ranks. Later, when the six established itself, the majority of four-cylinder makers of small cars started changing from fours to sixes, believing that they could not sell the four, no matter how small it was. They contended that the purchaser of the smallest car wanted a six, because that was what the wealthy purchaser had.

To-day we are witnessing a transition from sixes to eights and twelves, and already there are evidences that a few small cars are going to change to more cylinders. This constant change suggests the possible time when makers will not talk so loudly on the number of cylinders but when cars will be sold on performance, and it is really on performance that some of the new cars with more cylinders are being sold. The buyer wants performance, and the sooner he ceases to buy solely on the number of cylinders the better.

What difference should it make to the buyer whether he has four, six, eight, or twelve, providing it gives the best maximum performance, providing it gives desired acceleration, providing it gives high-speed performances with the greatest ease and absence of vibration, and providing the maintenance of the car is at the lowest mark? These are the important considerations. Two engineers may approach these subjects from different viewpoints, and the only criterion of their success should be the performance of the machine and not the simple question as to whether it has four, six, eight, or twelve cylinders.

More Official Tests

WITH changes in designs of motors and other car parts the importance of official tests such as made by the Packard twelve on the Chicago speedway last week becomes more apparent. Tests of this nature made by A.A.A. officials are the only tests that can be seriously considered by the public. Other tests made solely by the parties concerned invariably have a reverse influence in that the tests are not accepted by rival makers, and the selling forces throughout the country begin a campaign of discrediting the entire affair, and with a certain amount of right to do so. Such conditions are not desired, they should be avoided; we cannot afford to sow the possibilities of deception so broadcast. Let our public have official facts, facts that the rival maker cannot take exception to, facts that are indisputable.

This example of a concern coming out publicly and establishing its standards for speed, economy, etc., should be imitated. It is so immeasurably superior to other methods that comparisons are out of place. It is a business method as compared with publicity tactics, where a would-be standard is attempted out of the performance of some individual in the organization.

Hopeless Instruction Books

THE average instruction book to-day is a treatise for an engineer and not an educational book to be put into the hands of the owner, the chauffeur, the garageman, or the repairman. The books are poorly written, very often not well arranged, and in all cases quite uninteresting. Naturally they fail in their mission, and it is not surprising to find that they are not read or studied as they should be.

Instruction books should be in two parts, one a purely educational one and the other a semi-engineering treatise for the dealer, the expert repairman, and the garageman, who should know the ins and outs of all cars. The latter book would also be well suited to the engineering owner.

The educational book would be a purely educational one on the particular car or model and should not combine two or three models made by the same concern. This should aim at analyzing the entire car for the average reader, in a word, a dissertation on the car, which will result in the owner giving the car rational usage and perhaps directly resulting in the car giving much more mileage than it otherwise would.

Miles Host to N. A. C. C.

Directors and Friends Spend Three Days at His Maine Country Home

CHRISTMAS COVE, ME., July 13—The annual summer session of the National Chamber of Commerce, Inc., is in session here at the summer home of Samuel A. Miles, who in addition to officers and executive committee, is entertaining other leaders in the industry, the entire party aggregating thirty-five. The usual program of fishing, swimming, baseball and other sports is in force, two days being given over to holidaying and one day to the business of the chamber. Mr. Miles has every facility for entertainment at his big estate here with its miles of lake front, its salt water swimming tank, and all of the other essentials.

At to-day's business session of the directors, records of the traffic department of the N. A. C. C. showed that carload shipments of automobiles for June were more than 100 per cent greater than for the same period of last year. The figures are 15,308 carloads as against 7492 carloads for June, 1914.

There was an encouraging report of the desire of almost all the makers to have a uniform time for announcing annual models and some interesting data supplied relative to the progress being made on standardizing automobile treads and on the tendency of legislative bodies to give the jitney bus a fair hearing before passing laws affecting its operation.

Among those entertained by Mr. and Mrs. Miles are: Charles Clifton, C. C. Hanch, Thos. Henderson, Chas. Thaddeus Terry, Carl P. Pelton, J. Walter Drake, Wm. E. Metzger, H. H. Rice, Alfred Reeves, C. M. Hall, Chas. E. Thompson, James H. Foster, H. M. Swetland, F. A. Nickerson, R. D. Garden, Albert L. Pope, Wm. M. Sweet, Thos. J. Wetzel, T. C. Billings and D. J. Post.

Indiana Oxygen Co. Formed

INDIANAPOLIS, IND., July 8—A new firm recently organized here is the Indiana Oxygen Co. Four men form the organization. They are G. D. Armstrong, formerly general superintendent of the Prest-O-Lite Co., L. L. Sinclair of the same company, and W. L. and J. R. Brant. The company produces oxygen and hydrogen by the electrolysis system. A welding department for automobile repairing is a feature of the establishment.

Fisk Running at Full Capacity

CHICOPEE FALLS, MASS., July 9—The Fisk Rubber Co. is running at full capacity, its daily output being 5000 tires. It is expected that the company will show earnings of $1,500,000. These profits would contrast with $782,000 in 1914 and would represent a surplus for the common after paying 7 per cent on the $5,000,000 of preferred stocks of around 15 per cent. The common is not likely, however, to be placed on a dividend basis as the result of this year's good business. The company has a considerable floating debt and there is need of digesting its rather rapid growth before taking care of the claims of the common stockholders.

Overland's Morrow Plant to Be Enlarged

TOLEDO, O., July 9—The Morrow Mfg. Co., Elmira, N. Y., where Overland parts are made, is to be enlarged immediately by one-third its present size and capacity. The list of more than 2000 employees will be proportionately extended.

By Sept. 1, the Willys-Overland Co. will have an output of 600 cars a day at the local plant. Within less than 1 year the company expects to manufacture and ship 1000 cars every day. The company now has more than 11,000 factory and office employees in this city. A night force of 1500 workmen is laboring to increase the plant's output. The company now is 26,000 cars behind orders received.

Kalb Kelly-Springfield Engineer

SPRINGFIELD, OHIO, June 9—L. P. Kalb has been appointed engineer of the Kelly-Springfield Motor Truck Co., this city. He was formerly connected with the engineering department of the Pierce-Arrow Motor Car Co., Buffalo.

W. C. Guilder has been appointed factory manager in charge of production. He was for several years in the same capacity in the Mack truck factory in Allentown, Pa.

C. F. Gardner has been appointed an assistant to the president, J. L. Geddes.

Sternberg Changes Name to Sterling

MILWAUKEE, WIS., July 10—The Sternberg Motor Truck Co., originally incorporated as the Sternberg Mfg. Co., Milwaukee, Wis., has again changed its corporate title, the new style being Sterling Motor Truck Co. The change is made to conform with the adoption of the name "Sterling" as the trademark on its motor trucks.

Kennedy at Studebaker Plant

DETROIT, MICH., July 8—Henry Kennedy, managing director of the Studebaker Corp., of Australasia, Ltd., Sydney, Australia, has arrived at the Studebaker plant.

New S. A. E. Standard Ballots Out

Reports of Seven Divisions for Vote—Entire Schedule Expected To Be Approved

NEW YORK CITY, July 12—Ballots for the new S. A. E. standards have now been mailed to the members and upon the results of this voting will depend the fate of many new standards, although it is expected that the schedule will go through practically without exception owing to the care with which the standards committee has prepared the reports. The ballots are to be cast before Aug. 16. The reports of the seven divisions which are to be voted upon are those covering carbureter fittings, electrical equipment, electric vehicles, iron and steel, miscellaneous, springs and bell housings. These reports are all printed in the June Bulletin of the S. A. E., and have been digested in THE AUTOMOBILE.

The complete list of details follows:

Sixth Report of Carbureter Fittings Division

Flanges for ½-in. and ⅝-in. carbureters. Flanges for 2½-in., 3-in. and 3½-in. carbureters. Carbureter air heater.

Seventh Report of Electrical Equipment Division

Bulb bases, sockets and connector plugs.

Second Report of Electric Vehicle Division

Motor voltage. Motor name-plates. Number of cells in standard battery equipment.

Seventh Report of Iron and Steel Division

Revised vanadium steel specifications. Specification 3330—nickel chromium steel (new). Revised steel castings specification. Elimination of gray iron casting specification. Revised notes and instructions on steels.

Sixth Report of Miscellaneous Division

Flat fan belt and pulley widths. Cotter pin sizes. Brake lining sizes.

Fourth Report of Springs Division

Nomenclature of cantilever springs. Tests for parallelism of eyes and master leaf. Eye bushing and bolt tolerances. Wrapped eyes. Width of spring ends. Frame brackets. Offset of center-bolts. Nuts for spring clips. Center-bolts. Center-bolt nuts. Spring widths.

Report on Bell Housings

Number of bolts. Flange widths. Bolt hole circle.

Jarrard to Handle Apperson Sales

NEW YORK CITY, July 10—T. E. Jarrard, vice-president of the Apperson Bros. Automobile Co., Kokomo, Ind., is in charge of the sales department; assisting him will be J. H. Newmark, who also continues in full charge of the advertising department.

Hutchison Joins Gibson Co.

INDIANAPOLIS, IND., July 18—H. D. Hutchison, who has been in charge of the motor department for the Chicago district of the General Electric Co., has accepted the place of sales manager of the same department of the Gibson company, Overland distributor here.

Record Truck Exports for May

Pass $10,000,000 Mark—2,426 Trucks Valued at $6,583,912 Shipped

WASHINGTON, D. C., July 13—*Special Telegram*—The department of Commerce to-day announced that 2426 trucks valued at $6,583,912 and 4921 passenger cars, valued at $3,971,483, were exported in May.

This breaks the previous record made in April, 1915, when the $8,000,000 mark was passed.

During the 11 months ending May, exports were valued at $46,889,835, divided up into 11,006 trucks at $30,561,880 and 19,462 passenger cars at $16,327,955.

Comparing the same month in 1914 the large increase is shown. For the month of May, 1914, there were only ninety-nine trucks, valued at $127,024 and 3157 passenger cars, valued at $2,857,601, exported. During the 11 months' period ending May, 1914, the exports were 694 trucks, $1,061,354, and 26,324 passenger cars, $23,522,081.

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International Standards May Be International Co-operation Division

NEW YORK CITY, July 9—It has been proposed in the council of the Society of Automobile Engineers to change the name of the International Standards Division to International Co-operation Division. If approved by the members of the council, this change will take place immediately.

The reason for making this change is that at the time the International Standards Division was created by the council, a communication was written abroad advising the British Engineering Standards Committee of the creation of the division. At that time the British body inquired as to the activities of the division in view of the use of the word International. After an exchange of communications, it has been found that the original title of the division is misleading from a European point of view, and owing to the possibility of future misunderstandings, and as a result of a conference between Chairman Zimmerschied of the Standards Committee, Chairman Clayden of the International Standards Division, and Coker Clarkson, general manager of the S. A. E., it has been decided to put the question to a vote by the council.

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King to Make No Changes for 1916

DETROIT, MICH., July 12—The King Motor Car Co. has decided not to make any changes, either in construction or in price, in its eight-cylinder car until the end of this year. This is in accordance with the new policy recently adopted by the company.

During the first six months of 1915 the King company has built and sold about 3500 cars. The first eights were shipped about Jan. 15. It is expected that during the second half of this year the production will total about as many cars as during the first half of the year. Officials say that the business outlook is very good, dealers reporting conditions to be most satisfying in practically all parts of the country.

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11,895 Cadillac Eights Shipped First Half of 1915

DETROIT, MICH., July 9—During the first half of 1915 the Cadillac Motor Car Co. manufactured and shipped a total of 11,895 eight-cylinder cars. This is the biggest production for a period of six months in the company's history.

The first Cadillac eights were shipped in October, 1914.

The production records show that 7043 cars were made in April, May and June, as compared with 4852 during the preceding three months. Taking the figures month by month, the output was 1321 in January, 1575 in February, 1956 in March, 2325 in April, 2519 in May and 2199 to June 26.

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$50,000 Additions to Chalmers Plant

DETROIT, MICH., July 12—Two permits for two factory additions to the Chalmers Motor Co. plant were granted last week, involving an expenditure of $50,000. Factory building No. 4 will be enlarged by second, third and fourth story reinforced concrete additions, while factory building No. 5 will receive a four-story addition.

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Barton Top's New Plant

DETROIT, MICH., July 12—The Barton Auto Top Co. will move into its new plant, a one-story structure 65 by 140 ft., during the latter part of July. This plant is located to the rear of the present quarters, which are at 863 Woodward avenue, and which will very likely be maintained as offices.

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Gadabout Leases Detroit Plant

DETROIT, MICH., July 12—The Gadabout Motor Corp. of New York has leased a two-story factory building at 182 Lafayette Avenue.

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Graham Leaves Bower

DETROIT, MICH., July 13—D. F. Graham, for four years sales manager of the Bower Roller Bearing Co., has severed his connection with that company.

W. S. Bennett, who was assistant sales manager has become sales and advertising manager of the company.

24,000 Reo Cars for 1916 Season

Plans for Factory Additions Extended — New Truck Plant—Loading Dock

LANSING, MICH., July 9—General Manager R. H. Scott of the Reo Motor Car Co. states that the Reo company will build 24,000 passenger cars for next year. Fifteen 2-ton trucks are being shipped daily. Work has been started upon a tract of 4½ acres of ground for the erection of a large new plant for the truck organization.

The additions to the Reo plant announced several weeks ago will be more extensive than originally planned. They will consist of a three-story structure, 101 by 256 ft., with basement, being an addition to the general assembling department; to the final assembly department there will be added an entirely new addition, three stories in height, 115 by 138 ft., with basement, while the present assembly building will receive two additional stories, 80 by 153 ft. A three-story addition, 50 by 74 ft., will be added to the engineering building. Shipping facilities will be greatly relieved through the construction of a loading dock along the Grand Trunk railroad, 347 ft. long and 36 ft. wide.

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$1,000,000 Austin Co. to Make Two-Speed Axles—Seek Plant

GRAND RAPIDS, MICH., July 10—The Austin Automobile Co. will probably be incorporated with a capital stock of $200,000, while another company is to be organized having a capital stock of $1,000,000 to manufacture the Austin two-speed axles. A larger plant is also being sought.

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Kelly E. A. M. A. President

CLEVELAND, O., July 9— G. H. Kelly, secretary of the Baker R. & L. Co. was elected president of the Electric Automobile Manufacturers' Association at the annual meeting in this city, held recently, to succeed L. E. Burr of the Wood company.

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Couzens Joins Pathfinder

INDIANAPOLIS, IND., July 8—St. Clair Couzens, until recently advertising solicitor of the *Chicago Daily Journal*, has joined the Pathfinder company as assistant director of sales and advertising.

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Kenworthy Baker-R. & L. District Mgr.

NEW YORK CITY, July 10—C. Y. Kenworthy has been appointed eastern distric manager of the Baker-R. & L. Co. Mr. Kenworthy was formerly manager of the Rauch & Lang Co. in this city.

Registrations Break All Records

Iowa Passes 130,000—Close to California's 137,000—New York Over 200,000

DES MOINES, IOWA, July 14—Automobile registrations in Iowa for 1915 have passed the 130,000 mark, thus making a large gain on California, whose registrations up to July 3 numbered 137,383. The amount of fees received from registrations has passed the $1,000,000 mark.

New York State is still in the lead with a record registration of 200,189 cars. The receipts for the first half of this year for New York were $1,667,000, against $1,533,367 for all of 1914.

Iowa's 1914 registrations numbered only 106,087. It is estimated that there will be a total of over 150,000 before the close of 1915. The total receipts last year were only $1,040,000 and more fees were received in the first six months of this year than during the entire year of 1914.

Iowa farmers contributed $1,000,000,000 to the general wealth of the Hawkeye State as a result of the bumper crops of 1914. Its wealth per capita, figuring on farm wealth alone, is $1,682.

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Chicago Wheel Tax Must Be Paid by July 20

CHICAGO, ILL., July 12—Beginning July 20 Chicago motorists will have to have their wheel tax paid or be hailed into court by the police, as announcement has been made that after that date the Chicago wheel tax ordinance will be enforced. For the last 2 months car owners have not been obliged to pay a wheel tax because the measure was declared unconstitutional. Now that a new law has been passed by the legislature, the old measure will be enforced. However, inasmuch as the law was inoperative during May and June, only ten-twelfths of the annual rate will be collected. For vehicles under 35 hp., the tax will be $8.34 instead of $10. This will be good until April 30, 1916. Higher-powered cars will pay a proportionately higher rate.

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Du Pont Co. Delivering Cars

NEW YORK CITY, July 12—Under the name of Du Pont Motor Car Co., the Sphinx Motor Car Co., York, Pa., has been re-organized. The factory of the Du Pont company is at York and a factory branch agency has been opened in New York City with the S. S. Shears selling organization. It is stated that the company has French affiliations and will endeavor to do an export business. S. S. Shears, who is vice-president of the Du Pont Motor Car Co., is in charge of the sales in the East and the company at the present time is disposing of the 1915 model at a price of $595 preliminary to bringing out a 1916 type which will be announced, it is stated, in about six weeks.

The present car specifications include a Lycoming 3¼ by 5, L-head block motor with Covert gearset, Spicer joints, Weston-Mott axle, Hyatt bearings, Schwartz wheels, demountable rims, Connecticut ignition, Splitdorf-Apple lighting and starting, cantilever springs and wheelbase of 112 in., with five-passenger body. Cooling is by thermo-syphon; ignition, Atwater Kent; drive, left; control, center; and the spring suspension, cantilever front and rear. The springs are the product of the Sheldon company. The car is sold fully equipped, the price being f.o.b., York, Pa.

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9249 Cars in Louisiana

BATON ROUGE, LA., July 9—Up to July 1, there were 9249 automobiles registered in the State of Louisiana, approximately 9175 of these being gasoline passenger cars; 460 gasoline motor trucks and about seventy-five electric passenger machines. No electric trucks were registered. About $59,000 in fees was collected by the Secretary of State, no fees nor registration being required for chauffeurs. Approximately 120 re-registrations are recorded, but there are no non-residents registered.

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Michigan Has 99,460 Cars

DETROIT, MICH., July 13—Up to July 10 the Secretary of State of Michigan, has issued 99,460 automobile licenses, which is 23,138 in excess of the total number issued in 1914. It is anticipated that the estimate made early in the year that 120,000 cars will be licensed this year will even be below the actual count by Dec. 31.

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Twin Cities in Need of Uniform Laws

ST. PAUL, MINN., July 8—Need of uniform laws governing automobile operation has been emphasized in the Twin Cities by the new dimmer law in St. Paul and the new jitney ordinance in Minneapolis. Motorists and jitneurs travel between the cities. In Minneapolis there is no lamp dimmer ordinance, such as has just gone into effect in St. Paul. In St. Paul there is no special law covering jitneys such as went into effect this week in Minneapolis. In the latter city automobiles may pass unloading street cars at a certain distance to the right. In St. Paul automobiles must stop when street cars are unloading passengers. The conflict of the laws causes a great amount of trouble and many arrests of Minneapolis people in St. Paul and St. Paul drivers in Minneapolis.

Ferro 8 Completes 300-Hr. Run

Higher Power at Finish than at Start—Run Practically Non-Stop

CLEVELAND, OHIO, July 8—A 300-hr. run on the test block has just been completed by the Ferro eight-cylinder motor made by the Ferro Foundry & Machine Co. While a few short pauses were made to change the oil and make a few adjustments, it was practically a non-stop run carried out solely for the information of the Ferro engineers and experimental department. An interesting feature is that at the conclusion of the run a higher maximum horsepower was shown than at the start.

The idea was to keep the motor turning over at 1500 r.p.m., at which speed it develops its rated S. A. E. horsepower, and twice during the run the throttle had to be closed a little to keep the speed down to the desired limit.

Commencing with a maximum test which showed 59 hp. the motor was then throttled to 34 hp. and at the finish of the run the maximum was a little over 61 hp. The test was made primarily with the idea that it would show up any weak spots in the motor, and as a matter of fact it did prove that one or two small fittings for which the Ferro company are not responsible were hardly up to standard, and a few replacements of such parts were made. As regards all the essentials of the motor, however, its condition was excellent in every way. For example the exhaust valves, one of which we have had the opportunity of examining, showed no indication of having been in use for more than a few hours, it not being pitted or scored at all. Such stops as took place were of only a few minutes' duration, giving the motor no opportunity for cooling off. Thus the test can be regarded only as satisfactory.

It should be remembered that this is the first long test of an eight of which any details have been made public.

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Savannah to Register Automobiles

SAVANNAH, GA., July 8—Unless the State desires the city will not be a party to any appeal from the decision of Judge Charlton of the Supreme Court in the matter of the State automobile tax law and the city's automobile registration ordinance.

Now that the court has held the State law invalid the city's interest in the matter has ceased and it probably will take steps to pass a registration ordinance that is not based upon the State law. City Attorney John Rourke, Jr., will confer with Governor Harris and

Secretary of State Cook to learn what action the State proposes to take.

It had been the city's position all along that it could require the registration of automobiles and Judge Charlton upheld the contention. He declared the State law invalid because the method of apportioning the money to be derived from the special tax was not the proper one, and that the city ordinance was invalid because it was based upon an illegal law.

The probability is that the city will issue numbers and require them to be placed on all automobiles and motorcycles. The machines may be numbered according to the order of their registration. The purpose of Council in passing the ordinance was to provide a check on automobiles and motorcycles for the information of the police department.

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Japan Poor Truck Market

AKRON, OHIO, July 8—That Japan is a poor market for motor trucks is indicated in a letter recently received by an American truck maker from the Tokio, Japan, branch of the B. F. Goodrich Co. The letter gives a list of Japanese merchants who have agencies for different makes of trucks.

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Ford Buys Seven More Acres of Land

DETROIT, MICH., July 12—Henry Ford purchased seven more acres of land in the River Rouge district, where the new Ford plants will be located. The purchase price of the land was $20,000, it is said.

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$50 for Accessory Theft

JOLIET, ILL., July 12—The Will county automobile club has offered a reward of $50 for the arrest and conviction of any person who steals accessories from automobiles.

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Illinois Chauffeurs Examined

BLOOMINGTON, ILL., July 12—State examiners are now visiting the principal cities of Illinois, examining all chauffeurs eligible for licensing. A week is being spent in each city. All drivers who are under salary, are required to take the test.

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Detroit S. A. E. Fund Increases

DETROIT, MICH., July 9—During June three new concerns have become contributors to the general fund which has been started by the Detroit section of the Society of Automobile Engineers to make it possible to maintain its local quarters. The new contributors are the Paige-Detroit Motor Car Co., which subscribed $100; the Willard Storage Battery Co. which contributed a similar amount and the Perfection Spring Co. which pledged $50. The fund totaled $2,450 July 1.

Breaks Chicago-to-N. Y. Record

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E. C. Patterson Covers 1,015 Miles in 35 Hr., 43 Min. with Packard 3-38

NEW YORK CITY, July 13—From Chicago to New York in 35 hr. 43 min. was a record established to-day, when E. C. Patterson, Chicago motoring sportsman, and entrant of the Mercedes in which Ralph De Palma won the Indianapolis 500-mile race this year, finished the 1017.5-mile trip in a Packard 3-38, six-cylinder 4 by 5½, five-passenger touring car. This is elapsed time and shows an average of 28.48 m.p.h. In addition to maintaining this speed Patterson kept his motor running the entire time so that his performance was a non-motor-stop one. He carried with him three other passengers and pilots for the different stages so that the passenger load averaged five all of the time and it was six for short periods.

Delayed by Detours

The party left Chicago at 2.52 Monday morning and reached here 3.35 this Tuesday afternoon. The original schedule was to have brought the car here at 2.03 this afternoon, but there were delays due to detours, a long one at Elyria, Ohio, and another one near Buffalo. There was still further delay by a broken fan belt which had to be replaced at Albany, this being the only mechanical adjustment made during the trip. These delays, coupled with speed regulations entering Greater New York, held the car back. Stops consumed 1 hr. 29 min., leaving actual running time 34 hr. 14 min., which would give a running speed of 29.71 m.p.h.

Only Five Stops for Fuel

One year ago Mr. Patterson made a similar trip but with slower time, 41 hr. 37 min. Since then he has been working on arrangements for the present trip. He carried an additional tank carrying 20 gal. of gasoline in the tonneau and had only to make five stops for fuel on the road. Two speedometers were fitted, one showing 1017 miles and the other 1018. The Blue Book gives the route as 995, the added distance being for detours. Two horns were carried.

Roads Good All the Way

The route followed was through South Bend, Cleveland, Buffalo, Utica, Albany and Poughkeepsie. Roads were good all of the way. Mr. Patterson reports those in Indiana as good, Ohio as splendid, New York as excellent and Pennsylvania as good through Erie, etc. The weather was dry throughout. Night driving took place between Erie, Pa., and Canandaigua, N. Y.

Accompanying Mr. Patterson were: J. H. Cattell and J. E. Williams, official observers of the Chicago Automobile Club, and W. Gollan. Mr. Patterson drove 60 per cent of the distance. Two rear tires were changed.

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Chevrolet Builds New Plant

FLINT, MICH., July 14—The Chevrolet Motor Co. of this city has recently acquired the balance of the capital stock of the Mason Motor Co., which has been furnishing the motors for the Chevrolet cars, and has started the erection of a new one-story motor manufacturing plant. The new building is 616 by 150 ft. and when completed, it is stated, the plant will be capable of an output of 1000 motors a day.

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Anderson, Winton Engineer, Killed

CLEVELAND, OHIO, July 13—Harold B. Anderson, chief engineer of the Winton Co., was killed in a street car accident to-day in this city. Mr. Anderson had been with the Winton company since July, 1902. He was born April 1, 1878, and received his technical education in the Case School of Applied Science in this city. After graduation he was consulting engineer of the Van Wagner & Williams Co. for a period of one year, and was for 1½ years with the American Bicycle Co., and the International Motors Co., as mechanical engineer on gasoline car work. He went with the Winton company in July, 1902, being placed in charge of the engineering department not long afterwards. He leaves a widow.

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New Dort Distributor in D. C.

WASHINGTON, D. C., July 13—The Miller Brothers Auto and Supply House, this city, has been appointed Dort distributor for the District of Columbia, Maryland and Virginia.

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Disco Secures Large Contract

DETROIT, MICH., July 10—The Disco Electric Starter Co., Detroit, has the contract for supplying the Argo Motor Car Co. its starting and lighting systems. The Argo company has contracted for a minimum of 10,000 outfits, and the maximum is expected to exceed 20,000.

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Ford J. M. Prices Reduced

NEW YORK CITY, July 10—Starting with the second week in July, all J. M. shock absorber branches all over the country will sell Ford J. M. Shock Absorbers at $15 per set or $8 per pair, instead of the previous prices of $25 per set or $15 per pair.

Eight New Ford Branches

Number Now Totals Forty-Three—Twenty-Six Assembling Plants

DETROIT, MICH., July 12—Eight new branches will be opened by the Ford Motor Co. Aug. 1. They will be located in Washington, D. C.; Council Bluffs, Iowa; Jacksonville, Fla.; Wichita, Kan.; Fort Worth, Tex.; Nashville, Tenn.; Syracuse and Utica, N. Y.

This will bring the total number of Ford branches in the United States to forty-three and the number of assembling plants to twenty-six. Some of the branches will probably ultimately become assembling plants, but for the present the Ford company does not intend to start new ones.

During the fiscal year ending July 31, the Ford company will have opened four branches and six assembling plants, while work was started on four additional assembling plants and additions started on two others.

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Jackson-Church-Wilcox Additions Increase Production 50 Per Cent

SAGINAW, MICH., July 8—Additions to the plant of the Jackson-Church-Wilcox Co., manufacturers of steering gears, will enable this concern, it is claimed, to increase its production 50 per cent. One addition, consisting of a one-story building, 60 by 200 ft., with a saw-tooth roof, will provide more room for manufacturing purposes and for the stock room. The other addition, consisting of a two-story brick and steel open structure, 60 by 48 ft., will be used principally for a hardening department.

At the present time 200 men are employed, two shifts being used in some departments. The company's pay roll averages about $700 a day, it is claimed. During 1912 the company manufactured 27,000 steering gears; in 1913 the output was 57,000; the total was 67,000 in 1914, and for 1915 it is estimated that by the close of the business year, July 31, the output will show that a total of 100,000 steering gears have been made.

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$600,000 Corp. to Build Tires

NEW YORK CITY, July 10—The Gryphon Rubber & Tire Corp., with a capital of $600,000, has been formed to manufacture pneumatic automobile tires of a foreign design with a 10,000-mile guarantee. A plant has been taken over in Mount Vernon, N. Y., 65 by 135 ft., and three stories in height, where, in about three months, it is stated, the company will produce 250 tires a day.

S. A. Cunningham, of 2 Wall Street; P. S. Jones, 5 Nassau Street, and L. Emdin, Deal, N. J., are the incorporators. Jones is the temporary president and Cunningham is treasurer.

The same design of tire has been manufactured extensively throughout Europe, the patentee being Isaac S. McGiehan of London, England. The American patent is No. 1,110,451, filed May 15, 1911. The tire is composed of a fabric carcass or foundation and a tread portion composed of layers of rubber-filled fabric of different widths formed into a crescent band, united thereto by an interposed film of softer rubber, all homogeneously vulcanized.

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Firestone Adding Five New Buildings

AKRON, OHIO, July 8—The Firestone Tire & Rubber Co., this city, has placed contracts for the immediate extension of three of the big main wings, plus the doubling of a six-story separate factory building and the erection of a restaurant. This latter building will be three stories and a basement high, and will be about 150 ft. square with a floor space of about 90,000 sq. ft.

These new additions will add 302,000 sq. ft. of floor space to the present plant and will enable the company to nearly double its output.

The original Firestone factory was built in 1902. Here Firestone carriage tires were first made. Thirteen years ago Mr. Firestone and six others constituted the entire office force. To-day over 700 persons are required to handle the office work of the company.

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Remy to Add 15,000 Sq. Ft. of Space

INDIANAPOLIS, IND., July 8.—The Remy Electric Co. of Anderson, Ind., will contract for two additional buildings at its local plant that will provide 15,000 more square feet of floor space. It was also definitely announced that the manufacturing departments of the Remy company will remain in Anderson. Recently it was decided to establish an experimental department plant at Detroit. Experimental work will start there soon. It has been definitely decided to do no manufacturing at Detroit. The plant at Anderson at this time is employing 1300 persons and with the additional capacity will employ 150 more.

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To Occupy American Voiturette Plant

DETROIT, MICH., July 12—A metal refining company will occupy the plant formerly occupied by the American Voiturette Co. The Detroit Trust Co. sold the property and buildings for $45,000, which will go to the creditors of the former manufacturer of the Car-Nation and Keeton cars.

Paige Fairfield Six $100 Lower

Company Will Continue Model for 1916—Increased Production Brings Drop

DETROIT, MICH., July 8—The Paige-Detroit Motor Car Co. will continue for 1916 the Fairfield Six-48 which was placed on the market in January, 1915. The price of this seven-passenger car, the larger of the two Paige sixes, has been reduced to $1,295, or $100 less than this year's selling price.

The new price is said to have been made possible by increase in factory capacity and factory production, and the greater perfection of manufacturing methods and merchandising.

Briefly stated some of the principal features in the Fairfield Six-48 are 124-in. wheelbase, Continental L-head block motor, 3½ by 5¼, Bosch magneto, Gray & Davis starting and lighting system, cantilever springs, 34 by 4 tires.

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Garage Association for Queens and Nassau Counties

BROOKLYN, N. Y., July 13—The Garage Owners' Association of Queens and Nassau Counties was formed last night at Disbrow Bros. Garage. The action followed the general recognition of certain abuses in the trade. It is planned to meet at an informal luncheon every Monday evening during the early stages of organization. The officers are: President, H. A. Aubinger, Jamaica; secretary, Edward Koster, Jamaica; treasurer, J. T. Callister, Greene County. Membership committee, Paul J. Stock, Owensboro Garage, Flushing; C. W. Smith, Great Neck; R. B. Sterling, Lynbrook; Fred C. Gehrke, Elmhurst; and C. C. Morigl, Ogden Garage, Central Park.

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Mennonites Can Buy Cars

SABETHA, KAN., July 10—The prospect is that a few hundred automobiles, possibly reaching about 150 per cent of the families of the community, will be sold here soon. In other words, a community that has never bought automobiles is about to be in the market. The Amish church has modified its rule against automobiles and hundreds of Mennonite farmers are now buying machines.

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Recent F. W. D. Changes

CLINTONVILLE, WIS., July 10—J. C. Turk, recently with the International Harvester Co., Philadelphia and New York and formerly in charge of sales for the International Pump Co. in South America and Cuba, has accepted a position of special representative in the

Eastern territory, with headquarters in Milwaukee, for the Four Wheel Drive Auto Co., Clintonville, Wis.

H. C. Gooding, recently in charge of the New York branch of the Corliss Carbon Co., and formerly manager of the Flanders Electric Vehicle Co., Canada, has become identified with the Four Wheel Drive company, as special representative in the middle west with headquarters at Chicago.

F. H. Burdette, recently with the Standard Motor Sales Co., Pittsburgh, Pa., and formerly district manager of the Neyberg company on the Pacific Coast, has joined the sales force of the Four Wheel company. Mr. Burdette will eventually devote his time to the Pacific Coast with headquarters at San Francisco.

Klaxon Wins Horn Suit

NEW YORK CITY, July 10—The Lovell-McConnell Mfg. Co. has won its suit against the Oriental Rubber & Supply Co., a Brooklyn dealer in accessories, Judge Chatfield having rendered an opinion holding the Hutchison patent No. 1,120,057 valid and infringed by electric horns sold by the Oriental concern. The court has issued an interlocutory injunction in favor of Lovell-McConnell and has appointed Joseph G. Cochran master to take an accounting and determine the extent of profits and damages to be paid by the Oriental Co.

The Hutchison patent, which figures in the suit, is one of eighteen new mechanical patents covering details of horn construction taken out by the Lovell-McConnell Mfg. Co., during the past year and covers a new construction having the drive shaft forming the axis of the electric motor at right angles to the plane of the diaphragm and slightly below the center. A face cam is used to vibrate the button at the center of the diaphragm. The suit was in the U. S. district court for the eastern district of New York.

Milwaukee Motor Rejects $37,500 Offer

MILWAUKEE, WIS., July 8—Creditors of the defunct Milwaukee Motor Co., Milwaukee, Wis., have rejected the offer of E. G. Miller and E. K. John, the principal stockholders, to pay $37,500 on condition that all claims be released. The First Trust Co., Milwaukee, trustee, filed a petition declaring it has a suit against Mr. Miller to recover $55,000, alleged to have been paid him out of the corporation's funds while the concern was insolvent, and a suit to recover $100,000 from Elise John alleged to be due under certain contracts existing between Miller, John and the corporation. The Imperial Automobile Co., Jackson, Mich., also has several suits against the defendants and defunct corporation on account of nondelivery of motors.

1916 Inter-State $150 Lower

No Changes Made in Car—Reduction on Roadster and Touring Models

MUNCIE, IND., July 9—The Inter-State Motor Co. has made a price reduction of $150 on its touring and roadster models which for 1915 sold at $1,000. The new price, $850, is the only change made for this season, the car being the same mechanically and as regards equipment.

The specifications of the Inter-State car include a four-cylinder Beaver motor with the cylinders cast in a block and with over-head valves. The cylinder dimensions are 3½ by 5 with a 2-in. carbon steel crankshaft carried on three main bearings, the front one having a length of 2¾ in., the center 2 in. and the rear 3⅜ in. The motor is oiled by a circulating splash system and is fitted with a 1-in. carbureter. Compactness has been made an object in the layout of the motor, the intake being on the left and the exhaust on the right. The electric starter is on the right, operating through a ring gear on the flywheel with which meshing is secured by a Bendix gear. Cooling is by the thermo-syphon system.

The clutch is a leather-faced cone on an aluminum spider and from it the drive is transmitted through the shaft to the gearbox which is in a unit with the floating axle. The gearset has nickel-steel gears and the drive is taken through a yoke construction. The rear springs are double shackled and the rear axle has a gear reduction of 4 to 1. It is a one-bearing design with 1-in. brakes. To insure a short turning radius a bottle-neck frame is employed.

The dash instruments are carried on a cowl board and the gasoline tank is under the cowl. The equipment includes a one-man top of mohair and full set of instruments and tools. The price, $850, is f.o.b. Muncie, and applies to either the touring car or the roadster.

Will Make Van Speedometers in Elgin Plant

AURORA, ILL., July 10—Details of arrangement, announced in brief in THE AUTOMOBILE last week, between the Van Sicklen Co., Aurora, and the Elgin National Watch Co., Elgin, whereby the latter will manufacture Van speedometers under the patents held by the former, now can be made public. The watch concern will take over the machinery, tools, equipment, raw material and material in the process of manufacture, owned by the Van Sicklen Co., and will manufacture the instruments, the Van Sicklen Co. handling the sales.

Some of the advantages gained are a larger production, unlimited facilities and unquestioned financial backing, the entire manufacturing and financial resources of the watch company being back of the Van Sicklen Co. in the production of speedometers and any other specialties it later may determine to market.

C. H. Hulbird, president; Guy V. Dickinson, general sales manager, and George E. Hunter, general superintendent of the Elgin National Watch Co., are stockholders in the Van Sicklen Co. The control, however, is vested in N. H. Van Sicklen, Sr.

The company is capitalized at $250,000, with all of it paid for in full at par, and there is none for sale. The general offices of the Van Sicklen Co. will be in Elgin after Aug. 1.

No Standard Truck Change

DETROIT, MICH., July 13—The Standard Motor Truck Co. states that no change in its organization has taken place.

Detroit Starter Capital Now $150,000

DETROIT, MICH., July 9—The Detroit Starter Co. has increased its capital stock from $20,000 to $150,000. This concern was started in October, 1914, and its business has been steadily increasing making an increase of capital necessary. At the present time the daily output averages thirty-five starters. This is to be increased to about 125 beginning August 1.

Robbins Co. to Move Plant

INDIANAPOLIS, IND., July 8—The Irvin Robbins Co., designer and manufacturer of automobile bodies, will move its factory to the old plant of the Irvin Manufacturing Co. at Morris and Division Streets. The new home has been thoroughly remodeled and is considered one of the model plants in Indianapolis. It is located on the Belt railroad, offering excellent facilities. In the old location the demand of outside manufacturers was so great that the Indianapolis market was neglected. The new plant was leased with the idea of supplying local automobile companies with bodies. E. Guy Robbins has been continued as president and general manager. W. O. Streller is purchasing agent and production manager. W. S. Eaton has been appointed mechanical engineer and J. A. Dougherty, sales manager.

Ford's Milwaukee Plant Begun

MILWAUKEE, WIS., July 10—The Ford Motor Co., Detroit, Mich., has awarded the general contract for the erection of

its new branch plant in Milwaukee, and work is now under way. It is planned to have the building ready for installation of equipment by November 1, so that operations may start November 15 or December 1. The Bossert contract is stated to be approximately $250,000. The factory will be located at Prospect Avenue, Kenilworth Place and the Northwestern tracks. A. W. L. Gilpin is Milwaukee manager.

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Dividends Declared

Willys-Overland Co., Toledo, Ohio, quarterly 1½ per cent on the common stock, payable Aug. 1 to stockholders of record July 21.

Kelly-Springfield Tire Co., New York City, quarterly 1½ per cent on the common stock payable Aug. 2 to stockholders of record July 15.

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Norwalk Stock Order Paid Up

MARTINSBURG, W. VA., July 9—At a meeting of the creditors of the bankrupt Norwalk Motor Car Co., held at the office of Referee in Bankruptcy W. H. Thomas, the referee entered an order directing that the claims for labor, filed against the company by the workmen and others and amounting to approximately $1,150, be paid out of the assets. It was also ordered that all deferred payments on the stock of the company be collected immediately.

There will be a meeting of the creditors on July 19 at which time the report of Receiver C. G. Smith will be taken up for consideration. At that time it will be decided by Referee Thomas whether the claims filed when Mr. Smith was State receiver can be filed with the bankruptcy claims.

Security Prices Are Normal

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Prices Gain on Saturday After Publication of German Reply to Note

NEW YORK CITY, July 12—Security prices at the close on Saturday showed few important changes, the gains or losses hovering between a fraction to 3 points.

The publication of the German reply to President Wilson's note in Saturday's papers had a favorable influence on the initial trading, gains ranging from fractions to 3 points, with most of the buying from the speculative interests.

Automobile and tire issues remained active throughout the week with a few small changes. International preferred went up 3 points, the largest gain for the week. Its common went down ½ point. Chalmers preferred went up 1 point while its common declined 1 point.

Few changes were recorded in the tire issues. Goodrich common dropped 2 points and the preferred rose ½ point. Goodyear common rose 1 point; Kelly-Springfield common rose 2 points, and U. S. Rubber common and preferred rose and dropped ½ point, respectively.

The Detroit issues were a little more active last week, nearly every one of them showing changes. Continental common went up 10 points, the same stock having gone up 5 points.

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Stewart-Warner Extra Dividend

NEW YORK CITY, July 10—The Stewart-Warner Speedometer Co., it is said, will increase the common dividend rate or declare an extra disbursement next fall. The stock has paid 6 per cent per annum since the organization. Profits this year are running well ahead of those of the corresponding period of 1914, and indications are that in the year to December 31 next the company will earn between 12 per cent and 15 per cent on the $10,000,000 common stock.

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Michigan Buggy Plant Sold—Purchaser to Build $600 Car

KALAMAZOO, MICH., July 6—Part of the plant of the old Michigan Buggy Co. has been purchased by representatives of the States Motor Car Co. of Toledo, Ohio. The consideration is stated to be $60,000. The States company will manufacture a four-cylinder roadster and touring car, to be known as the Greyhound, and which is to be listed, it is stated, at $600. Those interested in the Toledo concern are W. D. Smith, Toledo, Ohio; Dr. F. C. Bonine, Niles, Ohio; James H. Johnson, South Haven, Mich. It is claimed that pending the time required to put the local plant into operation a Chicago manufacturing concern will turn out the first lot of the new car.

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Ross Heads Eureka Starter Co.

COLUMBUS, OHIO, July 10—The Eureka Mechanical Starter Co., which was incorporated some time ago with a capital of $30,000 has been organized by the selection of W. A. Ross, president; J. E. Matthews, vice-president and C. E. Bonebrake, secretary. The company holds patents on a mechanical starting device which is said to be out of the ordinary. The device will be manufactured under the contract by other concerns.

Automobile Securities on New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	220	..	300	..	..
Ajax-Grieb Rubber Co. pfd	98	..	101	..	..
Aluminum Castings pfd	98	100	98	100	..
J. I. Case pfd	83	92	70	79	..
Chalmers Motor Co. com	101	103	90	93	—1
Chalmers Motor Co. pfd	94	95	96	98	+1
Electric Storage Battery Co	50	52	52¼	52¾	— ¼
Firestone Tire & Rubber Co. com	300	305	500	506	..
Firestone Tire & Rubber Co. pfd	108½	110	109	111	..
General Motors Co. com	91	92½	156	158	..
General Motors Co. pfd	92	93	101½	102¾	+ ½
B. F. Goodrich Co. com	26	27	51	53	—2
B. F. Goodrich Co. pfd	88	90	103½	104	+ ½
Goodyear Tire & Rubber Co. com	166	170	270	273	+1
Goodyear Tire & Rubber Co. pfd	96	97½	106	107	..
Gray & Davis, Inc., pfd	98	102	..	..	..
International Motor Co. com	..	3	12½	13½	— ½
International Motor Co. pfd	..	9	35	37	+3
Kelly-Springfield Tire Co. com	56	58	161	162	+2
Kelly-Springfield Tire Co. 1st pfd	76	80	85½	87	..
Kelly-Springfield Tire Co. 2d pfd	94	100	160	170	..
Maxwell Motor Co. com	14	15	34	36	—1
Maxwell Motor Co. 1st pfd	44	45	82	84	..
Maxwell Motor Co. 2d pfd	18	19	30¾	32	— ¾
Miller Rubber Co. com	..	..	190	192	..
Miller Rubber Co. pfd	..	..	103	106	..
New Departure Mfg. Co. com	125	127	..	..	..
New Departure Mfg. Co. pfd	105	108	..	..	..
Packard Motor Car Co. com	103	112	..	112½	..
Packard Motor Car Co. pfd	97	100	96	100	— ½
Peerless Motor Car Co. com	10	17	67	70	..
Peerless Motor Car Co. pfd	..	50	94	96	..
Portage Rubber Co. com	..	30	35	38	..
Portage Rubber Co. pfd	..	90	92	95	..
*Reo Motor Truck Co	11½	12¼	15¼	16	+ ¼
*Reo Motor Car Co	18	19	30	31	+ ¾
Splitdorf Electric Co. pfd	40	50	..	..	..
Stewart-Warner Speed. Corp. com	51½	52½	67¼	68	— ¼
Stewart-Warner Speed. Corp. pfd	99	101	105	107	+1
Studebaker Corporation com	30	32	77	79	+1
Studebaker Corporation pfd	83	86	99	100	—1
Swinehart Tire & Rubber Co	85	87	77	78	..
Texas Company	141	143	126	130	—1
U. S. Rubber Co. com	59½	60½	45	47	— ½
U. S. Rubber Co. 1st pfd	103	104	105½	106½	+ ½
Vacuum Oil Co	218	222	193	196	—2
White Co. pfd	107	110	103	108	..
Willys-Overland Co. com	88	89	123	124	—3
Willys-Overland Co. pfd	94½	95	100½	102½	—1½

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Net Ch'ge
ACTIVE STOCKS					
Chalmers Motor Co. com	101	103	..	92½	—2½
Chalmers Motor Co. pfd	..	95¼	94½	98	—1¼
Continental Motor Co. com	..	180	195	..	+10
Continental Motor Co. pfd	..	75	82	86	..
General Motors Co. com	91	93	156	158	+2½
General Motors Co. pfd	92	95	101½	102½	—1
Maxwell Motor Co. com	14½	15½	34	36	—4½
Maxwell Motor Co. 1st pfd	44	45	81½	83½	—2¾
Maxwell Motor Co. 2d pfd	17½	19	31	33	—3½
Packard Motor Car Co. com	103	112	110	115	+2½
Packard Motor Car Co. pfd	97	100	96¼	100	..
*Reo Motor Car Co	18¼	19	29¾	30½	— ¾
*Reo Motor Truck Co	11½	12½	15¼	16	— ¼
Studebaker Corporation com	..	..	77½	79	+1¼
Studebaker Corporation pfd	..	..	98½	100½	..
INACTIVE STOCKS					
*Atlas Drop Forge Co	19	..	..	26	..
Ford Motor Co. of Canada	..	555	1275	..	..
Kelsey Wheel Co	185	..	205	..	..
*W. K. Pruden Co	..	20½	19½	21½	..
Regal Motor Car Co. pfd	20	..	..	25	..
BONDS					
General Motors, notes, 6s, 1915	101	102	..	..	..
Packard Motor Co. 5s, 1916	95	98½	98¼	..	..

*Par value $10; all others $100 par value.

Erskine Studebaker President

Fish Chairman of Board of Directors Who Are Now Divided in Five Groups

NEW YORK CITY, July 8—At a meeting of the directors of the Studebaker Corp., to-day, F. S. Fish was chosen chairman of the board, succeeding J. M. Studebaker. A. R. Erskine, who was vice-president and treasurer, was elected president. C. C. Hanch was chosen treasurer. Mr. Studebaker, the surviving one of the five Studebaker brothers, still stays at the head of the corporation as honorary president, having resigned as chairman of the board of directors.

At a special meeting held yesterday in Jersey City, N. J., the stockholders of the company adopted an amendment to the certificate of incorporation for the classification of directors in groups. The term of office of the board members was arranged afterward in this way: J. M. Studebaker, G. M. Studebaker and J. R. Turner to retire in 1916; E. R. Benson, W. R. Innis and D. M. F. Weeks in 1917; Herbert Lehman, N. J. Riley and A. B. Hepburn in 1918; F. P. Delafield, Philip Lehman and J. G. Heaslet in 1919, and F. S. Fish, A. R. Erskine and Henry Goldman in 1920.

The changes were in line with plans made in 1913 for increasing the corporation's productions and reducing manufacturing costs. At that time Mr. Erskine went over to the Studebaker organization from the Underwood Typewriter Co., of which he had been general manager.

War orders received thus far by the company amount to more than $20,000,000, the major part of which has been executed. These orders were received from the English, French, Russian, German and Austrian governments and included automobiles and harness.

The company is free from bank debt, its only obligation being approximately $3,000,000 of notes and the company has $7,000,000 in deposit in banks. The earnings on the stock at present are at a rate of considerably more than 20 per cent per annum.

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Ross Eight Builder Changes Name

DETROIT, MICH., July 10—The Ross & Young Machine Co. has been succeeded by the Ross Automobile Co., which will continue to build the ROSS eight-cylinder car which was announced last January. The new company has been incorporated, its capital stock being $300,000.

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Steel Prices Higher

NEW YORK CITY, July 13—The prices of Bessemer and Open-Hearth steel were higher last week on account of large domestic and foreign orders. Bessemer fluctuated throughout the week, reaching $20 a ton on Wednesday, dropping the next day to $19.50, and holding at that price until the close on Monday, a 50-cent rise. Open-Hearth had a gradual rise, closing at $20.50 per ton, just $1 higher than Tuesday's price.

The rest of the metals showed a declining tendency. Lead went down 5 cents a 100 lb. and both electrolytic and Lake coppers dropped ½ cent and 1 cent, respectively. Aluminum was steady with a fair demand, holding at 31 cents a pound throughout the week. Both coppers were dull, with domestic consumers remaining out of the market. The exports were light. Tin was dull and lower, quoting at the close at $38.50, a 28-cent drop for a 100 lb.

Only one change occurred in the oils and lubricants markets, that being a 7-cent drop on refined rapeseed oil, due to a falling off in demand. Cottonseed oil held steady throughout the week, closing at $6.03 a barrel.

No new features of importance developed in the crude rubber market. Fine Up-river Para held strong at 63 cents.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.30	.31	.31	.31	.31	.31	+ .01
Antimony	.36	.36	.36	.36	.36	.36	.....
Beams and Channels, 100 lb.	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer steel, ton	19.00	20.00	19.50	19.50	19.50	19.50	+ .50
Copper, elec., lb.	.20	.19¾	.19¾	.19¾	.19¾	.19½	— .00½
Copper, lake, lb.	.21	.20¼	.20¼	.20¼	.20¼	.20	— .01
Cottonseed oil, bbl.	6.12	6.04	6.00	6.02	6.00	6.03	— .09
Cyanide potash, lb.	.24	.24	.24	.24	.24	.24	.....
Fish oil, Menhaden, brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lb.	5.75	5.75	5.65	5.65	5.65	5.70	— .05
Linseed oil	.57	.57	.57	.57	.57	.57	.....
Open-hearth steel, ton	19.50	20.00	20.50	20.50	20.50	20.50	+1.00
Petroleum, bbl., Kans., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed oil, refined	.85	.85	.78	.78	.78	.78	— .07
Rubber, fine up-river, Para	.63	.63	.63	.63	.63	.63	.....
Silk, raw, Ital.	3.75	....	3.75	....	....	3.75	.....
Silk, raw, Japan	3.20	....	3.35	....	....	3.37½	+ .17½
Sulphuric acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	38.78	38.78	38.50	38.75	38.58	38.50	— .28
Tire scrap	.04¼	.04¼	.04¼	.04¼	.04¼	.04¼	.....

Texas Crops Increase Orders

Dealers Report Large Sales—Farmers Are Prosperous—Big Cotton Yield Assured

AUSTIN, TEX., July 10—It is stated by automobile dealers of Austin and other cities and towns of the State that the promising crop conditions are reflected in the large increase of orders for cars which were recorded during the thirty days ending June 8, as compared with the previous thirty days. In the wheat districts of north Texas and in the Panhandle the sale of cars is particularly heavy at this time. The wheat and oats crops have been harvested and the bulk of the grain sold at good prices. The farmers are enjoying an unusual degree of prosperity and many of them are investing part of their surplus funds in automobiles. The prosperous condition of the farmers makes business good in the towns and the automobile sales are very satisfactory at this time in the urban communities as well as in the country localities. Another big yield of cotton for Texas is now practically assured. Notwithstanding the decrease of acreage it will not be surprising if the total production of the staple this year is not in excess of 4,000,000 bales. Everything points favorably to unprecedented activity in the various lines of the automobile trade in this State during the late summer and fall months.

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Dividend Action on General Motors Stock Expected

NEW YORK CITY, July 8—The directors of the General Motors Co. will meet next month, and it is expected that at this session action will be taken on the matter of dividends on the common stock.

The company's fiscal year ends July 31, and it is estimated that surplus for the common stock will be well over $50 a share. Earnings on the common in the 1914 fiscal period amounted to 37.6 per cent, and the current fiscal year will be the third successive one in which the company has earned a surplus over 37 per cent on the common. The company has paid no dividends on the common stock as yet.

There is outstanding $14,895,200 preferred, and $16,501,783 common stock. It is stated that in addition to the common stock being placed on a cash dividend basis next month a stock dividend also will be declared.

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Wilson Body Buys Building

DETROIT, MICH., July 12—The C. R. Wilson Body Co. has purchased a brick building, 25 by 100 ft., located at 494 Clay Avenue.

2½-Mile Speedway for Pittsburgh

Association Formed with $1,100,000 Capital—Three Sites Under Option

PITTSBURGH, PA., July 12—Pittsburgh is going to have a speedway. The moving spirit therein is J. Numa Jordy, who hails from Florida and is general manager and fiscal agent of the Pittsburgh Speedway Association. The officers of the association, which is going ahead full speed already, are: President, F. J. Kress, who by the way is also president of the F. J. Kress Box Co., a large manufacturing concern, and also of the Pittsburgh Commercial Club; vice-presidents, J. Howard Fry, vice-president of the H. C. Fry Cut Glass Co., Rochester, Pa., and R. D. Ward, general manager of the Ward Baking Co., New York and Pittsburgh; treasurer, Joseph R. Robinson, president of the Braddock Laundry Co. These with Joseph B. Callahan, western Pennsylvania manager of the Security Mutual Life Insurance Co.; Dick Briney, president of the Mutual Laundry Co.; Joseph J. Carr, a well-known real estate man; W. J. Phillips, president of the Phillips & McLaren Co., and Dr. Adolph L. Lewin of the Pennsylvania Savings Bank and the Pittsburgh Central Board of Education, constitute the board of directors.

The Pittsburgh Speedway Assn. has been incorporated under Delaware laws with a capital of $1,100,000, non-assessable. The first 1000 memberships will be sold at the rate of $250 each, which gives the holder not only a life membership in the association but twenty-five shares of stock, paid up, and also all privileges of the Speedway association and the Speedway Park Club. Of this sum $62.50 is to be paid when the application is made and $187.50 in three equal amounts without interest at two, four and six months. The membership certificates are transferable one year after date on approval of the board of directors. About 410 of these first 1000 memberships have already been sold.

The association has secured for engineers Richard Irvin & Co. and the Hunting-Davis Co., both of Pittsburgh. As director of its amateur contests the board has secured Oscar C. Seikel, athletic director of the Pittsburgh Athletic Association.

The speedway as planned will be 2½ miles long and from 70 to 90 ft. wide with a graduated curve from 3 deg. in the straightaway to 19 deg. at the turns. In the infield, which will contain 160 acres, there will be an eighteen-hole golf course, and tennis courts. The grandstand will have a seating capacity of 150,000 people. There will also be a polo field, gun club and bridle path of 56 acres.

The association has three sites under option. All of these are within a radius of 14 miles of Pittsburgh, and any of them will be easily reached by railroad, trolley car and macadam roads. A definite decision as to site will be made before July 20.

The capital of the association is $1,100,000 in shares of $10 each. The estimated cost of the speedway ground, park and building is about $900,000.

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Detroit Electric's 2065-Mile Run Costs $29

DETROIT, MICH., July 9—The Anderson Electric Car Co., has given out figures on the cost of operating its electric brougham during a 26-day test run in June when the car made daily runs averaging 79.4 miles in the vicinity of Detroit. Total cost for the run which aggregated 2065 miles was $29, made up as follows:

Electric current for battery	$26.56
Flushing battery eight times	1.50
Filling grease cups three times	.75
Tightening steering tie rod	.19
Total	$29.00

The car used for the test was a model 53, weighing 3962 lb., having a 42-cell 15 W T X lead battery and being fitted with Silvertown cord tires 34 by 4½. The average number of passengers carried on each run was five, the minimum was four and the maximum was six. The average weight of the passengers was 740 lb., the maximum was 900 lb. and the minimum 550 lb. An average speed of 18 miles per hour was maintained during twenty runs, the maximum speed was 22 miles per hour and the minimum speed was 17 miles per hour.

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Readville 1-Mile Record Broken

BOSTON, MASS., July 10—In the postponed automobile races held here to-day originally planned for the holiday last Monday, Boston and New York drivers fought out the events with honors even at the finish. There were about 1500 present. A new record for Readville track of 55 4/5 sec. was made by Vail in a Mulford special. Matty Matthews of New York had charge of the races. The summary:

One mile time trials—Won by Vail, Mulford Special, 55 4/5 sec.; Le Cain, Chevrolet, 58 sec., second; Dickinson, Stutz, 59 sec., third.

Ten miles, non-stock—Won by Vail, Mulford Special; Jessup, Chevrolet, second; Jackson, Correjo, third. Time 9 min. 50 sec.

Twenty-five miles, non-stock—Won by Le Cain, Chevrolet; Dickinson, Stutz, second; Murchurio, Stutz, third. Time 26 min. 22 sec.

Ten miles, handicap—Won by Dickinson, Stutz, 33 sec.; Jessup, Chevrolet, 22 sec., second; Werner, Otto, 2 min., third. Time 12 min., 30 sec.

Australian pursuit race—Won by Dickinson, Stutz; Le Cain, Chevrolet, second. No time taken.

DePalma to Campaign Stutz Racer

Leases 300-Inch Car—Harry Stutz to Withdraw from Active Racing?

CHICAGO, ILL., July 12—Ralph De Palma has leased the 300-inch Stutz, driven by Howard Wilcox at Indianapolis and has entered the car in the Elgin road races of August 20 and 21. On top of this report comes the rumor that Harry Stutz will withdraw from active racing. Stutz is at present on a fishing trip in the Wisconsin woods, so this cannot be confirmed. Henry Campbell, treasurer of the company, when interviewed, said that the Stutz company had been negotiating with DePalma.

"We are not actually quitting the game. We are endeavoring to campaign them. The cars will belong to DePalma but we will furnish all parts and repairs free of charge and he will retain all prize money. We have the same arrangement with Earl Cooper and hope to close on this basis with DePalma."

When asked if the DePalma arrangement would mark the passing of the Stutz company from actual racing, Campbell evaded the question by saying that the Stutz name would receive the same publicity with DePalma as a team manager as it would under the factory directorship. Campbell refused to make a positive statement on the condition of affairs until Harry Stutz returned to Indianapolis. Stutz has been an ardent supporter of racing since 1911. Cooper has one of the three Stutz cars on the Pacific Coast; DePalma has closed for the other and the third is in Indianapolis.

DePalma has announced that he would campaign the Stutz for the remainder of the 1915 season in addition to the two Mercedes that he has had in his stable for the past year. Last Sunday and Monday he entered the car at the Saginaw, Mich., race meet, where he captured six races on the ½-mile dirt track. He announced that he would drive one of the Mercedes at Elgin and that Caleb Bragg would be at the wheel of the other, but did not name a driver for the Stutz.

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DePalma's Stutz First Elgin Entry

CHICAGO, ILL., July 8—The nomination of DePalma's Stutz is the first entry received for the Elgin classics. De Palma will withhold the Mercedes entries until later in the month. E. C. Patterson of Chicago, who has backed the Italian's Mercedes for the past two years, signed the entry blank for the Stutz. It is understood that he and DePalma will stand all the expenses of putting the car in shape for the Kane County events.

Maxwell Withdraws from Racing

No Racing Payroll After August 1—Not Due to Death of Driver Carlson

DETROIT, MICH., July 12—The Maxwell Motor Co., Inc., has withdrawn from speedway racing and is now winding up its racing affairs so that there will be no racing pay roll after Aug. 1. The various Maxwell racing cars have been shipped here where they will be overhauled, but no intimation is made as to their disposal, other than that they will not be raced by the Maxwell company or any of its subsidiaries. It is claimed that this withdrawal of the Maxwell company is not due to the death of Carlson and his mechanic in the recent Omaha meet, but to certain dissatisfaction they claim in connection with Maxwell races.

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Another Race on Omaha Speedway

OMAHA, NEB., July 12—The directorate of the Omaha speedway is planning to hold another contest on the 1¼-mile track in October, ten days or two weeks after the inaugural event on the Sheepshead Bay track October 2. The Omaha race will be held during the week of the Ak Sar Ben festival, when the Nebraska metropolis is thronged with visitors. The distance and prize money have not been decided upon as yet. The owners have decided to make two changes in the course. The guard rails will be reinforced by the use of hickory timber and the safety apron at the inside edge of the track will be extended 20 ft. further.

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Chicago's 350-Mile Race to Be October 16

CHICAGO, ILL., July 13—*Special Telegram*—At the request of Everard Thompson, manager of the Sheepshead Bay speedway, the management of the Chicago speedway has changed the date of its fall race from Sept. 18 to Oct. 16. Thompson feared that if the Chicago contest was held prior to the opening of Gotham's track, Oct. 2, he might lose some of his entries.

The Chicago race will be the same distance as that in New York, 350 miles instead of 300 miles as formerly agreed upon, in order that the drivers will have an opportunity here to shatter New York records made at Sheepshead Bay.

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Chicago Invitation Event Aug. 8

CHICAGO, ILL., July 9—In addition to scheduling a fall race of 300 miles for Oct. 16, the owners of the Chicago speedway are planning to hold an invitation event on the wooden bowl next month probably Sunday, Aug. 8. The contest will be 100 miles in length, and the following drivers will be asked to enter: Dario Resta, winner of the Vanderbilt Cup, Grand Prize and Chicago race; Ralph DePalma, this year's victor at Indianapolis; Barney Oldfield, and Earl Cooper.

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Increase Elgin Prize Money

CHICAGO, ILL., July 13—*Special Telegram*—Promoters of the Elgin road races have decided to increase the prize money for the annual classics, the purse for each of which totals $3,000. They will take a gambler's chance on the endurance of the cars and each day will give $100 to each driver completing 100 miles and $200 to each driver finishing 200 miles, provided the recipient is not eligible to participate in the split of the regular prize money.

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$500,000 Speedway for New Orleans

NEW ORLEANS, LA., July 9—An automobile speedway and equipment to cost about $500,000 will be constructed in time for a long distance race in February, 1916, the Saturday before Mardi Gras. It was declared that the Mardi Gras race would be made an annual event.

H. C. Moore and S. H. Lindsay of Chicago, are representing the promoters. They have obtained an option on an extensive tract of land in the outskirts of the city.

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No Uniontown Hill Climb in 1916

HARRISBURG, PA., July 9—State Highway Commissioner Cunningham has issued notice that no road races or hill climbing contests will be allowed on the state highways. The recent hill climb at Uniontown caused such damage to the road, it is said, that the commissioner asked the attorney-general whether it was within his power to forbid such exhibitions in the future. The attorney-general said that it was.

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Duesenbergs for Twin Cities

MINNEAPOLIS, MINN., July 10—Fred Duesenberg of St. Paul, entered the first three cars for the 500-mile race on the Twin-City speedway here Sept. 4. Two of the entries are new sixteen-valve motors, 299 cu. in. cylinder capacity.

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Porporato to Drive F-R-P Car

NEW YORK CITY, July 8—Jean Porporato is going to drive an American car, the F-R-P. Mr. Porter will remain general manager of the team and Porporato will hold the title of manager.

Burman Stars at Burlington

Averages 47.06 M.P.H. in First 100-Mile Race on ½-Mile Dirt Track

BURLINGTON, IOWA, July 9—In the first 100-mile race held on a banked ½-mile dirt track under the A. A. A. sanction, Burman, driving his Peugeot, captured first money this afternoon, covering the distance in 2 hr. 7 min., 29.66 sec., averaging 47.06 m.p.h. for the century. At the Kalamazoo 100-mile race last September, Burman made the distance in 1:34:29 2-5, an average of 63.6 m.p.h. O'Donnell's Duesenberg made the distance at Galesburg, June 9, in 1:36 or at 62.5 m.p.h.

The three Duesenbergs, driven by Chandler, O'Donnell and Alley, ran second, third and fourth and annexed $1,350, the major portion of the $2,550 prize money. O'Donnell also won three purses of $100 each for leading at 25½ and 75 miles.

O'Donnell was more than a serious contender at the crack of the starter's pistol; he and Alley jumped to the front and at the completion of 25 miles had a commanding lead over their rivals. O'Donnell kept increasing this advantage and was four laps ahead of Burman when he was forced to stop at his pits after covering 86 miles because of a cracked hub and a broken bearing. This stop lost the race for O'Donnell while he was repairing his car. Burman made up the lost ground and passed him, although he had to make a tire change, while the Duesenberg was at the pits. Burman finished almost 7 min. ahead of Chandler, who captured second place from O'Donnell by the narrow margin of 22 sec. Seconds only separated O'Donnell and Alley, making the race one of the most spectacular held on a dirt track this season.

Three other cars started, Joe Cooper's Sebring; Brown's Du Chesneau and Dall's Buick; the Sebring was put out of commission with a water-flooded carbureter when the car went through a fence and plunged into a pond on its ninety-eighth lap. The Du Chesneau made 199 circuits of the track but did not cross the finishing line. The Buick was distanced. The summary:

Car	Driver	Time
Peugeot	Burman	2:07:29.66
Duesenberg	Chandler	2:14:14.23
Duesenberg	O'Donnell	2:14:36.80
Duesenberg	Alley	2:14:51.19

O'Donnell's time for the intermediate distance was as follows:

Distance	Time
25	29:10.31
50	1:16.91
75	1:30:47.18

To Determine Status of Jitney

Indiana Trolley Co. Wants P. S. C. Control—Developments in Other Sections

INDIANAPOLIS, IND., July 13—*Special Telegram*—The Terre Haute, Indianapolis and Eastern Traction Co. to-day filed with the Public Service Commission a long petition asking for an order from the Commission "declaring persons owning, operating, managing and controlling jitney buses to be public utilities and subject to the authority of the Public Service Commission."

The Commission has set July 22 as a date for a hearing on the petition. The scene of the present battle is laid in Terre Haute, although the petition recites that the T. H., I. and E. operates in other cities of the State. That the new method of passenger traffic in the cities is a "substantial and destructive competition of a new type" is admitted by the petition of the Traction company. Senator Al. Zearing at the last session of the Indiana Assembly introduced a bill that sought to put the jitney buses all over the State under the control and regulation of the Public Service Commission. This bill was defeated in the Senate and never reached the House of Representatives for action.

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Want New York Jitneys Regulated

NEW YORK CITY, July 14—The first meeting of the Transportation Committee of the Safety First Federation was held yesterday in the Craftsman Building, on Thirty-ninth Street. The speakers were in favor of regulating the jitney by law and holding their owners responsible for accidents. Opinion was divided, however, as to whether the jitneys would be permanent or not.

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Baltimore Jitneys to Fight City Ordinance

BALTIMORE, MD., July 10—A unique turn in the plan to regulate jitney buses in this city came to-day. The City Council at a special session passed an ordinance regulating the machines after striking taxicabs and other passenger-carrying motor vehicles, with the exception of the jitney, out of the proposed law. William Curran, a candidate for State's Attorney, who represents a number of the jitney owners, said to-day that if the buses do not follow a regular route they are bound to come under the head of passenger-carrying vehicles and no longer can they be considered under the heading of jitneys.

It is planned that as soon as the law on jitneys goes into effect, which will be week after next, the jitney people will discontinue to run over regular routes.

It also is planned to take the fight into the courts and have it settled. The jitney men are said to have strong backing and they are determined to fight. They claim they are discriminated against.

The ordinance compels each bus to pay a tax of $25 per seat per year.

The measure also contains the following provisions:

No person under twenty-one years of age will be permitted to operate jitney, only one person is to ride on the seat with the chauffeur, buses will carry only seating capacity, no one is to ride on the running boards or steps, speed limit of 15 miles an hour and no soliciting permitted, licenses must be obtained from the collector of water rents and licenses and upon these must be stated the time the license is to run and the seating capacity of the vehicle. This license must be posted in the bus. A fine of from $10 to $100 is provided for violation of the law. The money taken in by the city is to go to the account for repairing streets.

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No Garages in Baltimore Residential Section

BALTIMORE, MD., July 12—No public garages are to be erected in the purely residential sections of Baltimore. This is the stand taken by Mayor Preston and he has already turned down some applicants who wanted to build garages in these sections.

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Reo Changes in Los Angeles

LOS ANGELES, CAL., July 9—One of the most important moves of the year in California automobile affairs is the taking over of the California agency for the Reo line by Earle C. Anthony, Inc. The Anthony organization now has the Packard and Chalmers and with the Reo and the state-wide service system which Anthony now maintains, the organization becomes one of the largest automobile agencies in the country.

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12 Tons Baltimore Limit

BALTIMORE, MD., July 10—An ordinance prohibiting motor trucks weighing over 12 tons with solid rubber tires to cross any of the bridges in Baltimore has been passed. The measure also provides that to pass over the city streets any truck weighing more than 14 tons, combined weight of vehicle and load, must do so under a special permit issued by the city engineer.

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To Regulate Columbus Garages

COLUMBUS, OHIO, July 9—Two ordinances have been introduced in the city council for the regulation of garages and gasoline filling stations. The ordinances were drawn by the Columbus Chamber of Commerce after an investigation of a special committee.

One ordinance provides that it shall be illegal to construct, maintain or operate a garage located within 187½ ft. of the street on any lot, where three-fourths of the buildings on either side to a distance of 500 ft. are exclusively dwellings, without the consent of two-thirds of the property owners within such frontage of 1000 ft.

The second ordinance is directed against both old and new filling stations and contains about the same provisions as in the ordinance affecting garages.

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Southern Pacific Railroad Adopts Master Carbureter

LOS ANGELES, CAL., June 23—The Southern Pacific Co. has adopted the Master carbureter as standard equipment for all its automobile coaches. There are thirty-five of these motor coaches on the Pacific Coast, eighteen out of Sacramento, eight out of Los Angeles, seven out of Portland and two out of Stockton. The cars have six-cylinder power plants with a bore and stroke 10 by 12, each motor using two carbureters.

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Jitney Ordinance for Minneapolis

MINNEAPOLIS, MINN., July 10—The Minneapolis City Council has passed a jitney ordinance providing for a $15 annual license, conditional on the filing of an approved bond for $10,000 maximum liability. Cars must operate to ends of routes indicated by signs, may carry two more passengers in excess of regular seating capacity, and provision is made for police inspection as to competency of drivers.

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Indianapolis Controls Pedestrians

INDIANAPOLIS, IND., July 10—The new traffic rules regulating the parking of automobiles in downtown streets and setting out that pedestrians must obey the signals of traffic policemen in the same manner as vehicles are required to do, went into effect here July 10. Hereafter pedestrians, when crossing streets downtown, will be required to listen for and obey the signals of the traffic officers. Restricted districts have been set aside for parking spaces.

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$500 and Jail for Drink

MILWAUKEE, WIS., July 10—A stringent law relating to the operation of automobiles by intoxicated persons has been passed by the Wisconsin Legislature of 1915 and is now in effect. The statute places a penalty of $10 to $200 fine for first offense and a fine of $50 to $500 or a jail term of not less than 60 days or both, for second and subsequent offenses.

Factory Miscellany

Western Battery Moves—The Western Storage Battery Co., Chicago, Ill., has moved to Portage, Wis.

To Make Wheel Rests—Eborn Brothers, Orland, Cal., are building a factory to manufacture automobile wheel rests.

Maccar to Build—The Maccar Truck Manufacturing Co., Scranton, Pa., is preparing plans for an addition to its plant for the manufacture of trucks.

Quality Tire to Add—The Quality Tire & Rubber Co. has increased its capital stock and will enlarge its plant at Hartville, Ohio, in the near future.

Covert to Build—The Covert Motor Vehicle Co., Lockport, N. Y., has let contract for a three-story and basement addition, 46 by 92 ft., to its factory.

Pequannock Rubber Builds—The Pequannock Rubber Co., Butler, N. J., will build a three-story, 47 by 180 ft. and a one-story, 40 by 75 ft. factory to cost $50,000.

To Make Accessories—The National Service Corp., Hummelstown, Pa., has purchased a canning factory and will convert it into a manufactory for automobile supplies.

To Mfr. Four-Wheel-Drive Truck—N. C. Miller & Son, Dodgeville, Wis., are planning to engage in the manufacture of a new type of four-wheel drive for automobiles and motor trucks.

To Make Truck Bodies—The Hercules Buggy Co., Evansville, Ind., will manufacture a new line of truck bodies and employment will be given to 150 additional men. The men will be put to work in two weeks.

To Make Wheel Builder—The Hinkle Mfg. Co. has been formed in Xenia, Ohio, to manufacture automobile wheel builders. C. R. Hinkle is president. Stock is now being sold and within a short time the company will take up the active manufacture of the new machine.

To Make Trailers—The Erie Trailer Mfg. Co., Erie, has established a plant at Twelfth and Liberty Streets for the manufacture of trailers to be attached to automobiles. These will be made in different capacities for various hauling purposes. In addition a line will be made for attachment to jitney buses for carrying passengers.

Dunlap Parts Plant For Sale—H. C. Park, receiver for the Dunlap Mfg. Co., Columbus, Ohio, formerly manufacturer of automobile parts, has asked the court for instructions as to the disposal of the plant, located on Parsons Avenue. The property was appraised at $42,505 and an offer of $40,000 for the plant and fixtures has been received.

To Make Tops—The Wisconsin Auto Top Co. has been incorporated at Racine, Wis., to succeed to the partnership business conducted by the heirs of the late C. E. McAvoy. The new company has a capital stock of $15,000 and the corporators are Alice, Edward and Charles McAvoy. The plant manufactures tops, seat covers and other trimming goods and devices for the motor car trade.

To Occupy S. G. V. Plant—The American Die & Tool Co. will occupy the building formerly known as the S. G. V. plant in Reading, Pa. The main office of the company will remain at its present location, Second and Buttonwood Streets, at which plant it will continue to manufacture axles and miscellaneous bevel-gear work. The new plant will manufacture automobile transmissions and miscellaneous spur-gear work.

To Make Universal Joints—A universal joint for automobiles is one of the new products which the American Rotary Valve Co., Anderson, Ind., has adopted, and preparations are being made at the plant to turn out about 100 joints a day by Oct. 1 and 200 per day by Dec. 1. W. T. Hensley, formerly with the Westinghouse company of East Pittsburgh, Pa., has joined the company as consulting engineer.

J. I. C. Co. Buys Plant—The plant and business of the Perfection Road Machinery Co., Galion, Ohio, has been purchased by the J. I. Case Threshing Machine Co., Racine, Wis., which has built road construction equipment for several years. The Perfection plant manufactures graders, plows, drags and other machines. No details are available as to the disposition the Case company will make of the Galion plant, but it is presumed these works will not be disturbed and will be operated as a branch of the immense Case organization.

Hupp Clubhouse Opened—The Hupp Motor Car Co., Detroit, Mich., has opened a clubhouse adjacent to its plant for the benefit of its employees. Pending the completion of its new lunchroom in the factory a restaurant will be operated in the clubhouse, which president J. Walter Drake wishes to make a social center. A large lawn next to the clubhouse is being fitted to permit all kinds of games. Office manager F. B. Sides is in charge of the clubhouse, which after it is in running order is to be managed by the employees themselves but with the financial assistance of the Hupp company.

Goodyear Installs Hydraulic Presses—The Goodyear Tire & Rubber Co., Akron, Ohio, has completed the installation of hydraulic presses in its various branches throughout the country, for the purpose of equipping motor trucks with the pressed-on S V truck tire.

The Automobile Calendar

Aug.	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21	Elgin, Ill., Road Races.
Aug. 30	Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept.	Indianapolis, Ind., Fall Show, Indiana State Fair.
Sept.	Peoria, Ill., Second Northwestern Road Congress.
Sept. 6	Providence, R. I., Speedway Race; F. E. Perkins.
Sept. 6	Detroit, Mich., Speedway Race; Detroit Speedway Club.
Sept. 6	Indianapolis, Ind., Show, Indiana State Fair.
Sept. 8-11	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13	Oakland, Cal., Pan-American Road Congress.
Sept. 17-18	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Sept. 18-25	Los Angeles, Cal., Show, Shrine Auditorium.
Oct.	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 1	Minneapolis, Minn., Track Race, Twin City Motor Speedway Co.
Oct. 1-2	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2	New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 16	Chicago, Ill., 300-Mile Race.
Nov. 18	Arizona 150-mile Grand Prix.
Dec. 31	New York City, Show; Grand Central Palace.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Gilson Puritan Sales Assistant—A. Gilson has been appointed as assistant to service sales manager, E. W. Hawley, of the Puritan Machine Co., Detroit.

Mason Heads Indianapolis Garford—The Garford Motor Truck Co., Lima, Ohio, has opened permanent headquarters in Indianapolis. W. R. Mason has been placed in charge of the state distribution. A service station is also maintained.

Frisbie Empire Rep. Now—Joe Frisbie, Indianapolis, Ind., manager of the Empire Tire & Rubber Co., has been promoted to special representative and will assume his new duties at once. J. E. Bright of Chicago, will succeed Frisbie as local manager.

Crawford Resigns from Case—J. F. Crawford, master mechanic of the automobile department of the J. I. Case Threshing Machine Co., Racine, Wis., in charge of design, has resigned to become associated with the Curtiss Aeroplane Co., Hammondsport, N. Y., as chief motor designer.

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Garage

New Kansas City Garage—C. B. Traves has opened a new garage at 3320-22 South Main Street, Kansas City.

Genemotor in Baltimore—E. I. Rosenfeld & Co., Inc., 8 South Howard Street, Baltimore, have become the local distributors of the Genemotor, the starter for the Ford cars.

Havana Garage Completed—The new garage building of Coppel & Harsman in Havana, Ill., is completed and the firm moved in this week. Franklin Harsman, formerly in business alone, has taken Lloyd Coppel into partnership, commencing with July 1. This firm has the agency for the Ford and Overland cars and handles a large amount of repair work from Mason county.

Louisville's New Retail Supply House—The Highland Auto Supply Co. will open a wholesale and retail automobile supply house at 813 South Third Street, Louisville, Ky. Salesmen will travel five states. The company also will handle the local wholesale business of the Highland Body Mfg. Co. of Cincinnati, Ohio, which formerly maintained a branch at 728 South Fourth Street. The company is the distributor for Rex plugs, Manzell motor-driven pumps; State agent for Wheeler & Schebler carbureter, and will feature a large line of babbitt repair parts.

Motor Men in New Roles

Levi Goes to Atlanta—J. E. Levi, late with the Premier Motor Manufacturing Co., has been appointed Dixie factory representative for the King eight, with headquarters at Atlanta.

Knapp Makes Texas Change—Wm. Knapp, formerly manager of the Hudson-Davis Co., Mesquite, Tex., has succeeded R. M. Ellis as manager of the Hudson-Davis agency in Arlington, Tex.

Howard Now a Dealer—C. E. Christian has sold the Hupmobile Agency at Kansas City to W. C. Howard. Mr. Howard was formerly assistant sales manager of the Hupmobile factories.

Gaugh Heads Dayton Tire Branch—A distributing plant for the Dayton Tire Co. has been established at 1945 Grand Avenue, Kansas City, Mo. This branch house is in charge of Mort Gaugh.

Carr and Morford Join Herff-Brooks—The Herff-Brooks Corp. has appointed J. G. Carr and Paul Morford district sales managers. Mr. Carr has been with the National Co. and Mr. Morford with the Regal Co.

Willis, Chalmers Assistant — F. B. Willis, has been appointed assistant sales manager of the Chalmers Motor Co., Detroit, Mich. He was eastern district manager of the Lozier Motor Co., also district sales manager for the Chalmers company.

Durning Makes Change—W. J. Durning, formerly connected with the Goodrich Rubber Co., Akron, Ohio, has opened a vulcanizing and tire repair shop at 138 North Third Street, Louisville, Ky. He contemplates taking the agency for a pleasure car.

Moore Rejoins King—I. B. Moore, late of the Empire Motor Car Co., Indianapolis, Ind., formerly with the King Motor Car Co., Detroit, has rejoined the King Motor Car Co. of Detroit and will occupy the same position with the King Motor Car Co. as he has heretofore, assistant sales manager.

McGiehan in New Orleans—T. H. McGiehan, the late vice-president and general manager of the Motz Tire & Rubber Co., Akron, Ohio, has opened a large retail and wholesale automobile accessory establishment at 1527 Canal Street, New Orleans, La. Mr. McGiehan represents several leading manufacturers in the Southern States.

Houston Makes Change—J. A. Houston, for the past seven years with the United States Rubber Co., has purchased from George Graham the business of the Broadway Fuel & Oil Co. in Spokane, Wash., dealers in accessories. Before coming to Spokane Mr. Houston was engaged in a similar line in Chicago. U. S., Goodyear and Firestone tires will be carried.

Rosen Heads Wilmington Packard—The Packard Motor Car Co. of Philadelphia, Pa., will open a branch at 222 West Tenth Street, Wilmington, Del. J. H. Rosen of the Philadelphia establishment has been appointed manager of the Wilmington territory. This branch will have under its control the entire State of Delaware, Chester County and part of Delaware County in Pennsylvania, and Salem and Cumberland counties in New Jersey.

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Dealer

Louisville Agent to Build—H. D. Bowman, Louisville agent for Chalmers, Pierce-Arrow and Rauch & Lang, will build an addition to his garage at Fourth and Oak Streets.

N. Y. Cadillac to Build—Bids are being received for the construction of a four-story, 60 by 100-ft. garage for the Cadillac Motor Car Co., 1881 Broadway, New York, N. Y. The estimated cost is $80,000.

Marmon's K. C. Quarters to Add—The floor space of the Kansas City branch of the Nordyke & Marmon Co. will be three times greater, in new quarters now being arranged at 1608-1610 McGee Street. The company has taken a 5-year lease on this new two-story and basement structure.

Jacksonville Overland in New Hands—R. T. Cassell has given up the Overland agency in Jacksonville and it has been turned over to a new firm composed of C. N. Priest and J. F. Claus. The new firm will have its salesroom at the Ford garage, although the new business will be kept entirely distinct from the Ford agency.

Spokane Studebaker Branch Opened—A. H. Brown of Portland, Northwest manager of the Studebaker corporation, has opened up a retail branch for Studebaker cars in Spokane. The Studebaker maintained a branch in Spokane 3 years ago, when it was discontinued and the eastern Washington, Idaho and Montana territory formerly under the Spokane office was transferred to Portland.

Ford Body Co. Makes N. Y. Lease—The Ford Motor Body Co. has leased the store and basement at 10 West 60th Street, New York City.

Republic Tire in Baltimore—The Tire Sales Co., 204 St. Paul Street, Baltimore, has taken the agency for the Republic tires.

New Tire Branch in Dallas—A branch office of the Dallas Double Tread Tire Co. has been opened at 1605 Young Street, Dallas, Tex. A. M. Loomis is in charge.

Detroit Dealer Moves—The McKenney-Devlin Co., Detroit distributor for the King and Haynes, has moved into its new sales and service building at 698-700 Woodward Avenue.

Fuller Battery in New Britain.—The Fuller Storage Battery Co., 62 Ann Street, representative of the Willard battery, has established a sub agency in New Britain, Conn.

In New Louisville Garage—The Oak Street Garage is now occupying its new quarters at 309 East Oak Street, Louisville, Ky. It is a one-story brick building of fireproof construction.

New Baltimore Accessory Agent—The Motor Supply Co., Baltimore, Md., a newly formed concern, has opened at Charles Street and Lafayette Avenue, with a complete line of accessories.

Green Bay Garage to Add—The Green Bay Motor Car Co., Green Bay, Wis., is contemplating the erection of a 57 by 65 ft. addition at the rear of the present garage, to give more room for repair shop and storage.

Portland Fisk Builds—W. C. Arthur, Portland (Ore.) contractor, will erect a one-story, 50 by 65 ft. brick building for the Fisk Tire Co., which will be located at the southeast corner of Couch Street and Broadway, Portland.

Opens Manchester Tire Station—J. B. McCrillis & Son have opened a service station and salesrooms at 1137 Elm Street, Manchester, N. H., to handle the Marathon, United States and Congress tires and other accessories.

New Buffalo Salesrooms Opened—The Poppenberg and Mutual Motor Car companies have opened new showrooms at Main, Carlton and Washington Streets, Buffalo, N. Y. The companies handle five makes of cars, King, Saxon, Apperson, Enger and Pullman.

No Longer a Branch—The Oakland is no longer handled in Boston, Mass., as a factory branch. L. B. Sanders, who went there two years ago as manager, has taken the business over as an agency and he will occupy the same quarters on Massachusetts Avenue.

Hartford Buick Makes Change—The Buick representation which has heretofore been vested in the Hartford Buick Co., which was also associated with the Buick agency in Springfield, Mass., has passed to D. B. Roberts, until recently manager of the Hartford Buick Co.

Louisville Co. Opens Showroom—The Callahan Motors Co., a new concern, which recently acquired the agency for the Chandler Six in Louisville, will open its new show room at 811-813 South Third Street. W. P. Callahan, who formerly resided in Arizona, is head of the concern.

Swinehart Tire in Louisville—The Independent Tire Co., which has secured the agency for the Swinehart tire, has opened a salesroom at 548 South Third Street, Louisville, Ky. N. B. Segal, president of the company, was formerly connected with the United States Tire Co., New York City.

Richards Machine to Increase—The Richards Machine Co., Milwaukee, Wis., manufacturing drill presses and special machinery, has arranged for a large increase in its production, particularly of repair shop equipment for garages, by the purchase of the plant at 3417-3419 Vliet Street, which it has occupied for several years, and adjoining acreage. C. J. Richards is president.

New Company Formed—The Regal Motor Sales Co. is the name of the new corporation formed to succeed the C. R. Robinson Co. for handling the Regal cars in New England with headquarters in Boston, Mass. Joseph Porter, who was one of the factory officials, is at the head of the company succeeding Mr. Robinson, and C. H. Klegge is still with the company as its treasurer.

Connecticut Ford to Remodel.—L. H. Elmer of the Elmer Automobile Co., distributor of the Ford in Hartford, Tolland, Windham, Middlesex and Litchfield counties, Connecticut, plans remodeling of the Palace Automobile Station at 348 Trumbull Street, which he recently acquired. The Ford interests will be grouped at the above location immediately alterations are made.

New Baltimore Concerns—After being used as a riding academy for 65 years, a property on Bolton Street, Baltimore, Md., is to be used as an automobile establishment. The property has been purchased by the Howell Motor Truck Co., H. D. Howell, proprietor. It contains about 8,000 feet of space. The Economy Tire Repair Works has been organized and has opened at 16 East Oliver street. W. E. Underwood is proprietor. Accessories also are being dealt in.

Recent N. Y. City Removals—The Hudson Motor Car Co. of New York, Inc., has taken possession of its new salesroom in the Circle Bldg., 1842 Broadway, New York City. The Hartford Suspension Co., Jersey City, has moved into a new salesroom at 1846 Broadway, New York City. The Franklin Automobile Co. of New York, of which G. H. Tisdale is the head, is now occupying its new salesrooms at 1848 Broadway. The Lozier Motor Co. has established New York City headquarters and salesroom at 1850 Broadway.

Goodyear Places New Ohio Agencies—The Goodyear Tire Co. has placed the following tire agencies in Ohio: Mansfield, I. F. Newcomer, Richland Motor Co., H. W. Smith, Mansfield Vulcanizing Works; Plymouth, Plymouth Garage; Shelby, M. D. Doty; Atwater, DeGraff & Biles; Beloit, W. H. Sanders; Berlin Center, L. E. Hawkins; East Rochester, Alfred Malin, F. H. Scattergood; Hanoverton, Conser & Wilson; Homeworth, M. Pilmer; Kensington, Oren Harsh; Marlboro, H. C. Slabaugh & Son; Minerva, Minerva Motor Car Co.; Sebring, Hall Machine Co.; Alliance, Alliance Auto Repair Co., Alliance Motor Car Co. and the Stark Cycle Co.

Hokanson Sells Buick Retail Business—The Hokanson Automobile Co., Buick distributor in Madison, Wis., has disposed of its entire retail business in Madison, Blooming Grove, Burke, Middleton, Verona, the north half of Fitchburg, the south half of Westport and the west half of Sun Prairie to James Doyle, formerly general manager of the Wisconsin Culvert Co. The business will be continued from the Hokanson headquarters on East Doty Street. The Hokanson company recently organized the Wisconsin-Oakland Co., with headquarters in Milwaukee, with Wisconsin, Northern Michigan and a portion of Minnesota as its territory for Oakland cars.

Recent Savidge Appointments—The Savidge Steering Device Co., Indianapolis, has recently appointed the following jobbers and distributors: E. Schoonmaker Co., New York; Klecker Shock Absorber Co., Minneapolis; H. F. Brownell Co., Sioux Falls, S. D.; Roy E. Warner Co., Louisville, Ky.; Herring Motor Car Co., Des Moines; The Fisk Co. of Texas, Dallas; Albany Hardware Co., Albany, N. Y.; Knepper & Knight, Detroit; Erie Rubber Co., Erie, Pa.; U. S. Rubber Co., Rochester, N. Y.; M. E. Remelin, Cincinnati; Fields & Rusness, Fargo, N. D.; City Auto Tire & Rubber Co., Cleveland; Iroquois Rubber Co., Buffalo; G. W. Shroyer Co., Dayton; A. W. Whitaker & Co., Memphis, Tenn.; Cox & Cummins, St. Louis; Burwell Smith Supply Co., Oklahoma City; Adams Alexander Auto Co., Sioux City; Wentworth Brown Co., Amesbury, Mass.; C. V. Reich, Pittsburgh; E. De Tamble, Los Angeles; A. C. Galbraith, Milton, Pa.; O. L. Hutchins, Chanute, Kan.; R. C. Weissmantel, Southampton, L. I.; Shoemaker Bale Co., Little Rock, Ark.; The Motor Shop, Indianapolis; Brant Bros., Indianapolis.

Schramm Building New Garage.—The Schramm Auto Repair Co. is building a new garage at 5610-5612 Easton Avenue, St. Louis, Mo.

Repairs Radiators in Columbus.—The Auto Radiator Repair Co. is the name of a new concern at 153 North Fourth Street, Columbus.

Motz Tire in Toledo—The H. P. Dodge Engineering Co. has been named Toledo distributor for the Motz Tire & Rubber Co., Akron, Ohio.

New Columbus Garage. — Harry Moore, formerly with the Columbus Buggy Co., will open a garage and repair shop at Broad Street and Wilson Avenue, Columbus.

Rothweiler Heads Seattle Truck—The Seattle Truck Co. is the latest to enter Seattle, Wash., headed by H. N. Rothweiler, with a service department at Broadway and Denny Way.

Duluth Co. Builds—The Western Automobile Co., Duluth, Minn., proposes to erect a two-story, 100 by 140-foot, fireproof building for salesrooms and repair department. The estimated cost is $50,000.

New Cleveland Welding Building—The Cleveland Welding & Mfg. Co., Cleveland, O., will erect a $26,000 factory addition to its present buildings on West 117th street. It will be of reinforced concrete.

Cleveland Ball Bearing Adds—The Cleveland Ball Bearing Co., Cleveland, O., is purchasing considerable new equipment, which, when installed, will give the company's plant three times its present capacity.

McNaull Tire Opens Branch—The McNaull Auto Tire Co., Toledo, O., has opened a branch in St. Louis, Mo., at 5032 Delmar Boulevard. The office has been organized as the McNaull Tire Co. of St. Louis.

Polson's New Plant—The Polson Mfg. Co., 27 Chenango street, Buffalo, N. Y., manufacturer of automobile parts, will build a two-story, 85 by 100-ft., reinforced concrete factory at Main street and Lafayette avenue.

To Handle Accessories—The Pettibone-Peabody Co., department-store operators at Appleton, Wis., proposes opening a department for the handling of automobile accessories and supplies.

Perfection Starter in Hartford.—D. S. Rich at 64 Allyn Street, Hartford, Conn., has taken on the agency for the Perfection motor starter in the State of Connecticut, and the Stone shock absorbers in Hartford County.

To Repair Jitneys—The Worcester Motor Carriers Corp. has been formed at Worcester, Mass., to make a specialty of keeping in shape all machines that are used in the city for jitney lines. The company plans to operate a jitney line of its own after looking over the territory.

Garford Service in Frisco—A. W. McKenzie, district sales manager of the Garford Motor Truck Co., is at present in San Francisco, planning to establish a direct factory branch for the recently reorganized Garford company.

Springer Manager.—The Standard Auto Co. has opened a one-story garage, 60 by 70 ft., at 648-650 West Bridge Street, Grand Rapids, Mich. R. F. Springer is manager. A general repair and supply business will be conducted.

Packard's Chicago Service Station—The Packard Motor Car Co., 2357 Michigan avenue, Chicago, Ill., has purchased the site at 2340 Indiana avenue, and will build a five-story, reinforced-concrete service station, to cost about $125,000.

S. K. F. Increases Office Space—The S. K. F. Ball Bearing Co. has increased its office space in the Hudson Terminal Bldg., New York City. Within the last 4 months it has about doubled its offices, so that now they occupy a full wing on the sixth floor.

New Garage for Pomona — The new brick garage now in process of construction for the firm of Potter & McCormick on South Thomas street, gives Pomona, Cal., a string of four garages which have sprung up within the past few months ranging from $3,000 to $7,000.

Gets Goodyear Truck Tire Agency—J. E. Power, supervisor of San Francisco, Cal., has secured the agency for the Goodyear truck tire and has opened a service department on Van Ness avenue in that city. The name of the new concern is the Motor Truck Tire Service Co.

Toledo Garage to Move.—The United Garage Co., Toledo, Ohio, has arranged to move from its present location to larger quarters at Ontario and Jefferson Streets, about September 1. The company has taken a 20-year lease on the premises. M. R. Himes is general manager.

New Vancouver Garage.—W. F. Silver has opened a garage at Central Park, corner of Kingsley and Silver Avenue, Vancouver, British Columbia. In connection with the garage he will maintain an up-to-date service station, stocking Pennsylvania Vacuum Cup and Congress tires as well as accessories.

Hupmobile Opens Newark Salesroom.—A new salesroom for the sale of Hupmobiles was recently opened at 200 Halsey Street, corner of Branford Place, Newark, N. J., by the newly-formed firm of De Cozen & Riess. The firm consists of Alfred De Cozen and George L. Riess, vice-president of Chas. E. Riess & Co., Inc., Metropolitan distributor of the Hupmobile.

Milwaukee Co. Dissolved—The Graper & Paulus Welding Co., 254 Fifth street, Milwaukee, Wis., has retired from business and the partnership between F. E. Graper and Wenzel Paulus has been dissolved. The concern was a pioneer in Milwaukee in the welding, cutting, lamp and radiator and fender repair business. Practically all of its trade was in the motor car business.

To Make Motor Brushes—R. H. Seabury, a chemical engineer of Wellesville, N. Y., has located in Toledo, O., to manufacture motor brushes, used on electric motors. Mr. Seabury is the owner of the patents. Large orders for the brushes have been placed by the Electric Auto-Lite Co. Seabury has received his machinery and the factory will be in operation in the near future.

Cartercar Service Station Opened.—A new Cartercar service garage is now in operation at 1822 Hendrie, near Woodward Avenue, Detroit, Mich. It is managed by W. D. Block, who was comptroller of the Cartercar Co., Pontiac, Mich. This service station has been established because the Cartercar Co. discontinued its local branch and service department some time ago.

Leavitt Co. Agency in Fresno—J. W. Leavitt & Co., Pacific Coast distributor of the Willys-Overland Co., has established a branch in Fresno. Calvin C. Eib, executive supervisor of the company, is at present in charge of the new branch and is installing a service system and perfecting the general workings. The company will occupy a space 50 by 150 feet in the main section of the town.

Hegeman Heads Milwaukee Firestone.—The Firestone Tire & Rubber Co., Akron, Ohio, has permanently established a Milwaukee factory branch in the new Oxford building at 481-483 Jefferson street, which provides nearly 12,000 square feet of floor space and stockroom for 7,500 casings. J. L. Hegeman is in charge as local manager. Practically every important tire manufacturer now has a direct factory branch in Milwaukee, and nearly all are located on Milwaukee, Oneida and Jefferson streets, built up during the last three years as Milwaukee's tire row.

Hartford Oakland Makes Alterations.—The A. C. Hine Co., Hartford, Conn., is making alterations in the store at 314 Pearl Street which, when completed, will be used as a salesroom for Oakland cars for which the concern recently signed up for the State of Connecticut. The basement will be used as a service station. A. C. Hine, formerly general manager of the Overland-Connecticut company, is the prime mover in the project and with him are associated his father, D. H. Hine, and E. N. Humphrey of the Traut & Hine Co. of New Britain. R. J. Flynn, formerly with the Auto Tire Co. as an Oakland salesman, has joined the Hine forces.

VOL. XXXIII NEW YORK—THURSDAY, JULY 22, 1915—CHICAGO No. 4

The AUTOMOBILE

$108,191,774 for Roads in 1914

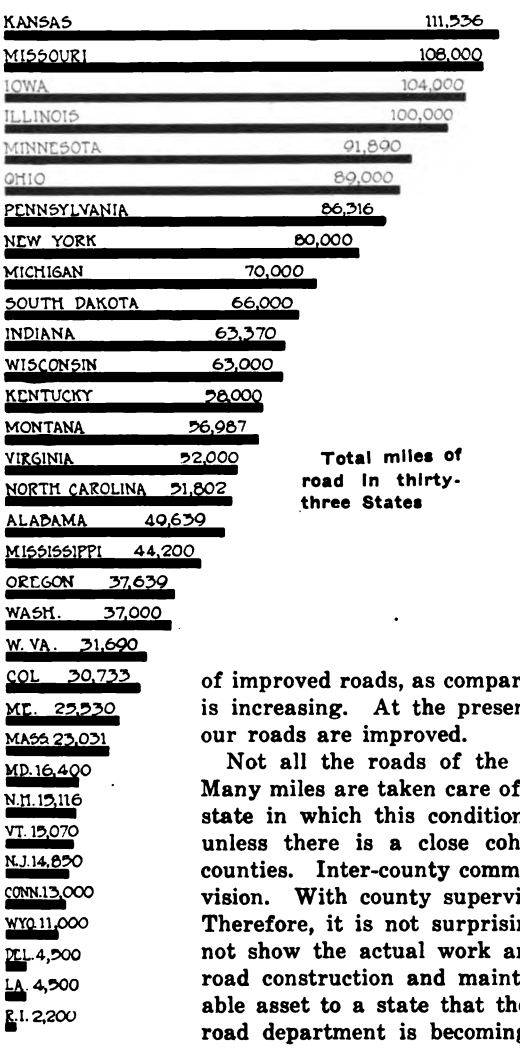
Over 6,000 Miles of New Road Added and Over 35,500 Improved During Year 1914 in 33 States

By J. Edward Schipper

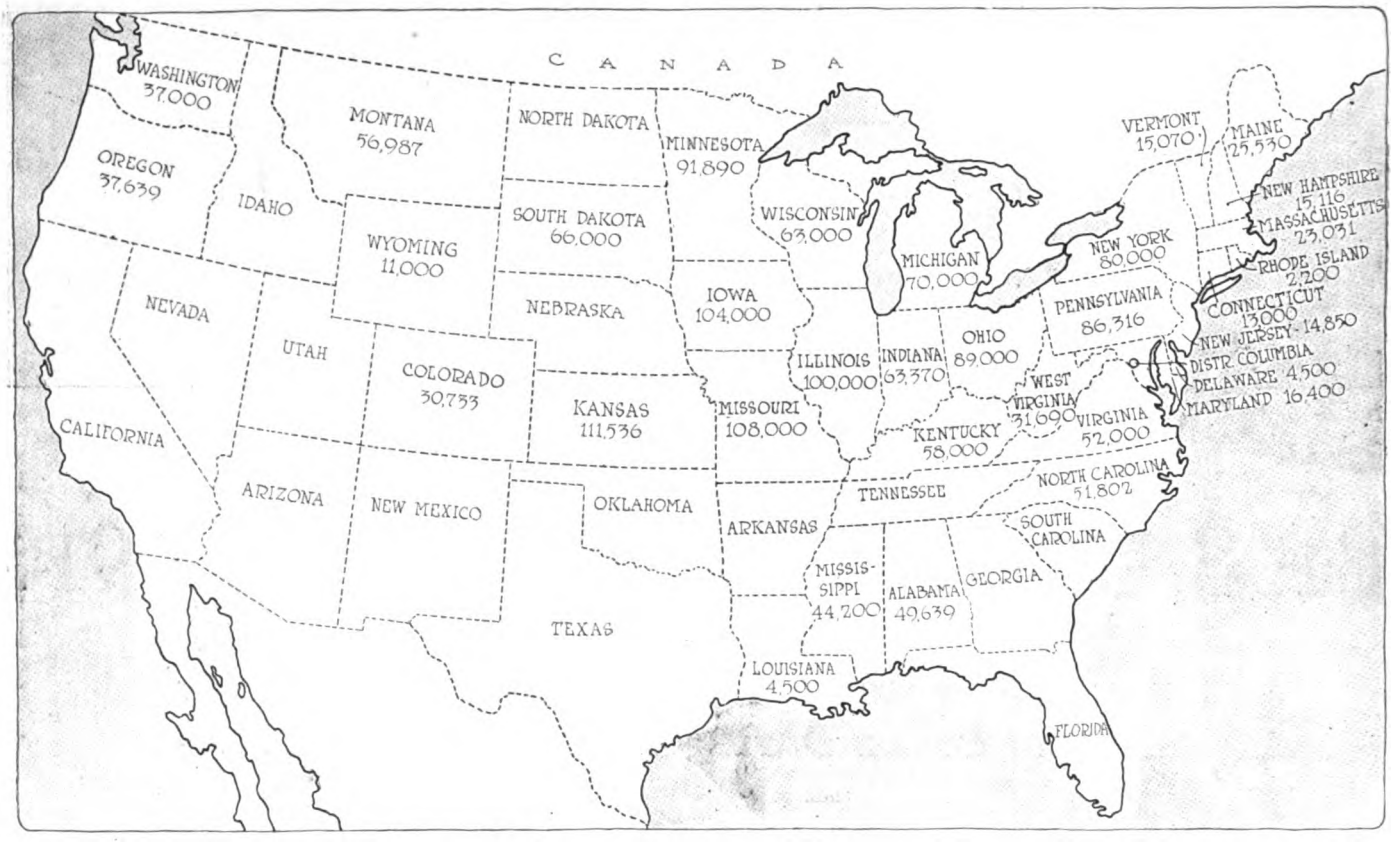
STRETCHED out in a single line the roads of the United States would encircle the globe more than eighty times. Traveling at the rate of 150 miles a day, it would take 36 years, or 13,000 days, to travel their length. The value of these roads is stupendous. At the lowest possible estimate of construction, $1,500 per mile, the value of the 2,000,000 miles of road in the United States is $3,000,000,000, but the sum which has been expended on the construction and maintenance of these roads is so far above this, that it would be impossible to even form the roughest estimate of the true amount of money spent for highways in this country.

Most of our roads have been gradually developed from the forest path to the highway. Even in our largest cities, the pathways that the oldest settlers followed in their trips to and from fresh water springs have been perpetuated in the form of streets. The old stage routes from city to city have become the automobile highways of the present day. Examples such as the old Albany trail, the Boston Post Road and the Boone Way are repeated all through the country. If present indications hold true, the pathways that the Forty-niners marked with the bleached bones of those who perished along the rigorous route will become part of an ocean-to-ocean boulevard.

While these gradual developments of some of our best known highways have been up to within recent years the greatest factor in the development of the highway system of the country, the automobile has introduced another factor which has become preeminently important in the road-building industry: The automobile stands for efficiency and anything with which it has to do follows its lead of well directed effort. The automobile road, unlike the old Indian trail, does not follow a serpentine course, but like the iron railroad path, follows the straight line, the shortest distance between the two objective points. The greatly increased speed of travel has brought the necessity for direct routes and smooth roads. In the days of the horse, the dirt road was good enough; in the day of the automobile—the present time—it no longer suffices. With the speed at the command of the motorist, irregularities in surface must be flattened out before the speed can be used. Rapidly the percentage of improved roads, as compared with the total roads in the country, is increasing. At the present time, approximately 7 per cent. of our roads are improved.



Not all the roads of the country are under state supervision. Many miles are taken care of by town and county authorities. A state in which this condition holds true is under a disadvantage unless there is a close cohesion of plan between the different counties. Inter-county communication is assured with state supervision. With county supervision it ought to be, but often is not. Therefore, it is not surprising that records from many states do not show the actual work and the actual results accomplished in road construction and maintenance. The roads are such a valuable asset to a state that the necessity for a well organized state road department is becoming recognized throughout the country.



Map showing number of miles of road in states scattered throughout the Union. The mileage includes all types of roads

More and more the state engineering department keeps its fingers upon the pulse of the road situation and by means of well organized effort and carefully kept statistics are systematically solving the road problem of the state.

Statistics from 33 States

Statistics gathered from the thirty-three states throughout the Union, in which records are carefully compiled, tell an interesting story of what this country is doing to keep its lines of communication from district to district in the best possible condition. In these thirty-three states there are 1,614,999 roads of all kinds. Of these 226,288 are improved, 35,704 miles having been improved during the year 1914. At the rate of 35,000 miles per year, these thirty-three states will have their entire mileage classed under the head of improved roads in less than 45 years. In these states during the year 1914 there were added 6,006 miles of new roads. Before the advent of the automobile, such a thing would have been unprecedented, but now it is becoming a yearly occurrence and gathering impetus as time goes on. In 1912, for example, these same states added over 5,000 miles of new roads and transferred from the classification of Roads of all Classes to Improved Roads more than 35,000 miles.

$108,191,774 in Twenty-nine States

All these improvements mean that money must be spent, and, again, drawing figures from the thirty-three states which are tabulated by name on page 141 the amount which it has been found necessary to expend will be perceived. During 1 year twenty-nine of these states expended $108,191,774. The greatest amount spent by any state was Indiana, which paid out $17,000,000. New York followed closely with $14,638,045; Iowa expended $11,000,000; Colorado spent $9,964,077; Wisconsin paid out $7,000,000; Montana, $8,389,278, and Illinois, $5,500,000. Thus, throughout the entire country it can readily be seen that the realization of the value of good roads is becoming complete. The citizens of these states are backing their knowledge of the necessity of these roads with millions of dollars. They have made the subject of roads of paramount importance in local politics and more careful supervision is being exercised.

Dirt Roads Predominate

America's representative road is still the dirt road—even a large percentage of the improved roads are dirt. Throughout the Union there are probably more than 1,250,000 miles of dirt road. In the thirty-three states from which records are available, there are 1,005,436, and even this is not an exact figure because many miles of highway in one state would be called a road and in another it would not. Even in the State of New York, with its millions of people, there are wild regions throughout the mountainous northern sections where mere trails are known as roads. The natives of this part of the state refer to old abandoned lumber trails as roads; whereas, as a matter of fact, they are impassable for any vehicle heavier than a buckboard. With the understanding that a dirt road, however, is any road composed of natural earth and which is passable in fair weather, the figure is quite accurate.

Among the improved roads the gravel construction is most typical of America, because the materials for its construction are generally quite close to hand and it is, therefore, possible to make good roads at a low cost. Taking the figure totaled from the estimates of the thirty-three representative record-keeping states, there are 78,846 miles of this type of road, or roughly, one-twelfth as many miles as of dirt. Ohio is the leader in gravel road mileage, having more than 14,500 miles of this type of road. Minnesota is next with over 11,400; Wisconsin has 7,000, and even little Rhode Island, with its total of 2,200 miles of roads, has 100 of these in gravel. Some of the states among those which keep careful state records of their highways have no gravel whatever. These are Connecticut, Delaware, Pennsylvania, South Dakota, West Virginia and Wyoming. Some of these states have roads of a composite type which resemble gravel to a great degree, but which are not the true gravel roads.

Macadam is probably the king of the automobile highways. When the average automobilist finds himself upon a newly finished macadam road he generally leans back against his seat and settles down for a period of comfortable riding. Ohio is the leader in macadam mileages, having 3,000 miles more than the second macadam state, Illinois. The respective mileages of macadam roads in these two states is 7,000 and 10,000. Kentucky has 6,000. Massachusetts, with its fine highway system, has 3,783. New York has 3,200, Wisconsin has 2,000, New Jersey 2,600 and North Carolina 1,209. Many states, such as Louisiana, have no macadam roads at all in the state. The total in the thirty-three states considered is 42,499. The other roads which are used to a sufficient degree to be separately classified are not many. Concrete and brick compose the majority of the other improved roads, but these have not reached a sufficiently high figure to be a vital factor when considered against the total. Many states are trying concrete on an experimental basis at the present time and it may be that this material, which has left such a heavy mark upon the building industry, will also be a factor in road development.

15,000 Miles New Road for 1915

To get the greatest mileage of roads at the least possible expense is one of the biggest problems that the state administration has to face. If a man wishes to construct a driveway from his front gate to his garage he is often appalled by the estimates of the contractors who aim to do the work. Yet, he has only 200 or 300 feet of road to construct perhaps and this is not apt to be of a nature to endure any appreciable traffic. When 1,000 miles of road is considered, the amount of money which its construction entails is so great that even a slight percentage of saving in any direction amounts to far more than the salary of the most highly paid engineers. Throughout the country in 1915 there will be perhaps 15,000 miles of road constructed and 35,000 miles improved. Already there have been $40,255,344.31 appropriated in fifteen states. There is no wonder that the road question is one of the biggest factors in internal politics in this country!

Convicts Used in Road Building

One of the big factors in recent years has been the employment of prison labor on the road. In the second annual report of the state highway commission of South Dakota, in making their recommendations to the Governor, the statement is made that the movement to have the prisoners of the state work on the highways has been enacted into a law in the states of California, Colorado, Oregon, Washington, Ohio, Virginia, West Virginia and others with splendid results to all concerned. The state is benefited by the material gain of good highways and by the moral and physical improvements of its charges. The prisoner is benefited from the physical and reformatory standpoint. This experiment has positively proven that the prisoners have profited by the fresh air and sunshine, were willing to work hard and looked forward to the next spring when they might again be so employed.

The Honor Camp

The State of Washington which successfully employs convict labor maintains what are known as Honor Camps. In this state under the indeterminate sentence law, convicts are given a minimum and maximum term and the plan is to place such convicts in the service wherever possible. The scheme is to allow the men a credit of 1 year's time for each 9 months' service on the road, arranging the term of service of the men, that when their 9 months' labor expire they will be discharged. The men are well fed, comfortably clothed and provided with well-equipped sanitary quarters. In general, the men prefer to serve in the quarry rather than in the penitentiary, and the results of their labor show a marked increase in efficiency. It has been found that the average cost of subsistence per man per day is 26.8 cents and the average cost of maintaining each convict per day including guarding, subsistence, clothing, items of general expense, medical,

Table of Highway Statistics of all States in Which Figures are Available

STATE	Total Miles of Roads in State	Total Miles of Improved Road	Miles of New Roads Built in 1914	Miles Improved Road in 1914	Miles of Macadam Roads in State	Miles of Brick Roads in State	Miles of Dirt Roads in State	Miles of Gravel Roads in State	Miles of Other Roads in State	Total Amount Expended for Roads in 1914	Amount Appropriated by State for Road Work in 1915	Remarks
Alabama	49,639	6,955	....	1,183	568	None	3,110	1,000	2,277	$1,878,170.00	$226,067.31	Approximate, as only 10 counties reported.
Colorado	30,733	5,014	....	2,577	....	....	.....	655	25,074	9,964,077.24	130,000.00	
Connecticut	13,000	1,282	332	66	....	....	.....	....	....	4,805,825.25	.....	
Delaware	4,500	400	60	150	160	....	.....	....	....	105,000.00	Bond issue of $70,000 in Kent	
Illinois	100,000	10,000	150	....	7,000	100	90,000	2,500	400	5,500,000.00	400,000.00 to July 1, '15	
Indiana	63,370	26,831	....	....	....	....	.....	....	....	17,000,000.00	.....	
Iowa	104,000	.....	....	10,000	50	None	100,000	1,000	Concrete 7 m.	11,000,000.00	10,500,000.00	
Kansas	111,536	1,170	....	....	220	4	110,366	153	111	5,427,424.00	.....	
Kentucky	58,000	10,600	....	500	6,000	5	47,000	4,000	600	2,000,000.00	2,900,000.00	
Louisiana	4,500	563	....	103	None	None	396	123	44	344,467.33	145,000.00	
Maine	25,530	1,000	None	192	60	None	24,500	940	None	2,900,000.00	900,000.00	
Maryland	16,400	693	233	....	313	9	.....	137	234	3,809,000.00	2,791,000.00	
Massachusetts	23,031	18,773	....	....	3,783	....	11,068	7,729	450	1,368,072.00	.....	
Michigan	70,000	3,000	....	700	647	....	53	1,570	167	687,000.00	.....	
Mississippi	44,200	12,000	....	400	50	....	43,530	500	....	3,500,000.00	.....	
Minnesota	91,890	9,934	....	3,000	....	....	73,512	11,401	....	3,809,792.00	1,480,000.00	
Missouri	108,000	4,750	....	....	....	....	103,250	3,500	....	.....	.....	
Montana	56,987	2,000	1,500	200	25	None	All	5,000	....	8,389,278.70	.....	
New Hampshire	15,116	1,026	150	....	9	None	16	120	6	244,158.00	650,000.00	
New Jersey	14,850	5,000	125	125	2,600	10	9,850	2,100	140	4,370,000.00	4,000,000.00	
New York	80,000	5,200	900	1,500	3,200	86	50,000	9,000	397	14,638,045.00	13,934,277.00	
North Carolina	51,802	10,000	1,476	2,534	1,209	....	41,670	698	5,519	4,500,000.00	895,000.00	
Ohio	89,000	25,000	....	....	10,000	500	64,000	14,500	....	.....	.....	
Oregon	37,639	4,964	90	295	962	None	32,689	3,745	243	3,060,000.00	240,000.00	
Pennsylvania	86,316	1,892	65	7,029	1,521	101	.....	....	271 bitum.	3,538,506.90	.....	
Rhode Island	2,200	550	None	325	450	....	1,650	100	....	156,000.00	.....	
South Dakota	66,000	30,000	150	2,000	20	....	65,980	....	....	579,948.00	1,224,000.00	
Vermont	15,070	4,000	....	200	....	....	14,000	900	....	.....	.....	
Virginia	52,000	2,916	....	855	876	....	381	475	1,184	1,767,010.00	.....	
West Virginia	31,690	825	200	300	500	25	30,865	....	300	3,000,000.00	.....	
Wisconsin	63,000	15,000	300	1,350	2,000	2	55,000	7,000	1,000	7,000,000.00	1,250,000.00	
Wyoming	11,000	2,000	....	....	....	....	.....	....	....	.....	.....	
Washington	37,000	2,950	275	60	160	25	32,550	3,700	....	1,850,000.00	.....	
Total	1,614,999	226,288	6,006	35,704	42,499	867	1,005,436	78,846	38,769	$108,191,774.42	$41,735,344.31	

escapes and transportation is 74.5 cents per day, giving a total cost of maintenance per convict per day of $1.83.

Washington's Pledge System

Working of convicts on highway under which has been called the honor system is an experiment in which the State of Washington has probably operated the most extensively of any state in the Union. Each convict signs the pledge of honor that for the clemency extended by the Governor and the state Prison Board for permitting him to work in the honor camp and the payment of 50 cents for each day's labor he agrees to perform such work as may be assigned to him and not to leave the camp without permission. Upon the acceptance of the conditions of the pledge, the Governor issues a conditional pardon to each man. The disposition of the honor men toward the system is in general very favorable. The freedom of the camp and the life in the open appeals to the men with the results that the work is done well and very few fail to keep their trust.

Bridges Bring Up Cost

Bridges are one of the big factors in raising the cost of road construction and in some states are a serious factor owing to the large number of small streams which must be crossed. In the State of Minnesota, for example, there are 20,603 bridges over 10 feet in length. The roads in this state are largely under the jurisdiction of counties, but in 1914 a new law went into practical effect which gave direct state supervision. However, the cost of the roads is to a large extent borne by the counties under the state aid system in which the state furnishes a part of the money required for road building. The county of Murray, which is 704 square miles in area, has 568 of these bridges, or in this county, in other words, for every twenty inhabitants there is a bridge. In the county there are 1,200 miles of road, or 9.8 people for each mile of road. To look at it from another angle there is a bridge for every 2.1 miles of highway. It is evident that road construction in counties such as these will be an expensive undertaking, and this is only a random example which is probably exceeded in many parts of the Union.

Kansas Leads in Mileage

The greatest road state in the country is Kansas with 111,536 miles. It has increased from 98,000 in 1912 when it was in fourth place. Missouri, which in 1912 had the highest mileage in roads, has now dropped in second place with 108,000, the same number it had at the end of that year.

Movement Is Nation-Wide

Iowa is now third with 104,000 miles of road; in 1912 it was second with 102,000 miles. Illinois has dropped from third to fourth place since 1912, having 100,000 miles of road. Thus there are continual changes in the mileages of the states, but one prevailing factor dominates the entire road building situation. This is the relative percentage of improved roads to total roads. Slowly this figure is advancing up the scale as the enlightened legislative bodies perceive the necessity for good roads. In 1912 the percentage of improved roads, as compared with total miles of roads, was a little over 6 per cent. In 1915 it is about 8 per cent. The advance is nation-wide. It is being demanded by farmers, manufacturers and merchants. It is not confined to one class, nor to cities or the country but is one universal movement which is reflected throughout all the industries of the United States.

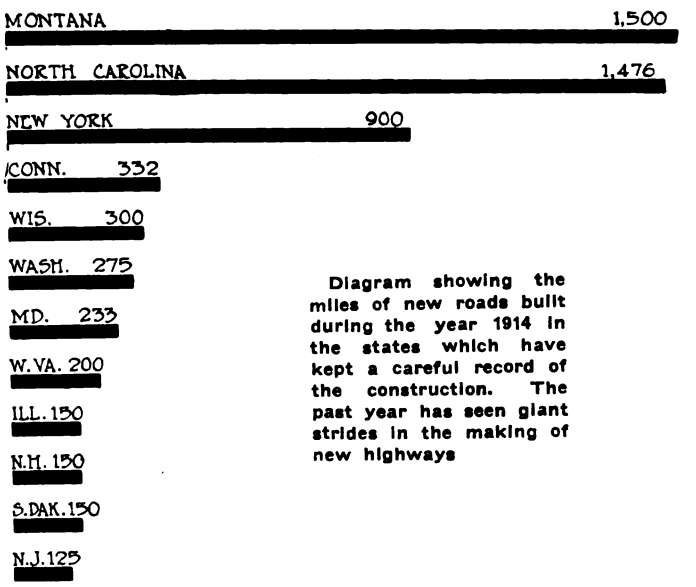


Diagram showing the miles of new roads built during the year 1914 in the states which have kept a careful record of the construction. The past year has seen giant strides in the making of new highways

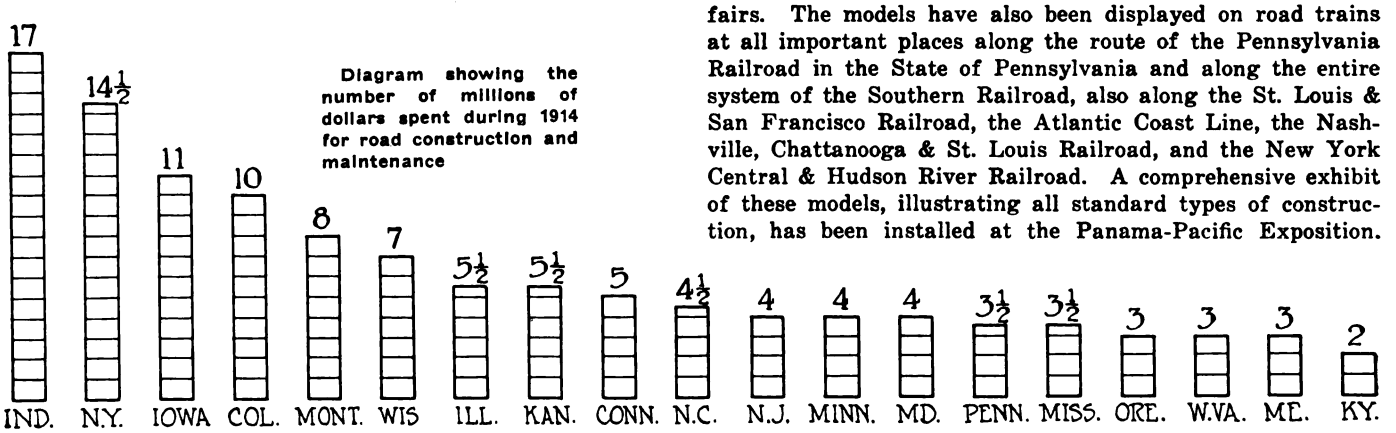


Diagram showing the number of millions of dollars spent during 1914 for road construction and maintenance

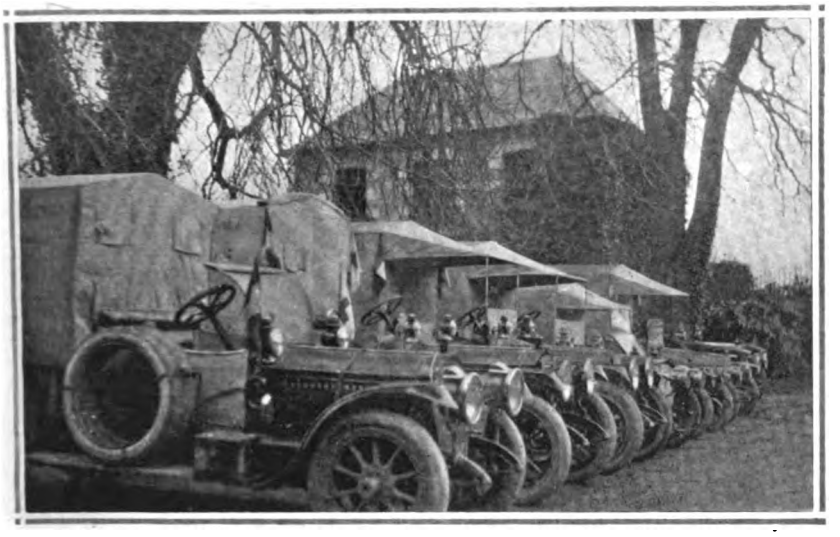
Road Models for the Public

The Office of Public Roads of the United States Department of Agriculture made an exhibit of road models for the first time in 1909 at the Alaska-Yukon-Pacific Exposition. The aim was to put on view such striking examples in miniature of model roads that visitors would not only appreciate the beneficent effects of improved roads but would, at the same time, be able to understand the methods of their construction.

Since the Alaska-Yukon-Pacific Exposition closed, the exhibit of the Office of Public Roads has been displayed at Omaha, Neb., during the National Corn Exposition; at Knoxville, Tenn., during the Southern Appalachian Exposition; at Chicago, Ill., during the National Land and Irrigation Exposition; at New York City during the Travel and Vacation Exposition and the Domestic Science Exposition; at Atlantic City, N. J., during the American Road Congress; at Lethbridge, Alberta, during the International Dry-Land Congress; at Buenos Aires, Argentina, during the International Agricultural Exposition; at Turin, Italy, during the International Exposition; and at various other expositions and fairs. The models have also been displayed on road trains at all important places along the route of the Pennsylvania Railroad in the State of Pennsylvania and along the entire system of the Southern Railroad, also along the St. Louis & San Francisco Railroad, the Atlantic Coast Line, the Nashville, Chattanooga & St. Louis Railroad, and the New York Central & Hudson River Railroad. A comprehensive exhibit of these models, illustrating all standard types of construction, has been installed at the Panama-Pacific Exposition.

American Cars in Red Cross Work

Day and Night Trips to Firing Line for Wounded



Fleet of automobile ambulances attached to field hospital at Montdidier

HOW Packard automobiles and American volunteers assisted in Red Cross work on the Allies' front is a thrilling story told by Curtis Goode, brother of the Paris manager of the Packard company. When the French armies took up their present position, after the Battle of the Marne, H. H. Harjes, of the banking firm of Morgan, Harjes & Co., secured from ex-minister of finance Klotz the use of a suitable building at Montdidier, and furnished it at his own expense as a field hospital. The Packard company supplied eight touring cars which were quickly transformed into ambulances and placed in the hands of volunteer drivers operating under the control of the French army. Curtis Goode was one of these drivers.

5-Mile Trip with Wounded

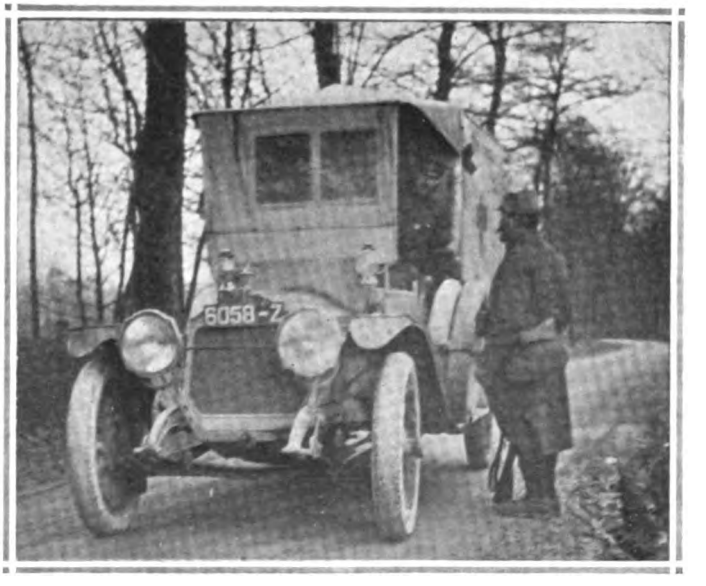
Although the Packards were directly attached to the Harjes hospital at Montdidier, they were at the call of the chief military doctor of the district, and had to take cases either to their own or other hospitals, as directed. From October to May the automobiles have been engaged in the task of making trips from the hospital to the firing line, the nearest point of which is only 5 miles away, and of bringing in the wounded. For 8 months the sound of guns has been so continuous that when a member of the hospital staff comes home on leave he finds the quiet of the city oppressive. Day and night, at irregular intervals, the call would come for ambulances to bring in wounded. Where road conditions allowed it, the ambulances went close behind the line of trenches, picked up the wounded men who had been carried out by their comrades, and hurried off with them to the hospital. By this rapid treatment thousands of lives have been saved and the men have been spared suffering inevitable with slower methods of transportation.

This portion of the front has undergone no change since the month of November. Both French and Germans are strongly entrenched, with a distance of only 100 yards between them. The position evidently is not of sufficient strategic importance to warrant the loss which would be sustained in a determined attack. Thus the men sit watching one another, and occasionally have the monotony relieved by heavy bombardments. Fortunately for the men, this kind of warfare is not very destructive. Curtis Goode relates that one evening the Germans began a bombardment on a serious scale. During the entire night big guns boomed as rapidly as if the huge shells were being fired from a machine gun. Occasionally a French gun joined in the welter of sound. Every window in the hospital trembled and rattled from 6 p. m. to 8 o'clock the next morning. The automobile staff was up early, expecting to have a busy day. The net result of the night's heavy firing was eight wounded cases.

A Trip to the Trenches

One of the experiences of which Curtis Goode has the most lasting remembrance is a trip he was allowed to make one night into the front line trench held by the French. "We set out from the hospital in a car," he stated, "and for the last 2 miles had to drive in complete darkness, for even a side light would have been observed by the enemy. At an indicated point we left the car in a farm building and proceeded ahead on foot. At this point there is a main communication trench 2 1-2 miles long leading right up to the French front line trench, but having branches off it to other trenches. During the daytime this main communication trench has to be used throughout its entire length.

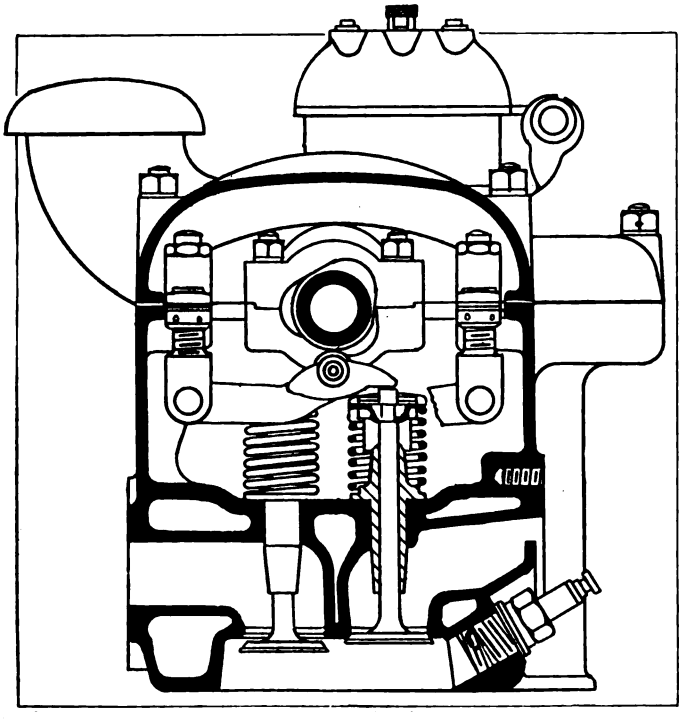
"In this district numerous shells have exploded on the roads, but they have not made traveling impossible. On the main highways the surface is so hard that the shells do not penetrate and the damage done is annoying only at night if running without lights. On the lower class roads, with little more than a dirt surface, greater damage is inflicted and it is sometimes impossible to pass until soldiers have filled in the holes."



Packard ambulance halted by French sentry on a trip to the firing line for wounded

Chalmers Valve-in-Head Motor

To Be Principal 1916 Product—Good Acceleration and High Gear Ability—Rear Axle Gearset



Section through Chalmers valve gear showing rocker arms and tappet adjustment

FEW of the new cars appearing at the New York show last January attracted more attention by virtue of their design than did the new Chalmers with valve-in-head motor, on account of the remarkably clean outline of the engine and the chassis as well. Naturally with so much novelty of construction as was present in the motor, the performance of the cars on the road has been watched with interest, but the fact that the manufacturer is continuing the same chassis practically unchanged is the best proof that the new motor has worked out very well.

The Chalmers Motor Co. has three cars for 1916, and of these the 6-40 is the principal product. The 6-48 and the Master six are continued, but it is not anticipated that there will be so large a demand for these as for the smaller car.

Of the 6-40 there are two types, five-passenger and seven-passenger, the latter having 4 in. more wheelbase and semi-elliptic rear springs instead of cantilevers as used on the five-passenger. These two models are priced $1,275 and $1,350 respectively. The 6-48 which has a T-head motor and some other small differences in design costs $1,550 with a seven-passenger body, and the Master six, $2,175 with touring body.

For fitting to the 6-40 a new body is being developed which is either a standard open touring affair or a sedan, and the attachment of the upper works is made in a highly ingenious and secure manner. Whether the car is open or closed there is nothing to show that it is convertible and in the closed condition the appearance is handsome. This new body is not yet in production, but will be available later on.

Camshaft Driven Centrally

Coming back to the 6-40 chassis the unique feature of the motor is that the overhead camshaft is driven at its center by a large worm gear and to obtain a similar drive at the center of the crankshaft the middle bearing is divided into halves. This makes a four-bearing shaft and it is remarkable that it has been possible to get the middle bearings of such good width. Having a bore of 3.125 in. and stroke 5 in. the motor is intended for high speeds. Crankshaft rigidity has been obtained by using a 2.25-in. shaft and rigidity of crankcase by very rigid web work around the center bearing supports, and the use of a box form of crankcase with sides that come much lower than usual. This type of case is not uncommon where the bearings are put in endwise being first mounted on the shaft, but it requires considerable ingenuity to arrange them as in the Chalmers so that they can be scraped in with the shaft in its proper place. The detail of the design can be observed in the section of the motor on the opposite page.

The cylinder block consists of three portions, the lower in which the pistons work is as simple a casting as could well be made. On this rests the head casting which carries the camshaft, the valves and the spark plugs, while on top of all is an aluminum cover.

Compound Lubrication

Two features of great convenience to the driver are the positions of the ignition distributer and the oil filler, since both these parts are above the top cover, as can be seen in the photographic reproductions. Oil is poured into the camshaft case where some small part of it remains, and the overflow passes down the space surrounding the camshaft drive shaft to the base.

With an overhead-valve motor and an overhead camshaft also lubrication is liable to be troublesome, because enough oil must be pumped to the top and yet the supply to the camshaft kept down sufficiently to prevent flooding the valves. In the Chalmers the camshaft is hollow and a small hole is drilled through each cam, at the center there is a supply for the skew gear and, of course, holes for the supply to each bearing. Oil is pumped to the front end bearing direct, and thence passes along the shaft, but the size of the outlets prevents too much lubricant reaching the valve compartment.

Sundry gutters serve to catch what little drip there is and to conduct the oil back to the shaft tunnel whence it returns to the crankcase. For the crankshaft there is a supply to each main bearing, all the oil leads being copper pipes, and dip troughs are used for lubricating the connecting-rod bearings. Splash cares for the pistons in the usual way.

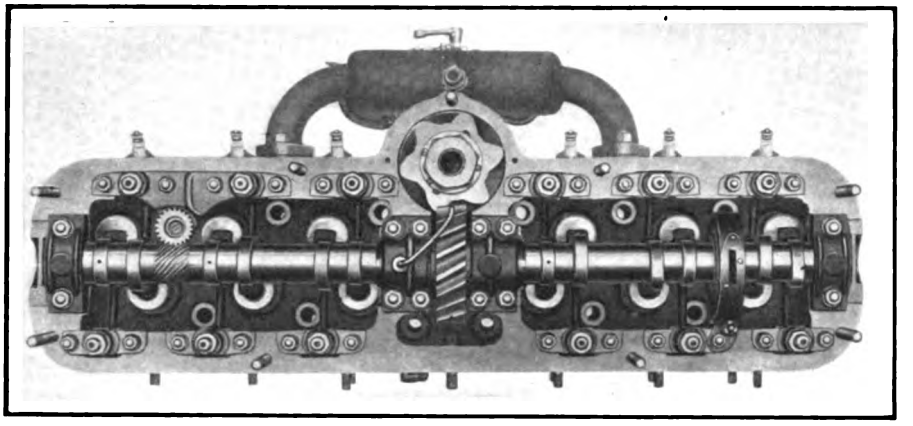
The same vertical shaft which drives the cams is used for the oil pump drive, as the pump is mounted directly beneath it and connected by a short, jointed shaft that allows the pump to be taken off for cleaning without disturbing other parts.

Accessories Disposed Neatly

Having all the valve gear on top of the motor means that the generator and starting motor can be put in any convenient place alongside, without interference with other parts. Thus, instead of the starting motor being low down and almost in the mud pan as it sometimes has to be, it is carried high on a bracket on the crankcase side. There are several bearings and joints in the mechanism which slide the pinion into mesh with the flywheel rim gear, and the high

The New Chalmers Valve-in-Head Motor

Chalmers 6-40 valve-in-head motor which is 3.125 by 5 in. Observe the large camshaft driving gears and the arrangement of the oil pump at the foot of the vertical shaft. The easy intake and outflow for the gas can be appreciated from this view. Note also the construction of the crankcase which is designed to give extreme rigidity



View of Chalmers valve mechanism as it appears when the aluminum top cover is removed

placing of the motor makes these points very easy of access.

A very simple and yet completely effective means for adjusting the generator drive chain is employed, this being made possible by the method of support for the motor. In the crankcase are two large holes, one at each end, extending transversely clear through the aluminum, and steel tubes are put through these holes to form the crankcase arms.

The Gray & Davis generator is hung just beneath the right hand end of the front tube, where it is sufficiently accessible for all purposes, and the bracket which holds it is gripped to the crankcase supporting tube by a clamp screw. The drive chain is outside the crankcase, as can be seen in the photograph, so, by slacking the clamp screw and gently tapping the bracket along the tube the chain can be brought to any desired tension and held there by a turn of the clamp. The whole operation of adjustment can be performed very easily and quickly.

Careful Balance a Feature

It is well known that the main trouble in the way of producing a successful high speed six is the vibrations which arise in the crankshaft. To eliminate these is partly a matter of design and partly one of manufacture. From the drawings can be seen the way in which design affects the Chalmers motor, for not only is 2.25 in. very large for a 3.125 bore motor, but the crank webs are also very substantial. The box form crankcase must help a good deal and no doubt the divided middle bearing is, from the rigidity viewpoint, the equivalent of a bearing the full 4 in. long.

In the factory processes there are two balancing operations, one for the flywheel and the other for the crankshaft, the parts being run on a special machine designed by the Chalmers engineers and developed from a couple of known tools into a much simpler form. The operation consists of running the parts in one direction only and balancing by drilling the flywheel rim or the crankpin.

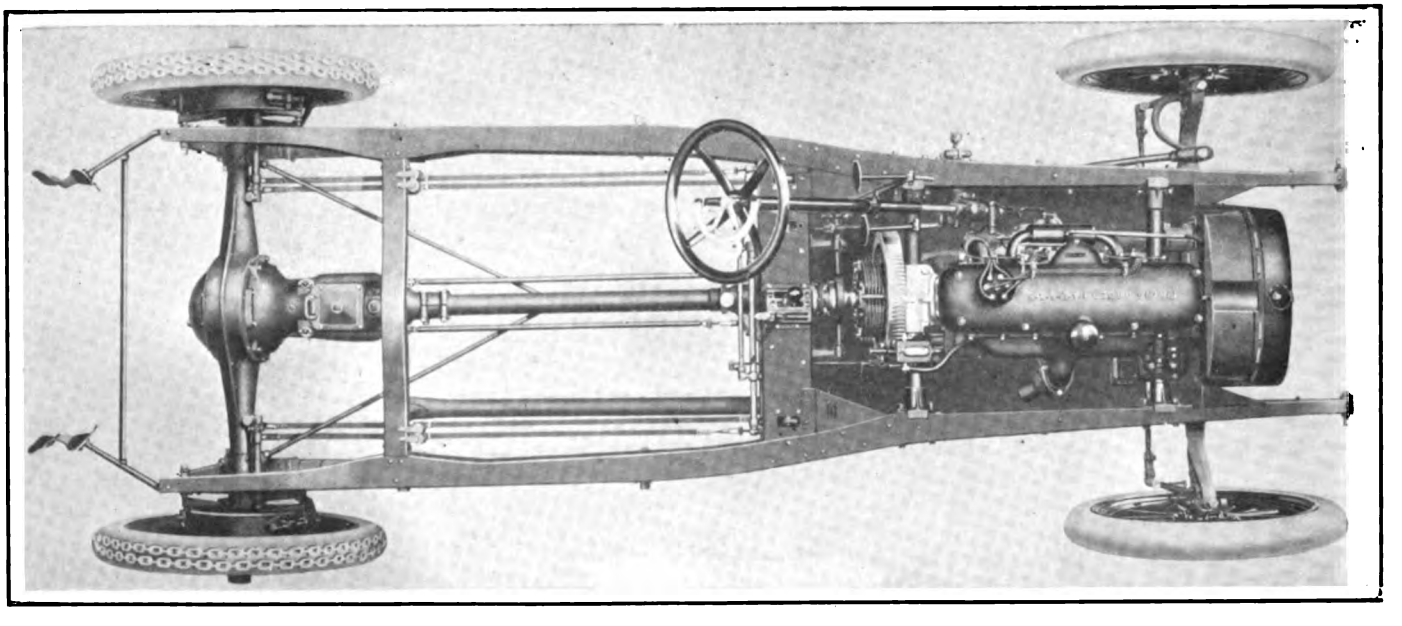
This method of handling the crank is made possible by the absence of internal oilways in the shaft, as frequently a quite large amount of metal has to be drilled out. Skill and experience of the workman count for almost everything in this operation as a practiced man can judge in a moment where it is that the shaft is heavy and to get smooth running at 1500 to 2000 r.p.m. very little inaccuracy is permissible. The crank webs are not machined externally, of course, as this would be of but little use. It is said that shafts and flywheels balanced on the special machines which Chalmers uses are always in static balance when their running balance has been corrected, which is not always the case with some other methods.

Tubular Connecting-Rods

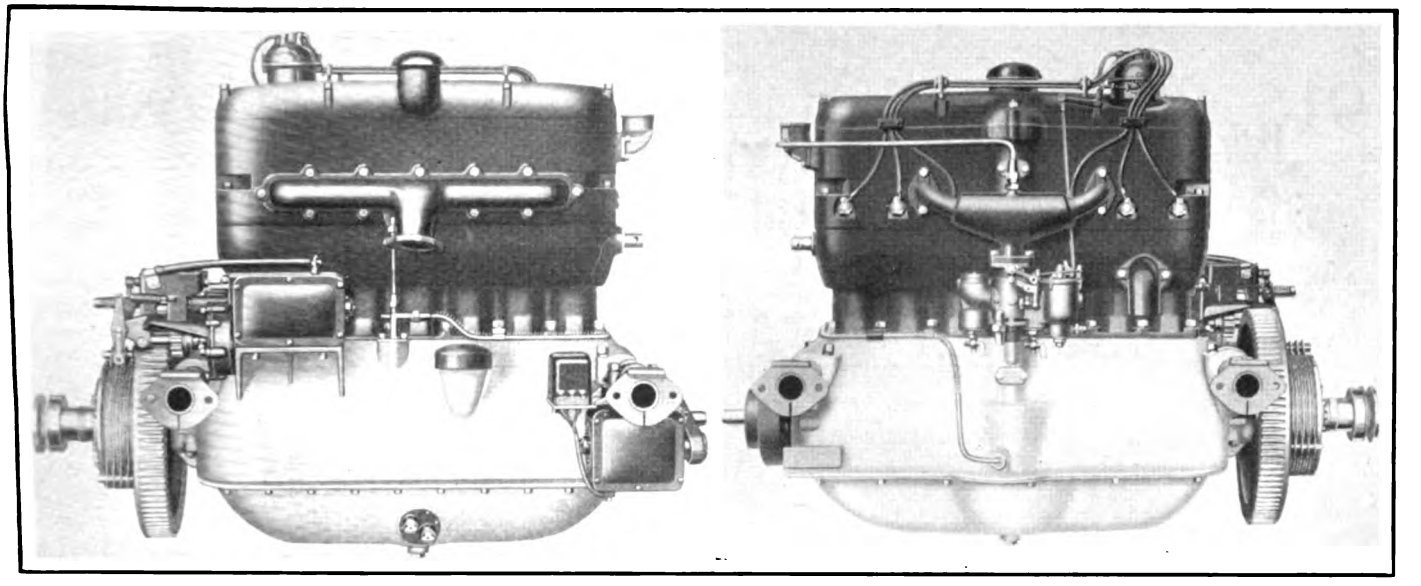
Another small detail that is of interest is that the round-section, hollow connecting-rods have small holes drilled through them near the bottom, this being to allow the escape of any oil which might find its way inside. As the rod is drilled right through the hole at the upper end is closed only by the piston pin bushing, and it is possible for oil to slowly work its way past this bush and so gradually fill up the rod. If this happened to one rod and not to the others the balance of the motor would be interfered with seriously.

Lightweight Axle Gearset

Back of the motor is a simple form of dry-plate clutch with a light action and a very decided grip, and then comes the short double universal to which the front end of the drive shaft attaches. Chalmers pins its faith to the rear axle gearset so that the chassis divides into but three main assemblies, the motor, the gearbox and the frame with springs and front axle. To cut the unsprung weight a carefully designed aluminum gearbox is used and another point which should



In this plan of the Chalmers 6-40 chassis notice that the springs are all under the frame and observe the direct brake connections. These latter are strips of thin spring steel which cannot rattle



Left—Exhaust side of Chalmers motor, showing Gray & Davis generator and starting motor. The cap on the crankcase side is a breather only as the oil is all put in through the top cap. Notice the accessibility of the Atwater Kent distributer. Right—Intake side of Chalmers motor. Observe the fins on the oil supply pipe which cool the lubricant on its way to the bearings

be mentioned is that the gearshifting rods are laid out on such centers that rough roads and high speed combined, have no tendency to throw the gearshift lever to and fro. This is a fault to which some rear-axle-gearset cars have been somewhat prone and to eliminate it is not quite so simple as might appear.

It is not easy to describe a car like the Chalmers, which is designed and made in its own factory and does not depend on assembly parts, without running to great length, so, having considered the main units of the chassis, the others may be hastened over a little. First, the brakes are 14 by 2 in. and 14.375 by 2.25; all rods and links are arranged to have a straight pull and the levers are well proportioned, so that plenty of arresting power is available without heavy pedal pressure. Again, special pains are taken to make the steering free and precise, this being a matter of large thrust bearings and a proper setting of the front axle swivel pins.

In the side view of the chassis the substantial support toward the middle of the cantilever spring can be seen, also the long shackle which permits very free action at the front. Putting the middle spring support *under* the frame instead of alongside it removes all twisting stresses on the side rail and saves weight in the brackets and attachments. In practice the springs behave in a most exemplary manner giving easy riding over the worst possible dirt roads and yet the rear springs are free from roll.

Car Performance

In a short demonstration run over a particularly vile piece of sand road near the Chalmers factory it could be noticed that there was very little tendency for the car to plunge, even with the rear seats unoccupied, and incidentally the same run showed the ability of the motor to pull smoothly on high gear through fairly heavy going. Naturally, one would expect plenty of high-gear ability with a 5.25 to 1 ratio, but a good deal of vibration round about 30 m.p.h. would also be anticipated and this most certainly does not occur even at speeds a good deal above this. The Rayfield carbureter suits the motor well and provides a very good acceleration, a couple of trials on a brick road showing from 5 to 30 m.p.h. on high gear in between 14 and 15 sec.

The touring bodies have an almost straight-line side and the high hood makes the car look powerful. Ample leg room and upholstery deep enough to give the soft feeling of a good arm chair, combined with careful finish, are the principal characteristics. Equipment is complete and includes a particularly handy rain vision windshield. Tires are 34 by 4 in. all around and there is one spare demountable rim. There is no need to mention everything in the smaller detail save to remark that it is in proper keeping with the character of the chassis.

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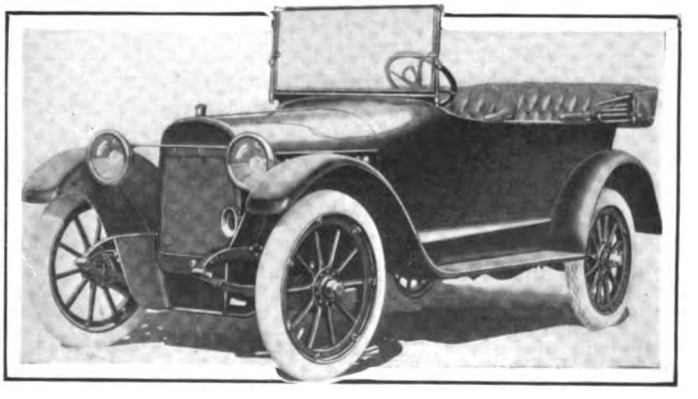
New Washington Law Is Sensible

TACOMA, WASH., July 17—It is the opinion of the automobile dealers of the State of Washington that the new motor vehicle code is being administered in a common sense manner by State officials and particularly by the Secretary of State.

Dealers in motor vehicles have given the law considerable study during the past thirty days, and have seen a great many things that would cause the motor car people generally a great deal of trouble if carried out literally.

One of the things which has been of especial interest is the matter of having licenses on new cars that are being taken from the freight sheds or distributing points to the dealer's place of business. In cases where dealers want to move several cars at one time, it would work a considerable hardship on them to have each car equipped with number tags, as it would mean the buying of several additional licenses that would not be needed except on these occasions.

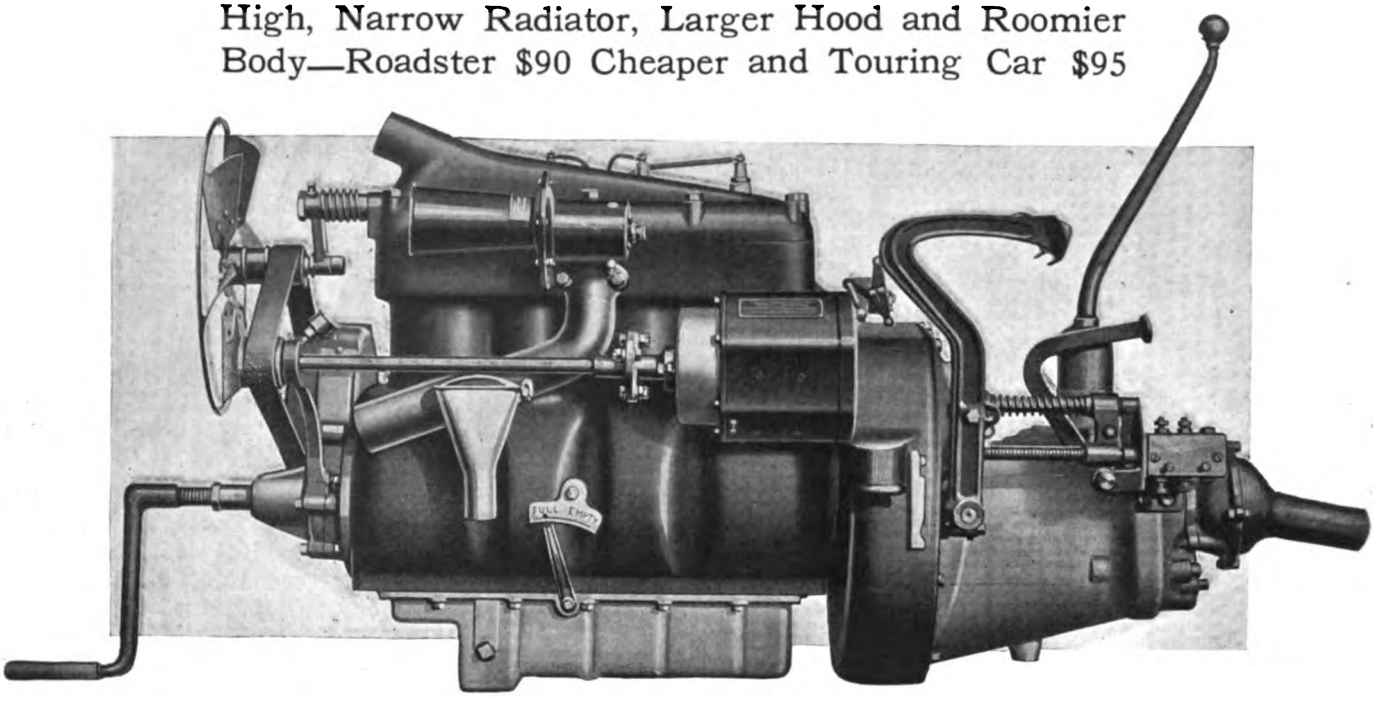
Secretary of State I. M. Howell, has advised that in his judgment it is not the intention of the law to require all cars to be tagged with State numbers when they are operated in such a manner if they are kept all together and the front and last car carries license tags in the regular way.



Chalmers 6-40 five-passenger car for 1916 which sells at $1,275

1916 Maxwell Larger—Price Lower

High, Narrow Radiator, Larger Hood and Roomier Body—Roadster $90 Cheaper and Touring Car $95



Left side of Maxwell four-cylinder block power plant for 1916. Note new oil gage and also fan drive

A BIGGER, better-appearing car at a reduced price is the offering of the Maxwell Motor Co. for 1916. The fitting of a high, narrow radiator, a larger hood, a more roomy body and the incorporation of a number of detail refinements in chassis and in comfort particulars have increased the value of the car to the purchaser while at the same time the Maxwell company has made a price cut of $90 on the roadster and $95 on the touring car. For 1916 the Maxwell touring car is $655, the roadster is $635.

While built upon the same chassis of 103-in. wheelbase, the new Maxwells appear larger than their immediate predecessors. The higher radiator, the changed body lines, and the rounding of the bodies into fuller lines, have produced this effect. The hood has been raised and the body where it meets the hood has been rounded out.

While the size of the motor has not been altered, greater port area has resulted in an increased power. Other changes in the unit power plant construction include the complete inclosing of the clutch and flywheel instead of the former construction whereby there was a yoke passing around the open flywheel and supporting the gearset. An entirely new feature is the running of the cone clutch in oil. The housing is designed to be oil tight, and thus the clutch is constantly bathed in the lubricant, which cushions its engagement.

In the Maxwell design of clutch, a woven asbestos fabric is used as a facing for the cone, thus the oil does not harm it in any way. It is probable that leather could not be used with an oil bath of this kind. A slightly heavier adjustable clutch spring is used with the new oil-bath construction. The cone is now made of cast aluminum instead of pressed steel, so that the unit is really lighter than before.

Oiling More Positive

Instead of introducing the oil at the front trough, and then allowing it to find its way through ducts to the other troughs, the new method is to introduce oil into each trough individually, making a more positive arrangement. A supply pipe runs along the inside of the crankcase and there is a lead to each trough. Along with this change a new aluminum base is now fitted which replaces the former pressed steel base and acts as the reservoir. An oil gage on the side of the crankcase is another new fitting. It operates by having a float-controlled pointer indicate the level. Another refinement is the fitting of a combination breather and oil filler on the left side. Although this breathes downward, the filling is from the top, and hence any oil that might be thrown out from the crankcase is sent to the drip pan instead of spraying over the engine.

The engine is of the detachable-head type, and this year an improved form of head is fitted. It is split higher up, and carries the water outlet connection as an integral part.

Power Plant Features

Reviewing the general features of the Maxwell power plant, the engine retains its bore of 3⅝ in. with stroke of 4½ in., and it has a S. A. E. rating of 21.1 hp. The dimensions give a displacement of 185.8 cu. in., and the stroke-bore ratio is 1.24.

Cylinders and the upper part of the crankcase are integral, making for a rigid construction. Valves and manifolding are on the right, as is also the Simms high-tension magneto. The two-bearing crankshaft is exceptionally large. Two bearings support the camshaft also, and the front gears are spiral bevels.

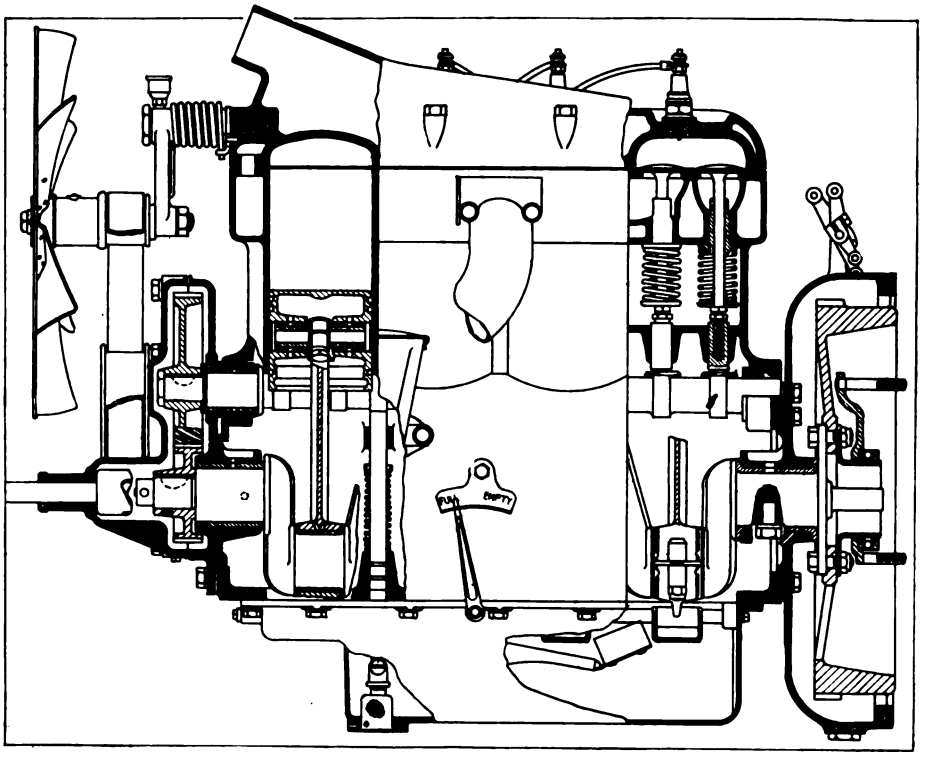
Principal Motor Dimensions

The bearing sizes and valve dimensions follow:

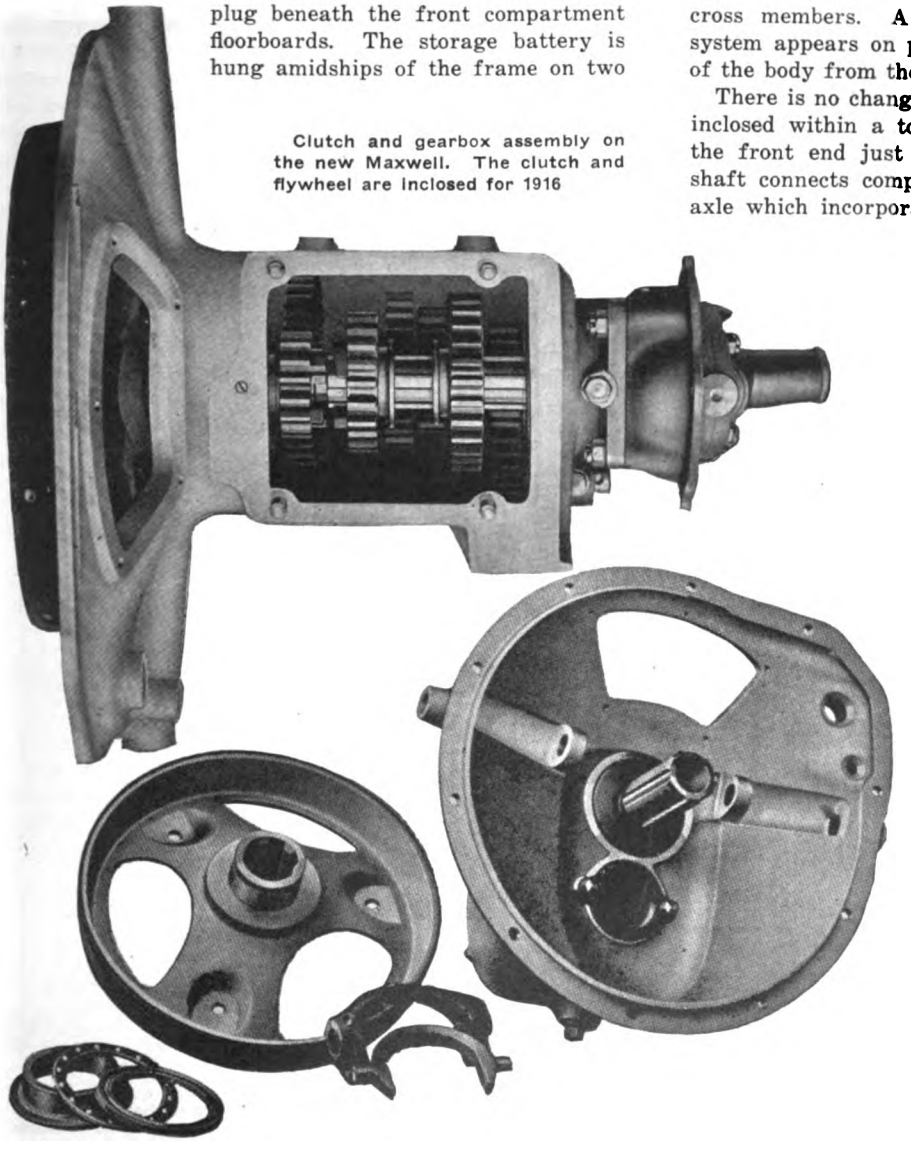
Front main bearing: 1⅞ by 2½ inches.
Rear main bearing: 1⅞ by 2 13-16 inches.
Connecting-rod lower bearing: 1⅞ by 1½ inch.
Camshaft front bearing: 1¼ by 1 13-16 inch.
Camshaft rear bearing: 1¼ by 1⅜ inch.
Valve diameter: 1 9-16 inch.

The Simms-Huff motor-generator unit is carried on the rear of the engine, and the one new feature is in the complete housing of the gearing which connects with the flywheel for starting. Driven as a generator, the unit is run by a shaft, but as a motor, it gears with flywheel teeth. Operating on a 12-volt current, the motor turns an average engine at about 100 r.p.m., although this will vary with the weather. Drive for the generator shaft is by a belt, which passes over three pulleys. The driving pulley is placed on the outward extension of the magneto shaft, and it passes over the fan pulley as well as the generator shaft pulley. Tension is kept constant in the belt by a spiral spring attached to the arm which carries the fan and its shaft and pulley. This bracket is carried by the cylinder head, and the spring holds the pulley up against the belt with sufficient force to maintain a good drive for both fan and generator with little or no slip. It makes a practically noiseless assembly.

There is a commendable refinement in connecting the wires on the body with those on the chassis by a junction plug beneath the front compartment floorboards. The storage battery is hung amidships of the frame on two cross members. A diagrammatic illustration of the new system appears on page 150. It greatly facilitates removal of the body from the chassis.



Part section through Maxwell four-cylinder block motor for 1916



Clutch and gearbox assembly on the new Maxwell. The clutch and flywheel are inclosed for 1916

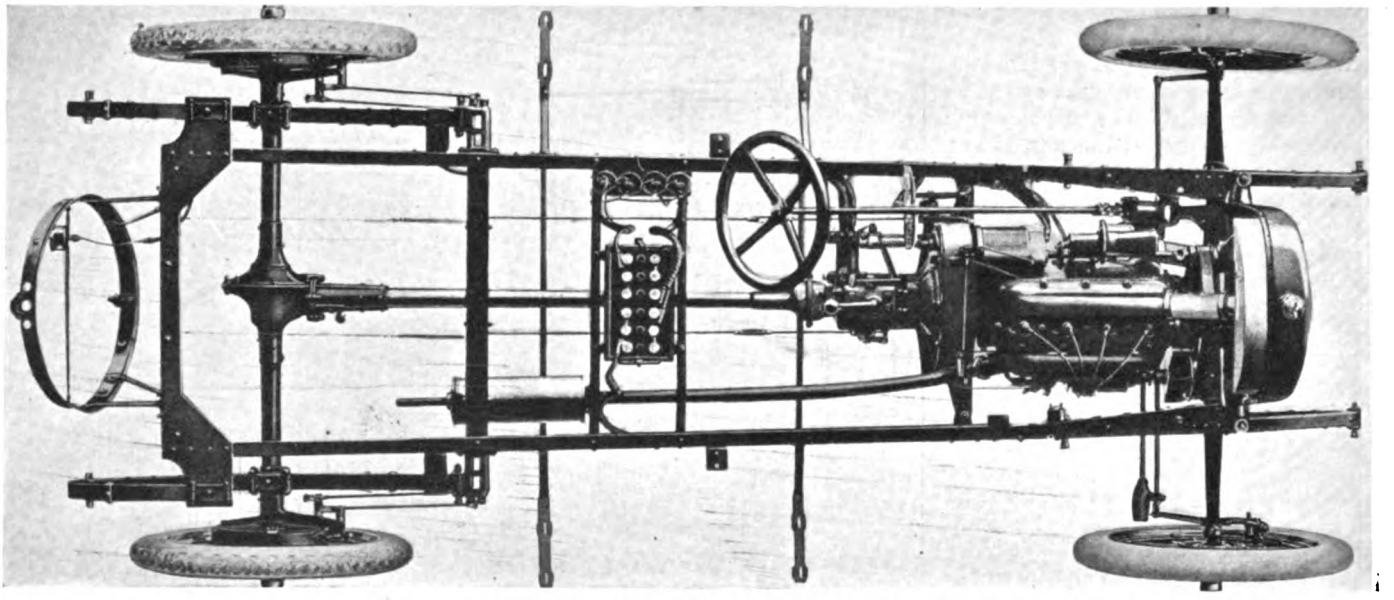
There is no change in the drive system. The driveshaft is inclosed within a torsion tube and there is a universal at the front end just back of the three-speed gearbox. The shaft connects compactly to the three-quarter floating rear axle which incorporates five Hyatt spiral roller bearings in its construction. There is one bearing under each wheel, one carrying the pinion and one on either side of the differential unit. Ball thrust bearings are used in conjunction with the Hyatts in the latter three positions. The axle shafts are of nickel steel, and are housed in tubes of seamless steel which rivet to the malleable iron differential housing. An axle ratio of 3⅝ to 1 is used.

Springing is continued as in 1915, with three-quarter elliptic rear springs 40 in. in length, and front springs 32 in. The rear pair is fixed at the front to transmit the drive, and attaches to the axle on a rocking seat, giving unrestricted action.

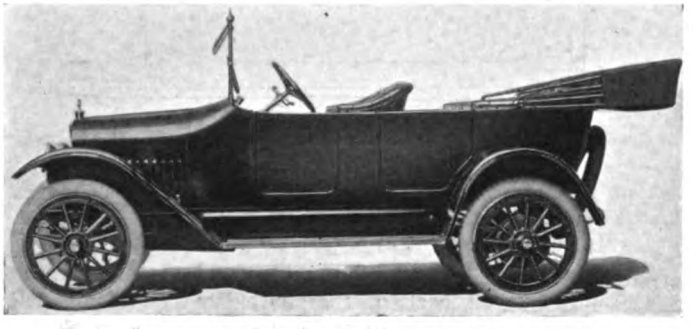
By tapering the frame, it gives good support to the body along the entire length, the rear width being 33 7/16 in. as compared with 28 in. at the front. There are three cross members, the rear forming a mounting for the upper end of the springs, while the tire carrier is also attached to it.

Tires are 30 by 3½ with non-skids in rear. A new feature on the 1916 cars is the use of demountable rims instead of the straight clincher type.

Aluminum-covered running boards are used instead of corrugated metal. On the floor of the front compartment,



1916 Maxwell chassis, showing tapered frame with cross member for tire carrier and giving an idea of the new radiator



The 1916 Maxwell touring car which sells for $655

linoleum is also used in place of the former rubber matting. Non-rustable metal edging is used to hold down the edges of the new covering for these parts, making a very neat job.

More rigid supporting of the headlights is secured by bracketing them to the fenders instead of by vertical supports from the frame. A noticeable change is the fitting of a well-arranged instrument board with speedometer and gages set flush with its surface in contrast with the former portruding attachment. The electrical connections are all brought to one unit which is removable so as to readily reach the terminals. In the center of this unit there is a plate held by a spring. This exposes the fuses, making it very convenient to replace them.

Body Longer and Wider

The body is widened and lengthened so that more leg room is provided as well as 3 in. greater width in the seats. There is 29 in. leg space in the front and 28 in the rear of the touring model. Pockets have been put in all four doors, which are considerably wider. Accelerator and starter pedals have been farther separated.

Points that do their part in adding to appearance are the louvres in the hood, the improved two-piece windshield which has substantial side supports to carry the front of the one-man top—also a new feature—and the domed fenders which are made unusually strong.

The gasoline tank has been somewhat enlarged so as to hold 10 gal. A conveniently-located sediment cup on the right under the hood strains the fuel going to the carbureter and is fitted with a shut-off cock.

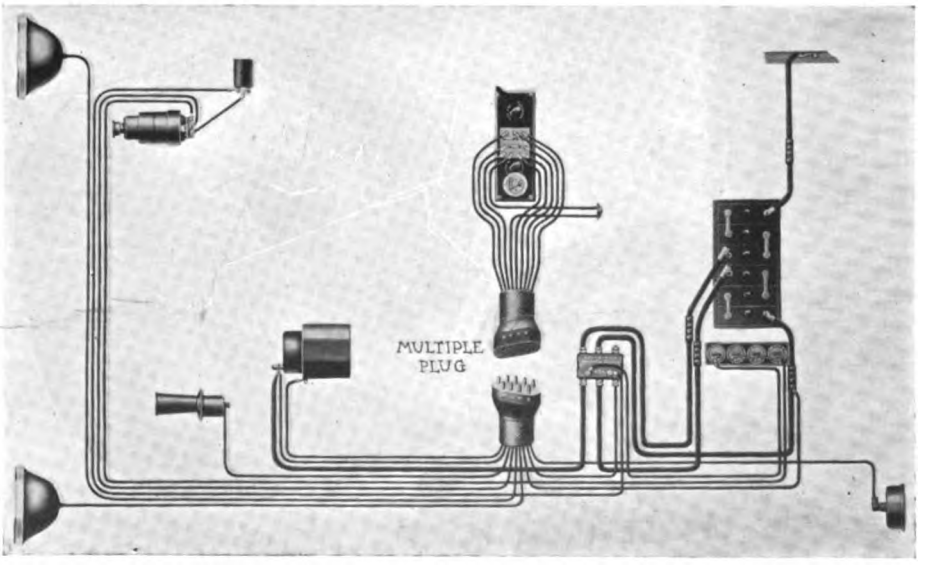
In addition to the open body models already mentioned, Maxwell offers a five-passenger permanent-top convertible-body type at $935, a six-passenger town car at $915, and a two-passenger cabriolet at $865. The first-mentioned is fitted with sash in the sides which may be slipped down into compartments in the body when desired, leaving all open with only the top permanent.

—

Regulate Truck Size in Ohio

CLEVELAND, OHIO, July 18—The weight and speed of motor trucks are to play an important part in the new laws now being enforced on city streets and county roads. The weight limit on any stone, brick or macadamized road is 3,400 lb., with vehicles having a tire less than 3 in. wide.

Vehicles with a greater total weight will not be allowed to travel over county roads without permission from the board of county commissioners. Vehicles or contrivances having flanges or lugs are prohibited.



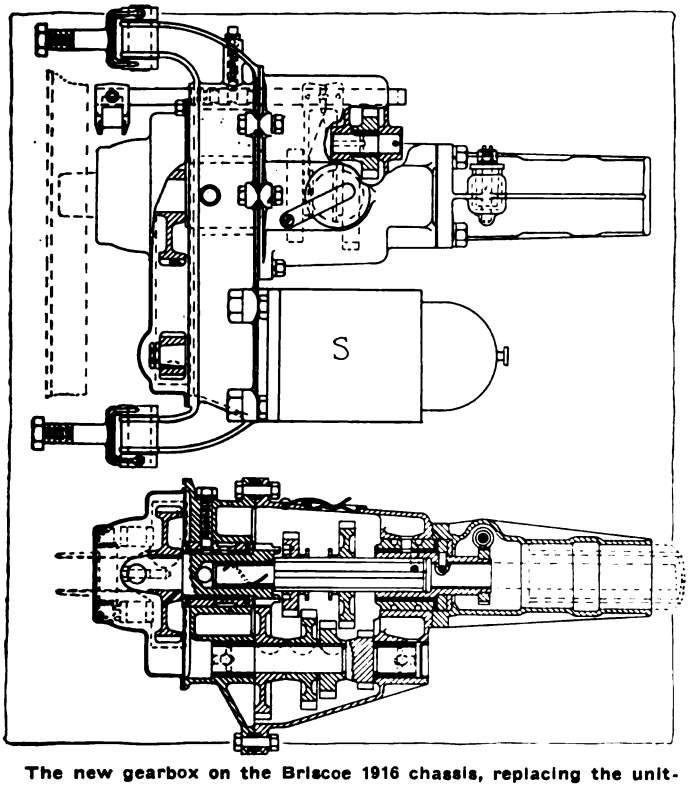
New Maxwell wiring system permitting easy removal of body from the chassis

Briscoe Eight and Four in Same Chassis

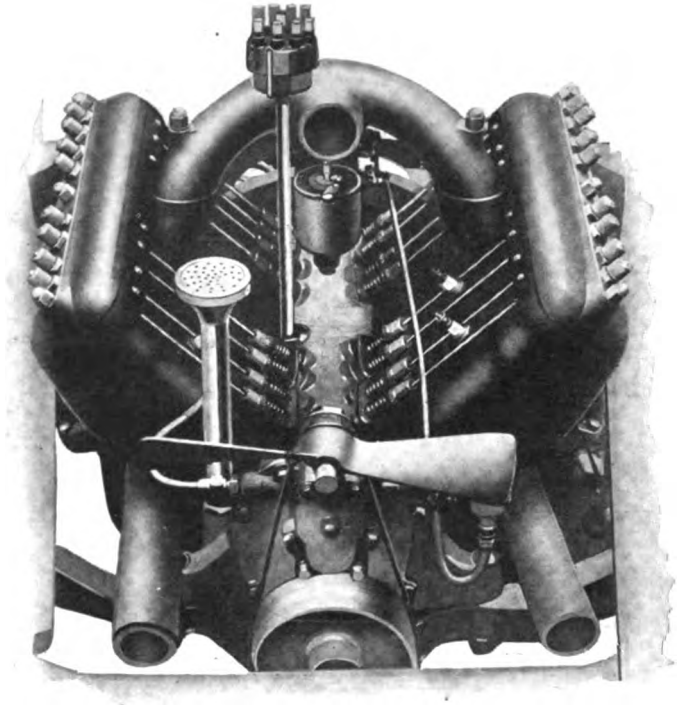
Eight Is Ferro 3 by 3 1-2 and Four a New Briscoe Design 3 7-16 by 5 1-8—Gearset Reconstructed To Render Motors Interchangeable—New Rear Suspension by Cantilevers—Two Headlights for 1916

THE 1916 season will, with a few companies, be the proving out as to the desirability of fitting two different motors on the same chassis, the chassis design being such as to make this possible at a nominal increase covering a larger motor. As announced in these columns some weeks ago, the Briscoe Motor Co., Jackson, Mich., has such a program and is prepared to furnish either a four-cylinder or eight-cylinder motor in the same chassis, giving a buyer the option of using the four-cylinder motor for thirty days and if at that time he decides on an eight he can secure the same at $200 additional, the Briscoe company taking back the four-cylinder motor and installing the eight. The four-cylinder motor is a brand new design and the eight-cylinder motor is built by the Ferro Machine and Foundry Co., Cleveland, Ohio, and characterized by having valves in the head and having the eight cylinders and upper half of the crankcase formed in one casting. This motor was exhibited during the recent New York show and has been undergoing development ever since. The four-cylinder motor which the Briscoe company fits is 3 7/16 by 5⅛. It is claimed to give 38 hp. at 1700 r.p.m. It is an L-head block design with detachable cylinder head and valve stems and springs inclosed.

The eight-cylinder motor is a conventional V-type design with cylinders 3 by 3½ giving a piston displacement of 198 cu. in. as compared with 190.4 cu. in. on the four-cylinder. This motor, like the four, has detachable cylinder heads.



The new gearbox on the Briscoe 1916 chassis, replacing the unit-with-motor construction, due to the necessity for interchangeability of the eight and four-cylinder motors in the same chassis. S is the motor-generator



The valve-in-the-head Ferro motor used in the 1916 Briscoe eight-cylinder model. This engine has a bore of 3 and a stroke of 3½ in., giving a piston displacement of 198 cu. in.

Owing to offering either eight- or four-cylinder motors in the same chassis, the Briscoe company has now mounted the gearset as a separate unit in the middle of the chassis whereas formerly it has been in unit with the motor. The substitution of one motor for the other is hence a matter of connecting the shaft between the clutch and the gearset insofar as the driving elements are concerned.

Two Headlights Instead of One

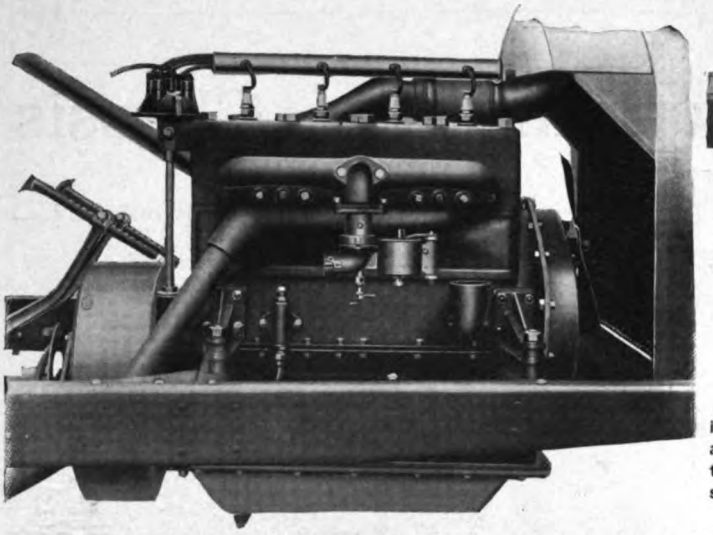
Externally, the 1916 Briscoe car is quite different from the 1915 model chiefly in that two headlights are used in place of the single light incorporated in the radiator, which scarcely met the requirements of certain states where two lamps are compulsory equipment.

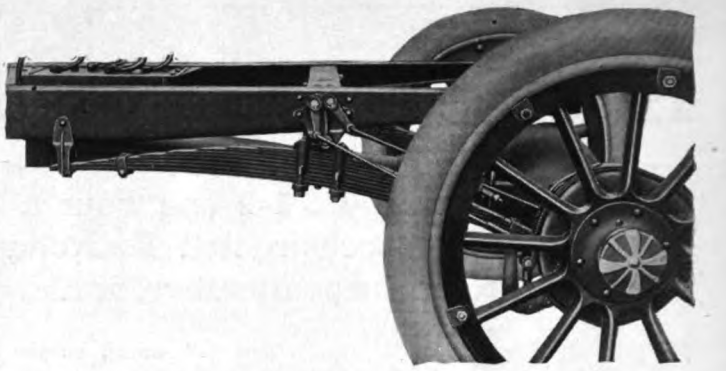
Domed fenders add to the general appearance, and they have been more rigidly fastened, by attaching them directly to the body in place of the previously used method of mounting them by brackets to the frame. Obviously there is less chance for rattle and wabbling by this method of construction.

The four-cylinder machine is so radically different from that of last season that it may rightfully be called a new job throughout. The scheme is to furnish either engine the customer desires, charging $750 for the car with the four and $950 with the eight.

New Cantilever Suspension

The new body gives 3 in. more leg room in the rear, and a new rear suspension supersedes the semi-elliptic design of 1915 models. It is of a nice cantilever type, and makes an exceedingly easy riding car. The wheelbase has come in for





Left—Manifold side of the new four-cylinder Briscoe motor, showing carbureter and distributer mounting. Note combined intake and exhaust manifold. Right—Cantilever rear suspension used on the 1916 Briscoe chassis. Note that the lower end of the spring is secured below the axle housing

a 7-in. increase to 114 in., and along with the general enlargement of the car, tires have been increased from 30 by 3½ to 32 by 3½ size. Control pedals are now adjustable; and the double internal expanding brakes have been replaced by the more usual internal expanding emergency and external contracting service sets.

Summed up, the new Briscoe four is a larger and more powerful car than the 1915 model, so that it is more value for the money. The motor is an entirely new design with a bore of 3 7/16 in., as compared with the 3⅛-in. bore of the previous engine. The stroke is the same—5⅛ in. Another important difference is the separation of gearset and engine, the former now being located amidships in contrast to the former unit power plant construction.

The eight-cylinder Ferro engine adheres very closely to the design as brought out the early part of this year. The valves are overhead, with rods running up from the single camshaft in the center of the V. Cylinders have a bore of 3 in., and a stroke of 3½ in., giving a piston displacement of 198 cu. in.

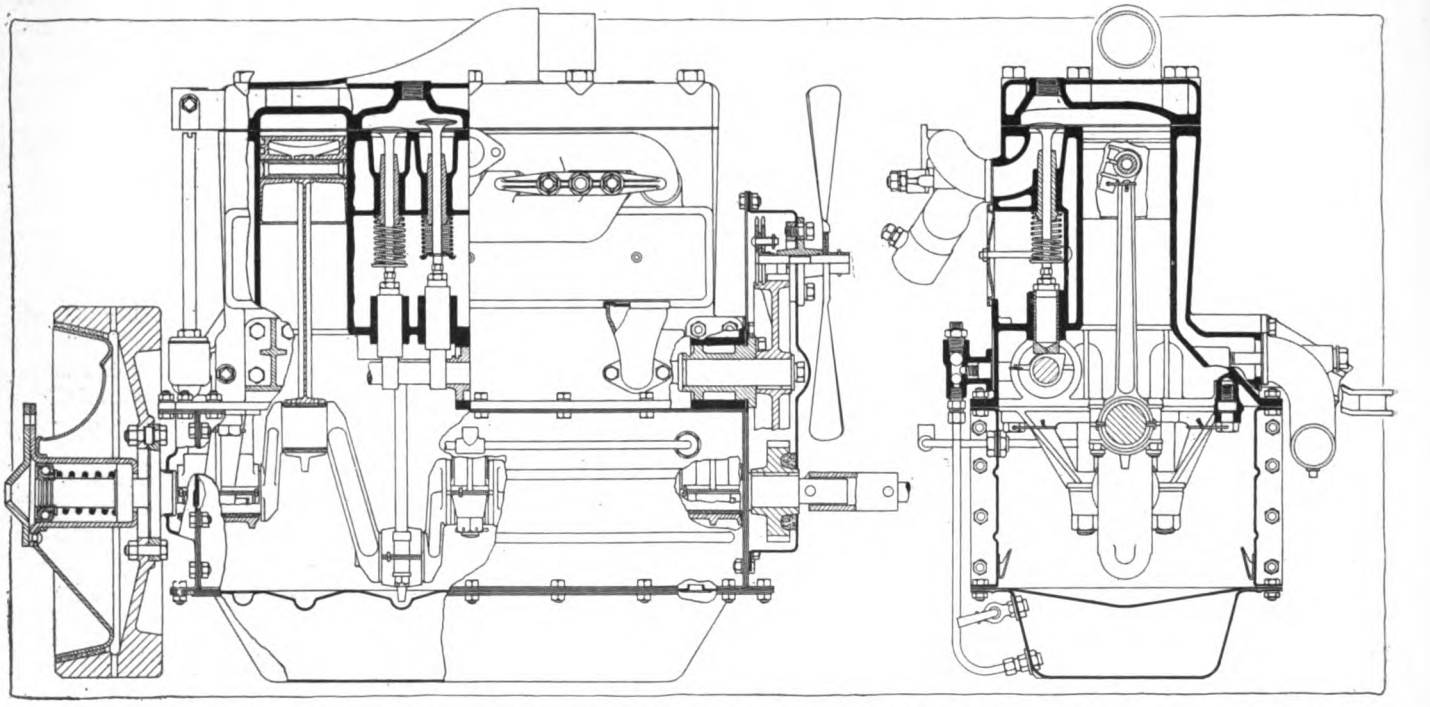
In this engine, the two blocks of four cylinders are set at the usual 90 deg., and the upper half of the crankcase is made integral with the cylinders. Thus, their eight cylinders and upper case are cast as one piece, and greater rigidity is claimed for the design.

Single Camshaft Used

Sixteen cams are used on the single camshaft, mounted at the center of the V, giving a cam for each valve and making possible a simple duplicate four-cylinder timing. That is, No. 1 cylinder on the right is followed by No. 1 left, and so on. There is also another special feature of the engine, namely, the use of hot-pressed steel rocker arms for operating the valves. These are so pivoted in the top of the cylinder heads on ball joints that adjustment is made through the use of knurled nuts protruding through the top of the cylinders. Thus, in order to take up any play between valve rod and rocker, it is a simple matter to loosen the lock nut and turn the knurled adjustment screw until the proper clearance is obtained, the location of these being very convenient on the top of the cylinder blocks.

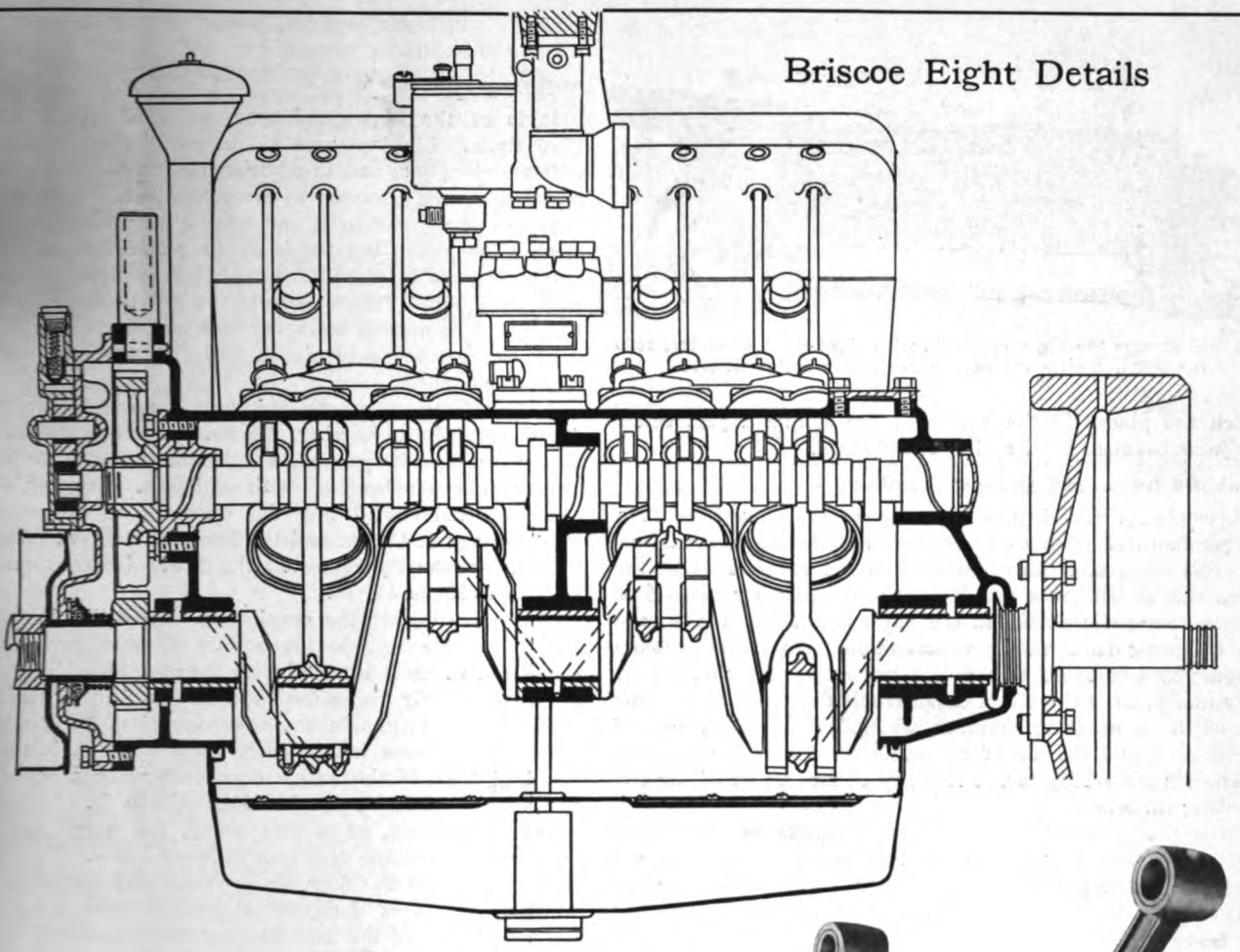
Cylinder Heads Detachable

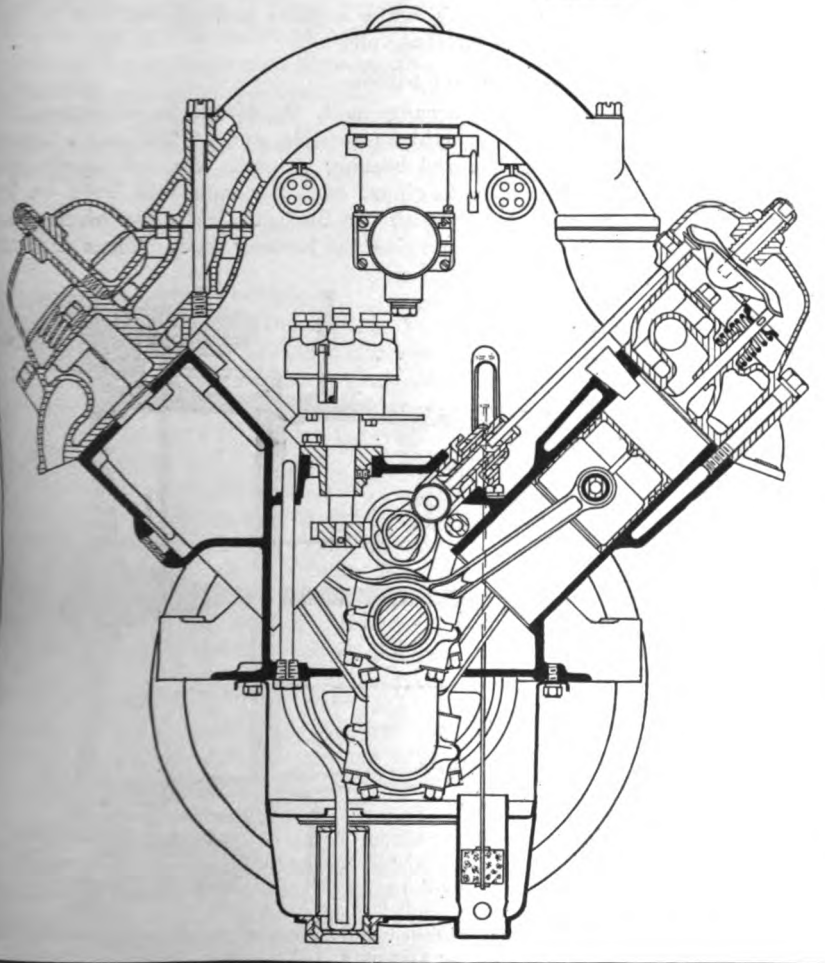
The cylinder heads are detachable, their removal giving access to the pistons. These heads carry all the valve mechanism, the water outlet connections and everything at the top part of the cylinders with the exception of the spark plugs

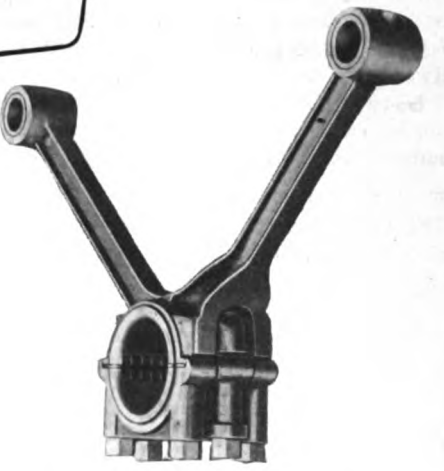


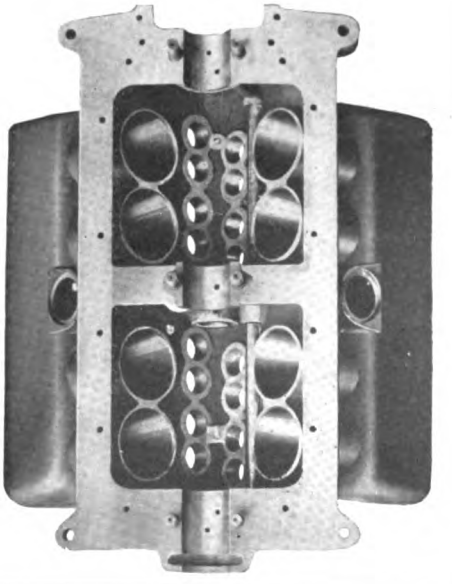
Longitudinal and transverse sections through the new four-cylinder Briscoe motor which has combined intake and exhaust manifolds, detachable cylinder heads, etc.

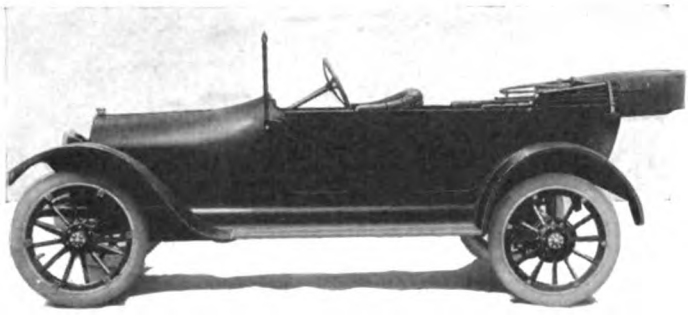
Briscoe Eight Details











The 1916 Briscoe touring car, which, with eight-cylinder motor, sells for $950 and with the new four-cylinder design at $750

which are placed in the V-side of the cylinders just below the joint between head and cylinder block.

Combined Intake and Exhaust Manifold

A combined fuel intake and water outlet manifold is a unique feature. The water passage really surrounds the inner fuel pipe, and the connection to the radiator is at the front side of the cross double-duty manifold. By the use of such a concentric manifold, the hot water circulates around the incoming fuel, aiding vaporization. As thermo-syphon cooling is employed, this outlet water construction works very nicely, since there is a considerable distance between the top of the combustion chamber, which is the hottest part of the engine, and the top of the radiator, due to the V form. This adds materially to the rapidity of movement of the circulating water.

In the attachment of the connecting-rods to the crankshaft, the forked design is used. That is, one rod has a yoked end, and the other rod for the opposite cylinder fits between the arms of this yoke. So as to make adjustment of the caps as easy as possible, the bearings have been split on a horizontal plane, instead of at right angles to the centerline of the rod.

The New Four-Cylinder Motor

With practically nothing in common with the previous Briscoe motor, the new four is an extremely smooth-appearing design, with the cylinder block and upper half of the crankcase in one piece. The head is detachable, and valves are located on the right and very compactly inclosed. It is suspended at four points in an unusual manner by four brackets which are separate pieces bolting to bosses on the sides of the cylinder casting.

38-Hp. at 1700 R.P.M.

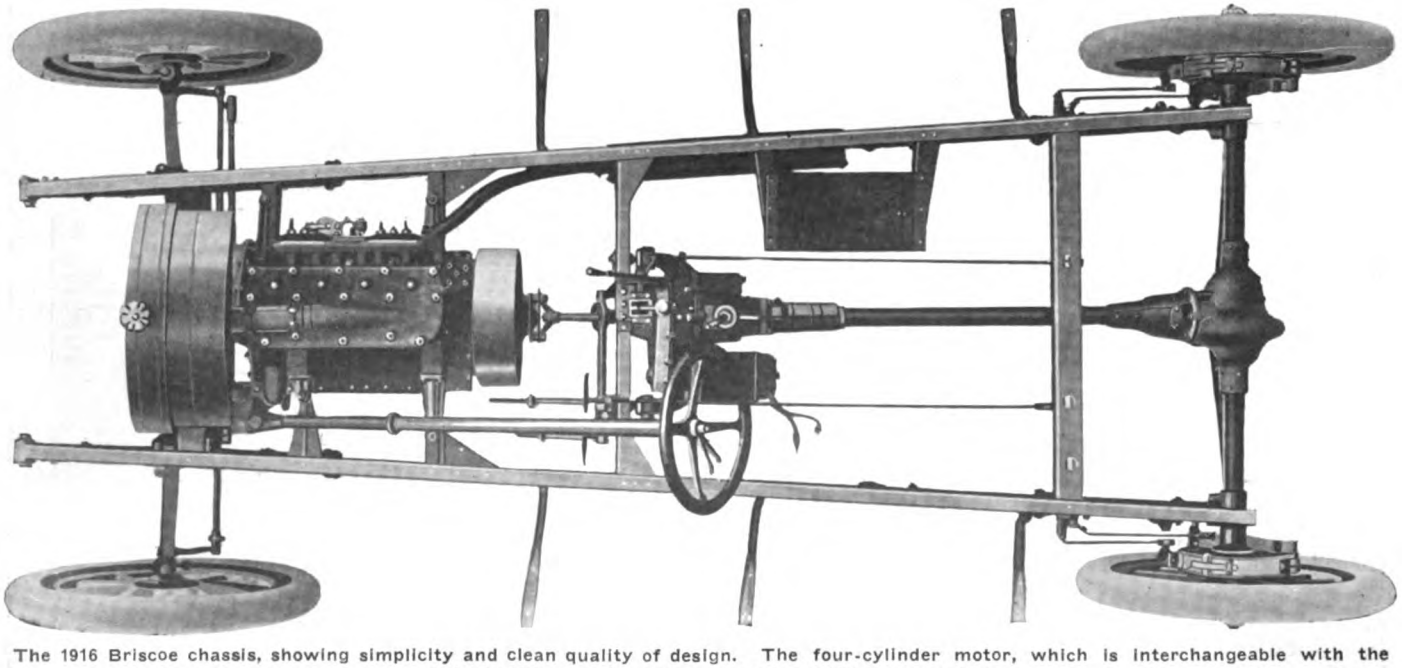
It is of the high-speed type, with 38 hp. produced at 1700 r.p.m. Light pistons aid in permitting of high speed without vibration, and in addition the crankshaft is of large proportions and mounted on three bearings. The connecting-rods are of regular form and forged from chrome-vanadium steel. The piston bearing is in the piston bosses, the upper end of the rod being split on one side, and the pin clamping in it by a bolt. Two bolts hold the cap to the lower end of the rod. The pistons are fitted with two rings, and the heads are concaved, so as to give a desirable semi-spherical combustion chamber.

A few features of the specifications are 1¾-in. valves; front crankshaft bearing, 1⅛-in. diameter, 2¾-in. long; center crankshaft bearing, 1 9/16 in. diameter, 2 in. long; rear crankshaft bearing with a 1⅝-in. diameter, 3¼ in. camshaft diameter, 1 in. The diameter of the connecting-rod bearings is 1⅝ in. and the length is 1¾ in., there being 9⅞ in. between the centers. The flywheel diameter is 14 in. and its width is 4¼ in.

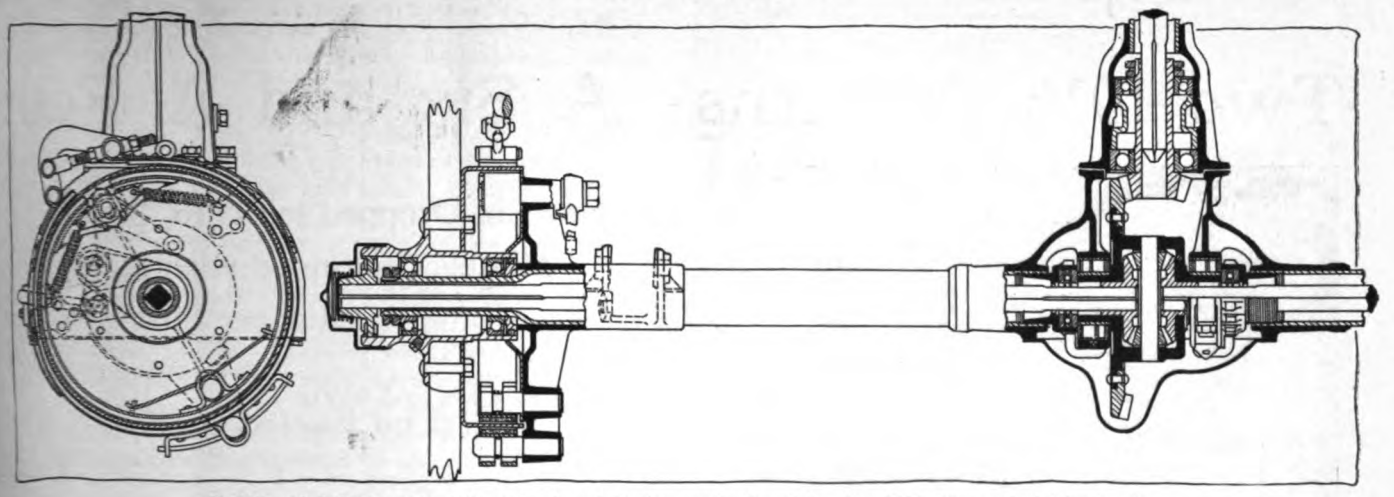
The mounting of the crankshaft is peculiar in that separate brackets bolt to the bottom of that portion of the crankcase which is integral with the cylinders. These brackets have exactly the same function as the usual integral crankshaft bearings in the crankcase, but the construction is lighter, because with equally rigid support, less metal is required than if the entire crankcase were extended down far enough to carry the bearings within it. This is especially true where, as in this motor, the upper part of the case is a part of the cast iron cylinder block. To extend the heavy metal all the way down would add materially to the weight. As it is designed, a pressed-steel cover acts as the lower part of the case housing the crankshaft and these bearing brackets, while another piece closes the bottom and acts as the oil reservoir.

Engine Light but Strong

The whole arrangement, therefore, is designed to make the engine as light as possible, and at the same time crankshaft rigidity and bearing strength are not sacrificed. The brackets are forgings, and the caps are held on by two 11/16-in. bolts which run up to the cylinder block extension, and assist in carrying the bearing load. Thus that part of



The 1916 Briscoe chassis, showing simplicity and clean quality of design. The four-cylinder motor, which is interchangeable with the eight in this chassis, appears in this particular assembly



Details of Briscoe rear axle, wheel and brake as designed for the 1916 four and eight chassis

the crankcase which really incloses the shaft is merely a housing or cover and has nothing to do with carrying the load of the shaft.

Thermo-syphon cooling is well applied to the engine, with a 2-in. water outlet connection integral with the cylinder head. The heads are entirely water jacketed, while the jacketing of the cylinders is uniform, due to the comparatively even thickness of the space around all the cylinders. Also, the water is carried down the entire length of the cylinders, and the water inlet is at the extreme lower front side of the casting.

Friction Drive for Fan

Drive for the cooling fan is unique in that a friction means is employed. The camshaft gear face is made wide enough so that two grooves can be accommodated in the face and back of the gear teeth. These grooves receive two small steel friction disks mounted on the fan shaft. Pins carrying small spiral springs pass through the two disks and the fan shaft flange, thus maintaining an even tension of the disks upon the grooves in the driving gear. The result of this scheme of drive is a noiseless and extremely simple combination which revolves the aeroplane type of fan at the required speed for proper cooling. This mechanism as well as the front gears is all inclosed by a pressed steel front plate.

Atwater Kent Ignition

Driven off the end of the camshaft is the vertically-mounted Atwater Kent ignition distribution unit. The balance of the electrical functions are provided for by the motor-generator mounted on the left side of the gearbox. This charges the battery and lights at 6 volts, and uses 12-volt circuit for starting.

In lubricating the engine, the circulating-splash method is used. The oil is brought up from the reservoir by a plunger pump operated by the camshaft, and it is delivered through a sight-feed on the dash and thence to the oil troughs under the connecting-rods, these having dippers on their caps to catch the oil and throw it to the bearing surfaces, from which it drains back to the sump.

New Gearbox Construction

The transmission mechanism is very simple. The gearbox is really in unit with the torsion tube which surrounds the propeller shaft. The front of the gearbox has two arms which hinge to a cross member. Thus axle variation is due to road unevenness is provided for by this gearbox hinging. As the rear of the gearbox attaches to the torsion tube, there is no frame support for it except at the front.

A floating Salisbury rear axle is fitted. This has two ball bearings supporting each wheel, one on either side of the vertical centerline of the wheel. This is in contrast to the type in which a single bearing is placed directly under the wheel, and there is obviously better support and less chance for misalignment and resultant wheel wobbling. Likewise, two ball-thrust bearings carry the pinion shaft, and there are also roller and ball-thrust bearings on either side of the differential.

Full Cantilever Springs

In its application of cantilever springs, Briscoe uses the full cantilever type, with trunnion mounting at the center to a frame bracket, a sliding bracket at the front, and attachment of the rear under the axle tubes. Plenty of action is afforded, due to this design. This year, bushed spring eyes are provided, making possible the elimination of grease cups.

Three Body Types

Three body types are offered, all of graceful lines. These are the touring car, three-passenger roadster and two-passenger coupé. The roadster is still styled the Clover Leaf, as the center seat is set somewhat back of the two outside ones. The coupé costs $1,000 with four-cylinder motor, and there is, of course, the same exchange proposition for the eight.

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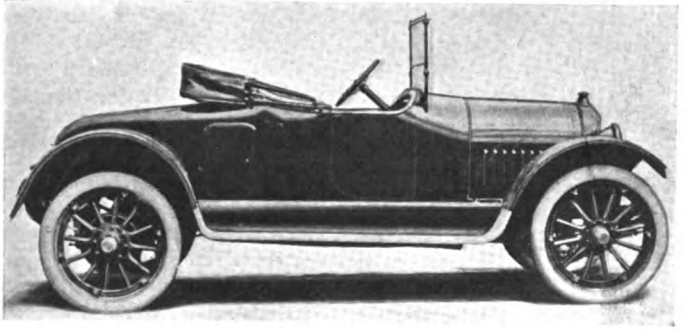
A New Moline-Knight Roadster Model Just Brought Out

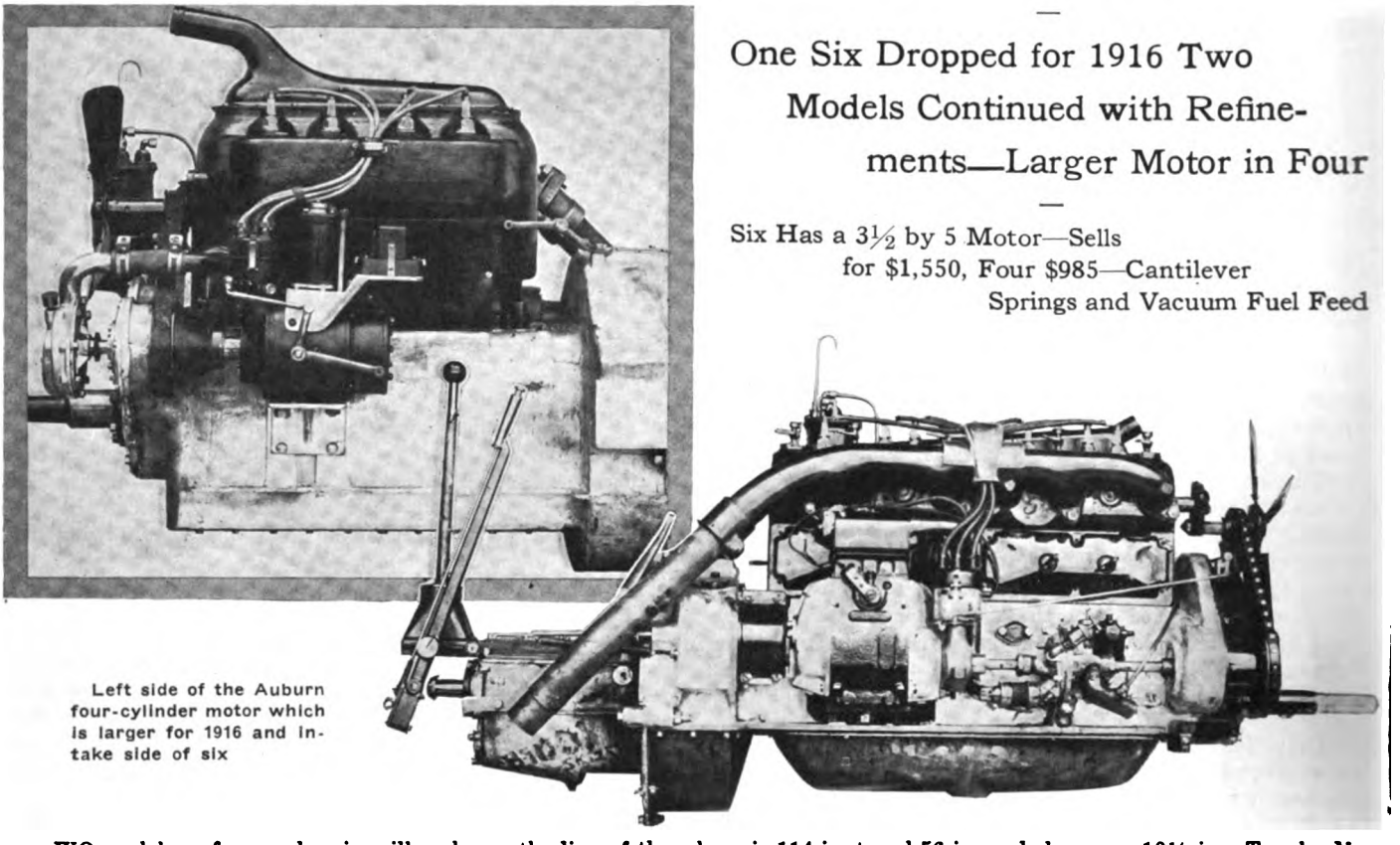


The Moline Automobile Co., East Moline, Illinois, maker of the Moline-Knight, have recently placed on the market a two-passenger roadster listing at $1,475. The new 40 horsepower roadster body is similar to its sister car, the model 50, roadster. It is mounted on the identical chassis of the present five-passenger touring model. The roadster has a large carrying capacity, the rear part of the body being divided into two compartments—one parallel with the seat and entered by an oval shaped door on the right side of the car, while the larger compartment opens from the rear. The large compartment is of such ample dimensions that it will permit the carrying of a steamer trunk, spare tires, suit cases and other luggage

Two 1916 Auburns—A Six and A Four

One Six Dropped for 1916 Two Models Continued with Refinements—Larger Motor in Four

Six Has a 3½ by 5 Motor—Sells for $1,550, Four $985—Cantilever Springs and Vacuum Fuel Feed



Left side of the Auburn four-cylinder motor which is larger for 1916 and intake side of six

TWO models, a four and a six will make up the line of the Auburn Automobile Co., Auburn, Ind., for the 1916 season. For 1915 there were three, a four, and two sixes. For this season the larger of the two sixes has been dropped, and the other continued along with the four. No radical changes have been made in the new models, although some of the alterations are of importance including the introduction of cantilever springs, vacuum gasoline feed with rear tank, flush doors, invisible hinges, flush door handles, roomier bodies and disappearing auxiliary seats in the seven-passenger car.

New Four Has Larger Motor

The four-cylinder model which last season was known as the 4-36 is now known as the 4-38 and in place of the 3.75-in. bore of 1915, the 1916 car has a bore of 3.875 and a stroke of 5 in. the latter figure being the same as for the 1915 season. The stroke bore ratio is 1.29 and the S. A. E. rating 24. A claim of 38 hp. on the brake is made by the manufacturers. As would be expected in a T-head design, the valves are large having an outside diameter of 2 3/16 in. with a port opening of 2 in. clear. The valves are interchangeable with cast iron heads on nickel steel stems.

Other features of the motor are a three-bearing crankshaft, three-bearing camshaft, chrome-nickel steel piston pins and a special patented lubricating system. This is a splash design with two overflow basins located in the lower part of the crankcase. In addition to the regular splash arrangement, there is cast integrally with the upper half of the crankcase an oil pocket over each main bearing. These are kept full, continuously providing oil to the crankshaft.

The timing gears are spirally cut and the generator is mounted on the pump shaft. The starting motor is installed back of the flywheel housing and the pinion meshes with a hardened ring gear on the rim of the flywheel. The wheelbase is 114 in. tread 56 in. and clearance 10½ in. Two bodies are fitted on this design, a two-passenger roadster and a five-passenger touring, both selling at $985, fully equipped.

Six Different in Design

Model 6-40 A is the only six-cylinder car listed by the Auburn company this year. It is an entirely different design from the four having its six block-cast cylinders L-head instead of T. It uses the three-point suspension system in connection with the unit power plant. The cylinders are cast from reverberatory air-furnace iron and then rough bored finish bored and ground. The pistons are cast from the same grade of metal as the cylinders and are fitted with three diagonally split, concentric expansion rings. The rings in the four are eccentric. Oil grooves are turned on the outside of the piston for collecting and distributing the oil over the inside of the cylinders. Piston pin is of annealed steel tubing, hardened and ground, and held stationary in the piston bosses by means of a simple locking device. The bearing surface is a long, large bronze bushing which is pressed into the connecting-rod.

I-beam connecting-rods are employed made from 0.35 carbon steel, drop-forged and heat treated. The connecting-rod caps are held in place by nickel-steel bolts properly secured by a locking device. The camshaft is drop-forged from carbon steel in one piece. The shaft runs in white bronze bushings and the valve pushrods are mushroom design special steel.

Three-Bearing Crankshaft

The crankshaft is carried on three main bearings. It has a special thrust arrangement in the form of flanges on each side of the center main bearing. The timing gears are helically cut and the timing set is made up of a crank, cam and pump shaft gear.

An ample size flywheel is bolted to a flange which is drop-forged integrally with the crankshaft. To this it is fastened by six bolts. A leather-faced cone clutch engages with the flywheel and transmits the drive to a gearset providing three speeds forward. These gears are drop-forged from nickel steel and carried on annular ball bearings. From the gearset the drive is taken to the rear axle by a shaft fitted with two universals. The torsional strain on the shaft is obviated by the use of a double tube torque arm, the front end of which is spring-mounted.

Other specifications of this car give the wheelbase as 126 in., tread, 56 in., clearance 10½ in., tires 34 by 4 and body capacity seven and three passengers. The two auxiliary seats in the tonneau of the seven-passenger car are large and are out of the way when not in use, folding back into the rear of the front seat. Full equipment is furnished with both bodies and the price is the same for each, $1,050.

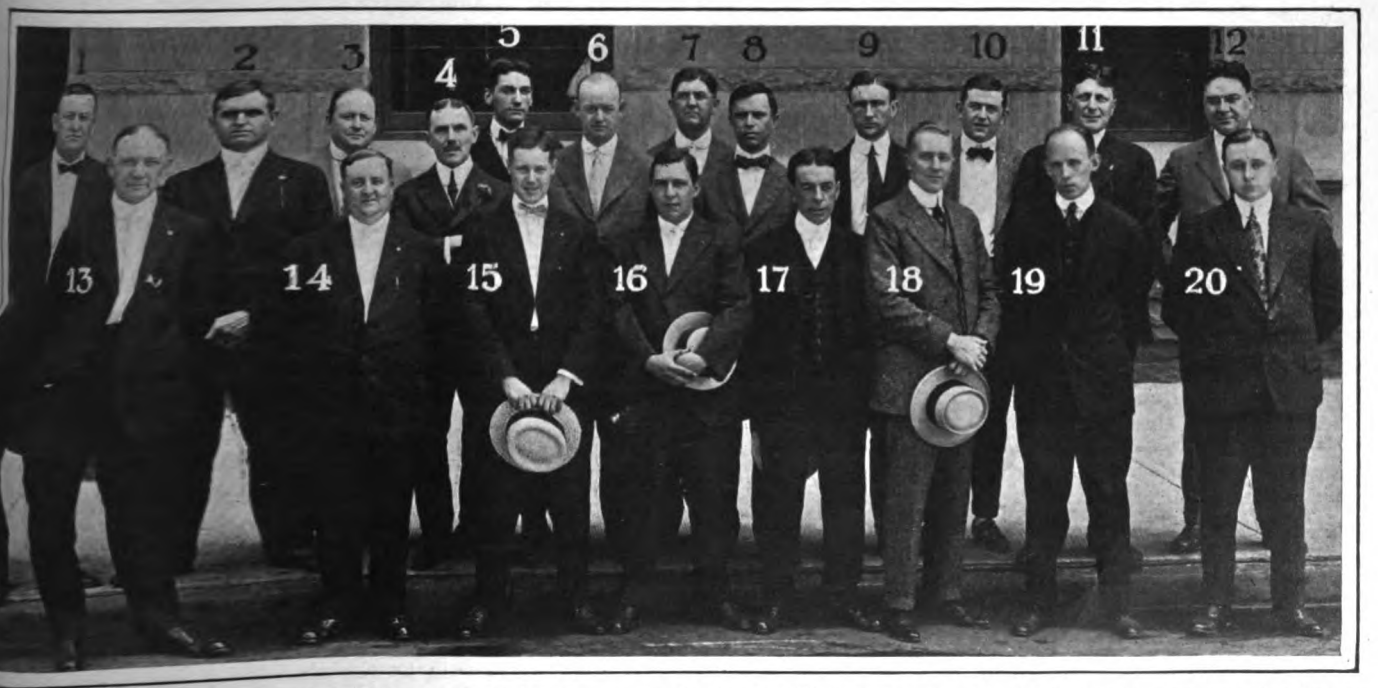
Fifth Avenue bus equipped with safety fender to guard against pedestrians walking into rear wheels

Safety Fenders for New York Buses

NEW YORK CITY, July 19—Long wooden safety fenders have been hung beneath the bodies of all the motor buses operated by the Fifth Avenue Coach Co., on Fifth Avenue, Riverside Drive and other thoroughfares of New York City. The fenders are hung on either side of the buses between the front and rear wheels and curved outward toward the rear so that the rear wheels of each vehicle are thoroughly protected. The fenders are shown in the illustration herewith.

It has been noted for some time past that the majority of accidents to pedestrians in the streets of both New York and London have been those in which the rear wheels have done the damage. It has been a peculiar fact that people wait for the front wheels of the bus to pass them and then heedlessly walk into the path of rear wheels. With the installation of the fenders it is believed that accidents of this kind will be eliminated. This will, it is hoped, eliminate a large part of the few accidents which do occur, as the statistics kept by the Fifth Avenue Coach Co. show that there is only one pedestrian injured to over 1,500,000 miles of service.

One of the interesting phases of the installation of the fenders was the shop work in connection with it. It cost the company $7.50 per fender for labor and material alone and this work was done on the company's own initiative as its safety record has not been criticised. It was desirable that the full fleet of vehicles should appear upon the streets with fenders attached on the same day. With this in view, everything was in readiness for the installation when the crews brought in their buses late Saturday night, July 17. A corps of mechanics was on hand and the fenders, fully assembled, were piled at convenient points nearby. As each vehicle rolled in, it was quickly attached by the workmen, who were equipped with jigs for drilling the frames and long before daylight the twenty-five workmen had fully equipped the 150 vehicles with fenders.



Organization convention of the Sheldon Axle & Spring Co., at the factory in Wilkes-Barre, Pa. The following were present: 1. Thomas Palmer, Gen'l Supt. Spring Mills; 2. F. L. Martin, Sales Mgr. Auto Axle Dept.; 3. H. L. Spohn, Class Journal Co., N. Y. City; 4. G. M. Wall, General Manager; 5. E. W. Acker, Detroit; 6. J. Fred Armstrong, Secretary; 7. J. A. Young, Trenton; 8. Chester A. Ide, Treasurer; 9. R. A. Schaaf, Engineering Dept.; 10. W. M. Jones, Cincinnati; 11. F. W. Kleist, Chicago; 12. David Landau, Consulting Engr. Spring Dept.; 13. O. A. Timberlake, Cincinnati; 14. E. J. Roth, Spring Dept.; 15. E. A. Shelly, Advertising Manager; 16. J. B. Kaler, Eng. Dept.; 17. A. M. Laycock, Chief Engineer Auto Axle Dept.; 18. L. E. Lyons, Detroit; 19. E. B. Flanigan, Eng. Dept.; 20. A. C. Jamison, Chicago

The Rostrum

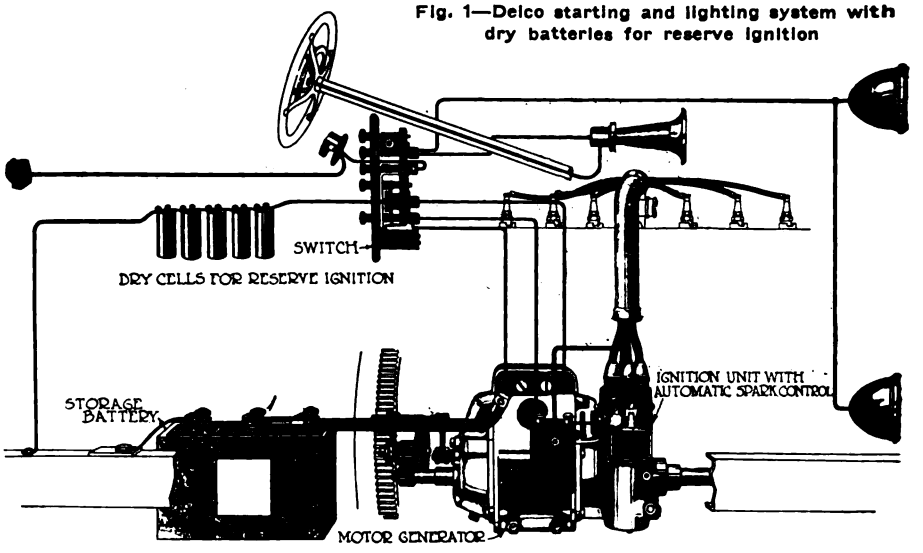


Fig. 1—Delco starting and lighting system with dry batteries for reserve ignition

Wizard D. C. Magneto Can Charge Battery

EDITOR THE AUTOMOBILE:—Several years ago the writer bought a Wizard magneto for furnishing current to run a model N Ford. I still have the magneto and have rigged it up on a 1912 Chalmers 30, and it furnishes current for a Klaxet horn. I have no way of telling the amount of current it makes, but from the way it blows the horn I thought possibly I could charge a 6-volt storage battery with it and in that way could equip my car with electric lights. This instrument was made by the Hercules Electric Co. of Indianapolis, and is their type FS-1.

As I understand it, it would require some means of controlling the output and a relay ammeter, etc. What information can you give me on this?

2—Would appreciate an estimate by you on the cost of everything necessary, exclusive of the battery and lamps.

Kings Mountain, N. C. W. S. D.

—Since the Wizard magneto is a direct current instrument, referring to type FS, it may be used for battery charging. This magneto can be used without an automatic cutout and when this is done it can be direct-connected to the motor by belting, the pulleys being so arranged that on minimum motor speed, the magneto speed will not be below 1600 r.p.m. At average motor speeds, the magneto speed should be around 2000 r.p.m. An installation of this kind will be the most simple because with it, the only switch which is required is a simple cutout placed between the magneto and the battery so that when the engine is stopped the circuit is broken and there will be no danger of the battery becoming discharged through the current flowing back through the magneto. Should this happen, it would be virtually a short circuit of the battery and would not only discharge same, but would also be likely to destroy it. When the magneto is connected to the battery in this way, direct-connected brushes or shunts should be used in the brush holders.

The Wizard magnetos are made for commercial power engines, and are designed especially for ignition with this class of work. For this reason, they require any transformation work to be done by mechanics of electrical knowledge and experience. It would therefore, be advisable in case you are not so equipped to turn the work over to an electrician.

2—The price would vary to such an amount with the manner of installation, that it would not be possible to give an estimate upon it which will be sure to be accurate.

In work of this kind it is rare that even the mechanic will fix his price in advance.

Dry Batteries Can Be Installed for Ignition

Editor THE AUTOMOBILE:—I have a D-45 1916 Buick which does not come equipped with dry batteries. Can they be installed? If so, how?

Would four batteries be sufficient for starting, in case the starting system should get out of order?

Round Lake, N. Y. W. N. G.

—Dry batteries are of practically no use on a car equipped like the Buick 1916, as the storage battery in the first place is sufficient for all requirements and in the second place, the batteries could not be substituted for the storage battery because the generator could not charge them and the chances are the generator would be damaged by working against the dry batteries. An ammeter is fitted on this car which shows immediately if the battery is not charging and gives plenty of warning should the storage battery be out of order. If you desire to fit an entirely separate dry battery ignition system working on the dual principle, it can be done by fitting the dry batteries to the car, then wiring to the distributer and coil, allowing the same high tension plug leads as are used for the present ignition system to carry the dry battery current. This would be solely an ignition system and would have nothing to do with the lighting or starting system which cannot be operated on dry batteries. As there is not sufficient energy contained in them.

Should the storage battery go wrong, which is quite unlikely, in a 1916 car for some time, you would have to start with the hand crank. In installing the dry batteries, five cells should be used, one terminal of the series connection being grounded and the other connected with the battery ignition switch. A diagram of the Delco system with dry cells for reserved ignition, is shown in Fig. 1. This is regularly placed on some cars.

Lifting Brush Protects Generator Circuit

Editor THE AUTOMOBILE:—In case it becomes necessary to take a battery off any of the starting and lighting systems of a car to be repaired, will the lifting of a brush protect the generator until the battery is put back into place?

2—Kindly explain by sketch the proper way to put new wristpins and bushings in a motor.

Pelham, N. Y. J. D.

—You do not state the make of generator to which you refer and hence it is impossible to give you other than a general answer with a few definite examples to cover the case you

mention. In general, it may be stated that the brushes of the generator should be removed if the battery is disconnected and the motor in use. Referring to the Gray & Davis system, for instance, if you were to remove the brushes a short circuit would be avoided and the possibility of burning out the dynamo would be removed.

Referring to the Delco ignition system, the lifting of one of the generator brushes will protect the generator during the operation of the car when the battery is removed. This method applies to all Delco generators prior to the 1916 production.

A constant potential system in general is not liable to injury if operated without the battery. A constant current system must be handled differently, as when operated without the battery, and no lamps lit, the generator endeavors to produce the constant current for which it is set and the only available place for this current to go is through the field circuit. The generator therefore reaches a sufficiently high voltage to send its rated current to the field circuit which is usually so high as to damage this field circuit unless individuality of design makes special provision for this and takes care that it does not occur.

On the Bijur system for example, the voltage regulated machine does not require any special attention to protect it and the lights may be operated directly from the generator if desired. On the constant current systems, however, produced by this concern, the brush must be lifted to protect the generator. On this instrument, the fields are excited from an auxiliary or regulating brush. On the Bijur Flexo generators, a fuse is provided in the field circuit which will automatically open the field circuit before damage occurs in case the gasoline engine is operated with the battery intentionally or accidentally disconnected. The most convenient way to protect the generator with this system when the battery is to be removed, is to remove the field fuse. The single unit systems do not have the field fuse and with them other means, such as lifting the auxiliary brush, should be used.

The automobile lighting generator of constant current type, with bucking series regulation, should not be run above the balance speed when disconnected from the battery. In case it is necessary to run the generator without the battery, the lamps and generator winding may be protected by removing either the positive or negative brush. This prevents the generation of a high voltage.

The Westinghouse lighting generators for automobile use using a Westinghouse automatic voltage regulator may be operated without the battery for a limited time without damage. This is possible because the voltage regulator prevents the voltage from being raised above a definite amount and protects the lamp and generator winding from being burned out.

2—Before this question could be answered properly by sketch or otherwise, it would be necessary to know the make of motor in order to determine the manner in which the piston pin is fitted. In some motors, the pin is held tightly at the upper end of the connecting-rod and oscillates in the piston bosses. In most motors, however, the wristpin is fixed in the piston bosses by means of a set screw which is passed through the boss and pin inside the piston and which must first be taken out before the wristpin can be driven out. This is a driving fit as a rule and can be hammered out by using a punch. The bushing for the wristpin generally fits in the upper end of the connecting-rod and is simply a bearing bushing which is installed in a manner depending upon the exact construction of the rod.

Tire Gages Proved to Be Inaccurate

Editor THE AUTOMOBILE:—A word of warning concerning the accuracy of tire gages might not be out of place.

Yesterday, while inflating with the free air supplied by that courteous gentleman, the garageman, three other drivers stopped and the subject of gages came up. Four gages were produced from as many pockets and all of different make. When tried on the same tire they were found to vary 15 lb. in their reading.

What of others in other pockets and their effect on tires? I submit the case to you.

Lansing, Mich. M. BECK.

—There is no question but that tire gages ought to be reasonably accurate and a variation of 15 lb. at an 80-lb. inflation is certainly more than reasonable. The question seems to be one which merits the attention of the gage manufacturer and also of the motoring public, who should insist on a comparison with a known accurate gage at the time of purchase. Naturally a dealer does not wish to sell inaccurate gages and if the customer so desires, he will be glad to compare the gage with one of known accuracy and if it is not within close limits, he should return same to the manufacturer. Gages should not vary to this extent ordinarily, because the concerns making them as a rule exercise quite rigid inspection methods to guard against this inaccuracy.

Transforming Phaeton to Fast Roadster

Editor THE AUTOMOBILE:—We have a 1913 Cadillac, phaeton body which we want to convert into a fast roadster. Can you give me any information regarding how we can fix up the engine? Also any other advice which you may have will be appreciated.

York, Pa. T. S. P.

—Generally, in arranging a motor for higher speeds, but two operations are performed by the ordinary motorist. One is to advance the magneto timing so that ignition is far enough advanced for the highest speed, and the other is to adjust the carbureter for high speeds. Sometimes the added expense of another camshaft is gone to, but not very often, as this entails the laying out of cams adapted to racing and the manufacture of an individual camshaft and the grinding of individual cams, which requires considerable money.

Another step which is often taken in adapting a motor to racing is to grind out the valve passage to allow for larger valves. On most motors this cannot be done and on the Cadillac the amount of metal which can be taken off at the valve seat would not justify the expense of the larger valve. If you will fit tight piston rings, advance the timing as far as you can carry it without having the motor knock and then adjust the carbureter so that a good powerful mixture is given at high speeds, you will probably have as good results as you desire. With the lighter roadster body, you would probably be able to stand a higher gearing than you have at present. As the country is hilly around York, however, it would be best not to go too far in this respect to get good performance. The same thing must be remembered in advancing the spark, in order that you will have good running when the engine is laboring in hill climbing.

Two Plugs Fire at Same Time

Editor THE AUTOMOBILE:—Having occasion a short time since to replace the crank, also the camshaft gear in a model B DeTamble D. opposed motor, after setting cams and magneto to fire at compression, was unable to get an explosion in the motor. The compression seemed good; also have new batteries. The plugs fired simultaneously. This car carries a Kurtz low tension magneto.

Three garagemen examined this and some said that it should not fire both plugs at once and others said it made no material difference. Can you say whether any cars fire two plugs in different cylinders at the same time?

3—I had an argument some time ago regarding the rota-

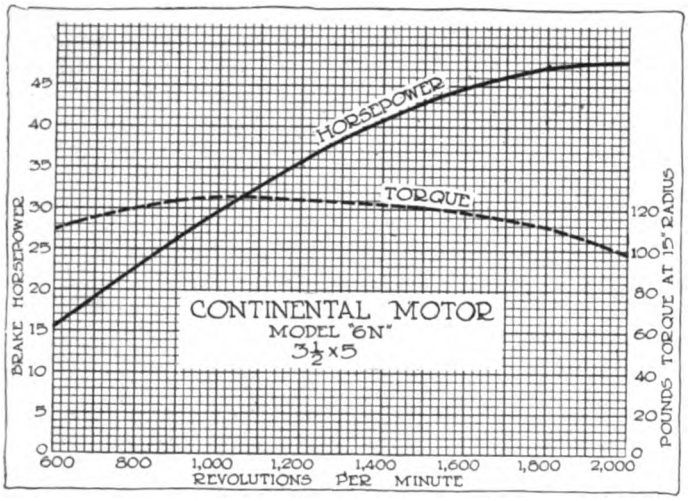


Fig. 2—Horsepower curve of 3½ by 5, six-cylinder Continental

tive speed of a camshaft. Can you mention a four-cycle motor wherein the rotative speed of the camshaft is different than at half of the crankshaft speed? The party claimed that it was different in different motors.

Hopkinton, Iowa. D. S.

—It is quite common practice with opposed motors for the magneto or ignition apparatus to be so arranged that a spark occurs in both cylinders at each revolution. This makes no difference as one cylinder will be on the exhaust stroke, with the other at compression. The reason you could not get an explosion was due to some other cause than that of ignition as long as you secured a good spark in each cylinder.

2—We have no record of any automobile employing a four-cycle motor in which the rotative speed of the camshaft is different than half crankshaft speed. Since the separate functions of a four-cycle motor occur at the same point during each alternate stroke. There are special design four-cycle motors with eccentric shafts geared one-to-one. Such a motor is described in this issue on pages 162 and 163.

Many Causes for Missing Motor

Editor THE AUTOMOBILE:—Would like an opinion on my motor trouble. My 1914 four-cylinder Studebaker misses when idling and when driving on high in different cylinders at less than 12 m.p.h. causing a very bad jerky motion apparently in the rear universal. Have had the valves ground recently and there is fairly even compression. The ignition seems to be all right and no change in the carbureter, which is a Schebler, seems to help it. There are apparently no air leaks and the car operates well when the motor has to pull; that is, when on a slight grade or on heavy roads.

Victor, N. Y. E. T. S.

—The motor missing may be due to loose connections in ignition wiring; broken conductors; breaker points burned out, dirty or improperly adjusted; valves not seating properly; dirt or water in gasoline; spark plug points improperly adjusted or not set deeply enough in the valve caps; weak battery; valve spring weak or broken; mixture too rich, or too lean; particles of carbon under the valves; defective spark plugs due to cracked porcelains or other causes; air leaks around the intake manifold, valve stem guides, valve caps, spark plugs or petcocks; valve lift improperly adjusted and many other minor causes. A good order of procedure would be to take the simplest points of the above list and go through those checking them off and then go into the more complicated causes.

The distributer contact should be carefully examined to see that good contact is being made and especially that all the contacts are clean. In case the valves are not seating properly, and the valves have been reground lately, examine the valve seat in the cylinder to see if it has become deeply pitted. It is sometimes necessary to take a light cut off the valve seat in the cylinder before proper seating can be secured.

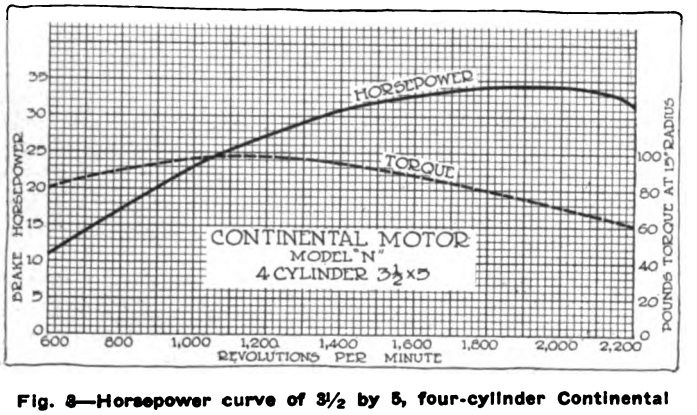


Fig. 3—Horsepower curve of 3½ by 5, four-cylinder Continental

Horsepower Curves of 3 1-2 by 5-Inch Motors

Editor THE AUTOMOBILE:—Have you a power curve of a typical 3½ by 5-in. motor such as in use in the representative makes of automobiles? What horsepower do these motors deliver at a speed of about 800 r.p.m.? I am figuring upon building a small gasoline tractor and any information you can give me about this size motor will be appreciated.

Mentone, Cal. J. L.

—Horsepower curve of typical 3½ by 5-in. motors such as are used in representative cars are shown in the accompanying illustrations. From these curves the horsepower and torque of this size motor at different revolutions per minute can be determined and as these curves give about as good an idea of the characteristics of this size motor as anything can do, further comment is unnecessary.

Connecting-Rod Bearing Probably Loose

Editor THE AUTOMOBILE:—I have a 1915 small Winton six and it developed a knock in the engine after running about 300 miles. This knock takes place when the car is running slowly on direct, or when the throttle is being opened and the car picking up. It seems to come about every two revolutions of the crankshaft. At the Winton shop they tell me that it is probably a side play of the connecting-rod between the piston bosses. I do not think that this looks probable as a connecting-rod with side play would also have side play on the crankshaft. They advised me to run the car a little and see if the knock did not disappear. I have run it 1000 miles and it is naturally still there. Can you give me any information on this?

Hopkinton, Mass. F. A. R.

—From the information you give the motor is evidently suffering from a connecting-rod knock. It is impossible to state whether the knock is due to side play or bearing looseness. Another possibility is that the motor has a piston slap which occurs at every explosion stroke. It sometimes happens that practically all the bearing of a piston is taken upon one ring. The result is that the piston oscillates about this ring which gives rise to a slap audible every two revolutions. Since you have had the car such a short time, you no doubt can make arrangements with the Boston branch of the Winton company to have this repaired.

Bad Oiling System Cause of Smoke

Editor THE AUTOMOBILE:—The other day when you found yourself in a dark blue fog of oil smoke, choking your breath and smarting your eyes, did you cuss motor cars in general? Well, you shouldn't. They do not all smoke—there is no real reason for any of them to be even in the slightest degree

objectionable on this score. You see many cars which are perfectly free from smoke from the exhaust. This *should* be the condition with all of them.

In some instances, it is true that the car user is responsible because he either carelessly or deliberately allows his motor to be over-supplied with oil. In the majority of cars which are smokers, however, the fault lies with the manufacturer. He has neglected to incorporate in his motor a competent oiling system.

The fact that many cars, or many different makes of cars do not look like soft coal burners turned loose on the street is ample and sufficient evidence that cars can be satisfactorily operated without the plume of odoriferous oily smoke.

The car user is as vitally interested in not smoking as his neighbors can be. The smoke offends them and destroys their peace of mind, but it costs the car owner dollars of his hard earned cash. For excessive smoking from a motor exhaust indicates the use of an excess of lubricating oil. The use of too much oil is not merely unnecessary, but positively vicious. It induces undue carbonization of valves, spark plugs and cylinder walls.

Carbon on valves means that they cannot properly do their work, and you have a motor of the hit and miss variety. Carbon on spark plugs means that they will ultimately short so cannot fire properly and must be removed and cleaned, which work, mark you, cures the trouble only temporarily.

A coating of carbon deposited upon the walls of that part of the cylinder used as a combustion chamber means a gradual increase of compression until finally your motor knocks easily when called upon to do a bit of real work. Such knocking is not pleasant or enjoyable, and if allowed to persist, causes undue bearing wear; such a condition means trouble of that variety which soon gets you into the mood where you feel like consigning your car and all that concerns it to that place where woolen underwear is not regarded as an absolute necessity.

Public demand has put the carbureter where it spends its time vaporizing gasoline, and does not try to set itself up as a perfume factory. Why not insist just as strongly that we get rid of that blue, greasy, foggy cloud of smoke from excess lubricating oil? It's easily done.

Detroit, Mich. W. A. BRUSH.

Formula for Calculating Piston Displacement

Editor THE AUTOMOBILE:—How do you calculate the displacement of a four-cylinder engine, a six-cylinder and an eight-cylinder engine in cubic inches? What I want to know is this: What is the displacement of an engine with four cylinders and a bore of 4.5-in. by 6.5-in. stroke? The formula I used was the following:

$\pi R^2 H$. $\pi = 3.1416$

$R^2 = R^2$ or radius squared

$H =$ Stroke of cylinder or 6.5 in.

The above formula is for one cylinder and for a four-cylinder engine would be four times the result of the above formula. The following is the result I obtained:

$\pi R^2 H$. $\pi = 3.1416$ $R^2 =$ Radius squared

$H =$ Stroke

4.5-in. bore by 6.5-in. stroke.

$R = \frac{1}{2}$ of 4.5-in. $= 2.25$ in., 2.25-in. squared $= 5.0625$ in.

5.0625 by $3.1416 = 16.00435 = \pi R^2$

16.00435 by stroke, or $6.5 = 104.028275 =$ Displacement of 1 cylinder; hence, for 4 cylinders $= 4$ by 104.02625, or 416.1131 cu. in.

I feel confident that the above formula is not correct and would thank you to put me right on this.

Detroit, Mich. E. M. DEW.

—Your method is absolutely correct but you have not carried out the work correctly. The fault is in the multiplication of 5.0625 by 3.1416. You have obtained as a result 16.00435 whereas, this should be 15.90435. Carrying the work to a conclusion will give you piston displacement of 413.5 which is correct for this size motor.

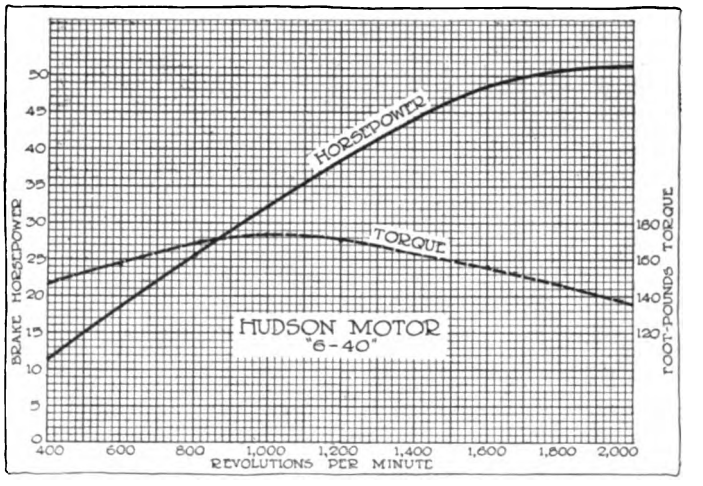


Fig. 4—Horsepower curve of 3½ by 5 Hudson six motor

Dimensions of Blitzen Benz and Jay Eye See

Editor THE AUTOMOBILE:—What is the size of the bore and stroke of the two racing cars, Blitzen Benz and Jay Eye See?

2—What compression have they?

3—What is the comparison of gears?

4—What are the sizes of the front and rear axles?

5—What is the horsepower?

St. Louis, Mo. R. L. H.

—The bore of the Blitzen Benz is 7.2835 and the stroke 7.8741 in. The Jay Eye See has a bore of 9.75 and a stroke of 8.625 in.

2—We have no records of any compression measurements on either of these two motors.

3—The gear ratios are changed frequently to meet track conditions.

4—The meaning of this question is not exactly clear as you do not state to which axle dimensions you refer. Since THE AUTOMOBILE has no detailed drawings of these parts at its disposal, a full set of dimensions cannot be furnished. The horsepowers of the two cars according to the S. A. E. rating would be 85 for the Blitzen Benz and 152 for the Jay Eye See.

Sign Your Inquiries

THE AUTOMOBILE *is in receipt of a number of inquiries signed by initials, the words Subscribers, Reader, Interested, etc. Since these letters give no clue to the sender they cannot be published in the Rostrum Columns. If you desire to use a nom-de-plume it is only necessary to add it to the signature, but the signature is necessary as an evidence of good faith.—Editor.*

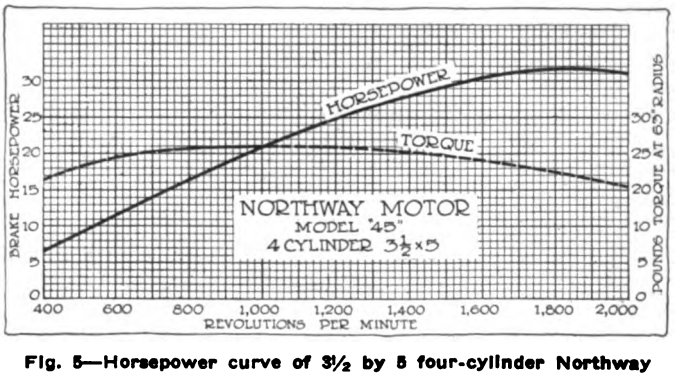
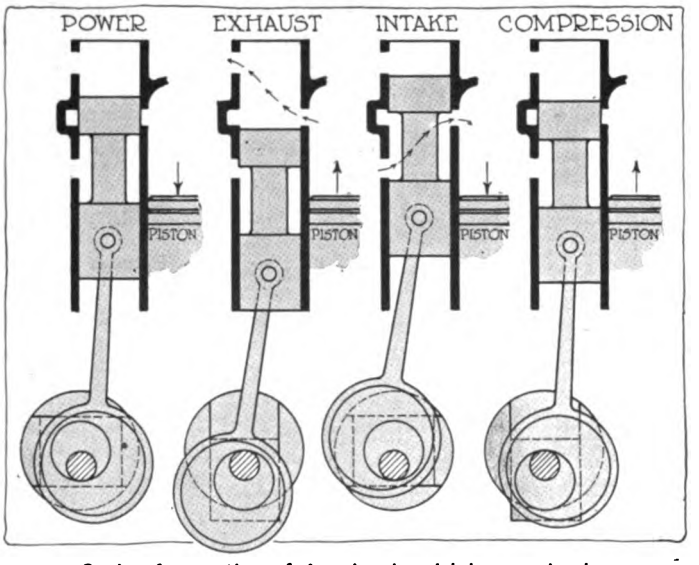


Fig. 5—Horsepower curve of 3½ by 5 four-cylinder Northway

Appel Is Novel Valve-Driving Mechanism

A Positive and Silent System for Piston or Poppet Types



Cycle of operation of Appel valve-driving mechanism

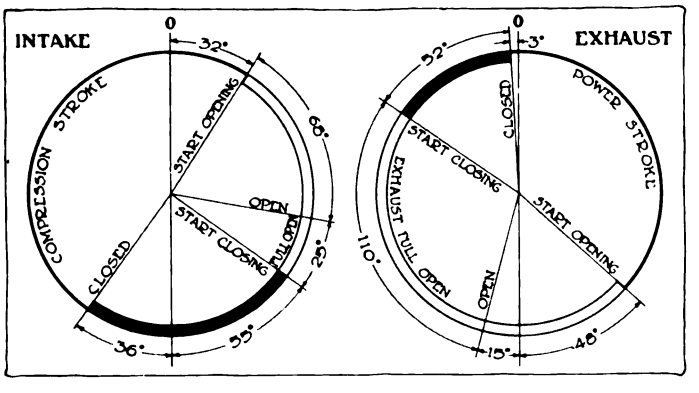


Diagram of Appel valve gear on intake and exhaust strokes

A VALVE-DRIVING mechanism for piston or poppet valves which is designed to be at the same time positive and silent, has been brought out by Daniel Appel, Cleveland, Ohio. This article is not being manufactured at the present time but has been brought out and is described as a novel development in valve gears.

The valve gear is so designed that it will operate a piston valve from a valve shaft which is driven at crankshaft speed by a set of one-to-one gears. On this shaft which is mounted as a countershaft on the model engine shown in the accompanying illustration, are arranged the operating eccentrics, one eccentric for each cylinder of the engine. The eccentrics are in pairs and are spaced at 180 deg., and between each pair of eccentrics and surrounding the valve shafts is a cylindrical rotary member which is arranged eccentrically with respect to the valve shaft and has a central sleeve-like portion journaled in a suitable bearing and provided at its ends with disk-like projections. The outer faces of these projections are provided with central transverse slots at right angles to each other and have parallel sides forming slideways for the slide blocks of the operating eccentric.

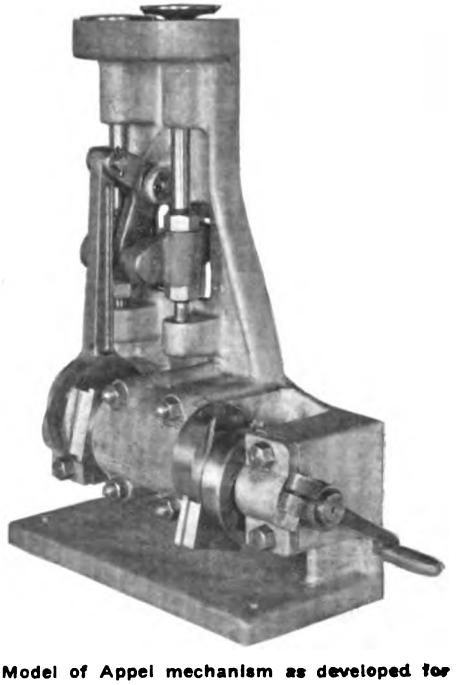
These slide blocks which form a part of the valve operating eccentric are bored to receive, with a running fit, the driving eccentrics of the valve shafts. Each block carries a valve operating eccentric which engages an eccentric strap and a transmitting rod, which operates the valve. This is shown in the constructional section view.

Rotary and Horizontal Movements

The drive is such that each of the slide blocks is given two movements, a rotary movement and a horizontal movement. Two cycles of reciprocating movement, and one cycle of rotary movement are completed during one complete cycle of engine operation. The resultant of the two movements, the rotary and reciprocating, is imparted to the valve operating eccentric, the center of which during one complete cycle of engine operation describes a closed approximately elliptical figure, having a re-entrant horizontal inward loop at one side about midway between the upper and lower ends of the figure. The center of the valve-operating eccentric while sweeping through the path of movement, has a velocity which varies from a high maximum to a low minimum. Assuming that the valve is in its lowest position with the center of the eccentric at the lower end of the figure or path of movement, and that the piston is at or near the middle of the exhaust stroke, the center of the transmitting eccentric is now at its maximum distance from the axis of the valve shaft and traveling upward along one side of the elliptical path of movement. This travel has the effect of giving the piston valve a very rapid stroke upward to its full open position so as to close the exhaust port and open the intake port. The intake port is full open when the valve reaches its uppermost position.

During the later part of the suction, and the early part of the compression stroke, the valve is given a quick but diminishing half-stroke downward, closing the inlet port, but at or near the end of the suction stroke, and during the major part of the compression stroke, the movement along the figure of travel is very slow, little movement being given to the valve.

When the center of the transmitting eccentric is near the end of the loop, firing takes place, and during the major part of the working stroke, the center of the eccentric is passing along the upper side of the loop, imparting practically no movement to the valve. During the latter part of the working stroke, and early part of the exhaust stroke, the valve is again given a quick and accelerating half-stroke downward to its lower position, again opening



Model of Appel mechanism as developed for poppet type motors

the exhaust port for gas passage.

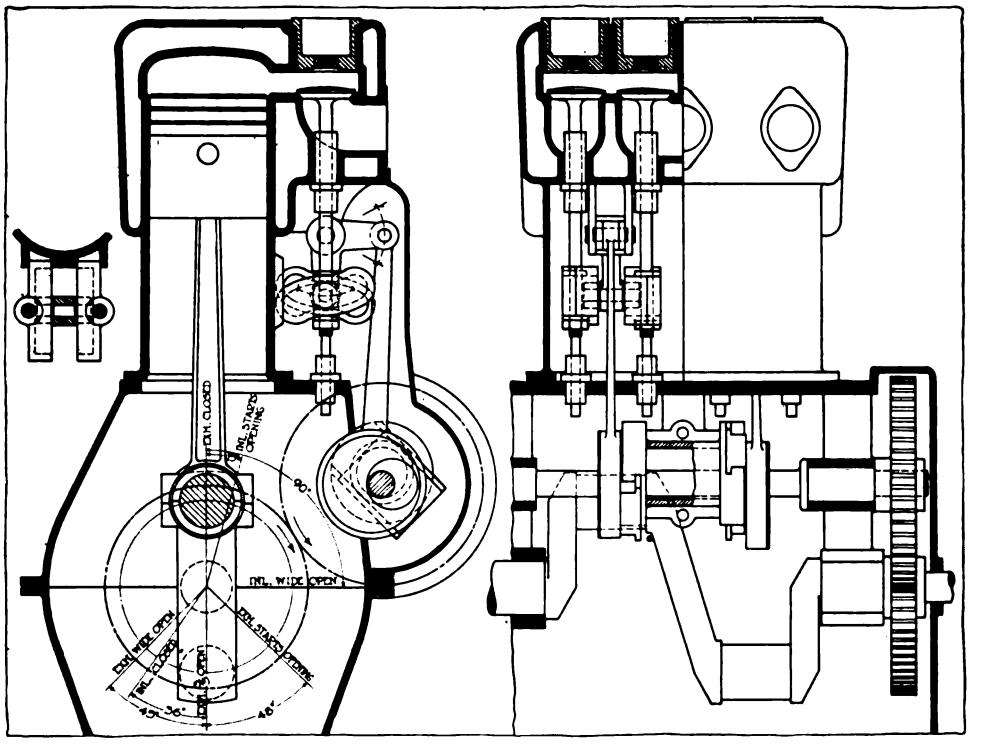
It will be seen that the movements thus given to the valve are such as are required to cause the poppet valve to function in the desired manner, for the inlet and exhaust ports are opened and closed at the proper time and the valve is held almost stationary in the mid-position with both ports closed during the major portion of both the compression and working strokes.

Both Movements

The two valve eccentrics used in this gear have both the movements which have been described. The exhaust valve passes through its 90 deg. before the intake and in a four-cylinder motor the other two cylinders, an opposite valve gear is provided for proper timing.

For Poppets

While this mechanism is intended primarily for piston or any other type of non-seating valves, it may also be used to operate poppet valves if connected with a device which will divide the valve gear movement so that the upward motion above the loop of the elliptical diagram will operate the intake valve and the downward motion below the loop the exhaust valve. The loop movement itself takes care of the active period of compression and expansion. Such a poppet-valve operating device is shown in the accompanying illustration. The movement of the poppet valve will be readily understood from the accompanying illustrations, the motion imparted to the bell-crank being identical with the valve motion above described.



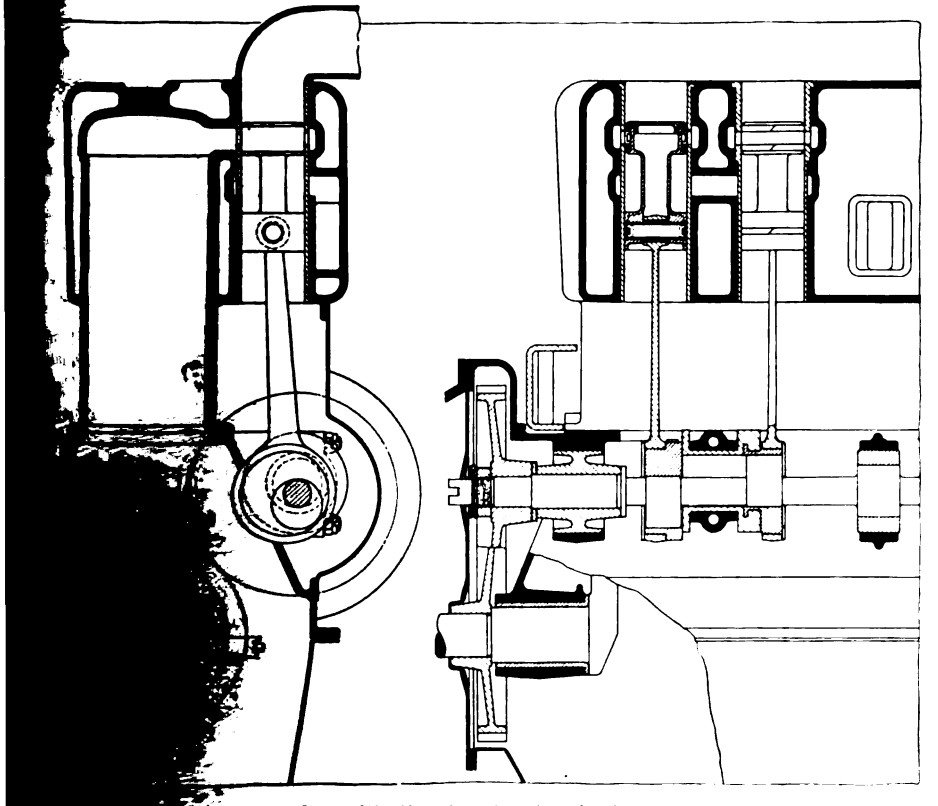
End and side sections of Appel valve-actuating mechanism with timing on a poppet-valve motor

The elliptical figure which is described by the valve linkage in its movement is shown in the sectional view of the poppet construction. The re-entrant loop will also be noted in this same figure. The functioning of the valve is so arranged that the quick opening and closing is secured without the noise which occurs from hammering of a follower on a flat-sided cam.

As will be noted in driving a piston valve the action is direct, the eccentric rod being pivoted directly to the piston valve and transmitting the motion imparted by the eccentric and slide-blocks without any intermediate linkage. For this reason, the full advantage of the motion would be gained in a piston or sleeve valve, although the action is not at all undesirable for poppet valve motors due to the possibility of securing quick opening and closing.

One of the advantages claimed for this type of drive is that at no part of the cycle is there any impact between different members of the operating mechanism, all contacts being of a sliding nature and hence without shock. No sacrifices in timing need therefore be made considering the intervals between the time that the valves start to open and are fully opened. Referring to the diagram given on the opposite page it will be noted that the intake starts opening at 32 deg. and is fully opened at 100, the travel being through 68 deg. while opening. The valve remains full open during a period of 25 deg.

With the exhaust the opening period is 63 deg. and the valve remains fully open during 110 deg. and closing during 52 deg. This timing can of course be varied.

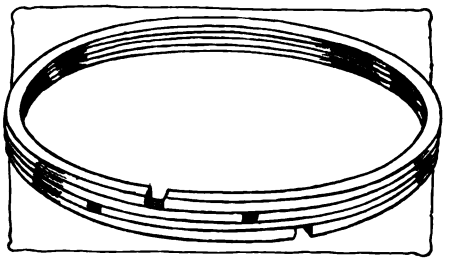


motor with the Appel valve-driving mechanism. Note timing

ACCESSORIES

Perfection Piston Rings

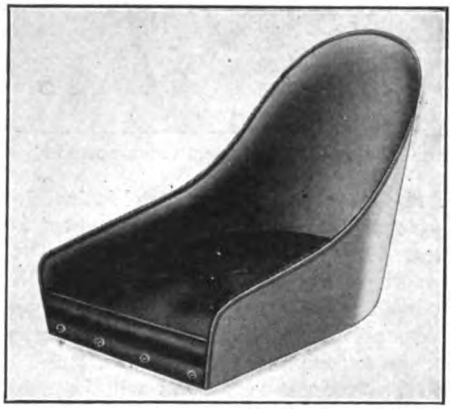
PERFECTION is the title of a piston ring of the multi-part, anti-leak variety. It is in the form of four small rings fitting into a single groove, the rings being made of special soft steel, heat treated, so that they soon lap themselves into the cylinder, and because of the softness of the metal, as compared with the cylinder walls, there is said to be no possibility of scoring the latter. This type of piston equipment is claimed to prevent leakage of mixture and oil past the piston. An additional advantage is that in installing the ring it is not necessary to spring it over the piston head. The separate rings are made in sections less than ⅛ in. wide and afford sufficient space to retain oil between the sections and also between the unit ring and the groove.—Automobile Construction & Engineering Co., Philadelphia, Pa.



Perfection piston ring which is made as four small rings fitting into a single groove, these rings being made of special soft steel so that they cannot score the cylinder walls

Belfast Racing Seats

To meet the demand for racing type seats which can be installed on any body by simply fastening them to the body frame with wood screws, the Belfast seats have been produced. The back is of 22-gage metal, well ironed to the wood-framed bottom and upholstery is in red or black imitation leather, well padded. The bottom cushion is removable and the back of the seats is painted battleship gray. The seats sell for $8 each or $15 per pair.—Belfast Mfg. Co., Station K, Cincinnati, Ohio.



One of the Belfast racing seats designed for cars remodeled into raceabout or speedster types. They are light but strong in construction and the cushion is removable

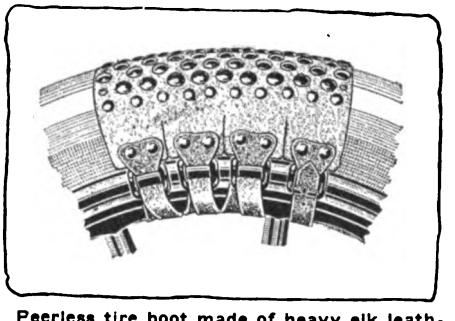
Schrader's Valve Box

As an improvement in the packing of its valve insides, the Schrader organization has brought out a small tin box large enough to carry five insides. This container is damp proof and dust proof, and is grooved so that each inside is kept separate from the rest, insuring their reaching the consumer in perfect condition. The box will appeal especially to dealers who have had to handle the valve insides in bulk up to this time. The box sells for 20 cents.—A. Schrader's Son, New York City.

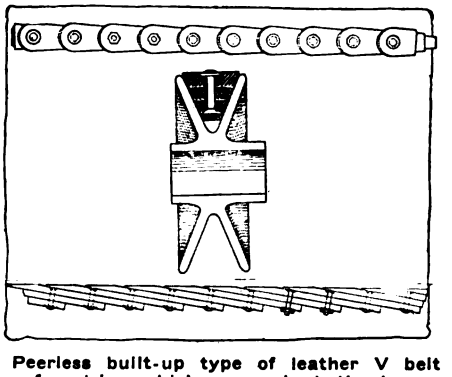
Peerless V-Belts and Boots

A strong and flexible V-belt for fan service, which hugs the pulley well. Both chrome and oak-tanned leathers are used. Prices, chrome, ½-in., 60 cents per foot; ⅝, 66 cents; ¾, 72 cents. Oak, 42, 48 and 54 cents per foot.

Elk leather is being used on a number of the Peerless products, one of the products being a heavy boot, fitted with straps so that it can be attached to any tire. The leather is tanned in such a way as to make it non-stretching and waterproof, the maker states; and the tread is reinforced with a studding of flat-headed rivets that will stand about 1000 miles service. The attaching straps are of 1-in. width, of heavy stock. A lighter strap boot is also made, as well as light and heavy boots of the hook type. Price, 3-in., $1.95; 3½-in., $2.25; 4-in., $2.50; 4½-in., $2.75; 5-in., $3.—Leather Products Co., Denver, Col.



Peerless tire boot made of heavy elk leather and studded with steel to endure 1,000 miles of service. The attaching straps are 1 in wide and of heavy stock



Peerless built-up type of leather V belt for fan drive which comes in both chrome and oak-tanned stock. It hugs the pulley

Bumper and Fender

A combination bumper and fender is shown in this sketch, the idea being that the usual position will be horizontal, but that the driver has a hand control that allows the device to drop should an accident threaten. Since the bumper fits on the spring bolts it is easy to attach, and no holes have to be drilled. It can be adjusted to suit any sort of car, though special patterns are made for Fords and trucks. Three classes of finish are made, all black, part nickel and all nickel, the prices being $22.50, $25 and $27.50, respectively.—Auto Safety Fender Co., Pittsburgh, Pa.

Raffia Tonneau Mat

A green tonneau mat of raffia grass which is very soft but tough and which is claimed to be more durable than other varieties of tonneau floor coverings has been put on the market recently. It is made in all sizes and for all makes of car, the price varying from $5 to $7, according to the size.—Pastre's Auto Garage, Brooklyn, N. Y.

Orolo Carbon Remover

A new carbon remover and engine cleaner is called Orolo. This is a liquid, which, when heated is said to be immediately converted into gases which completely destroy the asphaltum contained in carbon, leaving only a black powder or soot which is blown from the exhaust when the motor is started. It contains no acid, is not injurious to human flesh and cannot possibly injure metal of any kind. This is demonstrated by the fact that it is put up in thin, sheet-iron tinned cans. The use of Orolo every 30 days or 6 weeks will keep a motor free from carbon and add at least 300 per cent to the life and efficiency of the motor, it is claimed. It sells for $2.50 a can.—Orolo Mfg. Co., Louisville, Ky.

Frey Shield and Goggles

Rain or snow on a windshield prevent the driver from getting a clear vision of the road ahead and render driving dangerous. With this in mind the Frey organization is marketing a shield designed to prevent this difficulty, a visor-like device made of pyralin, a transparent ma-

terial like celluloid, being attached to the windshield by five vacuum cups, which the makers guarantee to hold so firmly that the shield cannot blow off. The shield keeps the rain off the glass, a rubber sealing strip fitting tightly against the glass so that there is no crack where it can leak through. When not in use the shield can be rolled up and stowed away. It sells for $1.50.

A line of two-color goggles is also put out by the Frey concern under the name of Dimmer goggles. These are also made of pyralin which is unlike celluloid in that it is not easily affected by heat and does not give off a disagreeable odor in an excessively warm atmosphere. The goggles are divided, as illustrated, the lower part being of an amber shade while the upper is green or orange. By raising or lowering the head the line of vision may be made to pass through either the upper or the lower portion of the lens. Different color combinations are offered. The goggles are listed at 75 cents.

Another Frey accessory is a paste varnish called Protexacar which is claimed to effectually protect the finish of a car from the deleterious action of water, heat and dirt. When the paste is applied to the surface of the body and chassis it is said to form a hard coating impervious to the elements. It is necessary to renew the coating only once every five or six weeks, as washing of the car does not affect it. Protexacar is applied with a soft cloth and is said to dry instantly. It is put up in ½-lb. cans which are sold for $1 each.—Frey Mfg. Co., Chicago, Ill.

Stull Ford Starter

This starter for Ford cars adds but 18 lb. to the weight of the machine, can be installed without machine work or drilling and does not appreciably interfere with the accessibility of the side of the motor on which it is placed.

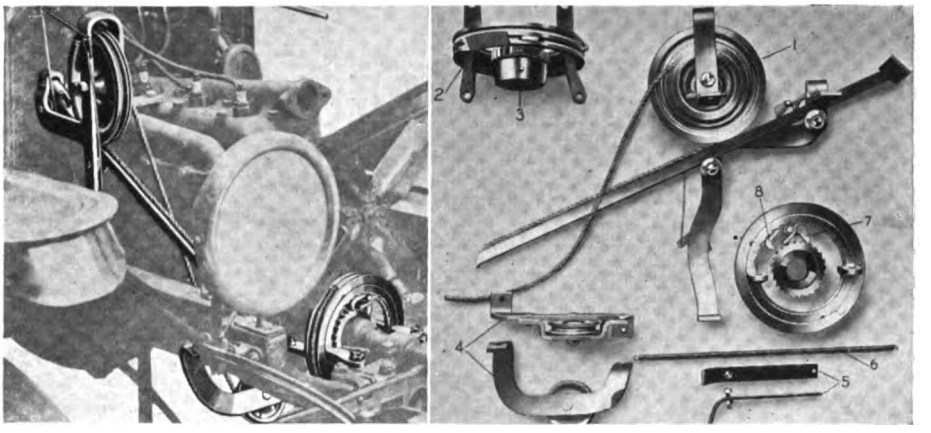
The starter consists of a pedal, projecting through the lower part of the dash just to the right of the coil box, on the end of a plunger rod; a pulley operated by a steel cable attached to the plunger; a smaller pulley integral with the first and carrying a second steel cable which extends over a guide pulley to the front of the motor; and a ratchet mechanism on the crankshaft which imparts motion when the pedal is pushed and which automatically disconnects in case of a backfire.

Referring to the illustration, it will be noted that the plunger rod has attached to its lower end one end of the steel cable that runs over the large pulley 1; the other end is fast to the pulley. The rod is guided by steel rolls running on studs on the bracket. One end of the second steel cable is attached to the smaller of the two integral pulleys, the purpose being to increase the leverage or, in other words, to lower the gear. The other end of this cable is fast to the crankshaft pulley 2. The pulley 4, bracketed at the front of the frame, serves to give the cable a right-angled change of direction. The crankshaft pulley has attached to it a long coiled spring 6, the other end of which is attached to the car frame. This brings the moving parts back to first position, ready for a starting stroke, when the pedal is released.

The final pulley is really a steel ring running on sixty-eight steel balls on a stationary ring which is held against rotation by arms bolted to the crankcase bolts. Attached to the crankshaft and carrying with it a special fan-belt pulley 3, which is part of the outfit, is a ratchet wheel driven by the main pawl 7, on the outer pulley ring. The stationary ring carries the backfiring pawl 8, which automatically releases if the motor kicks back.

As the tendency of the spring is to push the whole system, including the pedal, into starting position, the pedal is held down normally by a little latch projecting through it. Placing the foot on the pedal automatically releases the catch and permits the pedal to rise. A downward push carries two pistons over compression. When the motor is warm this is sufficient, as a rule, to start; but when cold, priming is required for a quick start. The starter is equipped with its own connection for priming the motor from the dash, replacing the original front primer.

The maker states that any first-class mechanic can install the starter in two or three hours. The cowl-dash Fords can be equipped, as well as the straight dash models. Full instructions and blueprint are furnished with each outfit, the whole being packed in a wood box. The price is $15.—Stull Starter Co., Sunbury, Pa. Nelson T. Gutelius, New York City, distributor to the trade.



Left—Stull mechanical starter for Ford cars, illustrating the method of mounting the starter on a Ford motor. Right—Parts of the device, showing simplicity of construction. The system is said to add but 18 lb. to the weight of the car and to be installed without interfering with the accessibility of the motor to any appreciable extent. The starter is actuated by a pedal which connects through steel cables to a ratchet mechanism at the front

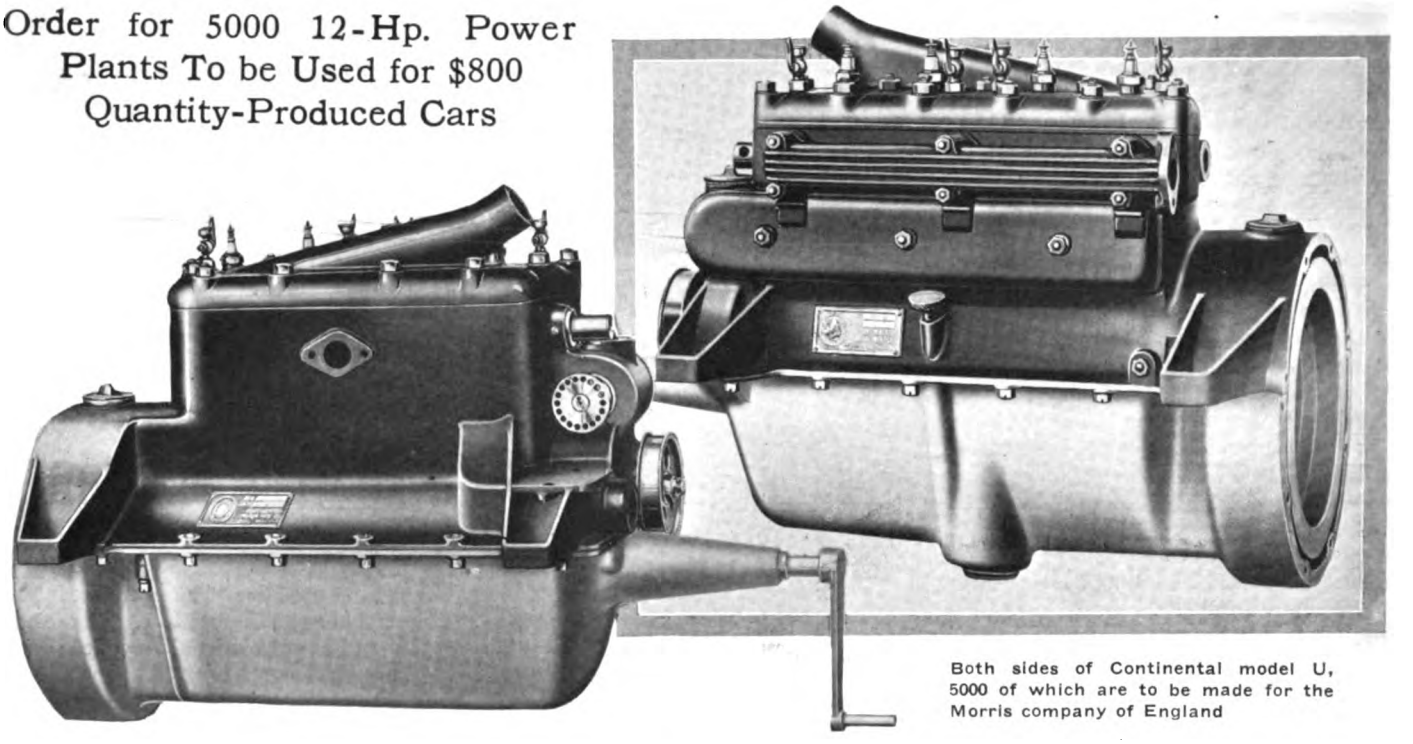
Two views of the new Dimmer goggles made by the Frey Mfg. Co. Upper part is green or orange, while lower is amber

Frey U-Can-C rain shield as it appears mounted on the glass windshield

How the U-Can-C shield keeps the space in front of the driver clear

Continental Motor for British Car

Order for 5000 12-Hp. Power Plants To be Used for $800 Quantity-Produced Cars



Both sides of Continental model U, 5000 of which are to be made for the Morris company of England

DETROIT, MICH., July 20.—What probably marks the entrance of a car manufactured on the American assembly scheme into the English field, is brought out by the announcement of the Continental Motors Mfg. Co., which is to produce a light weight high-speed type of motor of small piston displacement in quantities for the Morris Motor Car Co., Oxford, England. This motor has been primarily designed to meet the European demand for minimum horsepower compensated for by high motor speeds, but may also be found suitable for use by American automobile manufacturers.

The motor is a four-cylinder L-head cast in a block with the cylinders and top half of the crankcase cast integrally. The cylinder head is detachable, permitting access to the valves, pistons and combustion chambers, and the lower structure of the motor is accessible by dropping the bottom half of the crankcase. Four supporting arms are cast upon the crankcase and the rear end is so arranged that a unit power plant could be accommodated, the size of the plant being such as to accommodate several of the standard gearset and clutch units. The bore and stroke are 70 by 102 millimeters or 2¾ by 4 in. This gives a piston displacement of 95 cu. in. and an S. A. E. rating of 12.08 hp. It is stated that the actual brake horsepower developed at 2000 r.p.m. is 18.

Three-Bearing Shafts

Both the crank and camshafts are supported on three bearings, the crankshaft being 1½ in. in diameter. The steels used in these parts is of special composition drop-forged and heat-treated, giving a tensile strength of 90,000 lb. per square inch. Lubrication is by force feed and splash and cooling by thermo-syphon. The carbureter is the side-outlet design bolting directly to a flange on the cylinder casting with the intake passage entirely within the cylinder blocks. The fan is four-bladed and is of steel, being driven from its pulley on the front end of the camshaft. The weight of the motor assembly, exclusive of accessories, is said to be approximately 270 lb.

According to the present understanding, the Morris Motor Car Co. has contracted for 5000 of these motors which will be known as model U. These cars which are to be made during the coming season will be the first assembled British automobile to be produced in any quantity. The car is to be rated at 12 hp. and will sell for about $800 on the other side, although it is stated that a car of similar type could probably be produced and sold in this country for considerably less.

Meeting Arctic Conditions—Buick on Runners

The big sporting event of the year in Nome, Alaska, is the annual sweepstakes race between teams of malamutes and Siberian wolves. The accompanying illustration shows how Jack McQuire took in the finish and the start of the race at Nome, having converted a four-cylinder Buick in that far northern gold camp into an automobile sled, which enabled him to keep up with the contestants throughout the race

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, July 22, 1915 No. 4

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
T. B. Van Alstyne, Advertising Manager
231-241 West 39th Street, New York City

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SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Small Fours Returning

THAT fresh attention is about to be given to the fairly small four-cylinder motor is now certain, and there is little doubt but that we shall see shortly, not one but several, small fours emerging from factories where nothing but the very highest class of work is done. They will be made for quality just as carefully as the largest six or twelve and their price will not be very low, in fact, the cars will be built first and the price made to suit rather than the other way about.

Also it seems more than probable that at least one of the big producers of medium-priced cars will introduce a high-speed four of good quality at about the price now demanded for the average light six, between $1,000 and $1,250.

In making this type of car whether the price is $1,000 or $3,000 light weight will be the greatest consideration and the seating capacity will certainly not exceed five passengers. It is hinted that one car may even be produced at a quite high price with four passengers as the maximum load.

This, of course, is in accord with European practice, since the light, high-speed, four-cylinder motor is only really satisfactory for a reasonable load. With such a load, however, it makes the cheapest possible car to run, for, gasoline and oil efficiencies are very high and tire life in proportion to the light weight. Naturally such a car as a high-priced four will appeal to a certain class of user only, for the man to whom big seating capacity is everything will not find it suitable, but there must be thousands of people to whom a small car of high quality and great durability, good speed ability and the comfort that only costly bodywork can give, will appeal more strongly than larger and less well made chassis.

If things work out as the experiments in progress now indicate it is safe to predict there will be a mild boom in fours once more, the probable ultimate effect being to add a type of car to the American industry's output which will take a permanent place in America, and also be the finest export proposition possible.

Truck Safety

MOTOR truck owners are more than ever convinced that it is good business on their part to actively take up the question of greater safety in connection with the operation of trucks in our larger cities. Efforts on the part of truck owners to improve the safety precautions are not confined to such centers as New York, Chicago and Boston, but have been actively taken up in a score or more of the smaller cities. Experiments made in a Kentucky city last year, with folding rear steps on ice delivery wagons, showed a perceptible reduction in the number of accidents due to children riding on the steps. In New York certain mercantile associations are looking for safety devices and are willing to offer premiums in a few cases for feasible devices. The Fifth Avenue Coach Co. in voluntarily fitting fenders to guard the rear wheels of its coaches is a specific example of how strongly this safety movement has taken hold on our big motor vehicle operators. The coach company is convinced that it is a business investment.

This suggests how imperative it is for our police and traffic departments to better regulate the crossing of streets by pedestrians. It is accepted that pedestrians and vehicles have equal rights on our streets, each having at all times due regard for the safety of others, but it does seem unreasonable to hem the operation of motor vehicles around with restrictions and leave pedestrians free to wander at will to their own destruction.

Weekly Business Reports

THIS week THE AUTOMOBILE publishes the first of its weekly business reports on the condition of the industry not only in manufacturing centers but in many of the largest distributing centers. Our metal markets are reported each week through their respective channels, periodically our banks make public statements, weekly reports on building operations throughout the country are made use of, and it is opportune that the automobile industry is deserving of weekly reports that are carried into every State. The magnitude of the industry is yet not seriously considered by many of our 100,000,000. The time has arrived when the automobile light should not be hidden under a bushel.

300,000 Fords Built in Year

World's Production Record Established—Owners to Receive $15,000,000 in Rebates

DETROIT, MICH., July 16—To-day car No. 300,000 was turned out at Henry Ford's plant. It was not only a record for the Ford Motor Co., but it was the world's record, as no other automobile manufacturer has ever approached such a tremendous output, even in two years or three, not to speak of less than one.

Thus the prophecy that 300,000 Ford cars would be made in the 1915 fiscal year of the company has been realized, and when that fiscal year ends, July 31, the total output will be brought up to about 315,000 cars.

This total is by no means the most the company could make. At the present time the plant is not running to its full capacity, as is always the case when nearing the end of the fiscal year and when about to take its annual inventory.

Incidentally it might be mentioned that the history-making car No. 300,000 bears motor No. 850,938, which would seem to mean that up to that time just that many Ford motors, or Ford cars, have been made.

—

Hunt Packard Chief Engineer

DETROIT, MICH., July 15—O. E. Hunt has been appointed chief engineer of the Packard Motor Car Co. by J. G. Vincent, vice-president of engineering. Mr. Hunt was Mr. Vincent's assistant for several years. There are now over 200 members on the engineering staff of the Packard company, which concern expends from $400,000 to $500,000 annually on development work, it is said.

Graduating at the University of Michigan in 1907, Mr. Hunt followed another profession for two years and then determined to apply himself to the automobile industry. He obtained employment in the Packard drafting room and soon became chief draftsman of the truck department, following which he took over the body department and then became assistant to D. S. Waldon when the latter was vice-president. From this post he acquired the position of assistant chief engineer under J. G. Vincent in which capacity he was acting until his present appointment.

—

Hannibal Truck at $500

HANNIBAL, MO., July 17—N. L. LaBlond, manager of the Hannibal Wagon Co., announced to-day that his company soon would begin the manufacture of a light commercial motor truck the price of which will be in the neighborhood of $500. The new vehicle will be known as the Hannibal truck.

According to Mr. LaBlond, the company has an initial order of 100 trucks, which are to be delivered as fast as they can be put out of the factory. A large extension to the wagon plant at South Tenth and Collier Streets is now being planned.

An engine especially designed for the Hannibal truck is now being manufactured in Detroit, Mr. LaBlond said. The engine will be of 25 hp. and the hauling capacity of the truck will be 1200 lb.

—

Jackson Prices Lower—Two Eights and a Four

DETROIT, MICH., July 19—Three new models, two of them equipped with eight-cylinder engines and the third with a four-cylinder motor, are the 1916 line of the Jackson Automobile Co., Jackson, Mich., these replacing the four- and six-cylinder 1915 models. The eights are in two sizes, the smaller, designated as model 348, having 112-in. wheelbase and selling at $1,195, with 2⅞ by 4¾ in. motor. The larger eight, model 68, is a $1,685 car with seven-passenger body on a 124-in. wheelbase chassis. Its motor is 3½ by 4½. In the four-cylinder model 34 chassis, the motor is 3½ by 5 and the wheelbase is 112. This car is to sell at $985.

These prices are all big reductions for Jackson, as last season's four sold for $1,375 and the six was $1,650.

The motors used are all Northways, and the two eights follow the same general design throughout. The two-cylinder blocks are at 90 deg., and the crankcase is split vertically into two halves, one being integral with each set of cylinders. The four is the standard Northway design with detachable head. The larger eight has a horsepower of 70; that of the smaller eight shows from 45 to 50, and the four develops 38. These powers are all at 2700 r.p.m., and it is evident that the engines are really all of the high-speed type.

Models 34 and 348 have 32 by 4-in. tires, and the 68 is fitted with 34 by 4½.

—

Carter Capital Now $600,000

PONTIAC, MICH., July 17—Notice concerning the decrease of the capital stock of the Cartercar Co. from $650,000 to $600,000 was filed with the county clerk, the document being signed by President Thomas Neal, Secretary T. S. Merrill and Directors Thomas Neal, C. W. Nash, M. J. Murphy and Emory W. Clark. The decision to reduce the capital stock was taken at a recent meeting of the stockholders. It is stated that the amount subscribed after the decision to reduce the capital stock had been taken was $557,720.

Overland's June Shipment 9010

An Increase of 163 Per Cent Over June, 1914—11,400 Men Working at Plant

TOLEDO, OHIO, July 15—The Willys-Overland Co. shipped 9010 cars during the month of June, an increase of 163 per cent over the shipments of June, 1914, when 3298 cars left the Toledo factory. In the first six months of the calendar year the company has shipped almost as many cars as it did during the entire twelve months of 1914, or practically doubled last year's output.

The previous mark was in the month of March, when 7005 cars were shipped. The record shipment for June exceeds these figures by about 30 per cent.

Export shipments, not including Canada, this country having more cars shipped and sold there, so far this year, than during the whole of 1914, were found at the close of June to be fully 70 per cent of the entire export shipments of 1914.

A record was also established in unfilled orders which amounted to 20,000. The present production is about 400 cars a day. Mr. Willys plans to increase this production to 600 cars a day before the expiration of the present season.

The employees number 11,400 and the plant is going at full capacity. Many of the departments are working on a continuous 24-hour schedule, which keeps a night shift of 1500 men busy.

—

Prest-O-Lite to Make Steel Parts

INDIANAPOLIS, IND., July 19—The Prest-O-Lite Co. is preparing to manufacture car parts made out of cold-drawn steel, such as axle housings, cylindrical gasoline tanks, brake drums, etc. At the present time the company has at its local plant one of the largest batteries of presses for drawing steel. The facilities have recently been increased by the addition of some new presses, including one of 800 tons capacity, and the concern is ready to handle work of this kind from blueprints.

—

Prest-O-Lite Sues Sun-Lite

LOUISVILLE, KY., July 16—The Prest-O-Lite Co. has filed an injunction suit and a demand for an accounting of profits in the United States District Court here against the Sun-Lite Gas Co. a corporation of Louisville, Thomas F. Hackett, its president; C. A. Tucker, vice-president; J. J. Moran, manager and Margaret Moran, defendants. In the suit it is claimed the Louisville firm has been refilling Prest-O-Lite tanks.

Retail Car Sales Brisk—Marked Gain Over 1914—Reports from All Sections

New York Sales Heavier in All Classes of Cars—Boston Dealers Exhaust Allotments—Detroit and Indianapolis Factories Rushed—Parts and Accessory Concerns Busy

NEW YORK CITY, July 21—Automobile business throughout the country has during the past week averaged much above that of the corresponding week a year ago. With many of the popular-priced cars listing at under $1000, business has increased 100 per cent as compared with 1914, and in a few cases the demand of buyers has been three times that of a year ago. In the Central West there is a pronounced return of confidence in the financial situation, which is aided by improved road conditions, both potent factors in the purchase of cars.

Boston dealers all report increased trade as compared with the corresponding period a year ago, there not being a single exception. Some are being held up by lack of cars, but in general car shipments are in advance of last year and the business is waiting, dealers in four or five of the largest car producers being nearly two weeks behind in orders.

New York Trade

The New York metropolitan area embracing a population of over 8,000,000 is enjoying vastly improved selling conditions. Overland reports business 300 per cent ahead of a year ago, Ford is 135 per cent ahead, Buick places the increase at 300 per cent and Studebaker at 100 per cent. In the high-priced field Packard reports vastly increased business, Pierce-Arrow is on a par with a year ago and Locomobile has made gains. In the medium-priced field, namely $1000 to $2000, sales have been generally heavier than a year ago. Values in second-hand cars have gone up very materially largely due to the increased demand for new cars.

The Chicago field as representing the Central West has been very active. A few examples will serve to show how the demand has increased; Hupmobile business is double that of a year ago; Chalmers 25 per cent increase; Buick behind in 1916 deliveries; Hudson much in advance of last year.

Boston Market

A detail review of the Boston market as typical of New England shows very general increase in business. In the medium-priced class the well-known cars like Jeffery, Chalmers, Hudson, Velie, Reo, Cadillac, Chandler, etc., have left 1915 behind them and they are on the 1916 path. In the higher priced class the Marmon, Locomobile, Packard and Pierce did better than preceding weeks. The weather was good for sales because it was warm and tended to get people outdoors. The demand for second-hand cars exceeds the supply. And last week a number of people wandered into places looking for used cars and ordered new ones when assured of a speedy delivery.

In the electric car field some of the dealers reported the past week no better or no worse than before. Boston is not a first class electric pleasure car city. But some of the electric truck men said they did better than a year ago. And the hot weather seemed to have started business men into buying trucks, gasoline vehicles, for they made more sales. As a general summary if the dealers all had machines on the floor ready to pass out for cash the sales would have soared away up, for the preceding weeks had been rainy and cold so that motoring was not a pleasure, particularly over the week ends. And what is true of Boston is reflected in other parts of New England.

Indianapolis Makers

Conditions among the automobile manufacturers in Indianapolis are all much superior to those of last year in July.

The National states that its contracts for material and selling contracts provide for the building of 2500 cars for the year ending July 1. Officials state that this number will undoubtedly have to be increased to meet additional demands. The Empire has been kept in full swing throughout the entire spring and summer. The new plant will allow a great increase in production. Business for the season exceeds all other years by 50 per cent. This has been of four-cylinder models. Work has now started on six.

The Pathfinder company is basing its yearly production on 3500 basis of sixes and twelves. From present contracts its models will be very evenly divided. Officials say the sales outlook is wonderful. Hundreds of inquiries were received last week from distributors and contracts received to-day from ten large distributing centers.

Marmon is building cars at 700 capacity, and says that the demand is greater than before with the high spots in New York and Chicago. Say Pacific coast business is also excellent.

Stutz doing capacity business. Building cars in series of 500; expect to build from 1000 to 1500. At present rate of demand they will go over these figures.

Retail and wholesale conditions in St. Louis and territory are the best they have been for twelve years. This territory includes Missouri and parts of Kentucky, Arkansas, Tennessee and Illinois. Overland volume of business was four times that of a year ago during the same week. The distributor is 600 cars behind in delivery. Ford business is 150 to 200 per cent over last year. All dealers are booking heavily 1916 business and lack of cars is the greatest trouble.

Northwest Wants Cars

The practically universal note among Northwestern distributors in Minneapolis is inability to get cars. This condition was not improved last week, and yet orders began to come in for 1916 model deliveries. The new season begins here Aug. 1, but one firm had already sent out 100 new models. In this territory the slack season is July and August, and, somewhat delayed, it is undeniable that this drop is being felt just now. One reason is the unsettlement because of new announcements of models and prices. Another is that at this time the farmer, who is a heavy buyer of motor cars, is turning his attention entirely to his crops.

With this slight turn in the demand for cars one of the most remarkable seasons in Twin City headquarters of automobile concerns was interrupted. The only hindrance to business, apparently, was inability to get cars for the dealers.

In the truck line normal conditions seem to have reversed. Spring business ending at this time has been under expectation and the outlook to-day for fall business is unexcelled, if crops are up to the prospect.

Detroit at Pressure

For the week ending July 17 Detroit had no cessation in the demands of dealers for cars on the one hand, and in the efforts of the manufacturers of cars and parts to keep pace with required production, on the other.

July is proving a busy month. Last week six concerns besides Ford turned out well over 100 cars a day, two of these doing considerably better than twice that number.

Selling conditions throughout the country seem to have been in the best of shape last week. The farmers have been buying many cars, and the feeling seems to be that as the year's crops are among the best we have ever had, there is really more money in circulation in the farming districts than in many years.

With the foreign situation presenting no new or threatening aspects last week, the feeling was generally one of optimism. Prosperous days with the car makers are at once reflected in the activities of the parts people, who practically to a man have all the business they can handle.

Bell Delivery Car by Sept. 1

1200-Lb. Vehicle on Same Chassis as Touring and Roadster Models

YORK, PA., July 19—The Bell Motor Car Co. will have on the market by Sept. 1 a 1200-lb. delivery car. The car will be built on the same chassis as the touring car. There will be two prices with and without electric lights and electric starter. The former figure will be about $775, the price of the touring car and roadster. The delivery car will be equipped with a Bosch magneto instead of the battery-coil ignition system as used on the passenger cars. It will also have a lower gear ratio. The bodies will be built at the plant of the York Body Mfg. Co., operated by the Bell Co.

The first Bell car was completed and appeared on the streets last week. The new Bell car is built in two models, a touring car and a roomy roadster, the price of both being $775. Features of the car are a one-man top, three-point suspension engine, crowned fenders, control levers above steering wheel with horn button in center of wheel, ample body room with pockets in doors, leather-covered instrument board, genuine leather upholstery, Hotchkiss drive, double universal joint, 112-in. wheelbase, demountable rims, weight of the car 2200 lb., 22 miles a gallon of gasoline, Atwater Kent ignition, worm driven from the camshaft, speedometer, rain ventilating windshield, self-starter run by inclosed silent chain. The body of the car will be dark blue, chassis, hood and fenders enameled black.

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Warren Motor Truck Co. Formed

WARREN, OHIO, July 15—The Warren Motor Truck Co. has been capitalized at $25,000. The stockholders are Warren men who at a meeting elected the following directorate: R. B. Wick, William Wallace, D. L. Helman, R. A. Cobb, C. B. Loveless, G. C. Braden and G. F. Proctor. The directors elected officers as follows: R. B. Wick, president; C. B. Loveless, vice-president; L. L. Jones, secretary; G. C. Braden, treasurer D. M. Bell, general superintendent. The new company has purchased all of the machinery and equipment of the Standard Motor Truck Co. and expects to continue to manufacture trucks in accordance with plans of the former company.

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New Midget Cyclecar Price $325

SPRINGFIELD, MASS., July 17—The Midget is the name of a new cyclecar that is to be built at Springfield, Mass. C. S. Root and L. E. Bartlett are the men behind it. The car weighs about 600 lb., and will sell for $325. The principal field for it, according to its builders, is in the mail delivery service, a specially constructed body having been designed for it. The motor is a two-cylinder, four-cycle type, and water-cooled. The bore is 3⅜ and the stroke 4 in. The engine develops 12 hp. A. L. A. M. rating. The friction type of transmission is used with three speeds forward and reverse. No axles are used on front or rear as a special arrangement of the springs does away with both. The wheelbase is 102 in. and the tread is 36 in.

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Kelly-Springfield Adds Four New Trucks

SPRINGFIELD, OHIO, July 16—According to the plans of the Kelly-Springfield Motor Truck Co., this city, four new vehicles will be added to the line of Kelly trucks. This brings the Kelly line up to seven vehicles ranging in capacity from 1 to 6 tons. The new vehicles known as K-31, K-35, K-45 and K-60 are 1½, 2, 4 and 6 ton. In the two smaller the K-30 motor is used, which is the same as that formerly employed on the 1-ton model, and on the larger two the K-40 model motor is used, which is the same as that employed on the former 3½- and 5-ton models. Improvements have been made, but no radical changes are noted, the carbureter is now the Rayfield and the motor has the lower part of the crankcase cast in two parts.

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McGookin Leaves Stewart-Warner to Join Springfield Body

DETROIT, MICH., July 17—Earl McGookin, who has been connected with the Stewart-Warner Speedometer Corp. of Chicago, for the last 12 years, and has been in Detroit during the past 7 years, being manager of the local branch, has resigned and will leave Aug. 1. At that time Mr. McGookin will become identified with the Springfield Metal Body Co., Springfield, Mass., which will establish a plant here in Detroit, for production business, exclusively. Mr. McGookin has purchased an interest in the Springfield concern and with him in the new plant there will be associated Joseph Boyer, Jr., and W. T. Fry. It will be several months probably before the local plant will be in operation. Five factories have thus far signed contracts and will be taken care of by the new local plant, the Paige-Detroit Motor Car Co.; the Maxwell Motor Co. and the Chandler Motor Car Co. being among these concerns.

S. A. Douglass will succeed Mr. McGookin as manager of the Detroit branch of the Stewart-Warner Speedometer Corp.

Must Abandon Credit System

American Manufacturers Must Learn to Risk Their Pay in S. A.

DETROIT, MICH., July 16—Until the American manufacturer is willing to forget the credit system and take a chance on his pay, American-made goods will not find a ready market in South America.

This is the opinion of Peter Steenstrup, who recently returned from an eight months' trip to Central America, the West Indies and South America in the interests of the Hupp Motor Car Co. Mr. Steenstrup last fall told Detroit manufacturers trade with South America would not prove a "gold mine" because of the war in Europe and he has returned from another trip below the equator convinced that the war has served to make it harder to establish commercial relations with the Latin-American countries.

How Manufacturers Err

"The war destroyed three things most necessary for the South American trade," said Mr. Steenstrup. "It took away the credit of the countries, the ships for bringing them goods, and deprived them of a chance to get products at the terms necessary for their business. Manufacturers in this country attempt to do business with the Spanish merchants on the same basis as they do with local dealers whose credit is established. Where the manufacturer demands gilt-edge security before he will ship an order, the Spanish merchant expects from three to nine months' credit. He is forced to sell the goods before he can pay for them.

"There is no Bradstreet or Dun in South America outside of one or two big cities. Such business cannot exist because the merchant considers inquiry as to his credit as an insult. The Spanish are honest, but they demand that they do business in their own way.

Chance for United States

"Study of the conditions of the people and country made the German and English successful in South America. The United States has the same chance, but she must start twenty years back and attack the problem in the same way. The English even now are selling goods in South America and are making a play for the business from the countries.

"It takes a salesman of tact and patience to do business in those countries. He must be willing to await the pleasure of the merchant and he must sell him what he wants to buy, not what the

salesman thinks he ought to purchase.

"When the wave of 'sell to South America' swept the country last fall, a good many merchants imagined they could dispose of products with ease. This cannot be done, because what we call necessities up here are luxuries in the tropics.

"The retarded civilization of the countries eliminates a large number of products that have a steady demand in this country. Cotton goods is the most universally required article in South America, and England seems able to negotiate that trade.

"Another reason that retards trade at this time is the fluctuation of the currency of the countries. In some of them the exchange rate for United States money is getting higher all the time. Merchants hesitate to buy on that account, fearing that by the time that they pay for the goods their currency will have dropped lower in its relation to our money.

"What the United States exporter needs is an understanding of conditions. He needs salesmen who know the country, and above all he needs the grit to tide him over a period of loss before he can build up a paying trade."

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Marion and Imperial to Be Marketed by Mutual Motors

JACKSON, MICH., July 17—The Mutual Motors Co., this city, has acquired the exclusive sales right, good will, trade name, etc., of both the Marion and the Imperial cars and will hereafter market both of these through individual and separate departments of its own company instead of as heretofore through separate selling corporations.

The Mutual Motors Co. has heretofore confined its program to the manufacture of Imperial cars for the Imperial Automobile Co. and Marion cars for the Marion Motor Co., all of Jackson, Mich.

The Mutual company does not take over any of the physical assets or assume any of the obligations of either of the other two companies but has simply acquired the sole selling rights of both.

The Mutual will continue the manufacture of both lines, the Imperial line consisting of the Four which heretofore listed at $1,085 but listing now at $995 and the Six which heretofore listed at $1,285 but now listing at $1,185.

The Marion Light Six will continue as heretofore, but at a new list price of $1,185 instead of $1,250 as formerly.

The taking over of the sales ends by the Mutual Motors Co. does not in any way affect the field and dealer organizations of either line. In other words the Mutual will go right along supplying Imperial cars to Imperial dealers and Marion cars to Marion dealers just as the respective selling companies have done in the past.

Electric System on 1916 Monroe

Standard at $495 Instead of Extra—Refinements Only Changes in Car

FLINT, MICH., July 16—The 1916 Monroe car is now out and is being exhibited in many of the branch distributing agencies of the company. The car shows very little change from last year except for a few refinements and the fact that the electric lighting and starting are now standard at the purchase price of $495, whereas for 1915 they were extra equipment. It is featured by a streamline body, left drive, center control and full equipment including top, windshield, etc.

The car has a block motor with valves in the head, the 3 by 3.75 power plant delivering the drive through a 10.5-in. clutch to a three-speed gearset. Cooling is by thermo-syphon and the radiator is supplied with an auxiliary tank at the top. Lubrication is by a combination splash and pressure system. The oil is taken by pump to the connecting-rod, main bearings and timing gears. Nickel steel gears are used and the shifting lever is mounted directly at the rear of the gearbox, providing a direct control without intermediate linkage. The rear axle is semi-floating and torque is taken through a tube connected to the rear end of the gearbox by a forked yoke. The control instrument set is mounted on the cowl board.

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Michelin Reduces All Tire Prices 10 Per Cent

NEW YORK CITY, July 20—A price reduction of 10 per cent, effective July 19, has been declared by the Michelin Tire Co., Milltown, N. J. The reduction covers the entire line. The old and the new figures on some of the more popular sizes of tires are given here:

Size	Old Price	New Price
30 x 3	$11.50	$10.40
30 x 3½	15.70	14.14
32 x 3½	18.00	16.25
34 x 4	24.50	22.00
36 x 4	26.25	23.75
36 x 4½	31.75	29.25

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Heinze to Make Electric Starter

DETROIT, MICH., July 20—John O. Heinze, for nearly 5 years chief engineer of the Northway Motor & Mfg. Co., has resigned to go back into electrical work, having organized the J. O. Heinze Co., at Springfield, Ohio, to manufacture electric starters and other electrical apparatuses for automobiles.

Wm. Pflum, former manager of the National Cash Register Co. and later head of the Wagenhals Motor Co., and A. S. Knoblock, general manager of the Northway company are among those associated with Mr. Heinze in the new enterprise, which also includes some of the business men of Springfield and Dayton, Ohio. The new company is already incorporated for $500,000.

A new concrete plant has been secured at Springfield and Mr. Heinze states that the apparatus is to be manufactured completely, everything is to be carried on with the view of a high grade quantity output, 50,000 starters being planned for the first year with a working force of 350. Details of the starter design and of other apparatus will be forthcoming later.

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Premier Company May Move Plant to St. Paul

MINNEAPOLIS, MINN., July 17—Frank E. Smith, of the Premier Motor Mfg. Co., Indianapolis, is here, looking over the ground for a factory site. He met a committee of the St. Paul Commercial Club.

INDIANAPOLIS, IND., July 20—*Special Telegram*—Upon his return from St. Paul, Minn., Frank E. Smith, trustee of the Premier Motor Mfg. Co., stated that the Premier company was seriously considering moving its entire establishment to St. Paul.

The rumor that a movement was under way has been persistently denied by the Premier company until to-day. Mr. Smith stated that St. Paul capitalists had made an attractive offer for the taking over of the company through the St. Paul Chamber of Commerce.

Mr. Smith would not make public any details, but said that the deal may be completed in thirty days. While he would make no statement as to the inducement offered at St. Paul it is believed that a site and buildings are included. Although Mr. Smith will not admit as much it is generally believed that the deal is all but closed.

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Indiana S. A. E. Postpones to Sept. 24

INDIANAPOLIS, IND., July 17—A change in date and some added features is the latest news in regard to the opening meeting of the Indiana section of the Society of Automobile Engineers. The meeting was announced for Sept. 17, but it has been made a week later which will be Sept. 24. J. G. Vincent will be the main speaker of the evening, discussing twelve-cylinder.

J. E. Diamond, engineer of the Aluminum Casting Co., Detroit, will make an address on aluminum, while Mr. Vincent's address will be entitled, "Modern Tendencies in Motor Design" and will deal with the twelve-cylinder motor. Mr. Diamond's subject will be "Aluminum Pistons," very closely related to the twelve-cylinder subject.

21,826 Cars and Trucks in Colorado

Registrations During First Six Months of 1915 Show Increase of 5000 Cars, or 30 Per Cent Over Same Period Last Year, and 3395 More Than 1914 Total—Registrations Analyzed

By H. G. Hedden

DENVER, COL., July 15—A total of 21,828 automobiles, representing 197 different makes, is Colorado's registration for the first six months of 1915. This is a gain of more than 5000 cars, or 30 per cent over the same period last year, and a gain of 3395 cars, or 18 per cent, over the total registration for 1914, which was 18,433.

Besides heavy sales this year, two other factors are named by Secretary of State Ramer as helping strongly toward this increase. One was the system adopted by the retiring Secretary of State of starting the 1915 registration on the first of December instead of waiting till January, which was followed by Secretary Ramer with rigid insistence upon prompt registration throughout the state. The other has been Secretary Ramer's introduction of a license inspection system, which has brought in a large number of delinquents. In addition to these influences, extensive road improvements throughout the state and an earlier opening of the roads in general from snow and other hindrances to travel have played a part worth mentioning. Good

Colorado 1915 Motor Car Registration by Make

Make	Denver	Outside Counties	Total
Apperson	47	63	110
Ardsley	1	0	1
American	12	8	20
Avery	1	1	2
Abborn	1	0	1
Atterbury	1	0	1
Aero Car	2	5	7
Anderson	1	1	2
Atlas	1	0	1
Arbenz	1	0	1
Argo	0	1	1
Amplex	0	1	1
*American La France	0	1	1
Abbott-Detroit	72	69	141
*Autocar	14	4	18
Adams	0	1	1
Alco	3	4	7
Auburn	0	12	12
Babcock	5	2	7
†Baker	107	30	137
Buda	1	0	1
Benz	1	0	1
Buffalo	3	0	3
Buick	323	1266	1589
Brockway	11	0	11
Brush	22	77	99
Briscoe	2	17	19
*Best	0	3	3
Briggs-Detroiter	13	14	27
Bendix	0	1	1
Byron	1	0	1
Crawford	4	2	6
Clark	3	0	3
*Chase	27	21	48
Cartercar	26	68	94
Columbia	50	7	57
Cole	32	34	66
Colby	1	0	1
Corbin	3	2	5
Continental	7	1	8
*Commerce	20	5	25
†Chicago	1	0	1
Cadillac	330	428	758
Colburn	14	5	19
Case	16	82	98
Chalmers	198	235	433
Cunningham	5	0	5
Carnation	0	1	1
Cutting	1	4	5
Columbus	78	17	95
Courier	5	7	12
Crow	1	7	8
Columbus Buggy	0	1	1
Chandler	5	11	16
Chevrolet	60	54	114
Capitol	6	0	6
Croxton	6	0	6
Crescent	0	1	1
Cameron	0	2	2
Dodge	83	107	190
Dorris	31	14	45
Dolson	1	0	1
Davis	1	0	1
Dermot	1	0	1
Dort	3	1	4
†Detroit	59	17	76
Economy	0	2	2
Evans	0	1	1
Enger	0	1	1
Elmore	12	10	22
Everitt	40	41	81
Empire	12	10	22
Frayer-Miller	6	0	6
Ford	2132	6286	8418
Fuller	2	2	4
Fiat	4	1	5
†Fritchle	146	14	160
Flintlow	0	1	1
Firestone-Columbus	0	1	1
Flanders	54	93	147
*Federal	6	2	8
Franklin	94	92	186
French	0	1	1
*Grabowsky	2	1	3
Great Eagle	2	0	2
Great Smith	0	13	13
Great Western	1	2	3
*G. M. C.	5	3	8
Gleason	2	7	9
Garford	5	1	6
General	17	0	17
*Gramm	4	3	7
Gale	0	1	1
Grant	4	13	17
Glide	1	4	5
Galloway	0	2	2
Havers	1	2	3
Holsman	0	2	2
Hupmobile	91	210	301
†Hupp-Yeats	11	10	21
Henderson	5	4	9
Halladay	4	3	7
Haynes	31	32	63
Henry	0	2	2
Herff-Brooks	0	1	1
Hercules	0	7	7
*Hartford	0	1	1
Herreshoff	0	1	1
Harley	0	1	1
Howard	0	1	1
*H-D	0	1	1
Hudson	93	124	217
Inter-State	38	25	63
*International	15	31	46
Imp	7	3	10
*I. H. C.	3	34	37
Imperial	3	17	20
Jackson	34	37	71
Jeffery	9	31	40
King	3	1	4
Kissel	20	27	47
Knox	1	1	2
Kline	0	1	1
Krit	18	19	37
Lion	0	2	2
Lambert	2	16	18
Lexington	1	2	3
Little	10	3	13
‡Lane	1	0	1
*Little Giant	4	4	8
Lozier	36	34	70
Locomobile	21	11	32
Monroe	3	3	6
Marion	22	22	44
Middleby	0	1	1
*Kelly	5	0	5
Marathon	2	5	7
*Mack	5	5	10
Mora	2	1	3
Maxwell	415	499	914
Moon	9	20	29
Mason	3	0	3
*Modern	0	1	1
Mitchell	63	75	138
Mercer	2	1	3
Monarch	2	0	2
Marmon	4	5	9
McIntyre	2	3	5
Metzger	1	0	1
Modoc	1	1	2
Maxwell-Briscoe	0	3	3
Mercedes	1	0	1
Midland	1	4	5
Moline	3	4	7
McFarland	1	1	2
Mayer	1	0	1
Maytag	0	4	4
Matheson	0	1	1
Metz	79	183	262
Michigan	24	39	63
National	17	14	31
Norwalk	0	1	1
Northern	1	3	4
Nyberg	0	1	1
Owen	0	1	1
Oakland	58	82	137
Orient	1	1	2
Ohio	48	5	53
Overland	468	1067	1535
Oldsmobile	66	70	136
Packard	82	50	132
Plaim	0	1	1
Palmer-Singer	3	5	8
Pratt	0	11	11
Pilot	6	6	12
Pullman	5	1	6
Parry	4	7	11
Pierce-Racine	1	0	1
Pioneer	0	1	1
Peerless	35	19	54
Paterson	2	1	3
Pope-Toledo	0	1	1
Pierce-Arrow	114	39	153
Partin-Palmer	0	1	1
Pathfinder	8	5	13
Pope-Hartford	4	14	18
Petrel	0	5	5
Panhard	0	1	1
Pennsylvania	1	0	1
Paige	33	97	130
Pope	4	0	4
Premier	10	8	18
Queen	0	1	1
Renault	7	2	9
*Randolph	5	3	8
*Rapid	24	7	31
Reo	116	339	455
Rider-Lewis	0	1	1
R. C. H.	26	20	46
†Rauch & Lang	29	9	38
Rockway	0	1	1
Rocket	0	1	1
Royal Tourist	0	2	2
Regal	27	63	90
Rochet-Schneider	0	1	1
Rambler	26	53	79
*Reliance	1	0	1
Rickette	1	0	1
Stevens-Duryea	80	33	113
*Sampson	5	1	6
Stanton	0	1	1
‡Stanley	64	105	169
Stafford	0	1	1
Staver	2	3	5
Smith	14	0	14
Studebaker	324	633	959
E. M. F.	64	251	315
Stoddard-Dayton	37	55	92
Speedwell	1	3	4
Simplex	0	1	1
Stegler Wade	0	1	1
Stutz	3	4	7
*Sterling	0	2	0
Sears	0	8	8
Sears-Roebuck Buggy	0	1	1
Selden	1	2	3
Saxon	10	30	40
*Saurer	1	3	4
Savoy	0	1	1
Schacht	1	4	5
*Seitz	1	0	1
Stearns	9	5	14
Thomas	37	23	60
Twombly	0	1	1
Trumbull	0	2	2
*Vulcan	1	3	4
Van Dyke	0	1	1
Velie	14	79	93
Victor	2	0	2
Victoria	3	0	3
Warren	3	6	9
Winton	30	26	56
†Waverley	48	5	53
Waltham	1	0	1
*Utility	0	5	5
*Walker	1	1	1
Woods	2	3	5
*Wilcox	1	0	1
Welch	1	4	5
Westcott	2	4	6
White	26	44	70
Wayne	3	6	9
*Wichita	4	3	7
Winters	0	1	1
*Whiting	3	0	3
Whitaw	1	0	1
Yeager	1	0	1
Zip	2	5	7
Zimmerman	0	1	1

*Commercial vehicle. †Electric machine. ‡Steam

crops last year and good prospects for this year have greatly helped along the sales feature.

Denver Has 6705

Of the total number of cars in the state shown by the June 1 returns, 6705 were registered from Denver and 15,123 from the outside counties. Denver's increase is 585 cars above the total of 6120 for last year, or a gain of nearly 10 per cent.

With the prominent exception of Mesa County, on the western border, the eastern part of the State shows the main bulk of the increase. Mesa County has 396 cars for this year as against 316 for 1914, or an increase of 26 per cent.

Among the eastern counties leading in the gain are Arapahoe, joining Denver on the south, with a gain of from 210 to 346, or 64 per cent; Weld, two counties north of Denver, showing 1170 to 1430, or a gain of 22 per cent; Phillips, near the northeastern corner, with 220 to 162, or a gain of 35 per cent; and Baca, in the extreme southeastern corner, with a jump of 37 to 166, or a 348 per cent gain.

The only county not reporting any cars since the new state motor vehicle law went into effect two years ago is Dolores, in the extreme southwestern corner of the state, a thinly-settled, mountainous county. San Juan, also in the mountains and at an altitude where the snow stays on late, has not reported any registration so far this year, but reported three cars late in 1914. Some of the mountain sections have shown a pleasing increase, which is thought to be due in part to a substantial growth in the metal mining industry in the last year or two.

Classified according to style of car, horsepower rating and kind of motive power, the registration is as follows:

Class	Denver	Outside Counties	Total
Gasoline cars to 25 hp.	3,061	8,699	11,760
Gasoline cars above 25 hp.	2,495	5,495	7,990
Electric passenger cars	493	189	682
Steamers	64	105	169
Gasoline trucks	308	79	387
Electric trucks	33	4	37
Dealers' cars	251	552	803
	6,705	15,123	21,828

Total gasoline pleasure cars, classified: Denver, 5556; outside counties, 14,194; entire state, 19,750.

Of the 197 different makes represented in the state, the leading six rank as follows:

Make	Denver	Outside Counties	Total
Ford	2,132	6,286	8,418
Buick	323	1,266	1,589
Overland	468	1,076	1,544
Studebaker	324	635	959
Maxwell	415	499	914
Cadillac	330	428	758

Besides the regular Studebaker, there are also 315 registered as E. M. F., sixty-four being in Denver and 251 outside.

Secretary Ramer estimates that the total registration for 1915 will come close to 28,000, which will be an increase of 50 per cent over last year. He estimates that the total revenue for 1915 from all motor vehicles and drivers' licenses will be approximately $125,000, as against $80,000 in 1914. More than $100,000 of this will probably be available for road work through the state and county highway funds, the net motor vehicle license revenue being divided equally between the state highway fund and the road funds of the respective sixty-two outside counties individually in proportion to the fees collected by each county. Last year the net amount so divided for road work was $76,600.

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King Adds Three-Passenger

DETROIT, MICH., July 20—In response to a demand for roadsters, the King Motor Car Co. has added a three-passenger body mounted upon the eight-cylinder chassis, which has a wheelbase of 113 in. The roadster sells for $1,350, the same as the touring car.

Improvements have been made in the chassis itself, the bore having been increased from 2¾ to 2⅞ in. and to accommodate the larger volume of gas, the valve ports have been increased in size and a larger intake manifold fitted with an improved type of Zenith carbureter.

Roominess has been made a feature in the roadster, some of the principal dimensions being: dash to front seat, 20½ in.; floor to top of cushions 13 in.; thickness of cushions 8 in.; width of seat, 43 in.; front of seat to back, 18 in.; top of cushion to top of back seat, 19 in. Tires are 33 by 4 non-skid on the rear with one extra rim as part of the regular equipment.

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Brush to Assist Scripps-Booth

DETROIT, MICH., July 20—Alanson P. Brush, of the Brush Engineering Association, has been retained as consulting engineer for the Scripps-Booth Co. on its 1916 models. W. B. Stout, chief engineer, also receives the added title of advertising manager of the Scripps-Booth concern, to take effect Aug. 1.

By these changes the position of the Scripps-Booth Co. in its unique field of design is further strengthened. Mr. Brush is well known in engineering circles, and his automobile experience dates back to his designing work on the single cylinder Oldsmobile and Cadillac cars. He also has consulting connections with Moline and Ferro companies.

Bay State Fees Over $1,000,000

83,868 Cars and Trucks Registered—Gain of 27.5 Per Cent Over 1914

BOSTON, MASS., July 17—Massachusetts automobilists have poured into the state coffers more than $1,000,000 for the first six months of this year, and the registration figures will exceed 100,000 for the year without any doubt. Even now with the year half gone it takes at least half an hour to get a car registered at the Highway Commission's headquarters, and every day there is a line extending out into the hallway waiting to get numbers. For the first six months of 1915 there were 83,868 machines registered in the Bay State. That was an increase of 19,252 over the same period of 1914, and it is 6652 more than had been listed for the entire year of 1914. About $200,000 more than was gathered in for the first six months of last year has been taken in for the same period this year, and it is about $34,000 more than was secured for the full year of 1914. Before the season ends it is expected that at least $1,250,000 will be paid the state by motorists.

The increase shows an average of 27.5 per cent above the figures of last year, a very big gain which shows that New England is prosperous. The number of people securing driver's licenses is jumping rapidly until now about one in every twenty-six Massachusetts residents is allowed to drive a car. This increase is about 27 per cent, and when the year ends about 125,000 licenses will be in the hands of Bay State operators. The trucks have gained faster than cars. The dealer class, too, shows a good gain, there being 1653 registered so far this year to 1145 for the same period a year ago.

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Kentucky Gains 3743 Cars

LOUISVILLE, KY., July 16—According to Hugh Ramsey, deputy commissioner of motor vehicles, 15,500 automobiles are now registered in the State of Kentucky, a gain of 3743 since Jan. 1, 1915, when the official records showed the registration to be 11,757. It is predicted that a total of more than 22,000 cars will be registered by Dec. 31.

Massachusetts Registrations for 1914 and 1915

	Jan. 1 to July 1, 1914	Entire Year, 1914	Jan. 1 to July 1, 1915
Motor vehicles, all types	64,616	77,246	83,868
Trucks	9,900	6,950	8,236
Motorcycles	6,359	8,161	7,704
Manufacturers and dealers	1,445	1,518	1,653
Licenses, operators and chauffeurs	14,319	26,858	23,649
Renewals, operators and chauffeurs	43,418	72,674	49,443
Examinations	3,885	7,497	5,317
Receipts	$781,965.35	$965,669.59	$999,524.90

National Rubber to Move Plant

Work Begun on 1000 Ft. Structure in Williamsburg, Pa.—Efficient Layout

WILLIAMSBURG, PA., July 19—The National Rubber Co., with factory and main offices now in Pottstown, Pa., broke ground here to-day for the model daylight factory which the company plans to have completed and in actual operation by Jan. 1.

Since the first of the year the business of this company has increased so rapidly that its factory facilities in Pottstown are no longer adequate to meet the demand. Rather than attempt to build additions to the present plant, it was decided to build an entirely new and model factory which would be able to turn out at least 1000 tires and tubes a day.

The National people have been quietly looking for a desirable location for over two months and after looking over the offers and advantages offered by 150 different cities finally decided upon Williamsburg because of its natural advantages.

Ten acres of ground which was found suitable were secured on a railroad siding and next to the Blue Juniata River from which it will be possible to obtain free water and power—two important items for a rubber factory.

The factory is laid out to secure the highest possible efficiency in manufacturing. The main building is to be 1000 ft. long and 65 ft. wide and one story high. The construction is of Ponds continuous steel sash throughout, insuring perfect natural light and ventilation. There will not be a pillar or post in the entire 65,000 ft. of floorspace.

It is planned to have all the machinery independently driven by electricity in order to eliminate all overhead belting and shafting, the factory being arranged so that the raw material will be received at one end of the building and from there travel through the long structure without once moving backward or requiring any duplicate handling.

In addition to the main building there will be separate buildings for the powerhouse, the machine shop and the office building. The powerhouse is to measure 40 by 40, the machine shop 65 by 120 and the office building 50 by 50.

The factory in Pottstown will continue in operation until the new factory is completed. The machinery will then be moved to Williamsburg and operations resumed, it is hoped, within a week after leaving the old factory. Considerable new machinery is to be purchased.

The National Rubber Co. is incorporated for $2,500,000 and employs over 200 men.

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$1,000,000 Plant for Overland in St. Paul

ST. PAUL, MINN., July 15—The Willys-Overland Co., Toledo, Ohio, will erect a branch factory office building, warehouse and storage yards in St. Paul, costing $1,000,000. Work will begin in the near future on the plant on University Avenue, adjoining the Illinois Steel Co. plant.

The company has frontage of about 500 ft., with ample room for expansion. The plant here will assemble and ship cars to all Overland agencies west as far as the Pacific Coast. The plant will employ about 5000 people.

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Metal Prices Lower

NEW YORK CITY, July 20—With the exception of metal prices, quotations in the markets this week remained unchanged. Lead, tin, electrolytic copper and antimony, were lower. Lead dropped to $5.55 a 100-lb. on Friday and held at that price until the closing on Monday. The metal is being freely offered at that price, but the buyers are looking forward to a continuation of the downward movement and are not taking much metal. The tin market prices fluctuated last week, the highest mark being $38 on Tuesday. The market continues its downward course under the pressure of the weak and heavy markets at London and the Straits. Electrolytic copper showed a fractional loss and it is predicted that a further reduction may take place.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.31	.31	.31	.31	.31	.31	.....
Antimony	.36	.35½	.35½	.35½	.35½	.35½	—.00½
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.36	1.36	+.05
Bessemer Steel, ton	19.50	19.50	20.00	20.00	20.00	20.00	.....
Copper, Elec., lb.	.19½	.19¾	.19¼	.19¼	.19¼	.19¼	—.00¼
Copper, Lake, lb.	.19½	.19¾	.19¾	.19¾	.19¾	.19¾	+.00¼
Cottonseed Oil, bbl.	6.01	5.96	6.00	5.99	6.00	6.01	.....
Cyanide Potash, lb.	.24	.24	.24	.24	.24	.24	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	5.70	5.60	5.60	5.55	5.55	5.55	—.15
Linseed Oil	.57	.57	.57	.57	.57	.57	.....
Open-Hearth Steel, ton	20.50	20.50	21.00	21.00	21.00	21.00	.....
Petroleum, bbl., Kans., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	.....
Rubber, Fine Up-River, Para	.62	.62	.62	.62	.62	.62	.....
Silk, raw, Ital.	3.75	..	3.75	..	..	3.75	.....
Silk, raw, Japan	3.37½	..	3.37½	..	..	3.37½	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	38.00	37.75	37.50	37.50	37.63	37.13	—.87
Tire Scrap	.04¼	.04¼	.04⅜	.04¼	.04¾	.04¼	.....

1916 Allen Price $795

FOSTORIA, OHIO, July 21—The Allen Motor Co., this city, has announced the Allen "37" for 1916 selling at $795, the same price applying to both the roadster and the touring car. The 3¾ by 5-in. motor develops 37 hp. The motor is long stroke and is made by the Sommer Motor Co., Bucyrus.

Other features are Stromberg carbureter, Westinghouse electric system for starting, lighting and ignition, Stewart-Warner vacuum fuel feed system with tank hung at rear, full floating rear axle, pressed steel housing, 12-in. brakes with pressure equalizers, 55-in. long underslung rear springs, 112-in. wheelbase, 32-in. wheels, and a one-man top.

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No Goodrich Common Dividend

NEW YORK CITY, July 15—Despite the fact that earnings of the B. F. Goodrich Co. are expected in some quarters to show at the rate of 10 per cent for the common stock, it is stated that officers of the company will recommend at this month's meeting of the directors, July 28, that no dividend be declared on the common stock. The company intends to build up an immense surplus before dividends are resumed.

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Buys Entire Havers Factory Stock

CLEVELAND, OHIO, July 15—R. C. McLean, president of the M. & M. Co., 480-500 Prospect Avenue, has purchased the entire stock and equipment of the Havers Motor Car Co., Port Huron, Mich., from the receivers.

Mr. McLean is preparing to put the entire equipment and stock on sale at his warehouse, 515 Huron Road.

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Racine Co. Files Petition

RACINE, WIS., July 15—The Racine Drop Forge Co., this city, filed a voluntary petition in bankruptcy on July 17, admitting liabilities of $9,462 and assets of $3,553. The concern was identified with the motor and car industry and transacted practically all of its business in this line.

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National Spring & Wire Adds

ALBION, MICH., July 16—About $100,000 is to be spent by the National Spring & Wire Co., manufacturer of seat springs, in enlarging its plants here and

in Windsor, Canada. The additions to the local plant will consist of a two-story building, 294 by 60 ft., which will be an enlargement of the machine shop. A small section of the new structure will be only one-story high and will be used for enameling ovens and dip-room. Another addition, 146 ft. long now nearly completed, will include the new offices and tool rooms. A new building recently completed as a storeroom, will be fitted with machinery and become a part of the machine shops.

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Great Western Enters Six Field

PERU, IND., July 20—The Great Western Automobile Co., this city, which has for years been manufacturing a four-cylinder car, has entered the ranks of the six-cylinder builders. Fitted with a five-passenger body and mounted on a chassis of 112-in. wheelbase, the new car sells for $1,185 f.o.b. Peru. It is provided with a 3- by 5-in. power plant and is featured by a body of streamline design with divided front seats and roomy tonneau. It is low-hung and has adequate storage space. Curtains are Jiffy, secured to the bows of the one-man top.

The tool box and battery box are under a hinged door in the floor in front of the driver's seat, allowing the driver to reach any of the tools without disturbing the passengers. Luggage compartments are placed under the tonneau floor, there being two, each large enough for two suit cases. The gasoline tank is in the rear along with the tire carrier which is patented, it being necessary to remove but one screw to remove the rim and tire.

Securities Markets Strong

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General Motors Common Gains 32 Points on Dividend Rumor —Overland Another Feature

NEW YORK CITY, July 19—Securities closed on Saturday with some very substantial gains. The market as a whole showed a most remarkable advance, considering the fact that a big reaction was expected. Firestone common is now quoting at between 506 and 512, approximately 300 points higher than this time last year and General Motors common, which showed a record gain of 32 points last week, has shown a 100 per cent gain since last July.

Willys-Overland common and preferred gained 14 and 1½ points on the strength of the new Willys-Knight announcement. International Motors came to the fore again Saturday when its common rose to 17 and its preferred to 43, respective gains of 4½ and 8 points.

Tire issues, with the exception of Firestone, were not so prominent last week. All three Kelly-Springfield issues showed drops and U. S. Rubber preferred also showed a decline. Goodrich preferred made a slight gain of 1-2 point.

The Detroit issues were steady with a few gains. General Motors common showed a 32½-point gain, in sympathy with the Wall Street prices. Its preferred went 3¼ points. The rest of the changes ranged in gains from 1 to 3¾ points. In the inactive stocks, the only change that occurred was that of Canadian Ford, which was 75 points.

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Pope's Westfield Plant Sold

HARTFORD, CONN., July 21—*Special Telegram*—The Westfield plant of the Pope Mfg. Co. was sold at public auction Tuesday afternoon to H. Preston Coursen of New York, representing Wilbur C. Walker of the Hartford Motor Car Co. and a former officer of the Pope company, and Scott McLanahan of New York for $725,000. There was no other bidder. A certified check for $25,000 was deposited and the balance is to be paid within fourteen days from the time the sale is confirmed by the court.

The sale includes all the real estate, fifteen acres, the big factory buildings, machinery and equipment of the plant and the cash on hand with the receivers July 19, amounting to $229,186.65. The purchasers assume the liabilities of the receivers incurred in the operation of the plant.

Wilbur C. Walker will undoubtedly be the head of the establishment in the future. Associated with him will be his brother Charles E. Walker of the Walker Barkman Mfg. Co., this city. Several Hartford people will be financially interested.

A new company will be formed and it is understood that the capitalization will be $1,600,000 of which $800,000 will be common stock and $800,000 preferred. The outside financial interests which have underwritten the purchase price will no doubt be retired.

Automobile Securities on New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Goodrich Rubber Co. com	220	..	300	..	..
Goodrich Rubber Co. pfd	120	..	101	110	..
Hendrie Castings pfd	98	100	98	100	..
J. I. Case pfd	82¼	85¼	70	79	..
Chalmers Motor Co. com	100	103	91	93	+1
Chalmers Motor Co. pfd	94	96	95	98½	—1
Electric Storage Battery Co	50½	51	53	54	+¾
Firestone Tire & Rubber Co. com	310	315	506	512	+6
Firestone Tire & Rubber Co. pfd	108	110	109	111	..
General Motors Co. com	91½	93	188	189	+32
General Motors Co. pfd	25¼	25¾	104	105½	+3½
B. F. Goodrich Co. com	88	90	50	52	—1
B. F. Goodrich Co. pfd	170	175	104	105½	+ ½
Goodyear Tire & Rubber Co. com	97	98½	270	273	..
Goodyear Tire & Rubber Co. pfd	98	102½	105½	107	— ½
Harvey Davis, Inc., pfd	..	3	92	96	..
International Motor Co. com	3	9	17	19	+4½
International Motor Co. pfd	54	56	43	45	+8
Kelly-Springfield Tire Co. com	76	80	155	157	—6
Kelly-Springfield Tire Co. 1st pfd	94	100	85	87	— ½
Kelly-Springfield Tire Co. 2d pfd	14⅜	14¾	155	165	—5
Maxwell Motor Co. com	43½	44½	36	38	+2
Maxwell Motor Co. 1st pfd	17	18½	83	85	+1
Maxwell Motor Co. 2d pfd	..	..	32	34	+1¼
Miller Rubber Co. com	..	..	190	192	..
Miller Rubber Co. pfd	124	126	103	105	..
Moon Departure Mfg. Co. com	105	108	..	..	..
Moon Departure Mfg. Co. pfd	103	112	..	..	..
Motor Car Co. com	97	100	110	115	..
Motor Car Co. pfd	10	17	96½	100	+ ½
Motor Car Co. com	..	50	..	..	..
Motor Car Co. pfd	..	30	..	..	..
Rubber Co. com	..	90	35	38	..
Rubber Co. pfd	11½	12½	92	95	..
Truck Co	18	19	15	16	— ¼
Car Co	40	50	29½	31	— ½
Electric Co. pfd	51	52	..	..	..
Warner Speed. Corp. com	99	101	66	67½	—1¼
Warner Speed. Corp. pfd	30½	31½	104	106	—1
Weather Corporation com			81	83	+4

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Studebaker Corporation pfd	83	86	99	101	..
Swinehart Tire & Rubber Co	85	87	77	78	..
Texas Company	139	140	132	133	+6
U. S. Rubber Co. com	56	56¾	45	47	..
U. S. Rubber Co. pfd	101	102	103	105	—1½
Vacuum Oil Co	217	220	198	202	+5
White Company pfd	107	110	103	108	..
Willys-Overland Co. com	89	91	137	139	+14
Willys-Overland Co. pfd	94	96	102	103	+1½

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com	..	101	..	92	— ½
Chalmers Motor Co. pfd	94	95½	94½	97	—1
Continental Motor Co. com	..	180	195	..	..
Continental Motor Co. pfd	..	75	82	84	—2
General Motors Co. com	90	92½	187	192	+32½
General Motors Co. pfd	91	94	104	105½	+3¼
Maxwell Motor Co. com	14	15	36	38	+2
Maxwell Motor Co. 1st pfd	43	46	82½	84½	+1
Maxwell Motor Co. 2d pfd	17	19	33½	36	+2¼
Packard Motor Car Co. com	..	112	110	115	..
Packard Motor Car Co. pfd	97	99¼	96¼	..	..
*Reo Motor Car Co	19½	20¼	30	31	+ ½
*Reo Motor Truck Co	12⅛	13	15¼	16	..
Studebaker Corporation com	..	..	81	83	+3¼
Studebaker Corporation pfd	..	..	99	101	+ ½

INACTIVE STOCKS

*Atlas Drop Forge Co	19	..	..	26	..
Ford Motor Co. of Canada	..	..	1350	..	+75
Kelsey Wheel Co	185	..	205	..	..
*W. K. Prudden Co	..	20½	19½	21	..
Regal Motor Car Co. pfd	20	..	..	25	..

BONDS

General Motors, notes, 6s, 1915	100	100¼	..	..	..
Packard Motor Co. 5s, 1916	95	98½	98¼	..	..

*Par value $10; all others $100 par value.

To Continue Briggs-Detroiter

Detroiter M. C. Co. Formed —$48,000 Bid for Plant Refused by Trustee

DETROIT, MICH., July 17—The business of the Briggs-Detroiter Co. is to be continued, according t a statement made by A. O. Dunk, president of the Puritan Machine Co., who purchased the personal property of the bankrupt automobile company in the bankruptcy court July 15. The Detroiter Motor Car Co. has been formed with Mr. Dunk as president and it is said that officials of the new concern are now operating the service, parts and manufacturing departments. Frank M. Eldredge has been appointed advertising manager.

The real estate, consisting of the plant and land, was also offered for sale by the trustee, the Detroit Trust Co., but as only $48,000 were offered, and this was considered too low, the offer was not accepted. It had been provided that the trustee could sell the property for not less than $75,000 without the referee's approval, also that no offer for less than $63,000 was to be accepted without first giving notice to the creditors. A first dividend of 10 per cent is to be paid soon.

In the report furnished by the Detroit Trust Co., receiver for the bankrupt Briggs-Detroiter Co., the details as to the assets of the latter concern are given as in the accompanying table.

The Briggs-Detroiter Co. made and shipped 1100 four-cylinder cars in 1912. 2750 in 1913; 1600 in 1914. While, until it went into the hands of the receiver this year, it had made and shipped 450 four-cylinder cars and 280 eights.

Claims All Mercedes Cars Were Made for War Help

LONDON, ENGLAND, July 19—A statement has been made by a former German prisoner who has just arrived in this city that all German Mercedes cars were built for war help. C. B. Pray, an American automobile mechanic, states that his work up to the time of his arrest brought him into daily contact with the German Mercedes car. The chassis of every car of the 1912, 1913 or 1914 models was perforated at the sides with two sets of four holes each, at equal distances from the front and rear, for the purpose of riveting over the chassis frame a plate heavy enough to bear a weight of 1000 kg.

In May and June, 1914, the cars were called in for inspection and returned with the plates mentioned duly affixed without the owners' knowledge of what had been done. When the cars were requisitioned for war only the tops had to be ripped off and guns and searchlights mounted in their places.

Oldfield Gets Delage Racer

CHICAGO, ILL., July 20—*Special Telegram*—One of three Delage cars built for the 1914 French Grand Prix arrived in Chicago to-day and was turned over by its purchaser, David G. Joyce, chairman of the A. A. A. Touring Bureau, to Barney Oldfield, who will enter at Elgin and fall speedway meets.

Oldfield this afternoon challenged Resta to a 100-mile match race to be run on Chicago Speedway Aug. 7, and posted a $2,500 side bet.

Three Duesenbergs at Des Moines

DES MOINES, IOWA, July 17—Fred Duesenberg, builder of the Duesenberg racing cars, announces that O'Donnell, driving a Duesenberg with 360 cu. in. of cylinder displacement, will go out after a new 100-mile record on a mile track at the formal opening of the new Des Moines Speedway on July 25 when Barney Oldfield, driving a Christy front drive car, will go after records for the 1, 5 and 10 mile distances. Earl Cooper will come to Des Moines with O'Donnell for the July 25 event.

Three Duesenberg cars are entered for the 300-mile event on the new speedway on July 31. Two of the drivers for Duesenberg will be O'Donnell and Alley. Oldfield also is entered in the 300-mile event as well as De Palma. Rickenbacher, may be in the race at the wheel of a Duesenberg since the two Maxwell entries for the event have been withdrawn.

Tent for Indianapolis Show

INDIANAPOLIS, IND., July 15—The Indianapolis Automobile Trade Assn. will use a tent, 150 by 330 ft. in size, for the automobile show at the State fair, Sept. 6.

Assets of Briggs-Detroiter Co. From Receiver's Report

	Book Inventory	Inventory	Appraisal, Going Concern	Appraisal, Liquidation
Real estate	$89,111.36	$89,111.36	$63,500.00	$63,500.00
Materials, supplies, autos, finished and in process	265,825.44	121,135.74	75,000.00	53,024.65
Machinery, tools, equipment	10,623.41	12,980.33	8,179.40	5,333.85
Patterns, dies, special tools, service rights	184,741.52	34,741.52	25,000.00	10,000.00
Office furniture	2,557.97	2,557.97	1,750.00	1,417.80
Accts. and notes receivable	89,977.57	89,977.57	7,500.00	4,448.61
Auto Board of Trade rights	183.34	.....	.....	.....
Capital Body Co. note prepayments	14,000.00	14,000.00	Not appr'd	Not appr'd
	$657,021.61	$364,687.83	$181,112.74	$137,724.91

Stutz Not to Quit Racing

Co. to Enter Three Cars at Elgin—Disapproves of DePalma's Plan

CHICAGO, ILL., July 17—E. C. Patterson of Chicago, backer of Ralp DePalma in his racing campaign, to-day purchased one of the 300-in. cars made by Harry Stutz for this year's contests and driven by Howard Wilcox at Indianapolis and Chicago. Before to-day's deal was consummated, the car was entered in the Elgin road races by DePalma, who has secured Caleb Bragg to pilot it.

The outright purchase of the car by Patterson is the result of a deal in which Stutz offered DePalma the management of the Stutz team. The Italian consented to take over the cars provided he could campaign them with his Mercedes but the Indianapolis maker refused to agree to any such arrangement. The sale of the Stutz to Patterson does not mark the retirement of the Stutz company from racing. It has two cars on hand, one at the factory and the other on the Pacific coast, and is building a third at the present time. All three cars will be entered at Elgin, according to Stutz, and in the fall speedway meets.

1916 Tacoma 1-Day Event with 300 or 350-Mile Race

TACOMA, WASH., July 15—It was decided by the directors of the Tacoma Speedway Assn. at a meeting held July 12 that Tacoma's automobile races for 1916 will consist of one big race of 300 or 350 miles, and the Inter City race, both to be run on one day and with the big sum of $10,500 in prizes for the one main event alone.

After going over the financial results of the recent races the officials expressed themselves as well pleased with the receipts of the races this year.

In addition to deciding upon the one day of racing with the two events, the directors decided to offer an additional cash prize at the end of each 100 miles of the main event to the driver who is leading the race at that time. This is to be done in order to insure a faster race and prevent any possible lagging of the drivers.

The chief reason for deciding upon the one day of racing is that to make speed in the main race many cars are so badly damaged that they cannot compete in the second day's events. The directors wish the Montamarathon to be a race of speed in which the best drivers of the country will put their cars and individual cunning, prowess and endurance.

For the Inter City race the prizes awarded will be separate from those of

the Montamarathon. Dates for the Tacoma races will be fixed at the fall meeting in October of the directors of the Speedway Assn. of America.

It was also decided to put a heavy guard rail about all the curves on the Tacoma speedway before the 1916 races.

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To Hold Circuit of Twenty-five Races

UNIONTOWN, PA., July 15—For the purpose of holding a series of races in Pennsylvania and adjoining States, a number of men, including I. P. Fetterman, A. C. Smith of Pittsburgh, G. B. Gardner of Beaver, and C. W. Johnson of Uniontown, recently attended a meeting held at the Standard Auto Garage, this city, where contracts were signed to give permission for their cars to be entered in every race that will be held by the Automobile Racing Association this season. This association will receive its sanctions from the A. A. A.

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Exposition Automobile Week

SAN FRANCISCO, CAL., July 14—Chas. B. Lewis, who for some time has had charge of some of the exhibits in the automobile section of the Palace of Transportation at the Exposition here, has recently been made president of the Automobile Association of the Transportation Palace P. P. I. E. This association is now making arrangements for an automobile week in September.

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Denver-to-Cheyenne at 41.2 M.P.H.

DENVER, COL., July 17—A new record for the 112 miles between Denver and Cheyenne was established to-day in the road race staged by two Denver dailies with the aid of the Denver Motor Club. The event was an informal unsanctioned contest and was a kind of Denver greeting to the Cheyenne Frontier Day Celebration which opens next week. J. J. Mellwee drove a Hudson six the 112 miles in 2 hr. and 43 min. 29.3 sec., a speed of 41.2 m.p.h. as compared with the old record of 2 hr. and 49 min. Leon Nelson, driving a Metz, was second in 2 hr., 54 min. and 45 sec. The Saxon was third in 3 hr. and 8 min. Twenty-five cars were entered in the contest.

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24-Hours Saxon Parts Service

DETROIT, MICH., July 15—At the dinner given to the Saxon dealers who came here to take part in the economy run and driveaway which was held to-day, factory manager C. C. Cross announced a 24-hr. service on parts.

President H. W. Ford addressed the dealers principally pointing out the importance of economy runs and the facts they demonstrate. Chief engineer R. E. Hale spoke from an engineering point of view about the Saxon car.

The driveaway was pronounced a great success, 105 dealers start[illegible]

Only Passenger Cars in Yellowstone

Regulations Fixed—$5 Fee for Runabouts, $7.50 for 5- and $10 for 7-Passenger Cars

WASHINGTON, D. C., July 17—Complete regulations governing automobiles in the Yellowstone National Park from August 1, the date on which the park will be thrown open to the use of automobiles, have been issued by the Department of the Interior. Only passenger vehicles are admitted, motorcycles not being allowed in the park. Tourists entering the park are required to secure tickets of passage which cost $5 for runabouts, $7.50 for five-passenger cars and $10 for seven-passenger cars. Such fees are charged for each trip through the park. Speeds are set at 12 m.p.h. ascending grades, 10 m.p.h. descending and 8 mi. when approaching sharp curves. On good roads with straight stretches and with no teams nearer than 200 yards a speed of twenty miles is permitted.

Automobiles while in motion must keep 100 yards apart except for purposes of passing other cars which is only allowed on level and straight stretches. Cars must keep their gears in mesh constantly except when changing; in other words, coasting is not permitted.

Horse vehicles are really given the right of way and when teams, saddle horses or park trains approach the automobiles are required to take the outer edge of the roadway regardless of the direction in which they are traveling. In case of road difficulties automobiles will be backed or otherwise handled to permit the horse teams to pass safely. Automobiles must pass animals on the road at not greater than 8 m.p.h.

Schedule by Checking Stations

In order to see that all automobilists using the park do not exceed the speed limit a complete schedule of travel throughout the park has been adopted and a series of checking stations established at the hotels so that the park authorities can determine if an automobile is exceeding the speed schedule, in which case he is fined fifty cents per minute for each of the first five minutes he is ahead of schedule at any point; $1 per minute for each of the next twenty minutes, and $25 fine or ejection from the park or both, in the discretion of the park superintendent, for being more than twenty-five minutes early.

To Test Brakes

All automobilists will be given a preliminary examination of brakes, tires, etc. The brake test will require skidding of the rear wheels on either set of brakes. Gasoline can be secured at regular stations in the park.

In case of accidents to the car on the park roads the cars must be taken off the road, or if this is impossible they must be placed at the outer edge of the road. Cars will not be permitted for use on local trips around Hot Springs formation or other points off the main roads. Horns must be sounded on approaching curves. Automobiles may leave the park by any one of the authorized routes.

—

Beardsley Travels 1500 Miles in 14 Days on 14 Charges

LOS ANGELES, CAL., July 13—Traveling more than 1500 miles in 14 consecutive days on fourteen charges, a stock model Los Angeles-built Beardsley electric has completed one of the most remarkable electric runs ever held in the West. On the entire run, the average was 107½ miles to the charge.

The announcement was recently made by the Beardsley Electric Co., of this city that a stock model brougham would attempt to run 1000 miles in 10 days on ten charges. To show the ease of operation, Mrs. V. S. Beardsley was appointed pilot for the test and the press appointed ten observers, all women, to accompany the car on each day of the run.

In 10 days Mrs. Beardsley had run up a total of 1066.3 miles, every day's run exceeding the 100-mile mark.

—

Racing for South America

NEW YORK CITY, July 21—Automobile racing is to be introduced in several South American cities within a year. A 2½-mile track, it is said, will be built. Plans for a purse of $100,000 for its first race, which is to be over a distance of 500 miles, have been offered. Speedways will be constructed in a number of cities of South America.

—

300-Mile Track Race for Juarez

EL PASO, TEX., July 20—The El Paso Auto Club has applied to the A. A. A. for a sanction for a 300-mile automobile race to be run over the track of the Jockey Club Juarez, in Juarez, Mex., the last week of September.

It is the intention of the promoters of the race to bank the turns heavily so as to make them safe.

Purses aggregating $5,000 will be hung up to be competed for in the several races which, in addition to the proposed 300-mile race, will make up the three-day program now in mind.

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Forty Inter-States a Day

MUNCIE, IND., July 16—The Inter-State Motor Co. to-day manufactured forty cars which is double the capacity of two weeks ago.

"Get Cash, Pay Cash"—Ford

Answers Bankers' Questions on Country Bank Problem as to Automobile Loans

MILWAUKEE, WIS., July 19—Henry Ford told the Wisconsin Bankers' Assn. at its annual convention in Milwaukee, July 13-17, what he thinks of the responsibility of motor car builders to the bankers of the country. In reply to the question, "The Country Bank's Problem As to Automobile Loans," Mr. Ford promulgated a "Get Cash, Pay Cash" slogan and struck straight from the shoulder on a topic which has apparently been of deep concern to bankers of the country since the motor car was first built in quantities.

Does Not Believe in Credits

"You say that you feel automobile manufacturers will soon find it necessary to assist in financing the sale of their product in some such way as the manufacturers of farm machinery are obliged to do," says Mr. Ford's letter. "So far as I am concerned, I have never been able to determine just what is the difference between paying your debts now or putting them all off to some future time. Why should time be extended on farm machinery or motor cars until they are practically worn out, any more than time should be extended on the purchase of horses or cattle? I know that time is extended on cattle where they grow in value themselves, but I do not know of any system whereby horses are purchased on credit and paid for after they are dead or the best part of their usefulness worked out.

"It has always seemed that this putting off the day of payment for anything but permanent improvements was a fundamental mistake.

"The Ford Motor Co. is not interested in promulgating any plan which extends credits for motor cars or for anything else," continues Mr. Ford. "The farmer gets cash for everything he sells, and yet expects to buy everything on credit. The country banks complain about our taking the money out of their districts. The farmers have the habit in many sections of the country of holding their crops for better prices and then they want the farm implement manufacturer and the banks to carry the load while they are waiting for better prices.

"This trouble you speak of seems to be largely due to the farmers themselves, and I can see no reason why they should be encouraged in this. The country bankers should not expect to make more than a reasonable return on their capital and therefore should not expect to carry more loans, whether on farm implements or on motor cars, than their capital and deposits permit. If the country banks want to carry these loans themselves, why not increase their capital stock to enable them to do so? It is my opinion that many of the country banks could sell a good deal of their paper to Milwaukee banks.

"The manufacturer should have cash as well as the farmer. The manufacturer pays out enormous sums in cash for wages and he gets no extended credits on any of his material. The manufacturer cannot pay cash to labor; cannot pay for merchandise in thirty days and extend credits to purchasers of motor cars for months and sometimes years."

The discussion on motor car loans during which the Ford communication was read was one of the most important before the convention. It was brought out that to-day in Wisconsin there is an investment of $70,000,000 in automobiles, 90 per cent of which has been withdrawn from banks, either by withdrawal of deposits, money borrowed or notes purchased. This condition has caused a shortage of capital.

—

Semaphore Traffic Plan Tried in New York

NEW YORK CITY, July 20—A system of regulating traffic by semaphores was tried yesterday in Fifth Avenue between Thirty-third and Thirty-seventh Streets and was pronounced successful.

A semaphore at Thirty-fourth Street regulated similar semaphores on the four other crossings and traffic was permitted to travel first north and south, then east and west for a period estimated as that required for an automobile to travel the five blocks at 12 m.p.h.

A change was made also in the turns and automobiles traveling north and wishing to turn west passed south of the semaphore instead of north after reaching the middle of the street.

—

S. A. E. Could Aid on War Board

NEW YORK CITY, July 21—Automobile engineering circles are widely aroused over the fact that the Society of Automobile Engineers has not been invited to select two members to serve on the proposed naval advisory board which Secretary Daniels is forming, and to which eight engineering societies have been invited to select two delegates each. There is no question but that the S. A. E. could lend valuable aid, particularly in the motor transport work, which is proving to be such a potent factor in the present war. In England the Institute of Automobile Engineers has been a great assistant to the navy and war departments and in America the S. A. E. can lend similar aid. Standardization is a work that is needed and the S. A. E. has demonstrated its leadership in the matter.

Unquestionably the war department will follow the steps of the navy in organizing a war department advisory board and on such a board the automobile engineer would be of peculiar value because of the importance of motor transport not only for troops and commissary, but also heavy artillery, etc.

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Lux Wins Chalmers Sales Contest

NEW YORK CITY, July 19—At the conclusion of the Chalmers Spring Sales Contest yesterday, the most successful sales contest ever conducted by this company, Leo Lux, Chalmers dealer at Wadsworth, Ill., was awarded a five-passenger Light Six touring car, the grand sweepstakes prize. Mr. Lux made the remarkable record of selling 697 per cent of his quota between April 19 and June 30.

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Rajah Plugs on 1916 Cadillac

DETROIT, MICH., July 19—The Cadillac Motor Car Co. has contracted with the Rajah Auto Supply Co., Bloomfield, N. J., for its spark plug equipment for 1916. This means that some 130,000 to 150,000 Rajah plugs will be supplied.

—

Garlent King Factory Manager

DETROIT, MICH., July 19—J. E. Garlent has been appointed factory manager of the King Motor Car Co. and will cooperate with assistant general manager J. F. Siegfried. Mr. Garlent was until recently general superintendent of the Hupp Motor Car Co.

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Stevens-Duryea Parts Business Intact

CHICOPEE FALLS, MASS., July 19—The parts business of the Stevens-Duryea Co. is still intact and the manufacture and sale of parts continue under the management of Wm. M. Remington, Chicopee Falls.

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Rouze Knox Motors Sales Manager

SPRINGFIELD, MASS., July 15—C. F. Rouze has been appointed sales manager of the Knox Motors Associates, the sole distributors of the products of the Knox Motors Co. Mr. Rouze succeeds H. F. Blanchard.

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Drumpelmann with Chalmers

DETROIT, MICH., July 20—The Chalmers Motor Co. has appointed W. J. Drumpelmann as its Eastern district manager. Until quite recently Mr. Drumpelmann was with the Olds Motor Works, Lansing.

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Wilcox with Republic Truck

DETROIT, MICH., July 19—G. D. Wilcox, for 4 years advertising manager of the Regal Motor Car Co., has become advertising manager of the Republic Motor Truck Co., Alma, Mich.

Factory Miscellany

To Manufacture Accessories. — The Fitzgerald Noble Co., Richmond, Cal., is to build a factory to manufacture automobile accessories.

McCurdy to Make Tractors—W. H. McCurdy, president of the Hercules Buggy Co., Evansville, Ind., will organize a new concern for manufacturing farm tractors.

To Make Tops—The National Limousine Top Corp., Buffalo, has leased factory premises at 41 Letchworth Street, and is equipping it for the manufacture of automobile tops, etc.

Burd Increases Factory—The Burd High Compression Ring Co. is beginning the installation of machinery in an additional new factory building, containing 30,000 sq. ft. of floor space.

Standard Tire Begins Plant—The Standard Four Tire Co., Keokuk, Iowa, of which W. J. Richards is general manager, is about to begin construction of a factory for the manufacture of tires.

Rands' $20,000 Addition—The Rands Mfg. Co., Holden Avenue, Detroit, Mich., manufacturer of windshields, has awarded the contract for the construction of a three-story concrete addition to its plant, to cost $20,000.

Ford Band Goes to the Coast—The Ford motor band, consisting of fifty-five skilled musicians, left for an extended tour to the Pacific Coast on July 20. Every member of this band is on the factory payroll of the Ford Motor Co., and this transcontinental tour to the San Francisco and San Diego expositions is complimentary.

Service Gear & Machine Co. Incorporated—The Service Gear & Machine Co., Reading, Pa., was recently incorporated in the State of Pennsylvania for $20,000. The company is manufacturing parts for service stations and parts jobbers, and makes a specialty of manufacturing transmission gears, bevel gears, axle shafts, piston pins, etc.

Wadsworth Buys Land—The Wadsworth Mfg. Co., Detroit, Mich., recently organized with a capital stock of $250,000, has purchased a large tract of land on Jefferson Avenue, on which the company will erect a modern four-story factory, 240 by 260 ft. The firm manufactures and sells automobile tops, bodies and accessories.

Herbrand to Add—The Herbrand Co., Fremont, Ohio, will build a $20,000 addition to its plant. An enlargement of the factory has been made necessary by large orders for automobile parts from the Ford Company of Detroit and other concerns. The company is so rushed with orders that a three-shift working schedule has been adopted.

To Make Gasoline Device—The Stephan Mfg. Co., Freeport, Ill., has been incorporated and will sell automobiles and accessories. Fred Rice is president; Howard Rice, vice-president; A. M. Stephan is secretary, and Mrs. B. B. Stephan, treasurer. A gasoline saving device, invented by Secretary Stephan will be manufactured and distributed.

Atlas Foundry to Build—The Atlas Foundry Co., Detroit, Mich., manufacturer of castings for automobile parts, will erect a large factory on Artillery Avenue, to be 270 by 85 ft., and of steel frame construction, at an estimated cost of $25,000. The foundry will be equipped with a traveling crane of five tons capacity, and other modern improvements.

McGraw Tire Adds—Expansion of the business of the McGraw Tire & Rubber Co., East Palestine, Ohio, will mean the employment of probably 1000 more people. The company has asked the Municipal Council to vacate several streets in the vicinity of the plant, so that large additional buildings may be erected. The company is composed of local and Pittsburgh men.

Hartford Machine Leases Plant—The Hartford Machine Screw Co., Hartford, Conn., has leased the brick plant formerly occupied by the Hartford Dairy Co. and more recently by the Pratt & Cady Co. Alterations are now being made and will be completed about the middle of August, at which time the company will move in new machinery for light manufacturing. The building is of brick, two stories and basement, and comprises 48,000 sq. ft. of floor space.

To Make Steel Specialties—Howard Mann, who recently purchased the abandoned Burrell factory in Bradley, Ill., has commenced the manufacture of steel specialties for automobiles. The old plant has been improved and altered, 10,000 sq. ft. of concrete flooring being laid. Mann has contracts amounting to $50,000, which will take the output of the first year. New machinery has been installed at an expense of $3,000. A new line which may be added later will give employment to 150 additional men.

Pittsfield Coil in New Plant—The Pittsfield Spark Coil Co., Dalton, Mass., has secured a brick factory, three stories and basement, in Pittsfield, Mass., the city where the company originated twelve years ago, and will move the plant to the new quarters immediately. All correspondence, inquiries and orders hereafter should be sent direct to the Pittsfield Spark Coil Co., Pittsfield, Mass., to avoid delay, or ordered from any of the branches of the Western Electric Co., who are the distributing agents of the Pittsfield Spark Coil Co.

The Automobile Calendar

[illegible].....	Des Moines, Ia., Speedway 300-Mile Race.
[illegible].....	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
[illegible].....	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
[illegible].....	Elgin, Ill., Road Races.
[illegible].....	Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
[illegible].....	Peoria, Ill., Second Northwestern Road Congress.
[illegible].....	Minneapolis, Minn., Track Race; Twin City Motor Speedway Co.
[illegible].....	Providence, R. I., Speedway Race; F. E. Perkins.
[illegible].....	Indianapolis, Ind., Show, Indiana State Fair.
Sept. 8-11.....	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13.....	Oakland, Cal., Pan-American Road Congress.
Sept. 17-18.....	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18-25.....	Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25.....	San Francisco, Cal., International Engineering Congress.
Sept. 24.....	Indianapolis, Ind., S. A. E. First Section Meeting.
Oct. 1-2.....	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....	New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 3-10.....	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 11-12.....	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 16.....	Chicago, Ill., 300-Mile Race.
Nov. 18.....	Arizona 150-mile Grand Prix.
Dec. 31.....	New York City, Show; Grand Central Palace.
Jan. 22, 1916....	Chicago, Ill., Show; Coliseum.
March 4-11.....	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in  the Industry

White in Vulcanizing Business—C. E. White, owner of the Model Vulcanizing Works at Flower and Twelfth Streets, Los Angeles, Cal., has formed a partnership with H. H. Holmes and opened a tire house and vulcanizing plant at 912 South Olive Street, doing business under the name of the Olive Vulcanizing Works.

Fishleigh Joins Los Angeles Apperson—W. T. Fishleigh, until recently at the head of the automobile department of the college of engineering at the University of Michigan, has been appointed head of the technical department of the Los Angeles Apperson branch, which controls the entire California, Arizona and Nevada territory.

Take on Grant Six—Ralph Jernberg and F. E. Wheeler have formed a company to handle the Grant six at Worcester, Mass., with salesrooms at 18 Wellington Street. Mr. Jernberg was formerly with J. C. Harvey, Worcester agent for the Haynes, and Mr. Wheeler was a member of the sales force of the Grant company of Boston, Mass.

MacDonald Gets the Jackson—J. A. MacDonald, who resigned as president of the Providence Motor Car Co., Providence, R. I., the company having temporarily left the automobile business, has taken on the agency for Jackson cars in Rhode Island. He is making his headquarters at the Broadway Garage on Dean Street. The Providence Motor Car Co. will continue its tire business at a new stand on Empire Street.

Garage

Grand Rapids Station Opens—The Peck Auto Sales Co., Studebaker agent, Grand Rapids, Mich., has opened its new service station and repair shop, Island and Ionia Avenues.

Des Moines Co. Moves—The Leachman-Claiberne Co., Des Moines, Iowa, will move this fall from its present location at Eighth and Mulberry Streets to new quarters at Eleventh and Locust Streets.

Decatur Garage Opens.—B. H. Asher and A. L. Arnold have opened a new garage and repair shop in Decatur, Ill., specializing on the Ford. The firm has leased the building at 712 North Broadway.

Cal. Chalmers' Territory Expands—The L. H. Rose-Chalmers Co., recently established in San Francisco, Cal., to distribute the Chalmers, has opened on automobile row. The company has established sales and service branches in San Francisco, Oakland and Sacramento.

Motor Men in New Roles

Kelly Fisk Mgr.—D. B. Kelly has been appointed manager of the Louisville service station and repair shop of the Fisk Rubber Co., 941 Third Street.

Bragg Makes Change—F. L. Bragg, formerly retail sales manager of the Overland-Connecticut Co., has accepted a similar position with the J. H. Stuart Co., Burlington, Vt., Overland distributor.

Formigle Resigns—O. L. Formigle has severed his connections as assistant engineer of the Sheldon Axle & Spring Co., Wilkes-Barre, Pa., and will spend the summer at his home in Haddon Heights, N. J.

Rock Starter Inventor.—G. L. Rock, owner of the Jonesville Garage, Jonesville, Mich., has invented an automobile self starter and may interest local and Detroit people in promoting a company to manufacture the starter there or in Detroit.

Cadwell Sells Master Carbureter Interests—C. J. Cadwell has sold out his interests in the Master Carbureter Co. and is now connected with H. A. Miller of the Harry A. Miller Mfg. Co., Los Angeles, Cal., which will shortly bring out a new carbureter.

Canavan Sales Mgr.—J. J. Canavan, former member of the firm of Vance & Canavan, and controlling the agency for the Cartercar and Case lines in southern California and Arizona, has been appointed sales manager of the Pioneer Commercial Auto Co., Los Angeles, which has the southern California territory for the White.

Wiese Returns to Tire Business—J. F. Wiese of Los Angeles, Cal., has returned to the tire business. He has retired from the Winton branch and has formed a partnership with J. G. Boss, formerly in the tire business in Denver. Operating under the name of Boss & Wiese, a tire and repair business has been opened at 723 South Olive Street.

Donovan Baltimore Studebaker Mgr.—F. B. Donovan, Inc., has taken over the agency of the Studebaker in Baltimore. Mr. Donovan comes from Boston and is treasurer and general manager of the new company. A model service garage will be established with E. R. Maurer, formerly of the New York branch of the Studebaker agency, in charge.

Kalman Heads St. Paul Co.—The Twin City Motor Car Co., with quarters in St. Paul and temporarily at 719 Hennepin Avenue, Minneapolis, has elected the following officers: President, P. J. Kalman; vice-president and treasurer, J. P. Upham; secretary, W. G. Graves; sales manager, J. R. Histed; manager wholesale department, W. P. Abbey. A new building is being erected at Harmon Place and Willow Street.

Corson Back in Business—H. E. Corson, who retired from the automobile business last October after fourteen years of it in Springfield, Mass., where he had organized an agency and handled Ford cars, has gone back into the field again. He has formed the Corson-Berry Co. to handle the Studebaker line there, with headquarters at Winchester Square, State and Sherman Streets. John Mullarky, Jr., for ten years with Mr. Corson, has charge of the service department, and W. I. Stearns, Jr., until recently manager of the Blue Ribbon Garage, is outside salesman.

Cowan Sales Mgr.—W. K. Cowan, pioneer automobile dealer of Los Angeles, has been appointed sales manager of the William R. Ruess Co., distributor for the Mitchell and Stearns-Knight lines throughout southern California, Arizona and Nevada. Cowan took up the Waverley Electric in this territory in 1899. In 1902, when the first single cylinder Rambler car came out to the Pacific Coast, Cowan took on the agency and pioneered the automobile row there. Cowan continued to handle the Jeffery products until last fall, when he sold his interests and retired on account of ill health; but after a vacation he could not remain out of the industry and accepted the appointment at the head of the Ruess organization, succeeding J. H. McDuffie, who is now sales manager for the new Willys-Knight.

Dealer

Auto Parts to Enlarge—The Auto Parts Co. of Chicago, Ill., will enlarge both its radiator and top departments.

To Mfr. Pistons—E. W. Wridgway will manufacture the Zephyr pistons for automobiles under the name of the Wridgway Co., Wilkes-Barre, Pa.

Chicago Cole to Build—The Cole Motor Car Co., 2326 Indiana Avenue, Chicago, will erect a three-story service building, 50 by 161 ft., to cost $40,000.

Iowa Supply Co. Adds—The Iowa Auto & Supply Co., Des Moines, Iowa, will build a $10,000 addition to its plant. One floor of space of 9000 sq. ft. will be provided.

VOL. XXXIII NEW YORK—THURSDAY, JULY 29, 1915—CHICAGO No. 5

The AUTOMOBILE

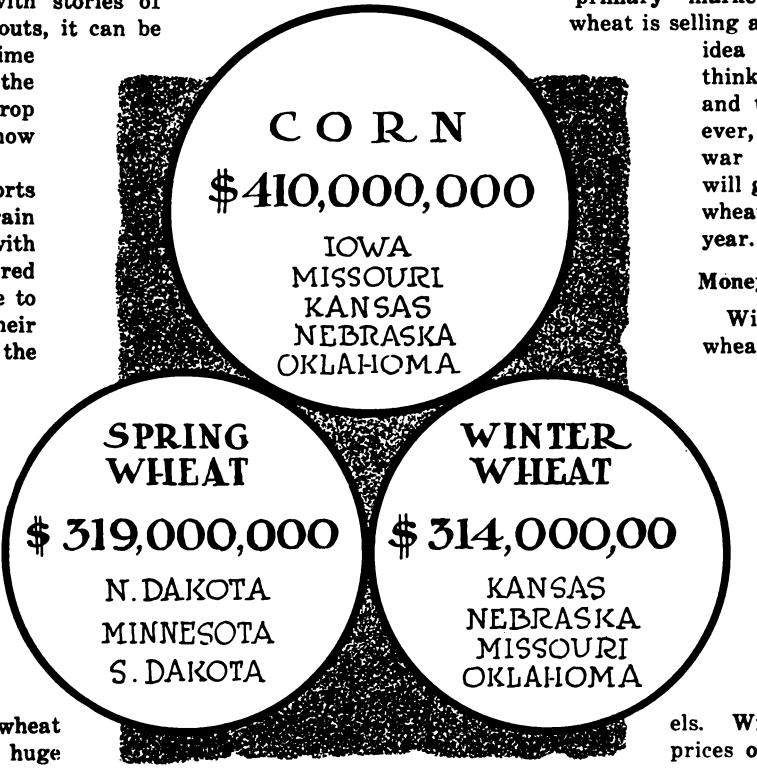
$1,058,000,000 from Crops in Valley West of Mississippi

KANSAS CITY, MO., July 21—Corn, spring wheat, and winter wheat, are the big three factors in determining the automobile buying possibility of the great agricultural plains west of the Mississippi, from Texas to the Northern boundary, and embracing Missouri, Kansas, Oklahoma, Nebraska, Minnesota and North and South Dakota.

From these States alone conservative estimates place the crop value for this year at $1,058,000,000, this total embracing only, at a sane market value, corn, spring wheat, and winter wheat.

As the automobile buying possibilities of these States are so largely dominated by the farmer, the crop value can be taken as a fair criterion of what automobile sales will be during 1916, and in spite of the almost daily reports of rain in these States, attended with stories of flooded farm land and washouts, it can be emphatically stated at this time that there is no danger to the great ready-money wheat crop which the Central West is now harvesting.

For days the market reports have contained reports of rain and flood, and men familiar with market conditions have feared the farmers would be unable to get into the fields for their harvesting. But Kansas, the biggest of all the winter wheat States, is three-fourths through; Oklahoma has practically finished and harvesting is proceeding in Nebraska; Missouri has fared about the same as Kansas. Grain men on the Kansas City Board of Trade who study crop conditions as closely as the market quotations themselves, are satisfied that the big four winter wheat States will have another huge crop, while the reports from the spring wheat States of the Northwest are equally encouraging. The rains in the Southwest will have some effect in shortening the crop, but nothing like what was feared if the rains kept up.



Good Wheat Prices

The Turkish forts still hold at this writing and if they should fall, it is believed by the grain men generally, that the price of wheat would be very little affected by the opening of the Dardanelles to Russian grain. There might come a quick drop, as was the case at the beginning of the attack, but they believe the market will go up again.

Cash wheat, of which there is very little now, is worth on the farm $1.10 to $1.40, depending on the distance from the primary market. For future delivery wheat is selling at $1.10, which gives a fair idea of what the wheat buyers think of the size of the crop and the war conditions. However, it is probable that if the war keeps going the farmers will get as good prices for their wheat this year as they got last year.

Money for Automobiles

With three-fourths of its wheat harvested, it is now estimated that Kansas will produce close to 135,000,000 bushels of wheat. This is 40 per cent larger than any previous crop except the one of last year when the State produced 180,000,000 bushels and sold it at its greatest price, from 90 cents to $1.40, depending on the time of sale. The average wheat crop in Kansas is 70,000,000 bushels. With the wheat at the war prices of last year, Kansas would

get from $130,000,000 to $190,000,000 for its wheat crop.

Imagine between $130,000,000 and $190,000,000 brought into a State largely from Europe, to pay the farmer for something that he has created. A ready-money crop with which the farmer may buy what he chooses!

70,000,000 Bushels in Nebraska

While Kansas is the greatest of the winter wheat States, Nebraska this year will produce 70,000,000 bushels on the July estimates. Missouri will have 37,000,000 bushels, a slight decrease over May estimates and Oklahoma will have 44,000,000 bushels. While Oklahoma will fall about 6,000,000 bushels below a normal wheat crop, Missouri will go as much over its normal crop. This means from the big four wheat States, 286,000,000 bushels of wheat this year. At the present quotation for September delivery this means $314,000,000 cash for this crop. If the war is on when the delivery of wheat begins in September, prices equal to last year's will be no surprise and they may go higher. At last year's war prices the crop of these four States will bring $400,000,000, all cash, which ought to be good news for the motor manufacturers with their increased output this year. While the rains have been heavy in the grain States in a season when the farmers needed dry periods for their work in the fields, the downpours offset the loss from the chinch bug which were doing great havoc.

Spring Wheat Reports

Reports from the spring wheat States of the Northwest are equally encouraging. The big three, North Dakota, Minnesota, and South Dakota, report good growth, and while the crop, of course, will not be harvested until some time after the winter wheat crop, there is every reason to look for a big crop, both on account of acreage, and the spring rains. The rains have not been so frequent in the western part of South and North Dakota. Nebraska has of late years become almost entirely a winter wheat State, but this year it will have the usual amount of spring wheat. The outlook in the spring wheat States based on the acreage is:

STATE	ESTIMATED ACREAGE	ESTIMATED BUSHELS
North Dakota	8,000,000	106,000,000
Minnesota	4,500,000	65,000,000
South Dakota	3,750,000	53,000,000
Nebraska	300,000	4,000,000

This makes a total of 228,000,000 bushels of spring wheat, worth at war prices $319,000,000. That gives in the spring and winter wheat States this year and fall $719,000,000 in cash from outside sources.

Corn Is Backward

The July indication for corn in the corn belt of the grain States indicate a good corn crop this year. The rains, while so frequent in many sections that they have prevented cultivation, have given the corn a fine growth and the weeds can be pretty well taken care of in the next two weeks. From the July reports of corn conditions these estimates can be made of the crop outlook for these States, the principal corn States:

STATE	1914 CROP, BUSHELS	NORMAL CROP, BUSHELS	ESTIMATE FOR 1915, BUSHELS
Iowa	389,000,000	400,000,000	306,000,000
Kansas	108,000,000	175,000,000	96,000,000
Missouri	158,000,000	200,000,000	183,000,000
Nebraska	175,000,000	200,000,000	156,000,000
Oklahoma	50,000,000	100,000,000	80,000,000

This is a total of 821,000,000 bushels of corn in the five big corn States west of the Mississippi River, a crop that will sell from 50 to 75 cents a bushel, bringing from $410,000,000 to $615,000,000 if sold for shipment. However, these States feed their corn and sell their livestock so that the return is much greater. Wars do not generally affect the price of corn except in that it affects the price of meat.

The other field crops of the West are doing well. The alfalfa of Kansas alone this year will make a $15,000,000 crop. The value of these crops will mean that the farmer will have less need of his wheat money in taking care of actual living expenses. The grain States of the Mississippi Valley may all be judged from the condition of Kansas, which raised nearly half of the winter wheat in the western States.

Automobile Increase 442 Per Cent

It is of unusual interest to note the way in which motor car sales have increased in Kansas, which represents probably more than any other State the farmer himself. Since 1910 the increase of automobiles in the State has been 442 per cent. The increase for the whole United States has been in the same period 240 per cent. Of the States that have 20,000 motor cars in use, Kansas's percentage of increase has been exceeded by only one State, Minnesota, great in spring wheat and dairy products.

This increase by years from 1910 shows:

March, 1910	9,301	Gain
March, 1911	14,456	5,115
March, 1912	18,625	4,139
March, 1913	24,794	6,169
Jan. 1, 1914	34,945	10,151
Jan. 1, 1915	50,454	15,509

Cars in Kansas

The survey of the automobile users in Kansas serves as a lesson in what the farmer means to the automobile industry. Kansas has only one large city, Kansas City, Kan., and that city has less than 100,000 population. The other cities of the States are county seat towns, mostly running from 1000 to 5000 population. There are two or three exceptions, Topeka, Leavenworth, Wichita, Atchison and Hutchinson, but with the exception of Topeka all represent the farmer and all live from the farmer's products. A survey of the industry in the State shows that where the towns are smallest the number of persons per car is likewise smallest.

Twenty-two Persons per Car

Pawnee county in the central part of the State, where wheat rules, has 547 cars with an average of only fourteen persons to the car. Almost as good a showing is made in Edwards and Lincoln counties with an average of fifteen persons per car each. Such thickly settled counties as Barton and Reno show averages of twenty-two persons per car each. And in Barton county are several small towns and in Reno the town of Hutchinson with a population of 16,000.

75,000 Cars Possible

It is impossible to give the figures of every county in the State with the number of cars and the number of persons per car, also showing the remarkable way in which the average of persons per car is going down. The moral, of course, is that where there are twenty-two persons per car in a county filled up with average sized farms, some small towns and a city the size of Hutchinson, every other county in the State, barring possibly the counties with towns of more than 50,000, can be made to have as low a percentage. This means that Kansas with a population in 1914 of 1,672,106 could be showing the use of 75,000 automobiles without difficulty and if the lowest present percentage of any county in Kansas were reached over the entire State, the number of cars in use would be 111,474, more than twice as many as are in use at present. And is there any reason why a rich Kansas county should not have as few persons per car as a county that is poorer in wealth which is the case in a third of the 105 counties of the State?

New Four Heads Jeffery Production List

Is Larger, More Powerful and Better Engineering Than Previous Model and Sells at Far Lower Price—Two Sixes Practically Unchanged Though Prices Are Lower

INCREASED production and clever engineering are factors in the success of the Thomas B. Jeffery Co., Kenosha, Wis., in bringing a car listing at $1,550 in 1914 down to the $1,000 class in price while at the same time making its details of construction and general appearance far in advance of the earlier, more expensive car.

The answer of the Jeffery company, Kenosha, Wis. to the appeal of the buyers, is a standard four-cylinder, seven-passenger car at $1,035 or the same car without extra tonneau seats at $1,000. This car uses the same motor as the $1,275 four of 1915, but the refinements and changes made in the chassis and the substitution of an entirely new body make it stand out as a new vehicle built to the demands of the American purchaser and sold at a price within his means.

Jeffery's new four will head the factory production list but as trailer there is the Jeffery six at $1,350, which in the 1915 season was called the Chesterfield and listed at $1,650. The six has been changed little, so little in fact that the maker has laid no stress on the refinements, making more striking the importance of the four.

Larger Than Previous Four

While the car has been reduced $275, it is larger than the previous four, it is more powerful and a better hill climber, shows better fuel economy, is easier to handle and on the whole is a better vehicle and will be heralded as such by those making a comparative design study. In general it has a 3¾ by 5¼ block motor, disk clutch, three-speed gearset, and semi-floating axle. The wheelbase is 116 in. and tires 34 by 4.

Three varieties of changes have been made, those resulting in better performance, greater stability and better appearance.

Under the first head comes the motor changes, which outlined briefly are: a change from separate gearset to unit power plant construction, alterations in carburetion, ignition, and the adoption of a new Bijur two-unit cranking and lighting system. The camshaft has been redesigned, the crankcase changed in material and appearance and the cooling system has been gone over.

Also under performance changes comes the new clutch which is fitted with a brake, longer rear springs, a new gearset of the three-speed type instead of four and behind it the emergency brake. The whole driving system is new from flywheel to axle.

The changes tending to greater stability of the mechanism are seen in the use of different metals in various places. The crankcase, for example is of cast iron instead of aluminum. The weight of the car has been reduced and there has beer a re-proportioning of sprung to unsprung weight.

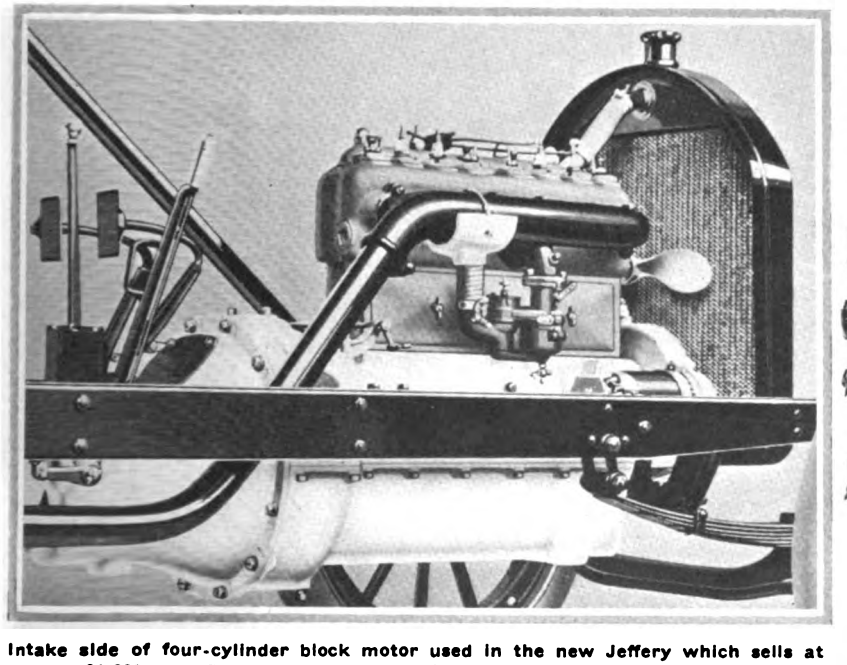
The appearance changes are apparent. The body is a cleverly laid out one of new lines, with new equipment and much roomier than the older one.

In the motor there are not so many changes as elsewhere but even though few they are quite important.

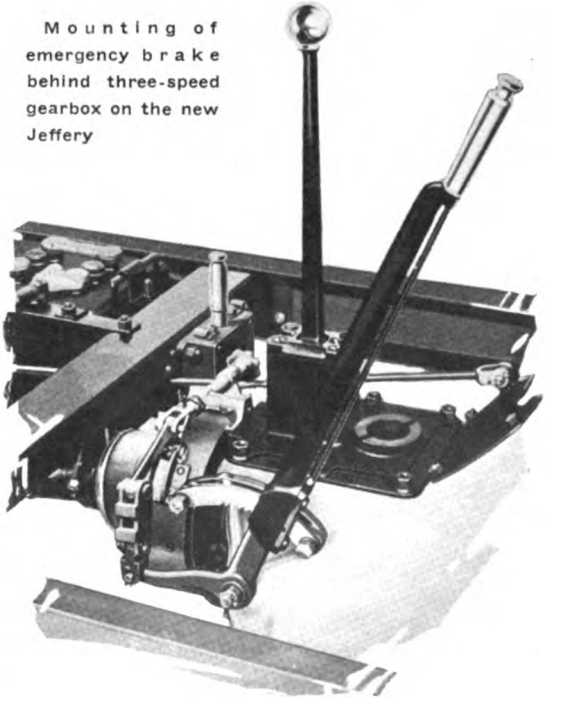
The cylinder dimensions, 3¾ to 5¼, are the same as before but the power, especially for hard pulling such as hill-climbing work, has been increased by using a new camshaft with different-shaped cams and these placed so as to change the valve timing as follows:

	1916	1915
Inlet opens	12 degrees late	18 degrees late
Inlet closes	46 degrees late	46 degrees late
Exhaust opens	46 degrees early	47 degrees early
Exhaust closes	12 degrees late	15 degrees late

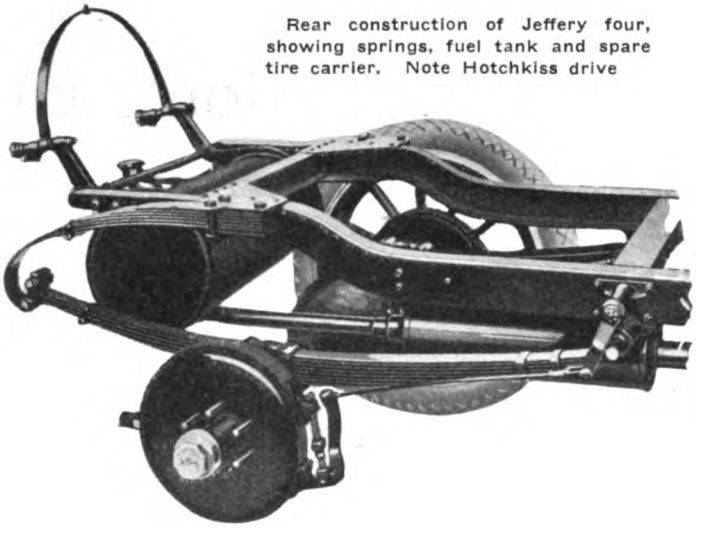
With the change in camshaft design the push rods now are of the mushroom type instead of roller as previously. All



Intake side of four-cylinder block motor used in the new Jeffery which sells at $1,000 as a five-passenger and with extra tonneau seats at $1,035



Mounting of emergency brake behind three-speed gearbox on the new Jeffery



Rear construction of Jeffery four, showing springs, fuel tank and spare tire carrier. Note Hotchkiss drive

of this has been done to get a better effective valve opening and to give more snap to the engine on hill work and rough going.

A power addition also has been obtained, and with it a slight increase in fuel economy, by joining the inlet and exhaust manifolds; that is, having them become integral at one point. This means that the heat from the exhaust manifold is imparted to the inlet and hence better vaporization is obtained. The carbureter, which is on the right side, is new, being a type K Stromberg, and mounted in a better position. It is slightly higher and feeds through cored passages which have been smoothed and straightened out so as to increase the speed of the ingoing gases. The carbureter now is fed from a Carter fuel tank by gravity instead of by pressure.

The exhaust manifold now attaches to the exhaust pipe without flange and bolts, the joint being a pinch fit. This makes a better joint, a simpler one and one which will not cause leakage so readily.

On the left side of the motor a change is apparent. The Folberth pump which used to be driven from the water-pump shaft has been removed and now is on top of No. 4 cylinder. The magneto also driven by the water pump shaft now is a Bosch NU4 instead of a Bosch duplex and, by the way, this is the only source of ignition. The removal of the tire pump has allowed of the magneto being placed a little more forward and in a more accessible position.

The valves are still of Rich tungsten steel but the springs have fewer convolutions and have lighter tension so as to work better in conjunction with the mushroom followers. Now that the lift is not so abrupt, these changes give better valve opening and closing and hence better performance at the higher speeds.

New Aluminum Fan

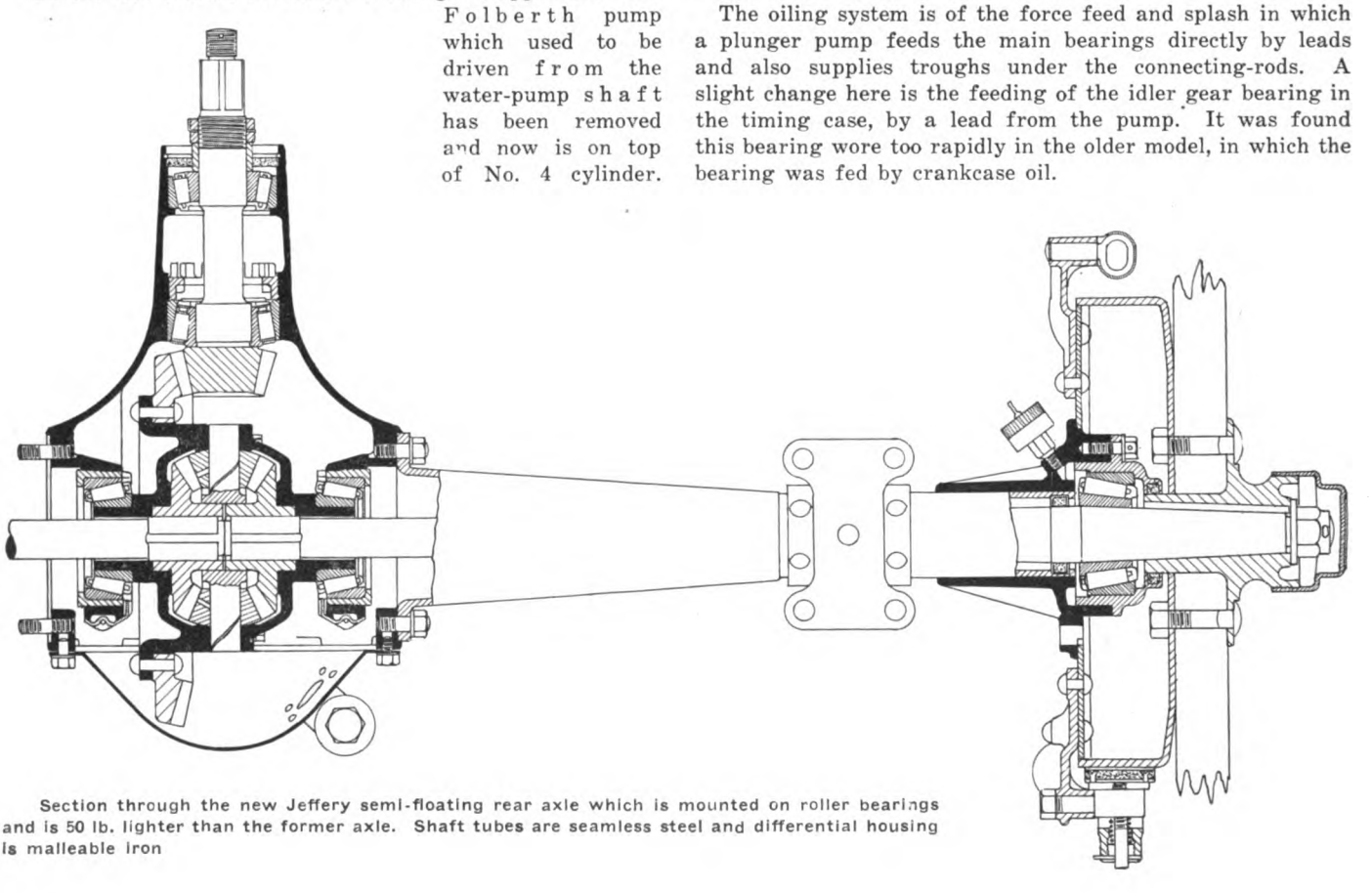
In the cooling system there is a new two-blade, aeroplane-type fan made of aluminum instead of the former pressed-steel, five-blade type. This change has saved a little weight and the new fan gives a greater air draught and working in conjunction with a new radiator gives better all-round cooling efficiency. The radiator is a new tubular type of 8 gal. capacity instead of 9, it is 25 lb. lighter in weight when filled and has greater cooling area. This radiator is made by the National Can Co. while the former one was made in the Jeffery shops.

The crankcase upper half now is of cast iron instead of aluminum the change having been made to save money and make a more rigid construction. The crankcase cover still is of aluminum. Also, there is a new form of bell housing to accommodate the clutch and gearset which was not the case before.

Few Motor Changes

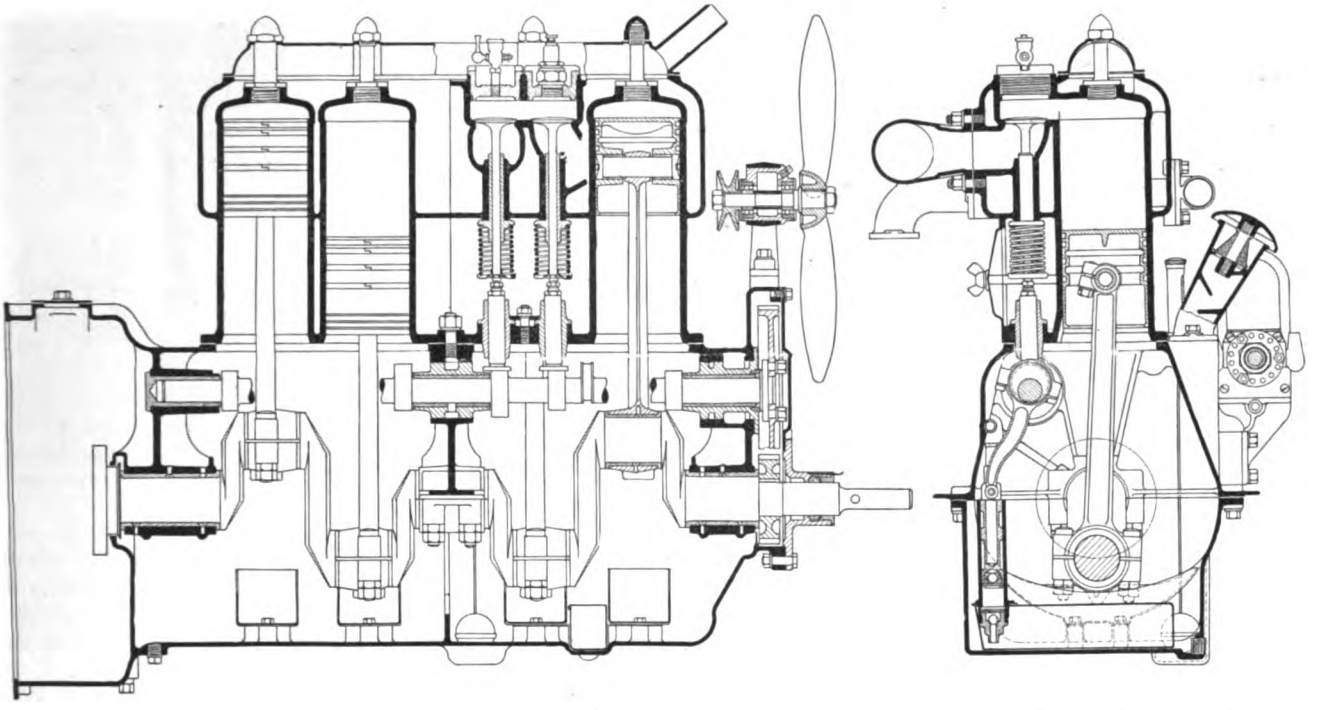
In the interior, the motor has not been changed much. The crankshaft is a 2-in. with three bearings of the following sizes: front, 3¼, center, 3¼, end, 4½. The pistons and rods remain the same and show nothing out of the ordinary. The piston weight is 3 lb. 9½ oz., including pin and rings, the piston length, 4-38 in. and the pin diameter, 15-16 in. The rings are a step-joint type. The connecting-rods weigh 4 lb. 10 oz. and are 12¼ in. center to center.

The oiling system is of the force feed and splash in which a plunger pump feeds the main bearings directly by leads and also supplies troughs under the connecting-rods. A slight change here is the feeding of the idler gear bearing in the timing case, by a lead from the pump. It was found this bearing wore too rapidly in the older model, in which the bearing was fed by crankcase oil.



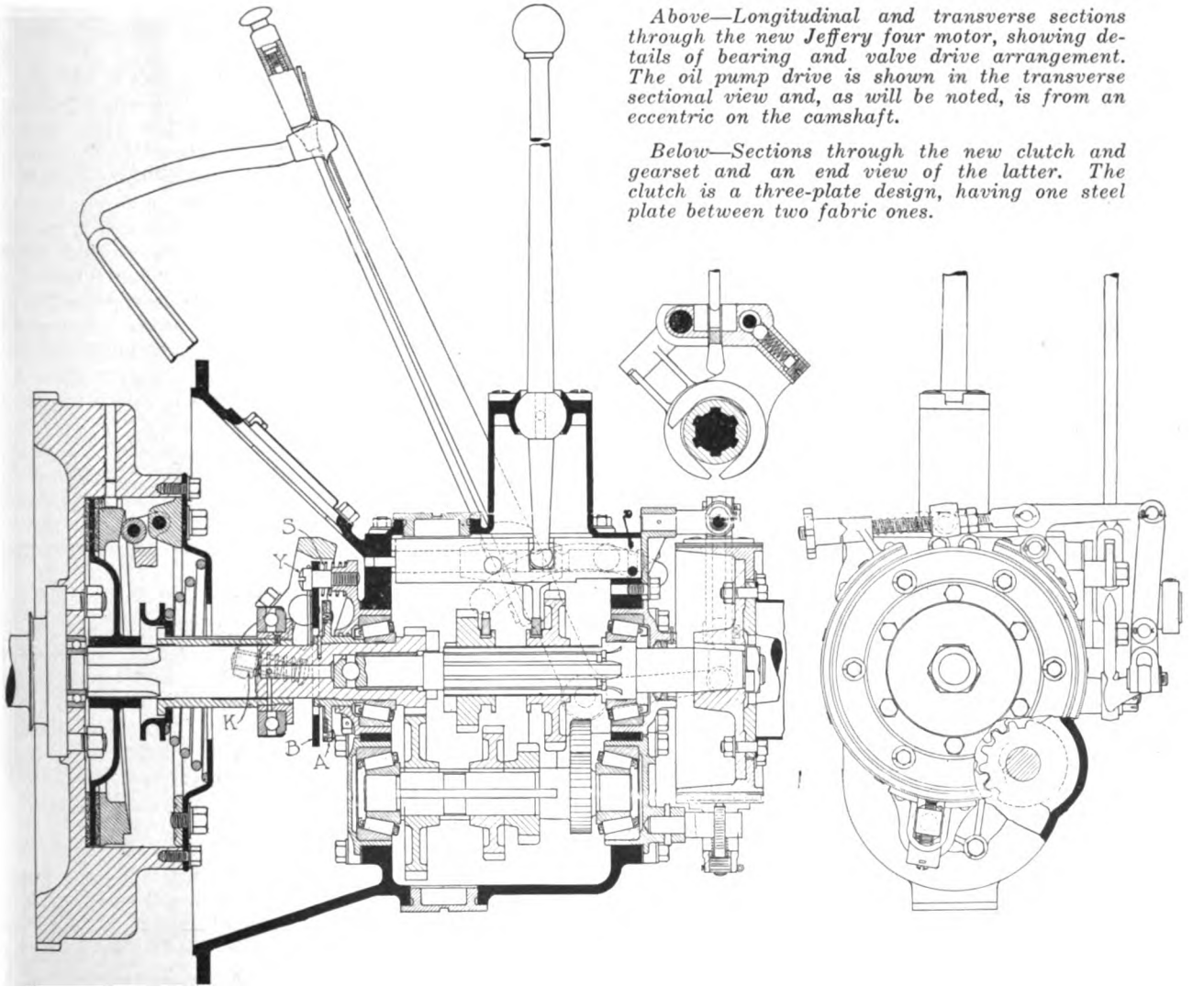
Section through the new Jeffery semi-floating rear axle which is mounted on roller bearings and is 50 lb. lighter than the former axle. Shaft tubes are seamless steel and differential housing is malleable iron

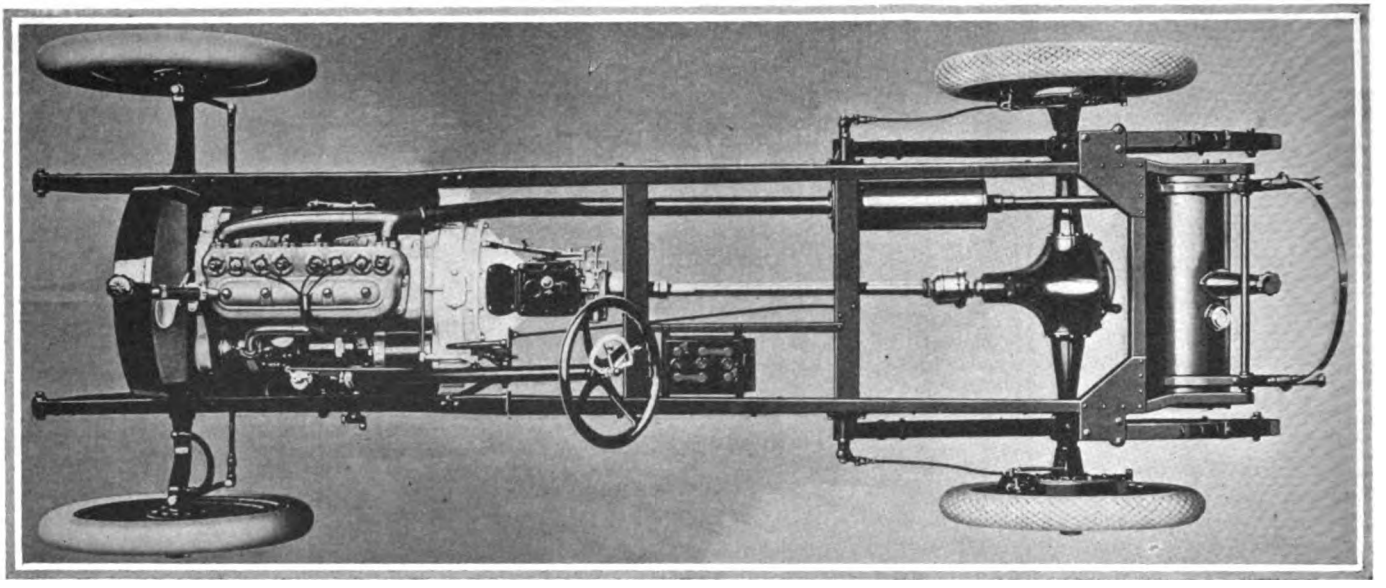
Features of the New Jeffery Four



Above—Longitudinal and transverse sections through the new Jeffery four motor, showing details of bearing and valve drive arrangement. The oil pump drive is shown in the transverse sectional view and, as will be noted, is from an eccentric on the camshaft.

Below—Sections through the new clutch and gearset and an end view of the latter. The clutch is a three-plate design, having one steel plate between two fabric ones.



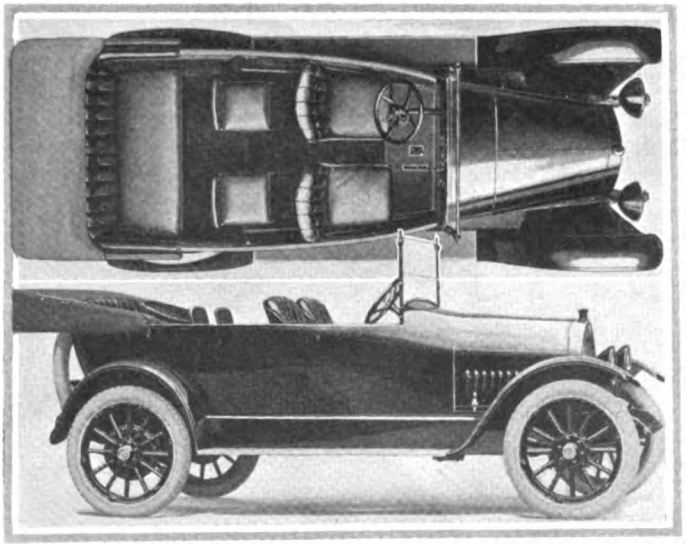


Plan view of the new Jeffery four chassis, showing strong, compact layout of the various units

In changing from the flywheel type of cranking and lighting system to the two-unit Bijur there has been made a saving in weight and power. The new system uses a U. S. L. 6-80 battery instead of a 6-12 volt 100, the smaller battery doing the necessary work in causing the starting motor to turn the engine over at 160 r.p.m. The old motor was turned at 250 r.p.m. which Jeffery engineers thought was too much, requiring too much current and showing no better results than the present system. The former starting system weighed 250 lb. including battery and this one weighs only 86 lb. with battery.

Operation of Bijur System

In the Jeffery application of the Bijur system the generator is driven from the timing gears on the right side and operates at one and one-half times motor speed. The regulation is inherent and it starts charging the battery at about 8 m.p.h. The cranking motor is on the left side and meshes with the flywheel by means of a mechanically shifted pinion. Pressure on the starting pedal causes the pinion to slide into mesh with the flywheel and at the same time connection is made with the battery so current flows through the starting motor. The reduction of cranking motor to engine is 11.6 to 1.



Plan and elevation of the four-cylinder, seven-passenger Jeffery touring car for 1916

With all of these changes, the Jeffery motor shows a higher revolution per minute than the former one and more power at that speed. On the test block it gives about 40 hp. at 1900 r.p.m. and it is stated it will run over that figure without reaching the peak of the curve.

The influencing factor in changing from separate gearset to unit power plant has been ease of assembly but there are others such as accessibility and cost reduction which have played a part.

The new clutch is a three-plate dry-disk with one steel plate and two faced with fabric. In connection with this clutch, which supplants the cone of last year, is a clutch brake of simple construction. As shown in the illustration herewith the main shaft has threaded to it the plate *B* which has fabric facing on a portion of its surface. Behind this plate is another spring backed plate *A* which is mounted so that it can slide freely on the bolts *Y*, of which there are three, spaced 120 deg. apart. In the clutch throwout collar *R* are two pins *K*. When the clutch is dis-engaged the throwout collar moves backward as shown by the arrow and after traveling a certain distance the pins *K* touch the plate *A* causing it to move forward and rub against plate *B* thus stopping the main shaft from rotating, and so stopping the clutch from spinning.

The clutch as a whole, gives better throttling performance than the former cone type and makes a better installation now that a unit power plant is used and the flywheel type generator removed. A feature of this clutch, which will appeal to the owner is that it may be adjusted for slipping, in 2 min.

New Three-Speed Gearset

Behind the clutch is a new three-speed gearset made in the Jeffery plant. This differs from the former one in that it has the main shaft below the shifter instead of beside it. This makes a cleaner installation. It is much lighter than the former four-speed and is fitted with tapered-roller bearings instead of ball. The gears are ⅝ face nickel-steel, and the shift now is by center lever in a ball joint instead of by H-slot.

In the fitting of this new gearset the Jeffery company has applied a gearset brake which is adjustable in a few minutes and is accessible by lifting the front floor boards. This brake, because of its effectiveness is used as the emergency and is operated by the usual center lever. It uses fabric facing for the band which is 2½ in. wide. The drum is 7 in. in diameter.

Continuing in the drive there is a hollow propeller shaft, of 1½ in. diameter instead of a solid shaft, 1⅜, with two Kinsley-Bennett joints instead of joints of another make, and a new type of semi-floating rear axle instead of a floating. This axle is mounted on roller bearings instead of ball and is 50 lb. lighter than the former axle, thus reducing the unsprung weight. The shaft tubes are seamless steel and the differential housing, malleable iron. The gears within are spiral-bevel instead of straight bevel and the motor to wheel ratios are as follows: first speed, 13.49 to 1, second, 7.55 to 1, third, 4.15 to 1 and reverse, 17.97 to 1. One set of brakes are used in the axle and these act as the service set.

Drive Taken Through Springs

The propulsion members used in the 1915 car have been discarded and the drive now is taken through the rear springs, to simplify construction and save weight. To do this the shackle bolts have been increased from ⅞ to 1 in. in diameter and the main spring leaves made of alloy steel. The rear springs have been lengthened to 54 in.

In the controls there is a Warner, Muncie, steering post instead of that used on the 1915 car, and as previously mentioned, a new gearshift lever. The light and ignition controls have been simplified and rearranged on a new cowl board.

The body is an entirely new seven-passenger but is sold without the auxiliary seats thus making it a five-passenger. The body lines, like the Chesterfield of 1915, are conservative streamline and the unit is much better than the former one, has more taper in front and better curves on the sides. The front seats are separated and have a reasonably wide aisle between them, this being new for this car.

New One-Man Top

In the equipment there is a new one-man top instead of the regular type, a Carter fuel feed tank which converts pressure to gravity, instead of straight pressure with the tank at the rear, a circular-section tank instead of a square one and a new type of Rand windshield. Tires remain the same, 34 by 4, but they are mounted on Stanweld rims instead of those employed previously. In the instruments there is an oil gage which is new and a combination terminal board and fuse block in front of the cowl. With this fuse replacement is a matter of a few seconds even at night for a spare fuse is in the box and it may be replaced easily. The dash lights have been done away with and Solar dimmers placed in the headlights.

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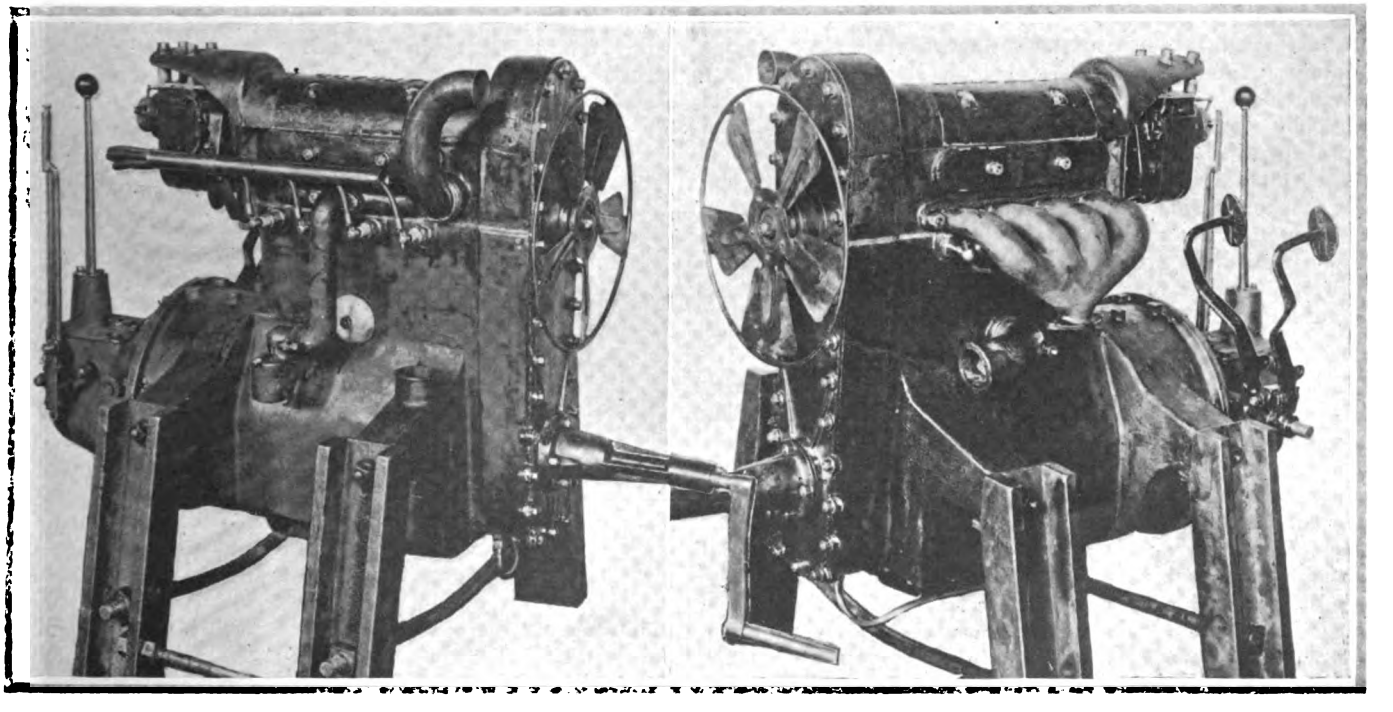
New Wollaston Valve-in-Head Motor

An overhead valve motor has been designed by the Wollaston Foundry Co., of Norfolk Downs, Quincy, Mass., which is in the business of making iron castings and doing electric welding. The motor, which is illustrated herewith, has an overhead camshaft running in a separate housing submerged in oil. Upon this shaft are four integral cams which operate the eight valves directly without the use of rocker arms. The overhead valves themselves are set in a removable head which has an inspection cover on either side allowing for accessible valve adjustments.

The camshaft is driven by silent chain on one motor and by vertical shaft and spiral gears on another, both of which are experimental jobs. Both systems work out satisfactorily. Oiling is by force feed with the lubricant drawn from an aluminum oil sump by gear pump which forces the oil to the camshaft bearings, through the main bearings to the crankshaft and to the lower connecting-rod bearings. The oil sump is removable and the connecting-rods and pistons can be inspected or taken out through the bottom of the crankcase without disturbing any other part of the motor.

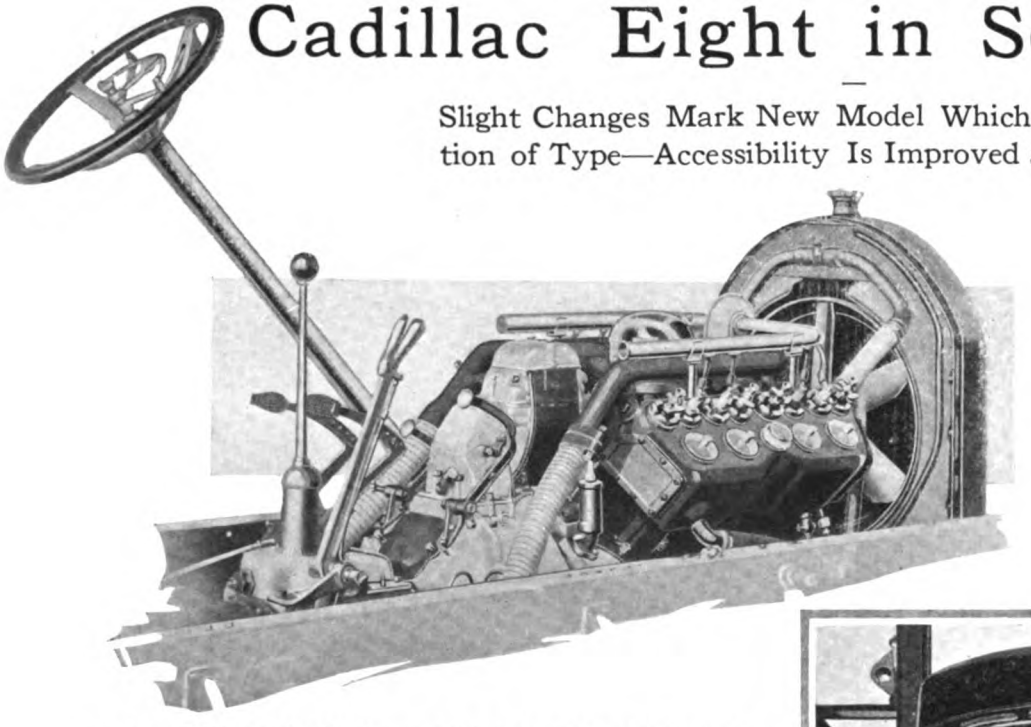
These motors are adapted to automobile use as is shown by the fittings of standard bell housings bolted to the rear end of the crankcase. The water connections are arranged to be adjusted to any angle and to suit any radiator connection. The motors illustrated are fitted with a Detroit Gear & Machine Co. gearset and clutch.



Both sides of the four-cylinder, overhead-valve Wollaston motor. The overhead camshaft runs in oil in a separate housing

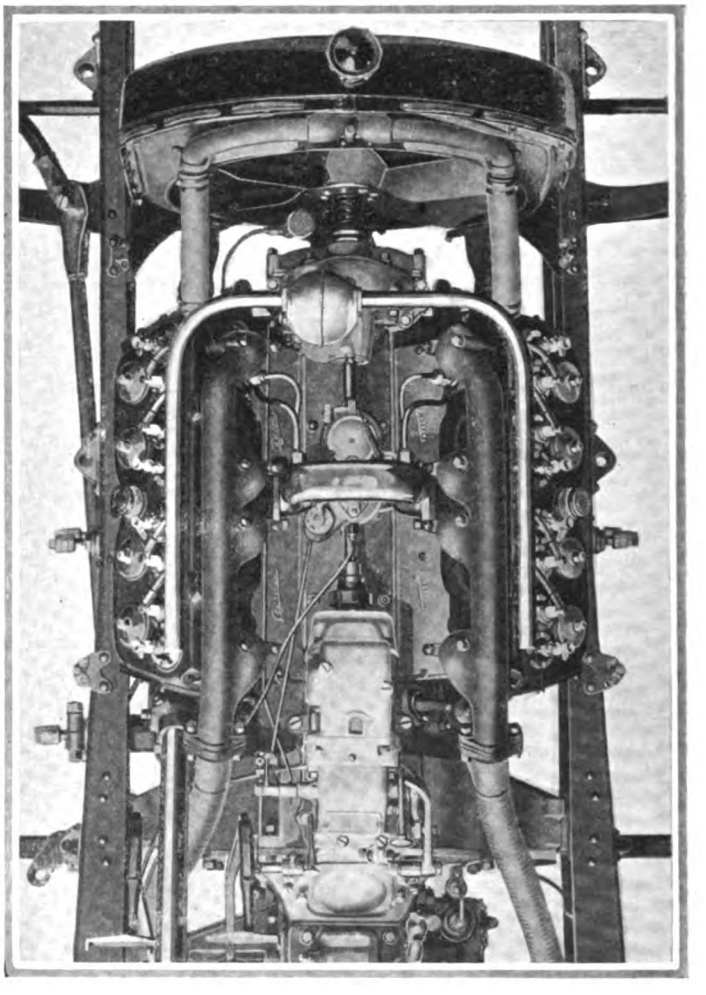
Cadillac Eight in Second Year

Slight Changes Mark New Model Which Proves Satisfaction of Type—Accessibility Is Improved and Body Larger



Left—Fore part of 1916 Cadillac chassis, with the eight-cylinder motor installed. This view gives a good idea of the new style ignition leads which can be detached as a complete unit without loosening any nuts

Below—Plan view of the eight-cylinder motor in the 1916 Cadillac, showing the accessibility of the tappets, a feature of the refinements for the coming season. Note the mounting of the tire pump beside the gearbox



WHEN an absolutely new thing, like the eight-cylinder motor was a year ago, is first put upon a manufacturing basis, it is usual to find that the first year of real production will show up some weaknesses. With a car which was as great a change from previous models as was the eight-cylinder Cadillac it would be reasonable to expect some points of imperfection in the first model, however careful the experimental work, so the fact that the Cadillac eight is to enter its second season practically unchanged is really noteworthy. It means that the features which seemed good to the skilled men who tried out the experimental cars, have shown up well in the hands of many thousands of users who are a long way from being experts.

Few Changes Necessary

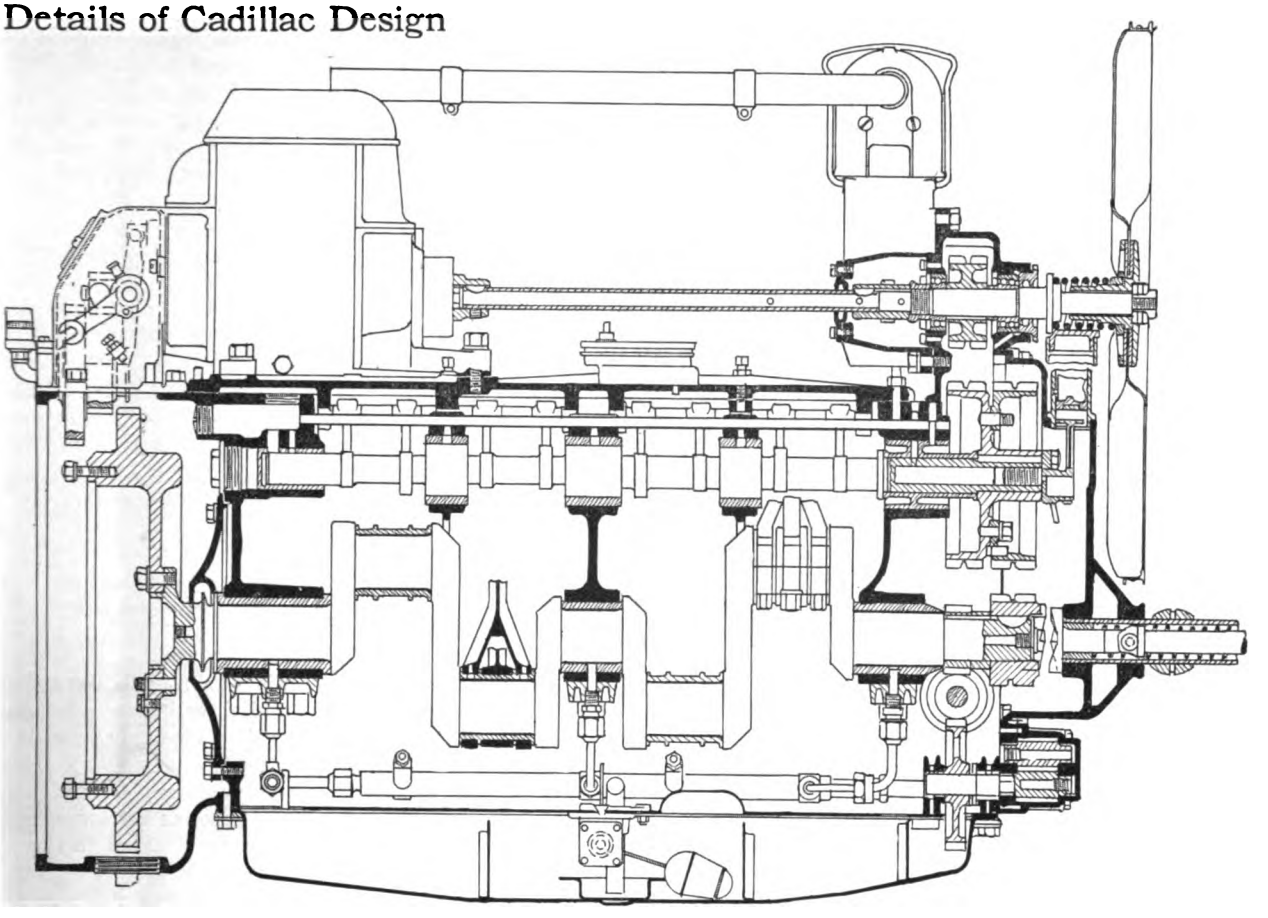
In a factory producing many cars, however good these cars may be, there are always some troubles, for it may be doubted if there is any machine in the world that is incapable of improvement. With new machines the troubles are usually more frequent and serious than with old ones and no doubt even the Cadillac has not been entirely free from complaints. The important thing is that no trouble has turned up which is due to any feature of the car, since had this happened changes would have been made. Thus one may say that the entrance into a second season with every single important feature of the chassis unaltered indicates a really remarkable foresight in planning both the design and manufacture of the car.

Price Increased $105

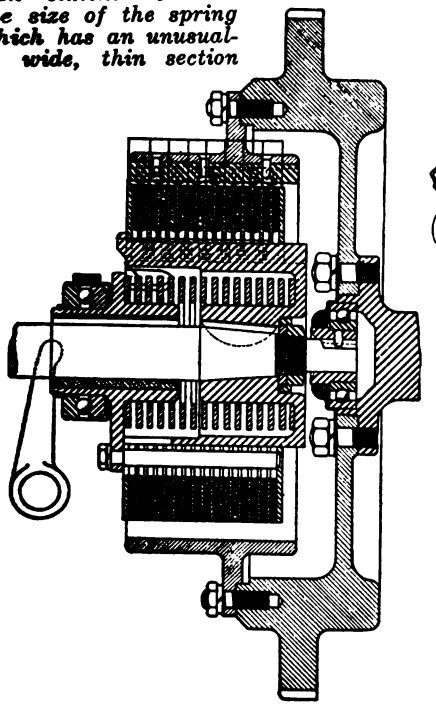
The Type 53 Cadillac will cost a little more than the original model, $2,080 as against $1,975. Five-passenger salon and seven-passenger bodies will be made for the coming season. Anent the price increase the company announces that the original price was fixed at a time when the production cost was not known, as the car was announced some considerable time before the plant was re-equipped to turn the eight. In accordance with the established practice of the company, no cut in the quality of the material has been considered and it is thus found necessary to raise the price in order that the margin of profit may be sufficient to give a reasonable, business return to the stockholders.

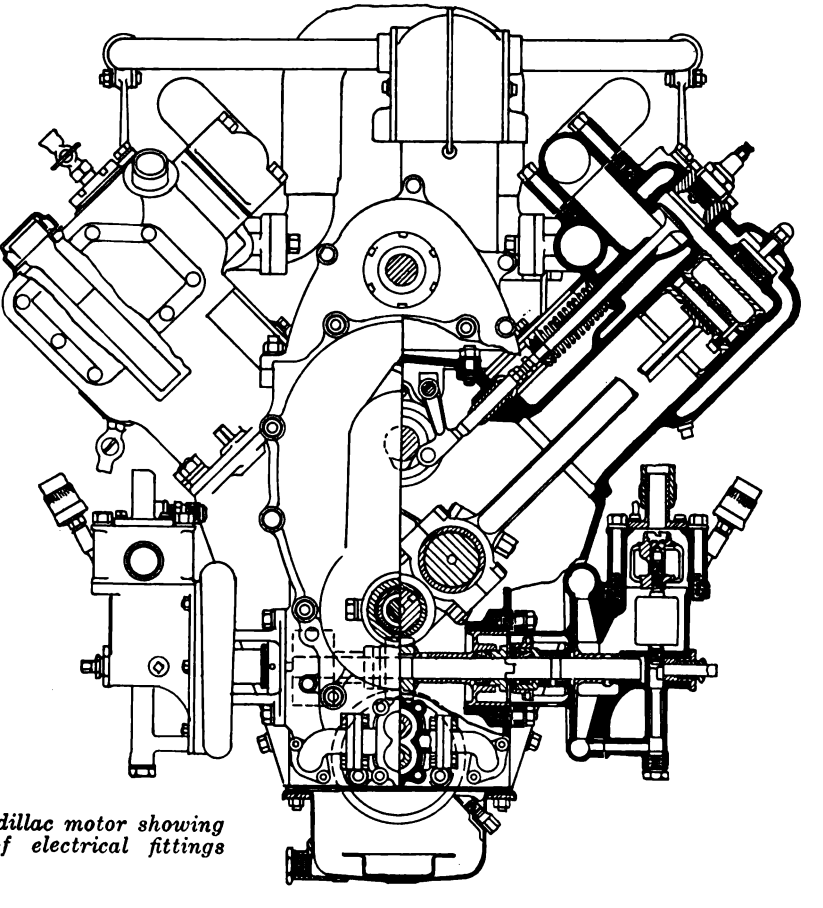
The change in design that is most noticeable is directed toward the improvement of the valve accessibility. On the old model it was perfectly possible to set a valve tappet, but the job was a little awkward to an unskilled mechanic. To make the task easier, the generator-and-starting-motor unit has been moved back a few inches, and the ignition breaker and distributer brought to the extreme front of the motor thus clearing the space between the cylinders of everything except the carbureter, because the tire pump has been removed from the motor altogether and is now located on the side of the gearbox.

Details of Cadillac Design

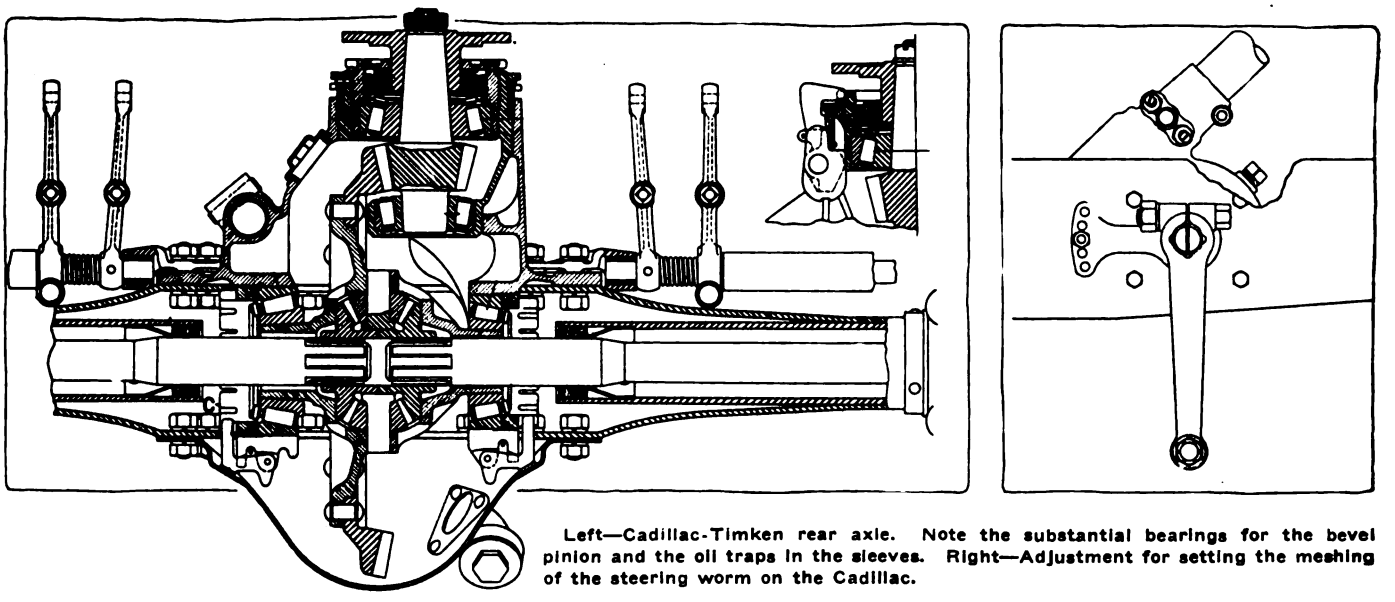


The sixteen-plate dry disk clutch. Observe the size of the spring which has an unusually wide, thin section





Sections of 1916 Cadillac motor showing changed position of electrical fittings



Left—Cadillac-Timken rear axle. Note the substantial bearings for the bevel pinion and the oil traps in the sleeves. Right—Adjustment for setting the meshing of the steering worm on the Cadillac.

Also the exhaust manifolds have been raised and separated further by lengthening and curving the four branches on each which connect to the cylinder outlets. It is now possible to grind the valves and adjust them without removing anything except the plates which inclose them. Still, to render it less troublesome to remove the carbureter, the ignition wires have been redisposed so that they branch right and left at the distributer, instead of being taken to the old cross conduit on top of the intake manifold. The conduits are held in clips, and the aluminum casing which incloses the distributer is also secured by a spring wire hasp, so that when the ends of the leads are detached from the spark plugs, the whole high-tension system can be removed completely by simply pulling it off.

Second Speed Lowered

In the gearbox the only change is a slight lowering of the middle gear ratio, so as to give still better pulling power on the rare occasions when the lower ratio is needed.

The new location for the tire pump on the left side of the gearbox makes for convenience, as it is no longer necessary to raise the hood in order to utilize the pump. It is connected by means of a small sliding gear as before, and there is a small brass button with a screwdriver slot in it brought through a hole in, and flush with, the floor board of the driver's compartment. The air line is taken to the tool box where the flexible tube would be stored, so that the process of connecting up is rendered quick and trouble free. The idea in using a screwdriver to turn the gear shift button of the pump is that this tool always is to be found in the door pocket, and it is desirable not to add another pedal or to have any additional projection through the boards.

Another change which will be appreciated by tall adults, is that the adjustable clutch and brake pedals have been moved two inches forward, thus increasing the possible range of adjustment; and another thing which makes for the driver's comfort is the new location of the horn button in the center of the steering wheel.

Body Appears Much Larger

Using slightly higher hood and providing higher sides to the body has increased the apparent size of the open cars quite considerably. Actually there is a good deal more room inside, but this is obtained mainly by increased width. The rear seat is wide enough for three passengers of 200-lb. caliber and the folding seats are not uncomfortable for anyone of normal or even a little over normal size. For upholstery an excellent quality of hand buffed leather is being used. Despite the greater accommodation it is said that the weight has been only slightly increased.

More Power Available

What might be called a settling down in the manufacturing of the eight has resulted in a slightly higher average motor power and the engines coming through lately have been giving a very good account of themselves. One little addition to the carbureter no doubt is partly responsible, as it is also for some slight improvement in the gasoline consumption. This consists of a small shutter which is attached to the throttle operating rod and varies the size of the air intake in proportion to the throttle position, the control being quite separate from the usual air valve, which is the same as before. The action of this shutter is to decrease the atmospheric pressure on the gasoline in the carbureter bowl at certain throttle openings and to decrease the amount of gas freed through the spray nozzle at certain engine speeds.

Unchanged Features

To deal exhaustively with so well known a car would be absurd, except to point out the main features which it has vindicated. First of these is, of course, the eight-cylinder motor from a quantity production viewpoint, for if Cadillac did not *invent* the eight it certainly *created* it.

Second is the high-speed system of light reciprocating parts, big valves with a quick lift, horsepower peak at a rate of revolution approaching the 3000 mark and so on. Nobody before the coming of the Cadillac had attempted to apply these principles on such a wholesale scale, or to so large a motor, measuring by piston displacement.

Third may be put the very low high-gear ratio which enables the revolution possibilities of the motor to be utilized at practical road speeds, for here again Cadillac was a pioneer. The speed of the motor at a thirty-mile-an-hour road speed is higher than that of any European car, yet the engine has not suffered on account thereof.

Manufacturing Problems

No secret is made of the fact that Cadillac would have liked to make many more cars than it has been able to do, since first the eight program was commenced, but it is easy to realize how large an undertaking it was to equip the plant for the manufacture of a totally new kind of product. H. M. Leland has given some figures concerning this reorganization which show what large sums are involved in the development of an utterly new type of car and the amount of shop work to be done before the decks can be cleared for action. He says that the first three engines made for experi-

mental purposes cost $46,000 not including anything for overhead charges; and that the first three experimental cars cost $63,000 or $21,000 each.

In tool equipment the changes in the motor department called for 269 new machines costing over $180,000, and small tools like drills and cutters numbering over 50,000 by a wide margin. Add to this the clearing out of old equipment and the installation of the new and it follows that the cost of getting ready to commence manufacture must have been at least over $500,000.

From the engineer's viewpoint some figures of Mr. Leland's relating to drafting-room work will be interesting. The number of experimental drawings made was 1922, the total number of drawings up to March of this year, when production was in full swing, totaled 2283 and the number of tool drawings was 10,869. Of blueprints the total number made was 223,175 using 38½ miles of paper, and figuring on a normal day it would take one man sixty-four years to make the original drawings.

Over 10,000 Parts

In the whole Cadillac car there are, says Mr. Leland, more than 10,000 parts if those in the electrical apparatus are considered.

Practically No Motor Changes

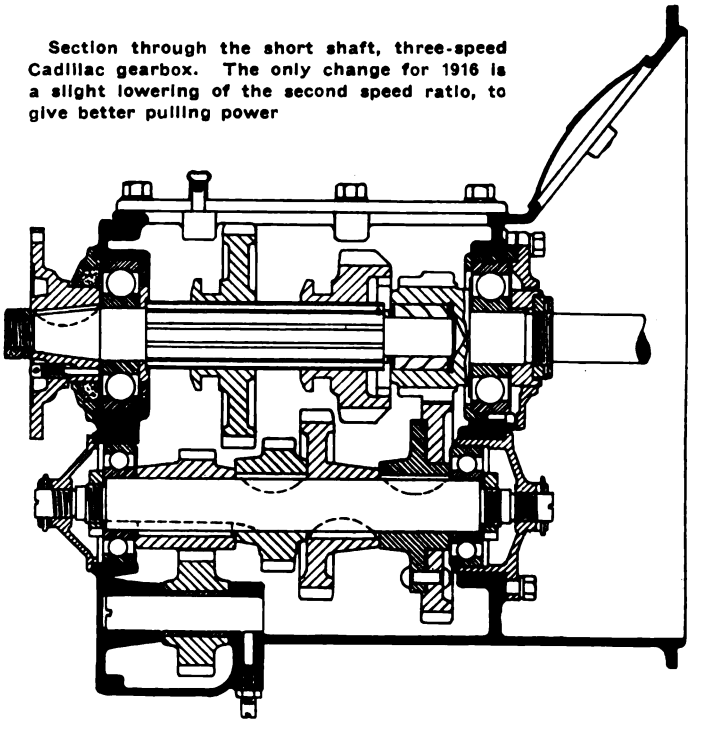
In the illustrations the changes are shown in the photographs and the new designs can be studied also in the drawings which lay bare almost every portion of the motor. Here the only change besides the redistribution of the accessories consists in bringing the flywheel ring gear to the central plane of the wheel, so as to allow the generator and starting motor to be moved aft. The fan shaft housing altered to suit the new location of the distributer and to provide a drive for the latter.

Just to recapitulate the unaltered motor specification, the dimensions are 3.125 by 5.125 giving a displacement of 314 cu. in., the forked type of connecting-rod is used, and there are only eight cams for the sixteen valves. The fact that this construction has not been altered in the least is interesting, because it has several times been suggested that the sixteen-cam motor with rocker arms eliminated was easier to build.

At the front end one wide, silent chain drives the camshaft, and a second chain takes care of the fan spindle and distributer drive, while the oil pump is driven by a skew gear direct from the crankshaft, being thus located at the extreme front end of the crankcase. The intermediate gear which lies between the crankshaft and the oil pump is on a cross shaft that has a water pump at either end, and the water circulation is controlled by thermostat.

On the gearshaft is mounted a sixteen-plate disk clutch, and this bolts to the flywheel when the bell housing is attached to the crankcase, it is a dry-plate type with alternate steel and wire mesh asbestos fabric surfaces and is sufficiently easy to operate to render starting from rest in high gear quite smooth. The gearset has no peculiarity, being just a robust three speed type with annular ball bearings. For the rear axle a Timken design is employed, certain parts,

1916 Cadillac seven-passenger touring car. Note straight top line. There is a new mud flap in front below the radiator protecting the water pumps from splash



Section through the short shaft, three-speed Cadillac gearbox. The only change for 1916 is a slight lowering of the second speed ratio, to give better pulling power

such as the spiral bevels, being made in the Cadillac plant. The propeller shaft is an open type with two universals. Drive is taken through the springs, but not torque, as a special stay is provided.

For the front axle and steering gear the detail work is very thorough and the bearing surfaces provided well up to the high speed work of which the car is capable. One little detail that often escapes attention is the adjustment for meshing the worm with the worm wheel in the steering box. As shown in the drawing, there is a small lever alongside the steering arm, locked to the frame side by a small bolt which can be passed through any one of five holes. Moving the lever oscillates an eccentric bushing on the worm wheel shaft and so sets the depth of tooth engagement. It is, of course, the sort of fitting that only comes to be appreciated after the car has been in use for a year or two, but it is very valuable then.

Great Reliability of Ignition

Almost needless to say, the electrical apparatus is all Delco and consists of the latest variety with no changes in principle from the outfit belonging to the former type. In the distributer the low-tension breaker has two blades which are joined up in parallel to halve the amount of current passing between the sets of contact points.

To complete the specifications: wheelbase is 122 in. and tires 36 by 4½ in. all around, and 56 in. is the standard tread though 61 in. tread can be obtained if desired. Gasoline feed is by air pressure supplied from a pump on the motor to a 20 gal. tank at the rear. Added to the five outside lamps and the dash lamp, the 1916 car has an opal glazed tonneau light, a Waltham clock and an inspection lamp. Recapitulating the prices, the seven-passenger touring car, the five-passenger salon and the roadster, each cost $2,080, the five-passenger brougham $2,950, seven-passenger limousine $3,450 and Berlin $3,600. A type that ought to be very popular is the three-passenger victoria, which has a most beautifully finished and fitted body with a leather top. The seating is arranged with the driver a few inches forward of the two passengers, who sit side by side and have plenty of width. This car costs $2,400 and, being either wide open or all closed at will, should be well worth the extra $320 to any man who does not want to carry more than three.

Weidely Four with Aluminum Pistons

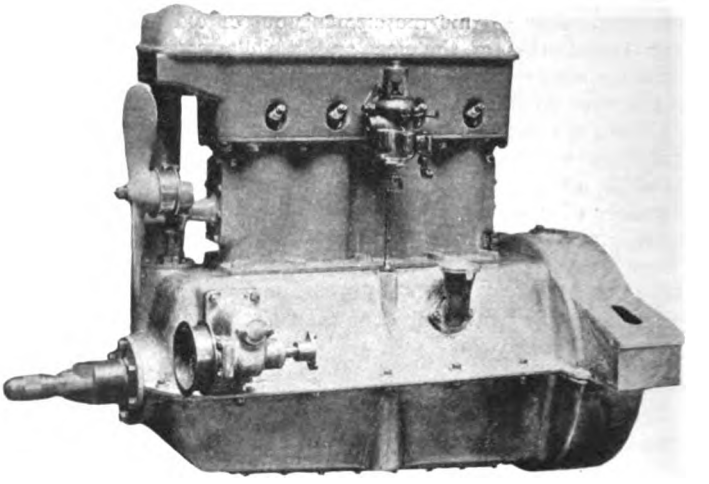
LIKE the six, the new Weidely four has all the valves in the head, without cages and operated by a camshaft lying above the cylinders, which camshaft is driven from the crankshaft by a vertical shaft, at the front, through worm gears, spirals at right angles, and the whole mechanism, shafting, gears, camshaft and valves completely inclosed and abundantly supplied with lubricant.

The cylinders are cast in a single block, the head likewise is cast integrally for the four cylinders and attached to the top of the cylinder block. Instead of casting the cylinders integrally with the upper half of the crankcase, as in the case of the older motor, this motor has them bolted to the upper half of the crankcase which is of aluminum instead of cast iron. This makes a better looking and much lighter construction. Practically all the water pipes and manifolds have been eliminated by the adoption of this style of casting.

The cylinder dimensions are 3⅜ by 5½, displacement 196.81 cu. in. The valves are exceptionally large for a motor of this capacity, especially as they are in the cylinder head. The outside diameter of the valves measures 2 1/16 in., and the clear opening is 1⅞ in. The valves have a lift of only 9/32 in. and are very short and light, weighing only 5.9 ounces each. This makes for a very smooth running and noiseless valve gear. There are no cages for the valves so the seats are efficiently water cooled. Each valve overhangs the cylinder bore slightly so that in the event of any breakage of the valve stems the valve head would not fall into the cylinder.

Valve Side Thrust Eliminated

No rocker arms are used, the camshaft being directly above the ends of the valve stems; but between the cams and the stem ends is a very light drop forged steel finger pivoted at the other end. This carries the adjustment by which the wear can be taken up and at the same time eliminates all side thrust on the valves due to the angularity of the cams.



Exterior view of Weidely four with side outlet carbureter

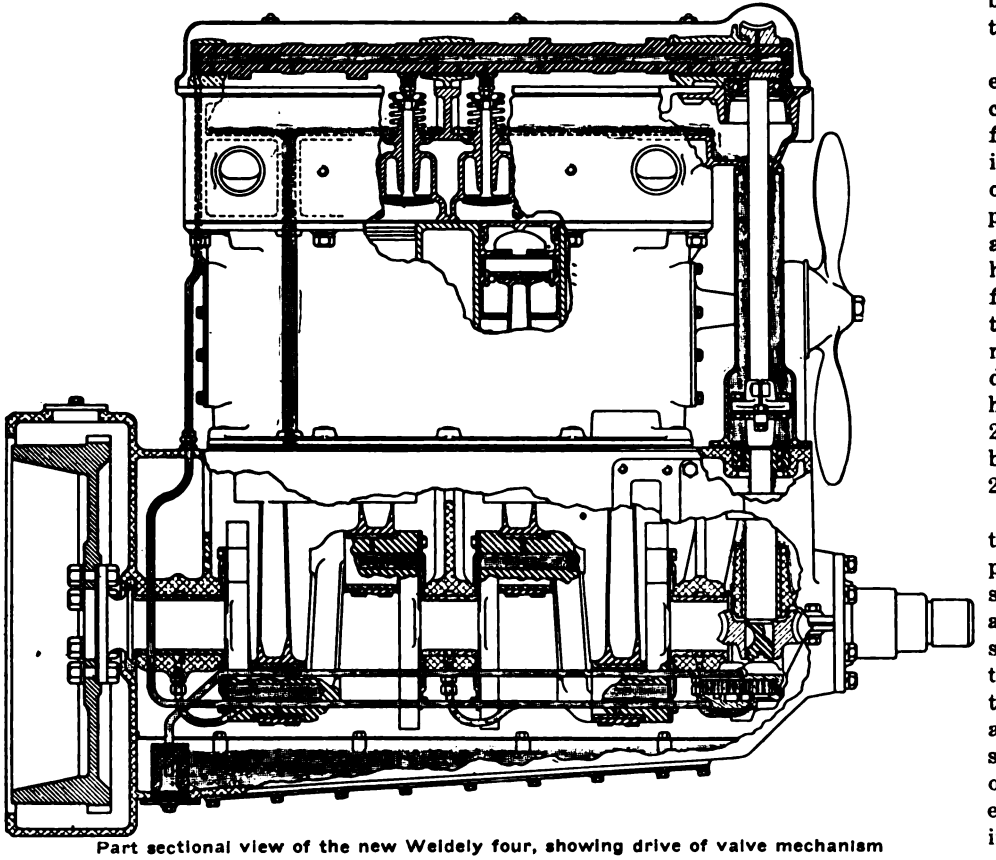
Tubular Connecting-Rods

The use of aluminum pistons and three-piece tubular connecting-rods is standard. The three pieces are electrically welded together. The pistons are also very light, weighing only 17 ounces with the piston pin in place. The latter is ⅞ in. in diameter and fastened into the piston.

The crankshaft is counterbalanced to offset the vibrations which occur at high engine speeds. The main bearings are oiled by force feed but the crankpins receive oil through the banjo rings which are attached to the cheeks of the cranks.

The flow of oil in these is governed by the speed of the engine as centrifugal force throws the oil from the rings into the pins. A 5-in. flange is provided at the rear end of the shaft to fasten the 16-in. pressed or rolled steel flywheel. On a high speed type of engine steel has been found necessary for perfect safety. It also provides material for the starting gear. The main bearings are all 2⅛ in. in diameter and from front to rear have the following lengths, 2 7/16, 2½ and 4 in. The connecting-rod bearings are 2 in. in diameter and 2¼ in. long.

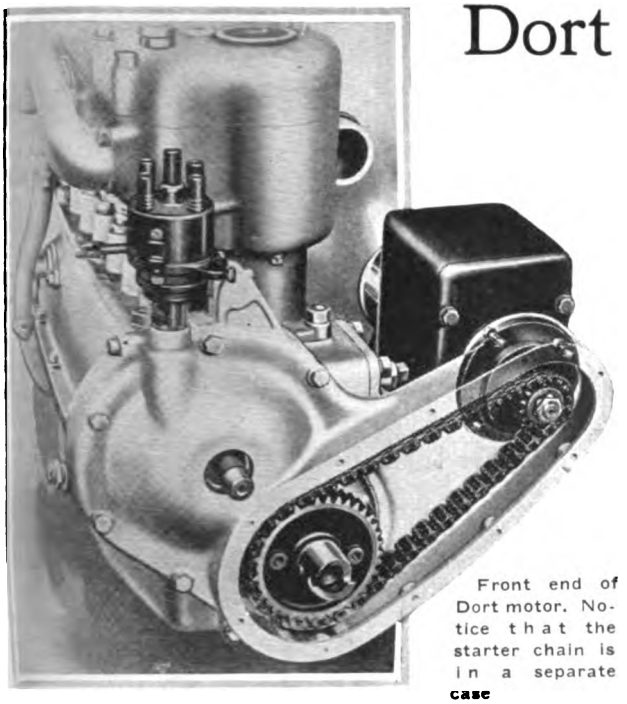
The oil pump is located in the bottom of the case and draws its supply of oil through a screen in the sump. The two gears of the pump are of different size; the larger one serves as a distributer and forces the oil through four separate leads, three going to the main bearings and the fourth to the hollow camshaft. The latter is drilled through on the back of each cam so that each valve and its mechanism runs in a bath of oil all the time.



Part sectional view of the new Weidely four, showing drive of valve mechanism

Dort Continues Roadster and Touring

Prices Reduced and Electric Starting and Lighting Fitted as Standard Equipment for 1916



Front end of Dort motor. Notice that the starter chain is in a separate case

ROADSTER and touring car models made by the Dort Motor Car Co., Flint, Mich., for 1916, show no changes in design over the 1915 types. The price of the touring car, however, has been reduced to $650 with full equipment, but the roadster still costs $540 with electric starting and lighting. Up to this time, the touring model has sold for $680 without starting apparatus or demountable rims. As the new price includes these, and they previously added $50 to the price, the real reduction figures to $90.

These Dort cars, which have a number of special features about them, are completely designed by the concern's engineering department. Though the firm name is comparatively new to the industry, the first models having made their debut at the national automobile shows this year, the Dort company is really composed largely of the same stockholders as the Durant-Dort Carriage Co., which has been prominently connected with the carriage industry for 28 years, it is said. In fact, a great deal of the manufacturing is done in the same plants, so that the Dort machines really come from an established manufacturing organization, and the taking up of motor vehicle manufacture is but a logical step.

Similar in Design

So far as general design is concerned both the roadster and touring car follow the same lines, although the roadster chassis is shorter and lighter and its motor is smaller. The aim has been to adapt each chassis specially to the class of service it is called upon to deliver. Naturally, a roadster does more running around and it can very logically be built lighter to promote economy of operation.

The touring model, in which a test run was made, has an exceedingly sweet-running power plant which handles the car in excellent shape with a surprising lack of vibration and noise. Of moderately high-speed type, this motor showed itself to be very flexible, coming down to a 4-mile gait without any hesitation and holding it, with rapid acceleration possibilities to above 50 m.p.h. There are several constructional features of the engine which undoubtedly have a bearing upon its performance, and these will be mentioned later.

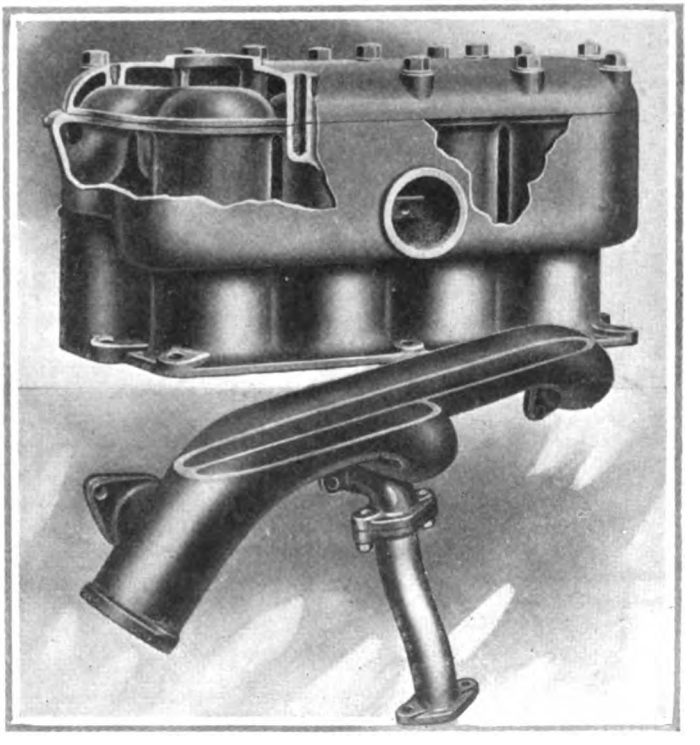
Following the specifications, the touring car, known as model 5, has a 3¼ by 5 motor, wheelbase of 105 in., cantilever rear springs, cone clutch, three-speed center control gearset, three-quarter floating rear axle, and 30 by 3½-in. tires. The roadster is fitted with a 3 by 4 engine, follows out the same general specifications, and its wheelbase is 92 in. This car is designated as model 4.

Detachable Cylinder Head

The Dort motor used in the touring car is capable of 20 hp. at 1000 r.p.m., while at 1600 r.p.m. it develops 28 hp. It is rated at 16.9 hp. S. A. E., and the displacement is 165.9 cu. in. The unit power plant construction is carried out with the gearbox and clutch attaching to the engine proper and all being supported on three points. Somewhat unusual is the use of a detachable cylinder head along with separate aluminum crankcase. Ordinarily when the head is made detachable, the cylinders and upper half of the crankcase form one piece, but the Dort design should be lighter through the use of more aluminum.

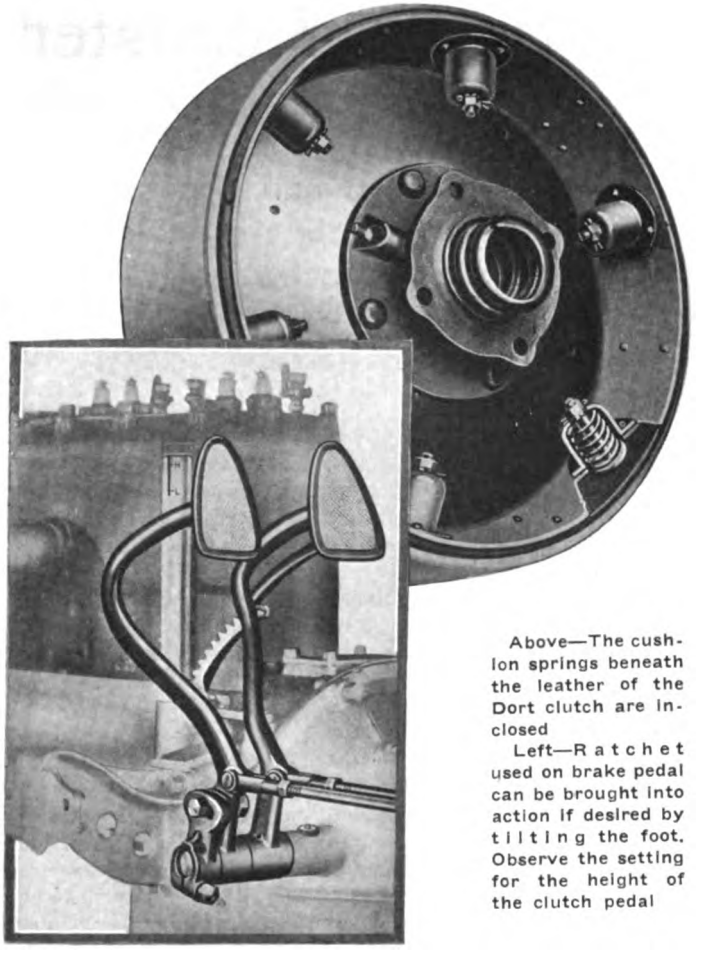
A striking feature of the motor is the use of an extra heavy crankshaft for its size, this serving as a big factor against vibration. It is a drop forging of 0.40 to 0.50 carbon steel and 1¾ in. in diameter, supported by two main bearings. Likewise the connecting-rods are forged from the same steel, and accurate balance of all of the reciprocating parts is said to be demanded to within ¼ oz. Long pistons are fitted, these serving to distribute the wear and reducing it to the minimum. Three rings are used on each piston, all above the wristpin.

The valve outfit does its part in giving the motor its high power. They are of large size—1 11/32 in. in the clear—



Upper—Cylinder block of Dort motor showing the extra large water spaces

Lower—Special exhaust manifold which separates the discharge so that from one cylinder does not interfere with free outlet from the next



Above—The cushion springs beneath the leather of the Dort clutch are inclosed

Left—Ratchet used on brake pedal can be brought into action if desired by tilting the foot. Observe the setting for the height of the clutch pedal

and have a lift of ¼ in. In their makeup, carbon steel stems are welded to the cast-iron heads, the two-bearing carbon steel camshaft operating them through the intermediary of mushroom lifters.

Motor dimensions follow:

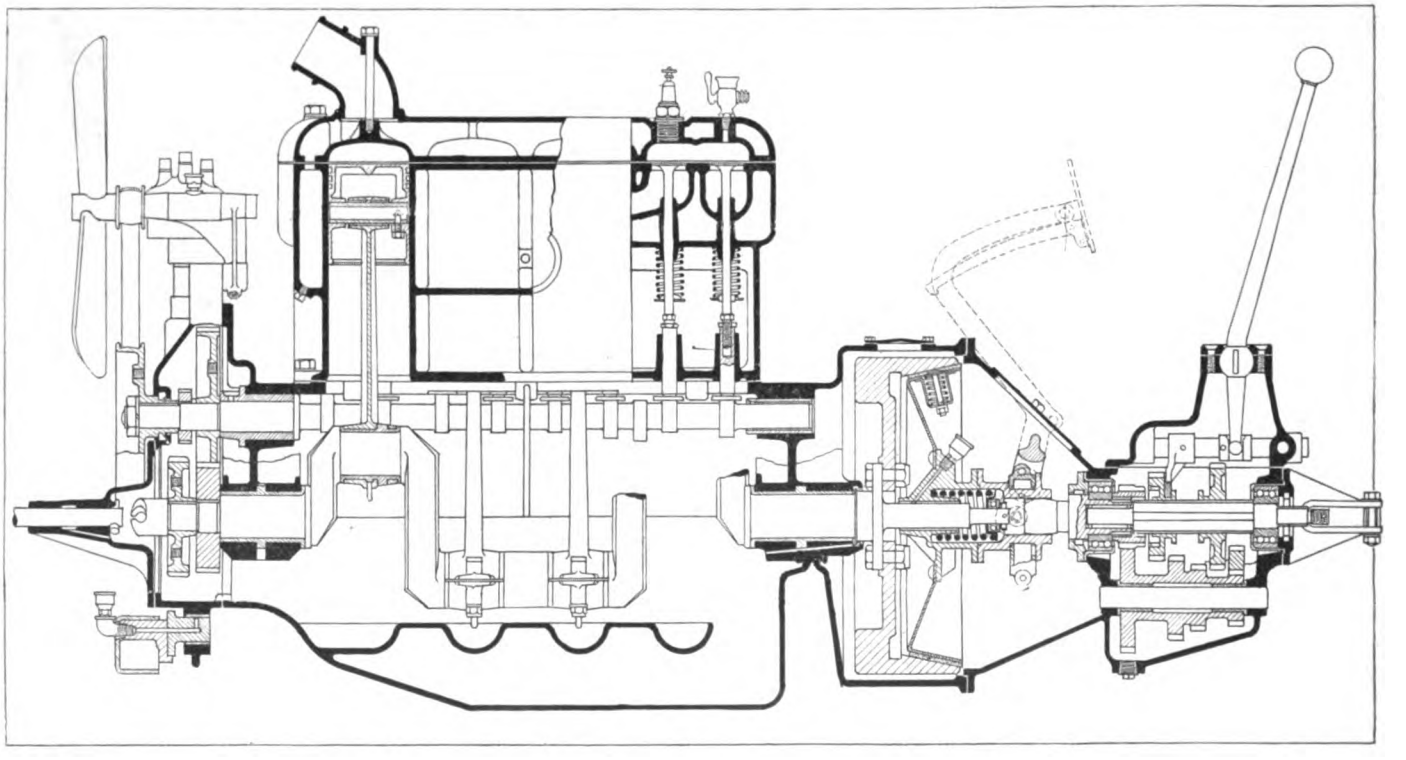
	Model 5—3 1-4 by 5	Model 4—3 by 4
Front crankshaft bearing	1 3-4 by 3 5-16	1 3-4 by 2 11-16
Rear crankshaft bearing	1 3-4 by 2 11-16	1 3-4 by 3 7-16
Front camshaft bearing	1 1-4 by 2 31-32	1 1-4 by 2 1-4
Rear camshaft bearing	1 by 2 31-32	1 by 2 27-32

Special attention has been given to the matter of uniform waterjacket space around each of the cylinders of the motors. The detachable head feature helps in this respect, for it permits of the making of accurate casting, so far as the waterjacket thickness is concerned. Equal spacing is secured all around each of the cylinders, making for uniform expansion of the cylinders all around with no distortion, which is apt to happen if cylinders Nos. 1 and 2 and Nos. 3 and 4 are close together, for instance. This unequal spacing, with the two front and the two rear in groups is sometimes found, and naturally expansion cannot be uniform in such a block arrangement.

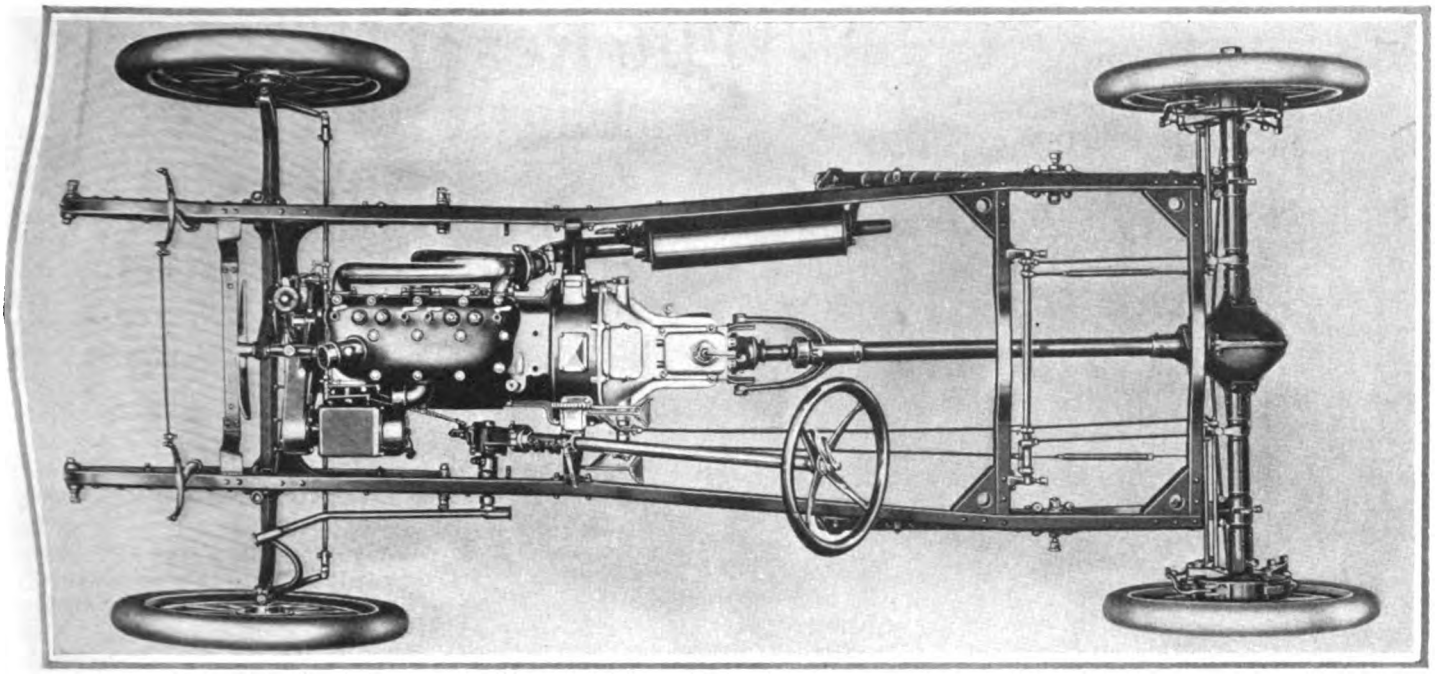
Double Exhaust Manifold

Unusual in four-cylinder construction is the double exhaust manifold, also. This is on the same order as the double designs often used with sixes, only instead of three cylinders exhausting into each passage, two cylinders use each outlet. The two passages are cast integrally with an inner wall between them. The object of the design of manifold is to prevent any back pressure in the motor. Cylinders Nos. 1 and 4 exhaust in one passage and Nos. 2 and 3 in the other. As the firing order is 1, 3, 4, 2, there is no possibility of exhaust gases from one cylinder running into the flow of gases from the preceding cylinders. In short, free outlet is assured.

Dort motors are lubricated by the constant circulating splash arrangement, whereby a pump operated from the camshaft draws oil from the reservoir at the bottom of the motor and forces it to the front gear casing, from which point it flows to the troughs under the connecting-rods and is picked up by the dippers on the ends of these. This serves to splash the oil to the main bearings, rod bearings and all other friction surfaces. Convenience for the driver has not been overlooked in the location of the oil gage which is combined with the breather. Placed on the left rear side of the crankcase, this combination is really a tall standpipe, with the indicator brought almost to the top of the cylinders,



Section of Dort Model 5 touring car power plant. Motor is 3.25 by 5 in. and has a detachable cylinder head



In this chassis plan of the Dort model 5 the frame is widened so that the cantilever springs are located beneath the side rails

making it easy to read the lever without getting the head down under the hood.

The Electrical System

The electrical system has for its main unit an Apple motor-generator carried on a bracket on the left forward side of the engine and driven by an inclosed silent chain from the crankshaft at a 2½ to 1 ratio. A simple adjustment of the chain is provided so that the chain centers can be varied.

A neat cone clutch has been designed for these cars. This has a leather-faced pressed steel cone with six compensating spring plungers pressing upon the leather at equal intervals around the circumference, and making for an easy action of the clutch on engaging. Each of these spring plungers is inclosed within a cup pressing which is attached to the cone, and the ends of the plungers extend through the cups to admit of adjustment of the spring tension. They carry adjusting nuts, held in place by cotters. The clutch pedal engages and disengages the clutch through a hollow phosphor-bronze collar, which is so arranged as to be kept constantly filled with grease through the fitting of a tube running to the outside of the gearcase so that it is an easy matter to reach the large grease cup supplying the collar through this tube.

In fact, lubrication of the gearset is well cared for, as a small elbow is fitted, this making it easy to put in the transmission oil. In the internal makeup of the gearset there is nothing departing from the conventional. The gears and shafts are formed from nickel steel, and the mainshafts run on ND bearings.

From the power plant, the drive system is still strictly Dort design throughout. Fitted with a universal just back of the gearbox, the driving shaft then enters a substantial torsion tube, the front end of which is of yoke form. The arms of the yoke are carried in brackets on either side of the gearbox end, and with freedom of end play to the extent of ¼ in., this to take care of axle variations.

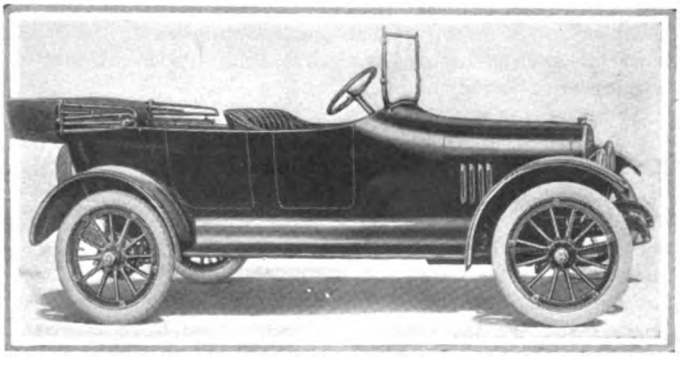
Axle Bearings Easily Adjusted

A special feature of the rear axle construction is that all bearings are adjustable from the outside, which is a point that cannot be too highly commended. In addition a special opening has been provided in the housing to enable the driver to see that the bevel gears are properly meshed. To allow for this external adjustment, a pin passes through the housing to a groove in the bearing carrier, and when this is unscrewed, the carrier can be turned through the opening in the housing thus made, bringing another groove into position for locking with the pin when the latter is again screwed into place. In the construction of the axle, differential gears are made of nickel steel, and propeller and differential shafts are of chrome nickel. The propeller shaft is carried on ND double and single-row bearings, with the differential and wheels running on Hyatts.

One Pedal for Clutch and Brake

Brakes are 10 in. in diameter with the service set external contracting and the emergency internal expanding. The service brake operates from the clutch pedal. Pushing the pedal halfway disengages the clutch, and further movement acts upon the brake. The emergency brake system is operative from the other pedal with a ratchet holding it in place when required. To release this brake, the lower part of the pedal is pushed, causing the ratchet to let go. By this arrangement of the brake controls, a second lever beside the gear change lever is eliminated.

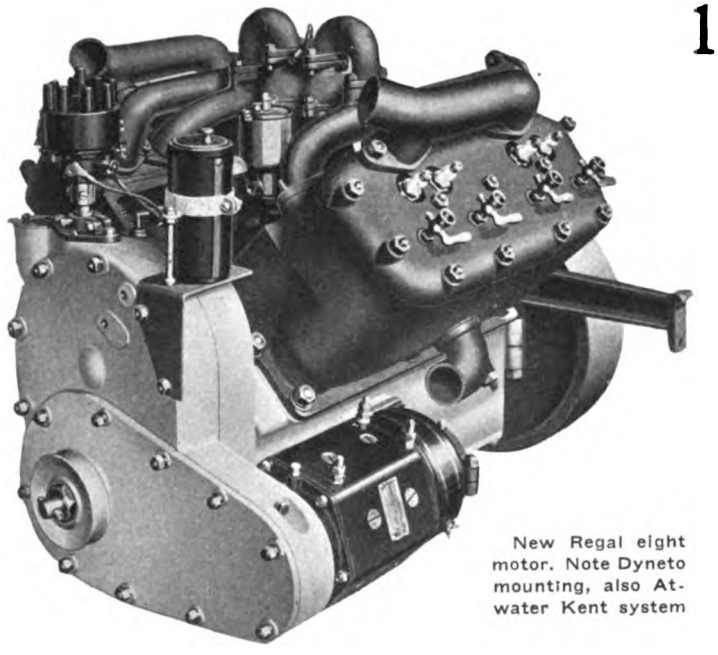
Cantilever rear springs are well applied to these cars. The springs are of the full type, shackling at the front to the frame, and having a trunnion attachment at the center. They measure 50¼ in. long by 2 in. in width on the touring car and 45¼ by 1¾ in. on the roadster chassis. Front springs are conventional half-elliptics. In appearance, the Dort models are very attractive, with hood sloping in unbroken curve from the cowl.



The Model 5 Dort touring car has a clean cut appearance

1916 Regal Line Is An Eight and Two Fours

All Three Motors Have Detachable Cylinder Heads—Dyneto Fitted—Valves in 8 at Angle



New Regal eight motor. Note Dyneto mounting, also Atwater Kent system

AS announced recently, the program of the Regal Motor Co., Detroit, Mich., comprises two fours at $650 and $985, and an eight at $1,200. Of these the big four is practically identical with the 1915 chassis described on page 1277 of THE AUTOMOBILE for June 18, 1914. The main change is in the electrical equipment which is now a Dyneto single unit combining the functions of lighting and starting. Ignition is cared for by an Atwater Kent automatic advance distributer located at the front end of the camshaft as in the last model. Of course, the Dyneto does not need a flywheel drive since it lights and starts on the same gear ratio, so it is driven by a chain from the front end of the crankshaft. This chain has an aluminum case which holds lubricant, and there is a simple adjustment for chain tension, the generator being mounted on a rocking pivot so that a turn of a nut suffices to set the centers.

This Dyneto outfit is used on the eight and on the small four also, the mounting being practically identical with the same means for adjustment. In the case of the eight it is not placed between the cylinder blocks, but is attached to the crankcase very much as on the fours, so its comparatively large size does not interfere with valve accessibility.

Turning to dimensional detail, the smaller four has a bore and stroke of 3⅜ by 4¼, the large four 3¾ by 5 and the eight 3 by 4½ in., giving displacements of 134, 221, and 254 cu. in. respectively. The wheelbase of the light four is 106 in., and that of the other two cars 112 in., while the tread is 56 in. in each case. Naturally the light four has a smaller body than the larger model, but the eight and the large four have almost the same body equipment.

As regards the chassis detail, the smaller car differs from the other two which are alike, but it is pointed out that the cheapest car is merely a little more simple in outline as the material and parts used are thoroughly good and well in keeping with Regal quality.

As before the standard or large four is made in the Regal plant but the small four and the eight are the New Port Huron motors, so the eight is more like the new four than it resembles the old one. All three engines have detachable cylinder heads covering valves arranged in the normal manner and a Stewart carbureter is used for each, with the addition of a vacuum feed except for the light four, the latter having a gasoline tank in the cowl, instead of beneath the front seat. On the eight the vacuum feed tank is located under the dashboard so it is accessible from the back. In this position it occupies space that would otherwise be wasted and its absence from under the hood aids the accessibility of the motor. As for accessibility, on the Regal motor the tappets could all be adjusted without removing any part, and if the carbureter were removed together with the intake pipe the job would be really easy. The removal of the carbureter is, in itself, so simple a proceeding that most men would take it off if they were about to set the whole sixteen tappets, though if it was a question of one or two only it would not be worth while.

On the fours the accessibility is marked and the placing of the carbureter on the valve side does not interfere with the valves.

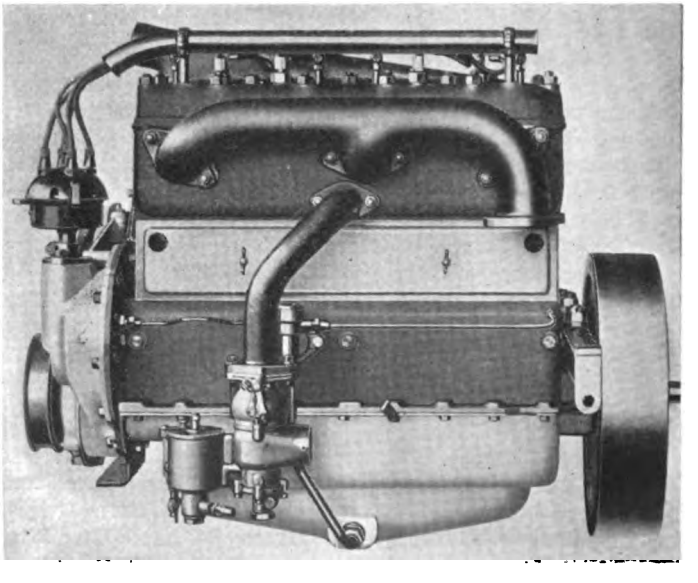
Unique Camshaft Arrangement

It has been pointed out once or twice that when the angle between the cylinders of a V-type engine is 90 deg. the sequence of valve operations is at 135 deg. so that one cam can operate two opposite valves if the camshaft is placed high enough to put the valves themselves at 135 deg. With a big motor this might be difficult because of the great amount of space it would make between the crankshaft and camshaft, but the idea has been worked into this motor very neatly. Having the valves at a larger angle than the cylinders also has the beneficial effect of inclining the pockets with reference to the cylinder bores and so cutting down their area. Of course this inclination of the valves so much further toward the horizontal makes tappet adjustment easier than ever.

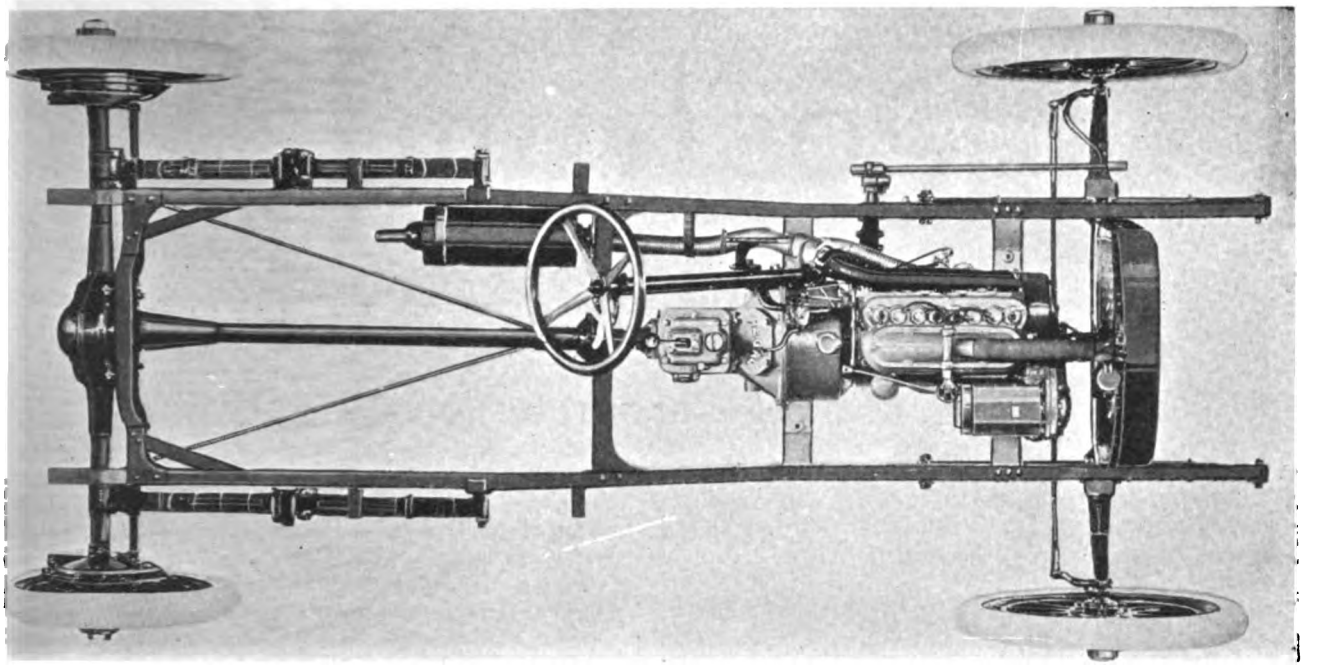
Helical spur gears are used for the camshaft drive on all models the materials being steel in cast iron.

Lubrication Systems Differ

For the light four the lubrication is splash, the level in the dip troughs being maintained by a plunger pump driven



Intake side of 1916 Regal four block motor



Plan for 1916 Regal four-cylinder chassis, showing compactness and simplicity of assembly

of the camshaft. On the big four the rear main bearing and the rear camshaft bearing have a force feed from the plunger pump, while the other two crankshaft and the camshaft bearings have pockets to catch splashed oil. Troughs and connecting-rod dippers are used in addition to insure ample and constant lubrication.

For the eight there are two separate plunger oil pumps located side by side on the front end of the motor these forcing to the main bearings on the crankshaft of which there are two. The crankshaft is drilled to the pin bearings and there are dip troughs also, as in the larger four. In both these pump leads see to the supply for the front end gears and the Dyneto chains.

Two Universals

Like the large four of 1915, the 1916 model and the eight have transmissions located on the rear axle and the driveshaft is inclosed in a torque tube. Unlike most constructions of this kind there are two universals, the torque tube being attached to the frame by a fork with two pivot bearings. There are no bearings between the driveshaft and its inclosing tube so the cutter acts simply as a protective covering and to take the twisting stress of the axle.

Small Four Has Unit Power Plant

For drive stresses two radius rods are arranged between the axle and the side rails of the frame so all possible stresses are cared for. The construction is as far from a Hotchkiss drive as it very well could be. The small car is different, having a unit power plant and a slightly different rear axle as will be seen in the chassis illustration. The axle is a [illegible] pattern with ball bearings throughout.

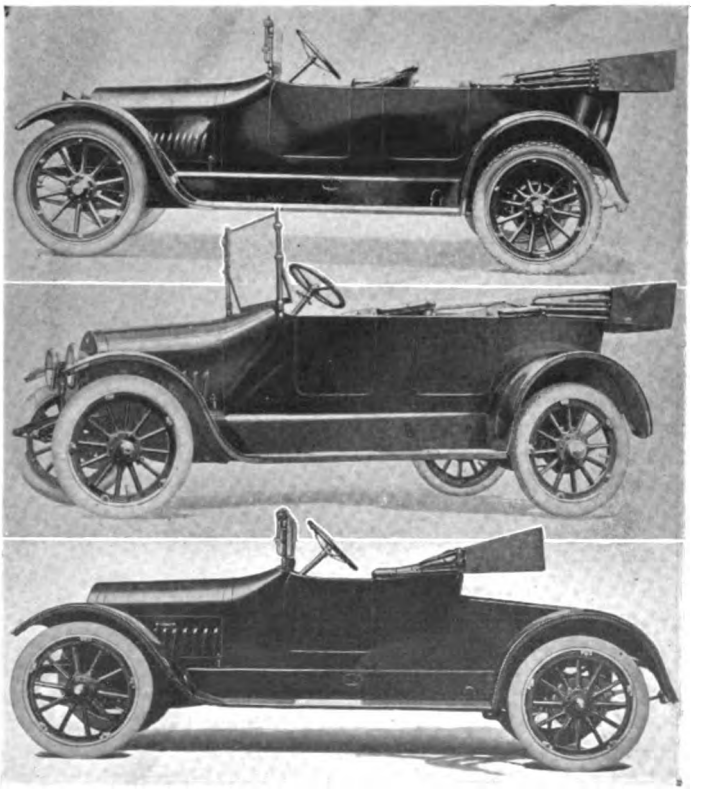
[illegible] have leather faced cone clutches, the two larger [illegible] provided with cushion springs beneath the

[illegible]ing Body Work

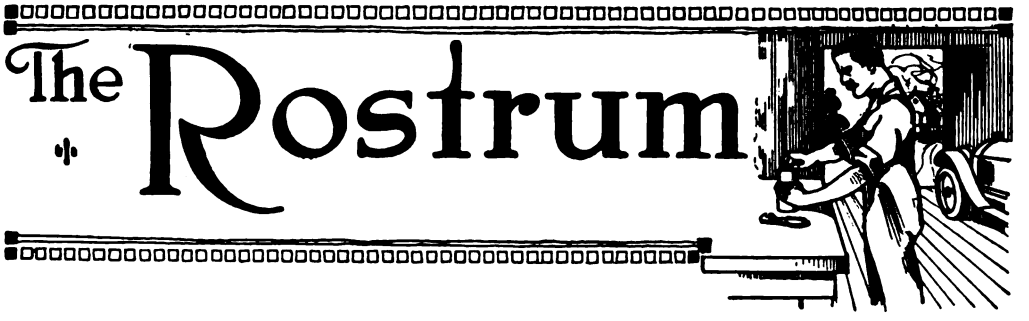
[illegible] four and the eight have almost the same five-[illegible] body and the keynote of their style in low ap-[illegible]. A fairly straight line side with an easy curve on [illegible] running smoothly into the hood, domed fenders and [illegible] of any sharp contrasts of curvature are characteristics. Internally there is plenty of leg room and a good depth of upholstery. The light four has a body on somewhat the same lines but smaller, of course. Two details of the larger bodies which add greatly to the smart appearance are the all-aluminum toeboards in the driver's compartment and the use of black enamel running boards with heavy aluminum treads opposite the doors.

Tire equipment is as follows: Light four, 30 by 3½; Standard four, 33 by 4, and eight, 33 by 4, all on demountable rims with the spare rim carrier at the back of the body.

Mohair tops are used on all three cars, the two large ones having Jiffy curtains and all three are a single sort of one-person design.



Top—Regal eight touring car, which sells for $1,200. Middle—Light four touring car listing at $650. Bottom—Roadster body fitted to any of the three chassis



Adjusting Marvel Carbureter on 1915 Buicks

EDITOR THE AUTOMOBILE:—Will you please send me directions for adjusting the Marvel carbureter used on the 1915 Buick six. The engine runs well, but will not throttle down and run slowly on high.

Wytopitlock, Me. A. E. B.

—In general if a motor will not fire regularly at idling and low speeds, it is not securing a sufficiently rich mixture at this time. On the Marvel carbureter the primary gasoline adjustment which affects this is at the bottom and is in the form of a turn screw with a cross handle. It is directly under the center of the carbureter. This adjustment should be turned slowly to the right or left until the motor runs smoothly at idling speed. Since turning to the left allows more gasoline to pass through the needle valve, it would probably be necessary for you to turn it slightly in this direction to secure the proper adjustment.

If you desire to start from the beginning, and adjust the carbureter, the following directions will apply: Start by turning needle valve A, to the right until it is completely closed, an air adjustment B to the left until end of screw is even with end of ratchet set spring above it. Next open needle valve A one turn. Start the motor as usual, using choker button, if necessary. Allow the motor to warm up, then with spark retarded, turn adjustment A to the right until motor runs smoothly.

After the motor has warmed up, turn air valve adjusting screw B to the left, a little at a time, until motor begins to slow down. This indicates that the air valve spring is too loose. Turn it back to the right just enough to make the motor run well.

To test the adjustment, advance spark and open throttle quickly. The motor should take hold instantly and speed up at once. If it misses or pops back in the carbureter, open needle valve A slightly by turning to the left. Do not move air adjustment screw B any more unless it appears absolutely necessary.

The best possible adjustment has been secured when air adjusting screw B is turned as far as possible to the left and needle valve A is turned as far as possible to the right, provided the motor runs smoothly and picks up quickly when the throttle is opened.

If the motor runs too fast with throttle closed, turn small set screw in throttle stop to the left. If motor stops when throttle is fully closed, turn the set screw to the right.

As the throttle opens, the hot air damper, which is connected to it by a link gradually closes, the greatest amount of hot air passing through the jackets when the throttle is nearly closed. The position of the hot air damper, at any time, is indicated by the slot at the end of the damper shaft. By loosening the set screw in the damper lever, this can be set for any desired relation between the damper and the throttle.

Motor Does Not Carbonize Quickly

Editor THE AUTOMOBILE:—How quickly will sufficient carbon collect in an automobile motor, so as to make it necessary to clean out the cylinders?

2—In the average life of a motor, how many times must carbon be burned out?

3—What is the average cost for burning carbon out of motors as per the following: four-cylinder, six, eight and twelve?

4—Are there any preparations on the market for mixing with the gasoline that will eliminate carbon without danger to the motor?

5—If possible, would like the names and prices of preparations in connection with question four.

N. Y. F. M. L.

—In a new motor it should not be necessary to clean out the carbon more than once in 3000 miles. As the motor becomes older and the piston rings wear forming an oil seal which is less tight, more oil works its way into the combustion chamber with the result that carbonization is more frequent and cleaning will have to be resorted to more often. The estimate of 3000 miles is a very liberal one as there are many new cars which run 5000 and 6000 miles without carbon trouble sufficient to require the cylinders being scraped or burned out. As a general rule, it is a good thing to clean out the carbon when the valves are ground. The two operations can be readily performed at the same time because with the valve caps removed, or with the cylinder head taken off as is done in some motors, the combustion chambers are accessible and can easily be scraped out.

2—As stated under question 1, this will depend entirely upon the condition of the motor. Some motors with leaky rings become so full of carbon after 300 or 400 miles that they start to pound and pre-ignite to such an extent that they cannot be sufficiently operated.

3—The average charge for burning out a four-cylinder motor is $2, a six $3, an eight at $4 and a twelve $6. This is based upon the charge generally made in garages of 50 cents per cylinder. The time required for this work is very short as with the use of the oxygen tanks it is only necessary to insert the lighted paper into the combustion chamber and then by use of the oxygen, combustion is immediately started and is quite rapid.

4—There are patented preparations on the market for mixing with gasoline which are stated not only to remove carbon but to increase the mileage. The danger of securing materials which will have a deleterious effect on the cylinder walls is so great that the nature of these preparations should be carefully scrutinized before they are used. A method of

removing carbon by kerosene which has been tried out with good results is to start the motor and then with the kerosene in a cup or some other small vessel, the quantity is poured into the air intake as the motor is running. While this is being done, the throttle is opened wider to prevent the motor from stalling as it will begin to splatter as soon as the kerosene begins to enter the manifold. The work should be done somewhere where it does not make much difference if the motor should smoke as the introduction of kerosene will cause large volumes of smoke to pour from the exhaust. It is also a good idea in doing this work to open the muffler cutout so as to prevent soot from filling the muffler.

5—This question is answered under the preceding.

Can Not Make a Solid Connection

Editor THE AUTOMOBILE:—In THE AUTOMOBILE for June 24, I have not secured exactly the information desired.

The meaning of my question in the Rostrum is,—would any harm result if I removed grease cups, and put metal bushings enough around the axle housing to keep it from moving while running the car.

I have investigated several cars and do not find any movable parts on the spring seats, and wondered if this could not be tightened on my Buick B model 36.

Angelica, Wis. J. L. DECOCK.

—The flexible connection here is necessary, as, were the connection solid, strains would be put on the springs and driving members which should not be encountered by them. This connection for the spring was designed to fit in with the other members of the rear system and therefore, should not be altered.

Transmission Losses Are Very Small

Editor THE AUTOMOBILE:—In trying to work out a proposition of hydraulic transmission of power, we are anxious to learn if possible what the percentage of loss is in the present gear driven and worm driven cars from the motor to the rear wheels?

Nashville, Tenn. J. S. F.

—It has been estimated that in the car having an average amount of use, the loss from the motor to the rear wheels is approximately 5 per cent. The exact loss is determined by a number of factors, however, which vary. One of these is in the universal joints which have greater losses as the drive departs from that of a straight line. Some companies state that in worm drive the losses are 2 per cent larger on loads ranging from 8 to 45 hp.

Specifications of Buick, Ford and Franklin

Editor THE AUTOMOBILE:—Kindly answer the following: Can you give me the numbers of the patents which have been taken out on the Air-Friction Carbureter now made in Dayton, Ohio?

2—What is the bore, stroke, gear ratio and kind of axle in the Buick model 19, five-passenger car?

3—What is the bore and stroke, also the gear ratio of the Ford?

4—What is the bore, stroke and gear ratio of the Franklin?

5—What kind of valves are used in the Franklin engine?

6—What is it which makes the economy of the Franklin?

7—What is the boiling point in deg. Fahr. of gasoline?

8—What is the boiling point in deg. Fahr. in kerosene?

Barberton, Ohio. O. H.

—THE AUTOMOBILE has no records of these patents.

2—Buick 19 model had a bore of 4¼ and a stroke of 4½ in. The cylinders were cast in pairs. The car was equipped with a tubular radiator, both magneto and dry battery ignition, cone clutch, selective three-speed gearset, and had a wheelbase of 105 in. with standard 56-in. tread. The tires were 32 by 4.

3—The Ford motor is 3¾ by 4. It is L-head block and geared 3.63 to 1. The wheelbase is 100 in.

4—The bore, stroke and gear ratio of the Franklin cars are as follows: 3⅝ bore, 4-in. stroke and gear reduction 3.69 to 1 to 1.

5—The valves are overhead.

6—The principal economy feature in the Franklin car is the lightness due to the selection of materials, air cooling and other features of design. In explaining the effort to secure economy, the Franklin company states the following:

"To move an automobile which has a tendency to remain stationary by virtue of its own weight, energy must be employed. The drag exerted by the contact of the wheels with the ground and the friction of the moving parts must be overcome by energy, and the source of energy itself must secure the greatest proportion of power which is in the fuel. To secure the most power from gasoline, little or no heat developed by the combustion of the fuel that can be changed into work should be lost; and due to direct cooling on these cars, a small percentage is thrown away. The efficient temperature of operation of a Franklin motor is 350 deg. Fahr."

7—The boiling point of gasoline varies with the gravity and hence it is impossible to give a boiling point which will cover many different grades of fuel. One hundred and fifty deg. Fahr. has been frequently given as the boiling point of common gasoline. Benzine it is stated has a boiling point of 176 deg. and kerosene of the highest grade, 185 or 190. These quantities are only estimates, however, and cannot be taken as mathematically accurate for any definite grade of gasoline.

Tangent of Tank Angle the Factor

Editor THE AUTOMOBILE:—We have a Thomas-Detroit which we are changing into a raceabout, having dropped the seat and placed the tank on the top of the chassis, and we would like to know if you could advise the amount of drop from the bottom of the tank to the carbureter which would be necessary in order to get a free flow of gas on all hills.

The tank was originally underslung with a forcefeed, but for some reason this was disconnected—probably because it did not work, although I have heard that the pump on this car was eminently satisfactory, and I want to know whether or not it will be necessary to rerig this up in order to take care of a steady flow of gas at all times and on all hills.

Williamsport, Pa. H. W.

—The distance of the bottom of the tank above the car-

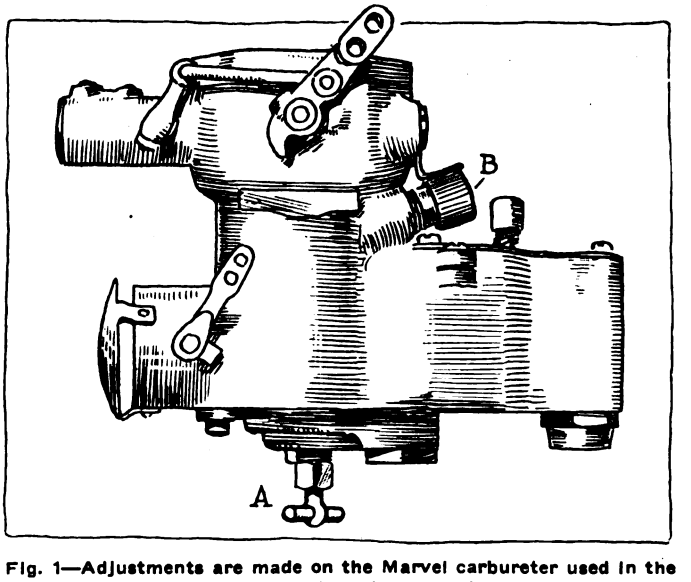


Fig. 1—Adjustments are made on the Marvel carbureter used in the Buick six at the points A and B

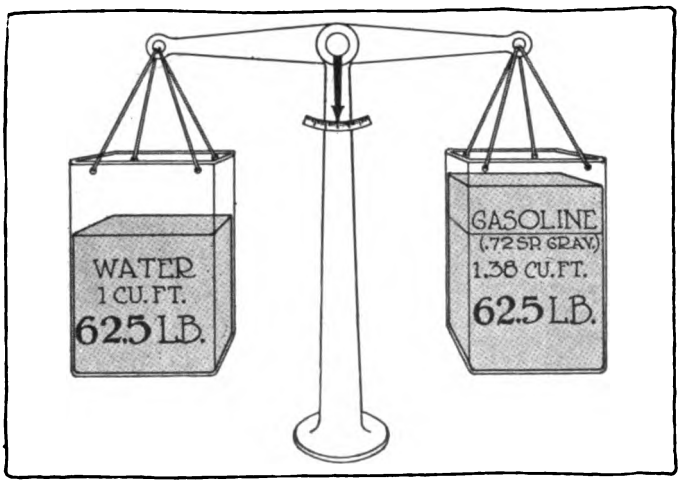


Fig. 2—A volume of gasoline must be 1.38 times as large as a volume of water to weigh the same amount if the specific gravity of the gasoline is 0.72

bureter is not the only factor which controls the flow of gasoline. Strange as it may seem at first, the distance of the tank behind the carbureter has just as much influence on the angle of the grade that the car may climb as the height has. To express the proposition definitely, the angle at which the car can climb, for any given tank location, depends upon the height of the tank above the carbureter vertically divided by the distance of the tank back of the carbureter horizontally. If, for instance, a tank is 12 in. above the carbureter and 2 ft. back of it, the determining factor would be 12 divided by 24 or 0.5. If the tank on the other hand were 3 ft. back of the carbureter, the determining factor would be 12 divided by 36 or 0.333. As will be noted this factor becomes less and less as the tank is further back of the carbureter. This fact becomes more evident still, if you will consider a tank which is a foot above the carbureter directly above that instrument and compare it with a tank which is a foot above the carbureter, but mounted in the rear of the car. It is evident that a better flow will be had from the tank directly above the carbureter on a slope of any steepness.

To bring the matter down to actual figures, if the height above the carbureter divided by the distance back of the carbureter measured vertically and horizontally respectively equals 0.176, the car will be able to climb anything up to a 10 per cent grade. If that figure equals 0.268 it will be able to climb anything up to 15 deg. If the figure is 0.364 the gradient will have to be 20 deg. before flow ceases and if the figure is 0.578 the flow would not cease under 30 deg.

Weight of a Gallon of Gasoline

Editor THE AUTOMOBILE:—Would you kindly inform me how much a gallon of gasoline weighs, the gravity being 0.72?

San Francisco, Cal. J. R.

—If, when speaking of gravity, you refer to the specific gravity scale the weight of a gallon of gasoline of 0.72 specific gravity would be 6.001632 lb., taking water at the specific gravity 1 to weigh 8.3356 lb. per gallon. On the other hand, if you mean 0.72 gravity on the Baumé scale, this would be equivalent to about 0.69 specific gravity. Gasoline of 0.69 specific gravity weighs 5.751564 lb. assuming that a gallon of water of specific gravity 1 weighs 8.3356 lb.

It is generally taken that a cubic foot of water distilled, weighs 62.5 lb. although the actual weight is somewhat below this. If the gasoline is 0.72 specific gravity, it would take 1.38 cu. ft. to weigh 62½ lb. In other words, the volume of gasoline to weigh the same amount as a given volume of water must be 1.38 times as large if the specific gravity is 0.72. This is graphically brought out in Fig. 2.

Gasoline of 63 Baumé is in common usage and for calculation in regard to the weight for any definite quantity of gasoline of this gravity, a handy chart is given in Fig. 3. Referring to this, it will be seen that the weight is very close to 6 lb. to the gallon and in making any approximate determinations of the weight of the various tanks filled with gasoline, 6 lb. to the gallon can be taken as sufficiently accurate.

If you desire to determine the weight of gasoline for any specific gravity, referring to gallon, it is only necessary to multiply the figure 8.3356 by that specific gravity. This figure is the weight of water since the specific gravity of water is 1, multiplying by the specific gravity of the liquid of which you wish to find the weight will give you the desired results. In case you only have the specific gravity in terms of the Baumé scale, it will be necessary to secure the specific gravity from a conversion table. The Baumé scale is so arranged that 10 Baumé corresponds to 1 specific gravity. In other words, water would be 1 on the specific gravity and 10 on the Baumé scale. Ninety on the Baumé scale is 0.6363 specific gravity. If you desire to secure the specific gravity from the Baumé scale, and have not a conversion table at hand, it can be found readily by the formula:

$$\text{Specific Gravity} = \frac{140}{130 + \text{Be}'}$$

For example, if your hydrometer showed the gasoline to be 64 Baumé, and you desired to find the specific gravity by means of the above formula, you would divide 140 by 130 plus 64 or 140 by 194. The result of this division is 0.7216, which is the specific gravity of a liquid 64 on the Baumé scale. To find the weight of a gallon of a liquid of this gravity you would multiply 8.3356 by 0.7216, which would give you 6.03+ lb.

Horsepower of Two Cylinder 5 by 6½

Editor THE AUTOMOBILE:—What is the horsepower of a two-cylinder motor with 5-in. bore and 6½-in. stroke at 750 r.p.m.?

2—What type of radiator gives the best results on a 16-hp. gasoline tractor and what capacity should it have?

Fingal, N. D. A. T.

—It is impossible to give the exact brake horsepower of a motor by making calculations from formulas based upon bore, stroke and r.p.m. The reason for this is that the manifold design, valve size and general structure of the motor, has so much to do with the matter that the power must be

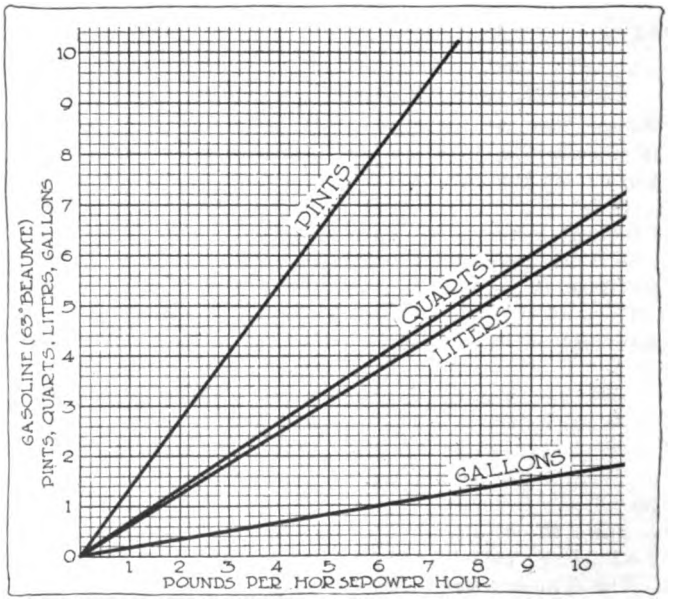


Fig. 3—Chart showing the weight of 63 Baumé gasoline in pounds per horsepower hour

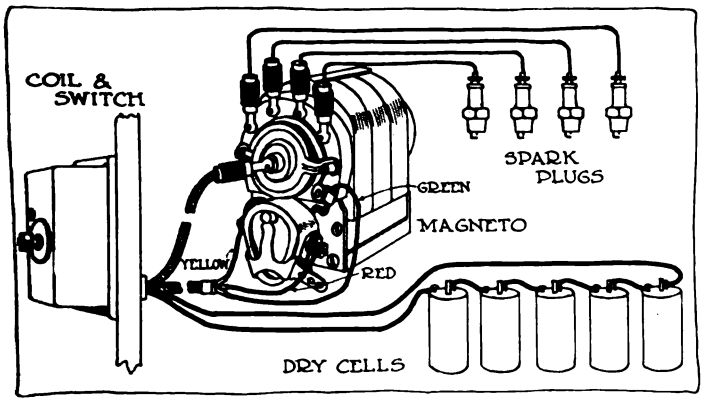


Fig. 4—Diagram of wiring used on model 10 Buick showing terminal connections

measured on a block to get anything like accurate results. An approximation can be made however, by formula, assuming that the motor is in fairly good condition and that the design is approximately correct. On the basis of this formula, your motor would develop about 20 hp.

2—It would be most economical for you to purchase a vertical tube radiator as these are cheaper than the cellular and more rugged. A radiator of about the size of that used in the Ford should be sufficient, and it will be perhaps quite easy for you to pick up a Ford radiator either new or second-hand.

Of course, in tractor work you have not the advantage of the speed of the car which you have in ordinary automobile practice. When running along a road at 25 m.p.h. the current of air striking a radiator has such a large cooling effect that a radiator of smaller size can be used and would be necessary if the car were running in such a manner that it did not get the benefit of this blast of air. It may be well possible therefore, that with a motor which is not designed to secure the best cooling efficiency, that a radiator of this size will be too small, although it would seem that ordinarily it would suffice. The question of radiator size is not one which can be determined by formula but is more in the nature of experimental work. Where a radiator of definite size has been tried out on a given motor with good results, it is natural to suppose that on other motors of the same size the same radiating capacity will do the work properly, and it is on this basis that most radiators are determined.

Piston Rings for Whiting Roadster

Editor THE AUTOMOBILE:—What are the piston ring dimensions of the model A, Whiting roadster, which was made by the Flint Wagon Works Co. of Flint, Mich.?

2—Would a worn cam and breaker arm on Remy magneto cause missing and hitting? Is it O. K. while running slowly?

3—Is model D Schebler carbureter suitable for this motor?

Fort Wayne, Ind. J. E. D.

—The piston ring dimensions on the Whiting roadster are 3¼ in. in diameter and 0.187 in. in thickness.

2—The worn cam and breaker arm would cause the trouble you refer to.

3—Model D Schebler can be fitted to this car, the proper size to use being 1 in.

Missing Due to Loose Terminals

Editor THE AUTOMOBILE:—Please give me a wiring diagram of the Model 10 Buick, and give causes and remedy for magneto missing or back firing at low speeds. The car runs excellently on dry cells, but very poorly on the magneto at low speed.

Meadville, Pa. I. H. A.

—A diagram of the model 10 wiring is shown in the accompanying illustration, Fig. 4. Missing is due, of course, to loose terminals and connections, dirty or burned contact points in the circuit breaker, or poor contact of the distributer brush with its terminals. The Buick company advises that the user should keep the magneto clean.

Back firing is not due to magneto trouble unless the spark is very badly out of time. It is generally due to running with too rich or too lean a mixture from the carbureter.

Wiring of Battery Lighting System

Editor THE AUTOMOBILE:—Kindly give me the best diagram for wiring electric lights on an automobile using a storage battery only but including a meter for two headlights, two side lights, one tail and one dash light with three separate switches.

Newark, N. J. L. S. H.

—The accompanying diagram, Fig. 5, shows the method for wiring electric lights from a storage battery. From your inquiry it is not clear whether you wish to operate all the lamps independent of one another, or to run them in sets as is customary. That is, it is generally the practice to have the two headlights in parallel on one switch with the side and tail lights on another. A third point on the switch turns on both sets, with the dash light independent, so that it can be turned on or off as desired. This gives you independent switching arrangement without the complication of an independent switch for each arrangement of lights. It is hardly possible that you will desire to burn one headlight at a time but since you are using the storage battery it might be that you will desire to economize in this direction and probably the best arrangement in that case would be to simply have an independent switch to break the circuit to one of the head lamps during the time that you desire to operate on but one.

Another means of effecting economy in the current consumption is to have the side lamps off when the headlights are on. You will rarely if ever require both, because the side lamps are merely for the purpose of running signal lights with the illumination feature secondary. The tail light you will need continuously while running or while the car is standing at night.

To sum up, the conditions which you will probably require with the battery as the only source of current are as follows: 1—Side and tail lights lit for car standing, or running through cities where headlights are barred. 2—Head and tail lights lit for country work; 3—One head and tail light lit for running through country with good roads. The accompanying wiring diagram gives the method for accomplishing these conditions and at the same time provides an ammeter to measure the current consumption under any condition. The dash lamp is so placed that it can be turned on occasionally to see the dash instruments and to test the tail light with which it is in series.

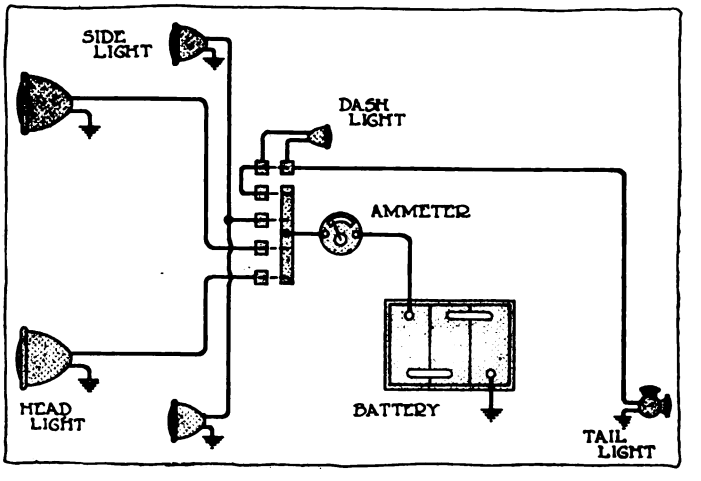


Fig. 5—Method of wiring a car for using electric lights in connection with a storage battery

Analysis and Valuation of Motor Fuels 14 Methods for Examining Them

From German Data

WHILE the number and diversity of motor fuels made, sold and used for automobile and boat purposes in Germany are much greater than in the United States, the results of the work done for a series of years by Dr. Karl Dieterich in examining all these fuels, with a view to determining their relative utility and value and enabling the public to distinguish among them, will also here be found of interest and valuable for reference, so much more as Dr. Dieterich adds to his competence as a chemist, being a director of the Helfenberg Chemical Works Corporation, that of an enthusiastic automobilist who has owned and driven nearly thirty different cars. He has lately advocated the plan of buying a new car or two every year on the ground that the pleasure is increased, the worries reduced and that the expense of it can be very moderate if the cars are treated right and the opportunities for trading the used cars at a good price are quietly watched with the aid of organized professional salesmanship. But, it may be said, other contributors to the German automobile press vigorously deny that this "American plan" can be made economical for persons in ordinary circumstances, though it may be possible to make it less extravagant than it generally is.

Dr. Dieterich reports his work in *Automobil-Rundschau* for May, where it occupies the whole issue, comprising thirty text pages, and the report is also published as a separate print by the *Mitteleuropaisches Motorwagen Verein* (Central European Automobile Association). An extract is presented in the following, giving the reasoning, statements and chemical information of widest technical and trade interest.

(The German term *Benzin* is throughout rendered as "gasoline," but the word *Gasolin* or *Gasoline* is used in Germany as a trade name for certain grades.)

Many Varieties—Insufficiently Labeled

The fuel for internal combustion motors was formerly only one substance called gasoline whose chemical and physical properties varied but little, but nowadays a large number of fluids are in the market, some of which appear under fantastic names and with claims of incredible fuel virtues. In most cases there is only question of mixtures of gasoline and benzol, of benzol and alcohol, occasionally with additions of kerosene, and they all, of course, have certain advantages, but on the whole they are never superior to the good unmixed gasolines for ordinary automobile motors. The admixture of nitrogen compounds is on account of the great increase of the explosive violence and the danger of backfiring not to be undertaken except with the greatest caution. During the examinations extending over a number of years, nitro-admixtures have been encountered very rarely but camphor and naphthalene with some frequency.

We have advanced so far with modern carbureters that we do not depend absolutely on gasoline but can make use of almost any fuel whose properties we know, if we acquire the experience and insight enabling us to adapt ourselves to the circumstances. The skilful motorist can drive with benzol and alcohol, and if the motor is sometimes found injured through the use of such fuels this result can generally be traced to unsuspected adulterations. It is necessary to have the mixtures so nearly pure and definite in their properties that nothing impossible is asked of the carbureter. Not only a chemical examination of motor fuels is therefore needed but certain criteria should be established for recognizing the properties of every fuel in the market. Under the present circumstances the automobilist or employer of motor power cannot be expected to find his way among the many grades and mixtures that are offered him, and the chemist who undertakes to analyze them looks in vain for systematic guidance in the technical literature. [The author gives a list of all important German books and articles dealing with the fuels and a digest of the contents of each of them.]

Many believe that after the war is over and gasoline again becomes available German automobilists will refuse to return to this fuel, having learned to get along without it, but it is to be remembered that there is a superior convenience in the use of gasoline. The motor can be started easily, even in winter, with the gasoline, and it can be obtained everywhere, while with benzol and especially with alcohol mixtures a marked drop in the temperature necessitates some re-arrangement of the carbureter with adjustment of the pre-heating and of jets. The chauffeur usually prefers the less exacting gasoline and influences his employer in this direction. A quite general return to the gasoline is therefore to be expected after the war, habits and convenience being strong factors, though it is to be hoped that benzol will become a stronger and stronger competitor. Meanwhile the enormous demand for motor fuels and the resulting price fluctuations have changed the market conditions radically. While formerly the standard article was a fairly pure gasoline with the boiling points close together and scarcely any components that did not evaporate at 100 deg. C. and was sold for less than 30 Pfennig (7½ cents) per kilogram, the fluid obtainable at this price now is a gasoline of medium specific gravity, impure, containing benzol, with boiling points far apart and with 20 to 30 per cent of components which do not evaporate below 100 deg. C. At the same time the carbureters have been adapted to the lower grades of fuel. In some of them, which are intended to work with impure medium and heavy gasoline, with benzols and even with alcohol, no other changes are needed for going from a volatile to a heavier fuel than adjustments of air intakes and jets, increased pre-heating and raising of the float level. In other carbureters even these changes can be dispensed with if maximum fuel economy is not demanded. At a pinch the modern carbureter thus consumes anything, even if it cannot digest it.

Specific Gravity No Criterion

Commerce in gasoline and benzol has so far been based on confidence, as they have been sold almost exclusively on a basis of specific gravity, although it is possible to produce any specific gravity of the middle range by suitable mixing of higher and lower fractions of the distillation. The result is usually one of the mixtures, before referred to, in which boiling points are far apart and a large percentage of the components does not vaporize till above 100 deg. C. This development has now made the testing of the motor fuels a necessity; also a separation between gasolines which are adapted for motors and those which are not. It has become desirable to establish physico-chemical specifications for the fuels and to discontinue the practice of grading them by their specific gravity alone.

Comparison of Gasoline and Benzol for Motors

	GASOLINE	BENZOL
Origin	**Distilled from Petroleum**	**Distilled from Coal**
Production and refining	By repeated fractional distillation, supplemented, if necessary, by washing with acids and alkalis.	Mostly from the gases of coke furnaces; also from light coal tar oil. Refined by repeated distillation and leaching with acids, lye and water. Can be made synthetically from benzoic acid or acetylene.
Chemical composition	Unstable mixture of hydrocarbons of the paraffine group: butane C_4H_{10}, pentane C_5H_{12}, hexane C_6H_{14}, heptane C_7H_{16}, octane C_8H_{18}. Principal component is hexane. Boiling point, 69 deg. C.	Almost constant mixture of aromatic hydrocarbons. Pure benzo has 95% C_6H_6; commercial automobile 90% benzol consists of 84% benzol, 13% toluol, 3% xylol and traces of thiophene It is called "90%" because 90% should evaporate up to 100 deg. C.
Chemical formula and specification.	In the main C_6H_{14}; further C_4H_{10}, C_5H_{12}, C_7H_{16}, C_8H_{18}. A paraffine hydrocarbon with open C-chain, indifferent to acids and alkalis.	In the main C_6H_6; in addition C_6H_5 (CH_3), C_6H_4 $(CH_3)_2$ and C_4H_4S. Aromatic hydrocarbon with closed C-chain. Nitric acid and sulphuric acid, mixed, changes benzol to nitrobenzo
Carbon and hydrogen contents	About 85% C and 15% H.	About 92% C and 8% H.
Specific gravity	From .680 (light) to .750 and higher (heavy), at 15 deg. C.	Pure benzol .8730 to .8770 at 15 deg. C. Automobile benzo about .880 at 15 deg. C.
Boiling points	Hexane 69 deg. C. (pentane 36 deg. C., heptane 98.4 deg. C., octane 125.5 deg. C.). Light gasoline (from .650 to .700 s.g.) between 40 and 100 deg. C.; medium from .700 to .730 s.g.) between 45 and 140 deg. C.	Pure 80 to 81 deg. C. Automobile about 80 to 120 deg. C Toluol, 111 deg. C. Xylol, 138 to 141.9 deg. C.
Heat units (calories)	9,500 to 10,500.	9,350 to 10,000.
Freezing point	Below 15 deg. C. minus.	Pure at 0 deg. C.; automobile benzol at 5 deg. C. minus. Mixture of ⅔ benzol and ⅓ gasoline at about 10 deg. C. minus Auto-benzol is doctored with additional toluol for winter use to lower the freezing point.
Velocity of flame propagation in explosive mixture.	2.5 meters per second (oxyhydric gas 100 times as fast).	Smaller than for gasoline.
Air required for combustion	For 1 kilogram 11.7 cubic meters of air, the latter composed of ⅘ nitrogen and ⅕ oxygen.	For 1 kilogram 10.2 cubic meters of air. In practice 20% more air is used.
Combustion formula	$C_6H_{14}+19O=6CO_2+7\ H_2O$; or hexane + oxygen = carbon dioxide + water.	$C_6H_6+15O=6\ CO_2+3\ H_2O$; or benzol + oxygen = carbon dioxide + water.
Fuel efficiency	With economical motor 20 to 23%. Rest goes into heat and intermediate combustion products, as only a smaller portion is completely oxidized.	Similar to gasoline. Benzol is less sensitive to correctness of air mixture than gasoline.
Effective horsepower from 35 hp. Bussing motor, by official tests.	At 1500 r.p.m.: medium gasoline, 54 hp.; heavy gasoline, 53.6 hp.	Only 49.4 hp.; 8% less than with gasoline.
Weight capacity of fuel tank for 100 liters.	70 kilograms.	86.5 kilograms; giving greater mileage from one filling of tank than gasoline.
Vaporization	Easier with gasoline. Most modern carbureters can work with either gasoline or benzol.	More difficult; requires therefor in practice more air as well as more heat.
Odor and exhaust	Almost odorless. Exhaust acid and irritating to mucous membranes.	Aromatic. Exhaust also aromatic; at all events pleasanter odor than from gasoline.
Toxicity	Gases poisonous; caution needed.	Unrefined more poisonous, auto-benzol not more poisonous; caution needed.
Fire risk	Considerable.	Less risk as less volatile.
Corrodes machine parts?	No.	No. If it does, the carbureter is not properly adjusted. Sooting and oily deposits are symptoms of irrational carburization or unsuitable carbureter.
Price per kilogram (in Germany, 1915).	Light grades more than 50 pfennig; heavy grades cheaper.	Formerly 30 pfennig; now higher.
Sources of supply	America, East India, Japan and Sunda Islands (Sumatra, etc.) produce 40 million tons of petroleum annually. Russia, Galicia, Roumania and Germany less than 13 millions. Dealers everywhere.	Germany produces now 120,000 to 150,000 tons, covering home demand. Sales stations organized, and more to be established.

Chemical analysis alone has, on the other hand, become more or less inadequate and unsafe through the specialization of the fuel preparations, as the methods of analysis prescribed in the technical literature take little or no heed of the demands which should be made in each class of the gasolines and of the other fuels. [There is a clash here in the nomenclature, as the Germans speak of light, medium and heavy *Benzin*, making three classes, while no similar classification of gasolines is recognized in the United States.] Such analysis now requires to be specialized with a view to bringing out the fitness or unfitness of each preparation for its intended purpose, and here the guidance of long and first-hand practical experience with the operation of motors is needed in order to throw the light of practice over the chemical examinations. This means, further, the general adoption of a special apparatus and process, devised under the guidance of all the required special knowledge and motor skill and suitable for being used and applied by ordinary chemists or even by motorists who are laymen in this branch of science. [One of the author's objects is admittedly to present the merits of

his own testing apparatus and of the preparation, called "Dracorubin" paper, which is the practical upshot of his protracted investigations in this field, while also giving exhaustively the technical and practical reasons for the preference accorded them among all appliances for tests of motor fuels.]

The accompanying table giving a comparison of gasoline and benzol in their main physical and chemical features is useful for reference and serves as an introduction to other tables giving complete physico-chemical examination of 92 gasoline, benzol and alcohol products, most of which are intended as fuels for motors, from automobile and aviation motors to Diesel motors, while a few are intended for industrial purposes and illustrate the subject by contrast.

Fourteen Methods of Examination

The methods by which each of these products has been examined and classified comprise: (1) determination of the specific gravity, (2) noting of colors and other exterior characteristics, (3) test of odor on filter paper, (4) noting time required for complete evaporation of given quantity, etc., (5) behavior with litmus, (6) coloration with sulphuric acid, (7) qualitative and quantitative tracing of aromatic hydro-carbons and unsaturated combinations, (8) test for benzol with isatine ($C_8H_5NO_2$) sulphuric acid, (9) test for benzol by nitration with nitric and sulphuric acids, (10) test with "Dracorubin," (11) test with nitrate of silver, (12) test for water with calcium carbide, (13) fractional distillation and (14) determination of refractometer degree.

[Dr. Dieterich now gives an account of the process with each of these methods and of the observations made in connection with each of them, finally coming to his conclusions with regard to the best classification of motor fuels, the demands which should be made in each class and the safeguards which should be established in commerce to enable purchasers to know what they are buying and how that which they buy may be utilized to best advantage. Reversing this order, his conclusions are here given first, while the tables of examination data for each of the ninety-two products are omitted. The descriptive account of the examination methods follows in part and will be finished in another instalment.]

Regulation of Motor Fuel Commerce

Above all it is asked that every gasoline shall be sold under one of three classes: Class A, light motor gasolines (*Motoren Leichtbenzine*), class B, medium motor gasolines (*Motoren Mittelbenzine*) and class C, heavy motor gasolines (*Motoren Schwerbenzine* or *Nutzbenzine*). These terms should correspond to definite characteristics, so that the class name alone will tell the motorist approximately the quality of the brand.

Steps in this direction have been taken by different automobile associations, by the commissary department of the army and by municipal bodies, in so far as they purchase gasoline according to specifications, relating especially to the boiling point limits, and the proposition is therefore not altogether new.

The details of the demands to be made are worked out in the following schedules, in which all the required classifications of benzols and alcohol mixtures are also indicated, and which refer to the results which should be obtained by the above-mentioned different test methods.

I. Motor Gasolines

Class A: Light Motor Gasolines

Specific Gravity: 0.650 to 0.700

Primary Properties—colorless, leaving no odor after evaporation, perfectly free from dirt, leaving no grease spot.

Time for Evaporation (of given quantity under given conditions)—less than two hours.

Reaction with Sulphuric Acid—almost colorless, at most a faintly yellow coloration of the acid.

Nitration Test—as nearly free from benzol as possible, at most a faint odor of nitrobenzol.

"Dracorubin" Test—the gasoline colorless, at most a faint rose pink sheen, traces of benzol, at no events more than 5 per cent.

Nitrate of Silver Test—perfectly negative.

Carbide Test for Water—perfectly negative.

Litmus Test—perfectly neutral.

Boiling Points—as close together as possible, lower limit 40 deg. C., upper limit 125 deg. C.

Components Above 100 Deg. C—preferably none, at most 10 per cent.

Refractometer Degree—not under 54. [Explained in the next instalment.]

Price: highest of any motor gasolines, at present fluctuating (in Germany) between 46 and 55 pfennig per kilogram.

Class B: Medium Motor Gasolines

Specific Gravity: 0.701 to 0.730

Primary Properties—colorless, no odor after evaporation, perfectly free from dirt, leaving no grease spot.

Time for Evaporation—not over 2½ hours.

Reaction with Sulphuric Acid—at most faint yellow coloration of the acid.

Nitration Test—almost free from benzol, small amounts of nitrobenzol admissible.

"Dracorubin" Test—gasoline nearly colorless, at most faint rose pink coloration; small natural benzol content, at most 20 per cent admissible.

Nitrate of Silver Test—at most a faint coloration.

Carbide Test for Water—perfectly negative.

Litmus Test—perfectly neutral.

Boiling Points—lower limit 45 deg. C., upper limit 140 deg. C.

Components Above 100 Deg. C.—at most 30 per cent.

Refractometer Degree—not under 53.

Price—lower than Class A; at present between 35 and 45 pfennig per kilogram.

Class C: Heavy Motor Gasolines

Specific Gravity: 0.731 to 0.750 and higher

Primary Properties—as colorless as possible, leaving as little odor and grease after evaporation as possible; yellowish coloration, some odor and residue admissible.

Time for Evaporation—preferably not more than three to four hours.

Reaction with Sulphuric Acid—from yellow to light brown coloration of the acid admissible.

Nitration Test—certain amounts of nitrobenzol or nitrotoluol admissible, showing a natural content (not an admixture) of aromatic hydrocarbons.

"Dracorubin" Test—gasoline rose pink to light red or yellow-brownish coloration; not over 25 per cent of aromatic hydrocarbons (benzol, toluol, etc.) admissible.

Nitrate of Silver Test—faint blacking admissible.

Carbide Test for Water—perfectly negative.

Litmus Test—perfectly neutral.

Boiling Points—lower limit 65 deg. C., upper limit 150 to 170 deg. C.

Components Above 100 Deg. C.—as many below as possible, not more than 75 to 80 per cent above.

Refractometer Degree—not under 50.

Price—lowest of all motor gasolines, at present usually below 30 to 35 pfennig per kilogram.

II. Motor Benzols

Specific Gravity: 0.880 to 0.885

Primary Properties—as colorless as possible, at most faintly yellowish, leaving no odor after evaporation, no residue.

Time for Evaporation—preferably not over 3½ hours.

Reaction with Sulphuric Acid—weak yellow coloration of the acid admissible.

"Dracorubin" Test—dark blood red color = 90 per cent benzol, the test paper after drying tile red, finely mottled.

Nitrate of Silver Test—blackened.

Carbide Test for Water—perfectly negative.

Litmus Test—perfectly neutral.

Boiling Points—lower limit 80 deg. C., upper limit 120 deg. C.

Components Vaporizing Below 100 Deg. C.—at least 90 per cent, the rest passing before 120 deg. C. is reached.

Refractometer Degree—37 to 38.

Price—at present 32 to 37 pfennig per kilogram.

III. Motor Alcohols

Specific Gravity: 0.822 to 0.825

Primary Properties—almost colorless, faintly yellow, odor according to denaturing agent (pyridine).

Time for Evaporation—at most 4½ to 5 hours.

"Dracorubin" Test—dark blood red color = 95 per cent alcohol, test paper after drying not mottled, bright rose pink.

Boiling Points—lower limit below 70 deg. C., upper limit 85 deg. C.

Components Vaporizing Below 100 Deg. C.—100 per cent.

Carbide Test for Water—only small air bubbles and traces of acetylene.

Refractometer Degree—58 to 59.

Price—at present about 35 pfennig per kilogram.

In drawing these requirements for the five classes of motor fuels, it has been considered that carbureters are being improved all the time and that therefore the demands should be formulated a little milder than the actual conditions of the moment would justify.

The brief references to the different testing methods which are not sufficiently explained in the schedules are made clear in the detailed account of each method, the first part of which follows herewith.

1. To Determine the Specific Gravity

Specific gravity is determined either with Mohr's scales or by aerometer at 15 deg. C. For the gasolines a corrective test is advisable, and that devised by Mendelejef has been used. It is described in HOLDE'S *Untersuchung der Kohlenwasserstoffe, Oele und Fette*, 4th edition, page 55.

The medium gasolines now most used, which are those ranging only from .715 to .730, show such wide differences in composition and value that for this reason alone the customary classification by specific gravity without mention of other test results becomes worthless. This classification must therefore be used merely as a convenient basis giving the rough division lines, and within each class each fuel must be judged individually by other indications and with its purpose and price in mind.

The proposed classification by specific gravity is given in the foregoing schedules. Mixtures of gasoline and benzol or of benzol and alcohol have their specific gravity determined by the proportions of their components.

2. Color and Other External Characteristics

After shaking the fluid one pours some of it into a high vessel of clear glass and observes it, using a sheet of white paper as background. In the case of gasolines, if they are colorless, it is not possible to tell what class they belong to. Only the very heavy gasolines and impure benzols and alcohols show a yellowish tint. And it must of course be demanded of all the fuels that they shall be clear; that is, that they shall not contain particles of dirt.

3. Test for Odor on Filter Paper

A little of the fluid is poured out on filter paper and is evaporated. The characteristic odors of gasoline and of benzol can be recognized. The easier and more rapidly a gasoline or benzol evaporates, without leaving any odor or grease spot on the filter paper, the better it is. The odor disappears slowly after a mixed or highly composite gasoline. Impurities remain altogether, and poor gasolines of class B leave a permanent odor and sometimes, as also in the case of most of the gasolines of class C, a greasy residue. Denatured alcohol leaves a white residue smelling of wood alcohol and pyridine. Fluid containing water leaves beads or drops of water.

4. Timing of Evaporation in Clock Crystal

An evaporation pan shaped as the crystal of a clock (the edges rising at a right angle, not flaringly as a saucer), 10 centimeters (4 in.) in diameter and 1 centimeter deep, is placed on a piece of black paper, for easier observation, in a place that is free from drafts and where the temperature can be maintained between 15 and 20 deg. C., and is filled with 10 cubic centimeters of the fluid to be examined. The observation relates to the time required for complete evaporation, to the uniformity—whether it evaporates more rapidly at first and later more slowly—and to the residuum, which may be odorous, oily, white or of other nature.

This test is not commonly employed and has the disadvantage that it is not always easy to maintain an equable temperature without drafts in a room, but this difficulty corresponds somewhat to the working conditions of a carbureter, and the test gives a practical picture of fuel quality which is not so readily obtained by other means by laymen. The average time limits which must be required of the different classes of fuels is given in the schedules.

An observation in connection with this test is that mixtures of light and heavy gasolines as well as poor gasolines in general show a tendency to the formation of drops, but no safe inferences can perhaps be drawn from this peculiarity.

A guide to the proportions in which admixtures affect the time of evaporation of gasolines is given in the following list, in which it will be noticed that the time for pure gasoline is only 57 min., while the schedule of requirements for light gasolines of class A allows "less than 2 hr."

TIME FOR EVAPORATION OF 10 CUBIC CENTIMETERS OF FUEL IN VESSEL OF 10 CENTIMETER DIAMETER AND 1 CENTIMETER DEEP

Pure gasoline						57	min.
"	"	+ 5%	benzol		1 hr.		
"	"	+ 10%	"		1 "	7	"
"	"	+ 20%	"		1 "	26	"
"	"	+ 25%	"		1 "	46	"
"	"	+ 30%	"		1 "	51	"
"	"	+ 40%	"		1 "	54	"
"	"	+ 50%	"		1 "	56	"
"	"	+ 60%	"		1 "	58	"
"	"	+ 70%	"		1 "	59	"
"	"	+ 80%	"		2 "	3	"
"	"	+ 90%	"		2 "	19	"
Ether						38	"
Benzol 100%					2 "	23	"
Toluol					9 "	15	"

Xylol—after 3 days not yet evaporated.

Motor alcohol 95%.....4½ to 5 hr.

As the time and the uniform progress of the evaporation, from beginning to end, means a great deal for indicating whether the fuel is liable to clog a carbureter nozzle and for the functioning and responsiveness of the carbureter in general, and the test shows marked differences in the evaporation time of the gasolines in class C, and less pronounced but still important ones in classes A and B, its practical utility may be considered established.

It shows a number of interesting peculiarities in the retarding and disproportionate effects of heavy components.

(*To be continued*)

ACCESSORIES

Midgley Non-Skid Tire

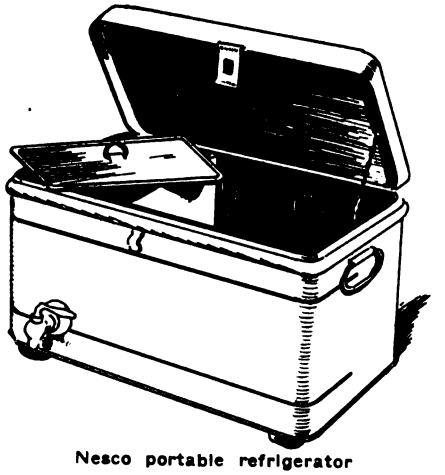
THE Midgley tire secures its non-skid quality by steel wires embedded in the tread. These wires are in the shape of spiral springs made of steel piano wire. As shown by the section herewith, there are four of these spirals, each long enough to completely encircle the wheel. They are vulcanized into the rubber, with their outer surfaces just at the surface of the tread. After running a few miles the wear against the road cuts the exposed edge of the wire, cutting the spring in such a way that the wire is no longer in a spiral, but consists of a great number of wire loops shaped like horseshoes, with the ends appearing just even with the surface of the rubber. The idea is that when the tire comes in contact with the road the rubber is pressed back and the points project, gripping the road like claws.

This action of the wire is secured until the tire is worn down completely past the bottom of the wire loops. According to the manufacturers of the tire, the non-skid quality will be maintained for 6,000 miles, and besides being proof against skid are also of such a nature as to reduce the chances of puncture, eliminate the possibility of stone bruise and protect the side walls against blow-out.—Midgley Tire & Rubber Co., Lancaster, Ohio.

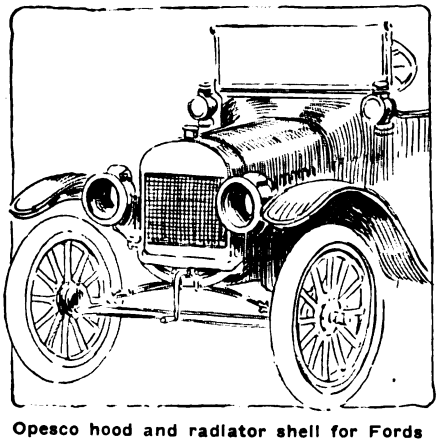
Midgley non-skid tire in section

Nesco Portable Refrigerator

Very often the automobilist desires to carry with him a quantity of fresh food for a trip where a picnic lunch is indulged in. In order to keep the food on such a trip fresh and cool, the Nesco refrigerator has been brought out especially designed for the purpose. It is contained in a convenient size metal case with side handles so that the entire outfit can readily be moved from one place to another. The measurements of the box are 17¼ by 12 by 10½ in. and the outfit includes a granite enamel water cooler with a nickel-plated faucet which screws into the cooler making cleaning easy. The box is made with rounded corners as shown herewith and is made in two styles, either japanned oak or japanned white. The list price either style is $50 per doz.—National Enamelling & Stamping Co., Milwaukee, Wis.



Nesco portable refrigerator



Opesco hood and radiator shell for Fords

Ospeco Hood for Fords

A new hood and radiator shell for Fords under the name of Ospeco is being manufactured which not only gives a new style of hood line but also alters the outward appearance of the radiator, effecting considerable change in the appearance of the whole front of the car. The equipment has a shell which fits over the radiator and the whole is rigidly attached by means of a hood ledge which is part of the outfit and is fastened to the dashboard. The lower part is held by the regular Ford radiator fasteners. The hood is of heavy steel finished in two coats of baked enamel. The radiator shell may be finished in nickel, if desired. Price, $15.—The Ouchie Specialty Co., Detroit, Mich.

Positive Split Rim Tire Remover

A positive tire remover is designed to take the tire from split rims in a short time without prying, hammering, or running any danger of injuring the casing or rim. Many difficulties have been encountered in the moving of detachable rims from casings, and it has always been a difficult task where the casing showed any tendency to stick. The subsequent hammering has often damaged rims to such an extent as to make them practically useless.

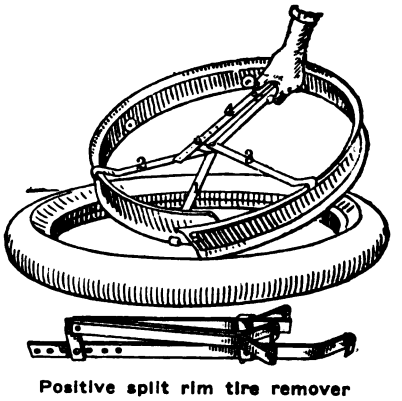
With the positive remover the rim is drawn together evenly and sprung out of line. It can be folded up to fit in the tool kit of the car and can be adjusted to fit any size rim. Its weight is 3 lb., and it is sold for $2.—Positive Supply Co., Davenport, Iowa.

So-Luminum Aluminum Solder

The latest aluminum solder evolved is called So-Luminum which is designed to render possible perfect soldering of broken aluminum parts without recourse to welding. The new preparation is too hard and strong to permit of using a soldering iron, though the metal runs at a very low temperature and tins quickly. A gasoline torch is the only thing that is necessary and the So-Luminum is claimed never to break at the soldered point while there is no oxidization. Lost bits of aluminum can be replaced by building up and are said to be found harder than the original under the hammer test. So-Luminum is claimed to take the place of welding and to do the work in one-fourth the time at one-fourth the cost.—So-Luminum Mfg. & Engineering Co., New York City.

High Power Magnet Charger

In order to permit car owners to do their own charging of magnets for magnetos, a simple device has been desired for some time. The new high-power magneto charger is designed to fit the needs of either the repairman or private owner,



Positive split rim tire remover

and is a compact instrument which can be readily operated by any one. The charging box is compact, of light weight and simply operated. The horseshoe magnet is removed from the magneto, placed against the opposite poles in the charging box and then pressed down into the box where the coils are located. The current is then switched on and off and the magnet is charged. The outfit sells for $15 complete.—C. C. McDonald Electric Co., Chenoa, Ill.

Topping Jack

Since the advent of the automobile there has been a demand for safe, efficient and easy-working jacks. The Topping jack, built on the same principle as a locomotive jack, that is, operating by means of a screw, has recently been introduced with these features.

The special feature of the jack is the screw, which produces a rise at both ends, the jack therefore working twice as fast. No appreciable increase in effort is required to operate it. On the center of the screw is fitted a bevel gear which meshes with a bevel pinion, this pinion being actuated by a ratchet into the socket of which the handle is fitted.

On the upper end of the jack is a right-hand thread which engages with the traveling lifting head and the left-hand thread on the lower end with the standard. Both the head and standard are inclosed in a protecting case or shell, out of which they emerge as the jack is operated. The jack is reversed by throwing over a small pin located at the base of the handle socket. Another feature is that the swivel top is removable and can be replaced by another swivel top having a side spur for low set axles as shown in the accompanying illustration.

The passenger car jack, which has a rise of 7 in., costs $6.50 with an extra charge of 50 cents for the side lift. The truck jack with a similar rise costs $8.50. —Topping Bros., 122 Chambers Street, New York City.

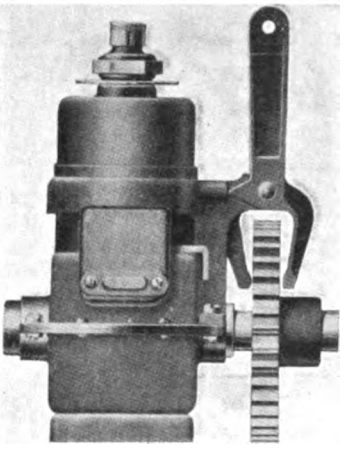
Stevens Products

Breaking off a cylinder-head or water-connection bolt in the hole is often a serious matter to the owner of a Ford car, because of the difficulty of getting out the stub and keeping the threads clean and intact. The work is easily done, however, with a Stevens set which includes a drill of the proper size to drill out the bolt, leaving only a small amount of metal in the threads; a bushing which goes in the clearing hole in the cylinder head to guide the drill—solving what is perhaps the most difficult part of the problem; and a tap to clean out the threads ready for the insertion of a new bolt. The set is inclosed in a neat case and sells for $1.

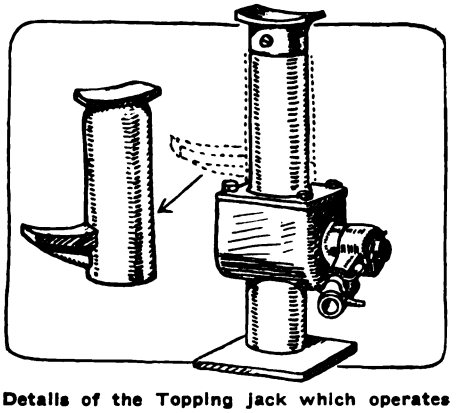
Another product of the company is a gasoline valve for Ford cars which is arranged to stop the supply of fuel to the motor and so warn the driver when there is 1 gal. left; turning the valve to the emergency position permits this gallon to be used. Another position of the handle shuts off the supply altogether, locking the car. The device is screwed into the tank and the indicating dial and the handle are attached to the heelboard. The valve can be installed by the owner. Price, $1.

To help keep in the driver's mind the Safety First idea the Stevens concern has placed on the market a neat radiator emblem, consisting of a radiator cap surmounted by a plate bearing the words "Safety First" in white letters on a green ground—the official colors of the "Safety First" Society. The emblem is adapted to any car. It sells at 75 cents. —Stevens & Co., New York City.

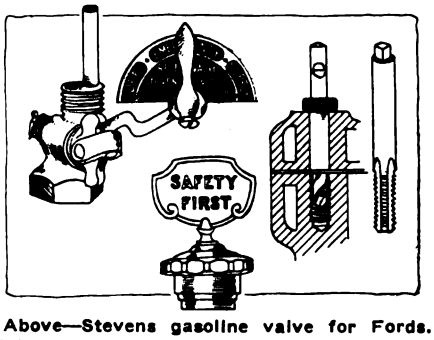
McDonald high-power magnet charger



Improved Stewart single-cylinder tire pump



Details of the Topping jack which operates on the screw principle



Above—Stevens gasoline valve for Fords. Right—Drill, bushing and tap for removing sheared bolts. Bottom—Safety radiator emblem

Stewart Tire Pump

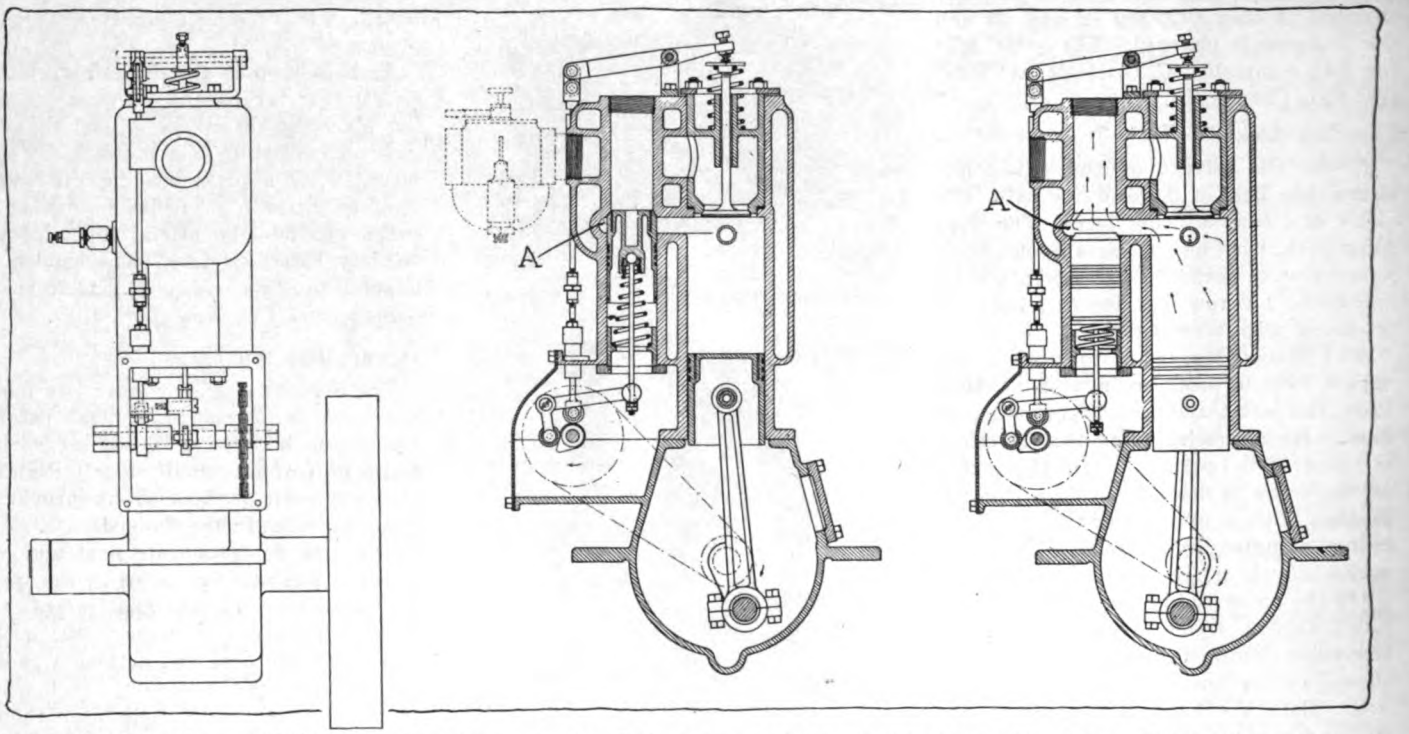
The Stewart single-cylinder tire pump has been improved in several details. The piston is fitted with one large ring and a unit of five small rings. Rigidity of attachment is insured by providing four bolt holes in the flanged base. The shifter arm is a separate part and can be set at any angle required by the space available for the installation of the pump. A brass coil connects the outlet valve with the hose and acts as a radiator, preventing the sending of hot air to the tire in case the operator should neglect lubrication for a long period. The pump is furnished complete with attachments for attaching to any standard car on the market. Price, $15.—Stewart-Warner Speedometer Corp., Chicago, Ill.

Titan Bronze for Manufacture

A new metal which is designed to take the place of brass castings, and also to cheapen the cost of manufacture, for certain purposes, has been brought out in the form of a bronze known as Titan. The new metal has a tensile strength, according to its manufacturers, of from 75,000 to 85,000 lb., and an elastic limit of 40,000 to 48,000 lb. The reduction of area is said to be from 45 to 50 per cent and elongation 22 to 30 per cent, thus enabling its use in many places where steel has been used but where bronze would have been preferable. The advantage over steel is said to be principally in its corrosion-resisting qualities. The metal can be worked hot and where the reduction in manufacturing cost enters, is due to the use of a method by which the gear makers can cast it in sand or iron hills and then press it into a die of correct size. This gives a process with many of the advantages of die casting principally in that the machining costs for finishing are avoided. The main uses of the new metal are given as for drop-forgings, hot-rolled thread bolts, screws, gears, pinions, etc.—Alpha Metals Co., Bellefonte, Pa.

Medanich Motor Has Balanced Exhaust

Semi-Automatic Exhaust Valve and Unusually Large Intake



Left—Side view of one-cylinder Medanich motor. Center—End section, showing exhaust valve close. Right—Exhaust valve open. A is the cylinder pocket which permits the gases to pass around the valve, balancing it and preventing it from sticking

A MOTOR which is featured by the possession of a balanced exhaust valve and an unusually large intake valve and port area, has been brought out by the Medanich Motors Co., Inc., Louisville, Ky. This concern was recently incorporated in that State with a capital stock of $125,000 subscribed by local capitalists and has had since the early part of March a single-cylinder motor in daily operation driving a 3½-hp. generator at the plant of a local concern devoted to experimental work.

The illustration herewith shows a section of the motor with exhaust valve in closed and open position. The manner in which the exhaust valve springs clear of the operating mechanism, when the force of the exhausting gases gets beneath the seat and above the valve, is also shown. This and the unusual construction and type of valve and port shapes and arrangements make up the features of the new design.

Will Work on Kerosene

As will be seen from the illustration, the intake valve is an overhead poppet which is only noticeable from its unusual size and the size of the cage containing it. The intake passes from the side-outlet carbureter illustrated, around the cored exhaust passage and directly into the chamber above the valve. The passing of the exhaust ports directly through the intake passage preheats the mixture, and it is one of the claims of the inventor of this motor that, due to this heat, it will operate on kerosene with the usual type of carbureter.

The semi-circular, cylinder pocket A, in the upper portion of the exhaust valve chamber permits the mixture under compression and the burning gases during explosion to pass entirely around the exhaust valve, thus permitting it to balance itself and preventing it from sticking against the cylinder wall. When the exhaust valve is open, any pressure in the cylinder tends to force the valve back upon its springs, compressing same. This is done whenever the exhaust cam touches its bell crank with sufficient force to pull the valve down a minute fraction of an inch and break the seal of the valve seat. When this is done, the force of the out-rushing exhaust gases forces the valve downward against the spring. The cam is so arranged that the valve will not close when the cylinder pressure falls before the pressure of the spring, but will be held open by it until the cylinder is completely scavenged.

It is stated that the cylinder pocket surrounding the exhaust valve at *A* is so small that the economy of operation is not affected. Carbonization of this balancing port is also stated to be avoided by the thorough scavenging which takes place at each exhaust stroke.

The unusually large size of the intake valve and its cage will be noted from the section. With this arrangement the proportion of valve diameter to cylinder diameter is 2 to 3, thus a cylinder of 3-in. bore would have an intake and exhaust valve 2 in. in diameter. The manner of driving this valve is shown clearly, the cam acting directly upon a roller follower and thence to a vertical pushrod with a cross bell crank lever at the top. Throughout, the entire design is intended to provide a motor which will be capable of high rotative speeds.

Begin Work on Massachusetts Roads

BOSTON, MASS., July 20—Work has commenced upon the Massachusetts small town roads, and highways are under construction in about 350 places. Before the work is ended $900,000 will be spent, not including the $2,500,000 provided for the western part of the State. The commission has about $750,000 for State highways and about $600,000 has been allotted to some fifty cities and towns.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, July 29, 1915 No. 5

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
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Long Distance Telephone ---------- 2046 Bryant, New York

SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Wanted, Better Detail

THE characteristic of the 1916 automobiles which so far have been announced that is most conspicuous is better motors. Having adopted the high-speed type, the American engineer has developed it to a high pitch with great rapidity, and he has good reason to fear no competitor when high-power efficiency is the point at issue. This is a fine thing to be able to say, and the men responsible are greatly to be congratulated, but in thus expressing belief in the very real nature of the progress made, attention may be drawn to other opportunities for engineering skill to show itself.

Most automobiles, whether good or medium in quality, develop many small noises when they have done over 5,000 miles. The universals sometimes rattle a trifle, the brake rods work loose, the control becomes a little less precise, and the motor may be even better than it was when new, but the chassis certainly deteriorates in detail from the first time it goes on the road.

For years we were satisfied with crude motors, but we shall never be again. So with the petty detail. Once it is improved by painstaking thought and careful experiment, the user will soon look for and expect the perfection of small detail which makes for continued, complete satisfaction. With soundless motors the least little chinking noise in the chassis becomes irritating to the average man and maddening to the mechanically hyper-sensitive. To remove these noises and to make the chassis easier to look after at the same time needs about one-thousandth part of the attenion that the motor has received. The work when done is not of a showy order, but the owner of the car will notice it soon enough when he starts his second season's driving.

A Chance for Spring Makers

IN several of the leading British automobile journals lately there have been comments and correspondence on the subject of springs, doubtless because the normally fine roads of the United Kingdom are badly cut up by heavy military traffic. While opinions differ a good deal in detail, there stands out as a prominent fact the idea that American cars are better sprung than European.

Against the opinion thus expressed we find criticism that the rear springs are often too free on American chassis and that shock absorbers are necessary to obtain the best effect. However, when it is remembered that the springs which go to Europe on American cars are designed to suit rough dirt roads primarily, and therefore are not fully suitable for a better class of surface, one is forced to the conclusion that the American spring must be very good indeed. At the moment the British and Continental motor car factories are not producing automobiles in any quantity except where they are making for the war departments, which means that the demand for parts to suit normal designs of cars is small. But directly after the war, when the factories get once again into full swing, should be a golden opportunity for the American spring makers to secure a permanent footing.

In order to supply the best sort of spring to suit European roads it would be necessary to study conditions on the spot; both of road and of chassis, but this should not be difficult. Any time during the next six months would seem to be particularly opportune for a visit to Europe by a few of our leading spring designers and there is good reason to think that this has been widely appreciated.

S. A. E. Assistance

WAR is a destroyer, the greatest destroyer of equipment in existence. Such destruction means replacing. The cheapest and easiest replacement is that accomplished when standardization is highest. It would be difficult to imagine any condition where standardization in army or navy work could be carried too far.

Because of this standardization aspect, the invitation of Secretary Daniels of the navy to the Society of Automobile Engineers, asking that it select two members for the Navy Advisory Board is most opportune, as we know of no other engineering society better qualified to give advice on this all-important work of standardization. Perhaps S. A. E. members are not so familiar with navy requirements as with army requirements, but the rudiments and elements of standardization are the same and the experience of the S. A. E. will be a most valuable asset to the board.

S. A. E. Issues New Data Sheets

Includes Information on New Standards and Reference Tables for Drafting Work

NEW YORK CITY, July 27—Members of the Automobile Engineers have been supplied with a number of additional data sheets for the S. A. E. loose-leaf handbook. These comprise in all seventy-two new data sheets, thirty-five being for Volume 1 and thirty-seven for Volume 2. Among the data sheets are those giving details of the most recently adopted standards of the Society putting at the disposal of draftsmen in the designing rooms of the different factories the standard dimensions which are of such value in the design of many parts of the car and its equipment. In fact, the supplying of the draftsmen with these dimensions is the practical cashing in on the long period of work done by the Standards Committee up to that time.

The new standards, now in data sheet form, include those on yoke and rod and pin dimensions, large hex spark plug shell, large diameter thread pitches, standard sizes of pneumatic tires, recommended practice for pleasure car frames, side outlet carbureter flanges, large sized flared tube ells and tees and the new specifications for ground return electrical installations on gasoline cars.

Horsepower Tables Extended

In addition, the table of horsepower values derived from the N. A. C. C. (formerly A. L. A. M.) formula has been extended to cover eight- and twelve-cylinder engines. Conversion tables of percentage of grade to angle of grade are also included. Piston displacement tables for eight- and twelve-cylinder engines of from 137.4 to 1531.5 cu. in. content are given. Two sheets are devoted to crank angles and corresponding piston positions. The effect of altitude on horsepower development of gasoline engines is treated on three sheets, with curves and formula. Diametrical and circular pitch tables, which are useful to engineers in laying out transmissions and other gear work, are given on four sheets. To the metric conversion data previously issued there has been added a table giving decimals of a millimeter for each thousandth of an inch. It is believed that this is the first time this information has been distributed generally.

Linear Units Table

The new table of standard linear units should be found very beneficial, as well as the conversion curve of miles per gallon to liters per 100 kilometers, enabling the engineer to judge intelligently of gasoline consumption performance expressed in terms of the metric system. The sheets on the standardization of pipe thread gages, total keyway depth, equivalent values of electrical, mechanical and heat units and the economical selection of belts and pulleys, make the Handbook of greater value.

Simultaneously with the distribution of the new sheets, a revised index was issued containing exhaustive cross references in order that all data in the Handbook, which is now constituted of over 400 pages bound in two loose-leaf folders, can be located in a minimum of time The members of the Society are furnished with a complete index for insertion in each volume of the Handbook.

As new standards now before the Society for mail ballot are adopted, additional data sheets will be issued. The Society also collects and prepares for publication other data than its adopted standards when the former are of direct interest to the automobile engineer and manufacturer, proper credit being given to the original sources.

The S. A. E. Handbook is one of the most valuable products of the Society. In addition to the official version of newly adopted and firmly established automobile engineering standards, it contains more data necessary in the automobile drafting room than are obtainable in any other one publication. It is the most important and useful of the handbooks in the engineering library of the technical man engaged in the automobile and allied industries.

Owen Leaves Chalmers to Become Saxon Vice-President

DETROIT, MICH., July 23—Percy Owen, general sales manager of the Chalmers Motor Co. has resigned to become vice-president of the Saxon Motor Co. where he will have entire charge of sales. Mr. Owen was one of the nine original organizers of the Saxon Motor Co. and still holds his original stock interest.

It is with the consent of Hugh Chalmers, president of the Chalmers Motor Co. that Mr. Owen goes to the Saxon. The agreement was reached some time ago, but Mr. Chalmers was unwilling for the actual change to take place until it could be arranged without impairment of the efficiency of his own organization.

Mr. Owen came to the Chalmers Motor Co. being at first eastern district sales manager. Then he came to the factory and after a short time was appointed sales manager, which position he held until June 1, when he was given the title of general sales manager. Before joining the Chalmers organization Mr. Owen was sales manager for the Carl H. Page Co., New York distributors for the Chalmers. Previous to that he was one of the pioneer importers.

Ford Reduces Car Prices $50

Effective Aug. 1—Possible Rebate for Coming Year To Be Decided Later

DETROIT, MICH., July 28—Beginning with Aug. 1 the Ford touring car will be sold at $440, and the roadster at $390. This is a reduction of $50 on each model as compared with the existing price during the past year.

Aug. 1 marks the opening of the fiscal year of the Ford Motor Co., and the company announces that no rebate is to be given persons buying Ford cars during August, September and October, but that it is possible a rebate will be decided upon later when the exact cost of manufacture, etc., which cannot be determined for several months, has been calculated. It is claimed that the roadster will be produced in much greater quantities than during the past year.

Canadian Ford Reduces Parts

FORD, ONT., July 26—The Ford Motor Co. of Canada, Ltd., has reduced the price on all spare parts for Ford cars by about 10 per cent. This means a saving from the former quotations of about $60 for a complete touring car.

Stearns Cuts Four $355

CLEVELAND, OHIO, July 24—A price cut of $355 is the announcement of the F. B. Stearns Co. on the light four Knight car which last year sold for $1,750 but which now sells, with the reduction, at $1,395.

At this lowered price the company offers practically the same car as for the 1915 season but with improvements in body design and added mechanical refinements. The body refinements are not radical but merely detail changes to bring the appearance of the car up to the latest dictates of body fashion. Mechanically, the car is practically unchanged except for the addition of the Westinghouse lighting and starting system.

Crown Co. Incorporated

KALAMAZOO, MICH., July 27—The Crown Automobile Mfg. Co. has been incorporated, its capital stock being $50,000. This is the new concern which recently purchased part of the former Michigan Buggy Co. plant to make a low priced four-cylinder car. The incorporators of the new company are: D. H. and W. B. Smith, Toledo, Ohio; Jas. H. Johnson, South Haven, Mich.; C. E. Kracht, Des Moines, Iowa; T. H. Walbridge, Toledo, Ohio; Ida Cadwallader, Fostoria, Ohio; J. B. Shifflet, Cleveland.

Trade Review of the Week

New England Busy—Northwest Slows Up—Sales in Central South Improving

NEW YORK CITY, July 28—The last week has shown no indication of a let-down in the amount of business done by Detroit and Indianapolis automobile and parts makers.

In Detroit nearly all of the factories are working at capacity and many of them are greatly behind in orders.

Behind in Shipments

Packard expects to ship its twelves to dealers in August, and begin shipments to customers in September. One-third of the Cadillac dealers were at the factory this week and reported conditions good in their territories. The 1916 Cadillac shipments will start the first of next week. Dodge is oversold. Hupp is behind with shipping orders; and Studebaker, Paige, Maxwell, Saxon and Hudson report the past week a busy one.

Parts and accessory makers report increased business the same as automobile builders. The demand is indicated by rapid strides in addition to plants and equipment. Among the concerns on which building operations are being pushed ahead are, Continental, Timken, Lycoming, and such car makers as Chalmers, Paige, Dodge, Hudson and Ford.

Indianapolis Demand

From Indianapolis are reports of continued demand from all parts of the country during the week. Marmon is working full force and its difficulty is getting materials to meet the demand. National says that the demand is double the supply. Pathfinder closed one of the most successful weeks in its career, one order alone calling for 600 cars. Stutz is moving along at its regular rate of 1500 cars a year production. Cole is concentrating its efforts on Southern business.

Minneapolis Slows Up

Reports from leading distributing centers such as Boston, Cincinnati, Minneapolis and Los Angeles show generally increased demands for cars.

In Minneapolis the expected slackup in sales at this season has begun to be felt by Twin City distributing houses. Dealers are burdened with orders they cannot fill. Field men from the territory report that the harvest has begun and farmers are not buying; they are too busy. A big business is expected in the fall, the outlook for the small grain crop being heavy. The only backward crop is corn. Many dealers throughout the territory report prospects holding back in placing orders until several 1916 cars not yet announced are brought out. Radical price reductions are creating considerable disturbance with many buyers who purchased before the reduction. This fact is holding back buying as some anticipate further cuts. There is no market for used cars, price reductions in 1916 models having destroyed the market.

The Cincinnati territory which includes a good part of Ohio, Kentucky, Indiana and West Virginia reports business from 50 to 300 per cent ahead of a year ago. Maxwell business is double that of last year; Saxon is 300 per cent better; Studebaker 30 per cent better; Overland 100 per cent better, and so it goes with many of the more popular priced makes. Ford sold 200 cars in the last week as compared with 350 in the entire month a year ago. In the field of higher-priced cars, the demand is stationary except in one or two unusual cases. Locomobile reports a little better and so it is with Marmon, White, Pierce, and others. Winton business increased considerably the last week as compared with the preceding three weeks. Stutz and Mitchell report good business.

New England Awake

Conditions in New England have taken a surprising change for the better during the past ten days, warm weather and more settled buying conditions as a result of the blowing over of the announcement of new cars at heavy price reductions have generally improved the buying conditions. Immediate deliveries are wanted and it is apparent that manufacturers making 1916 announcements and who cannot make deliveries are losing sales. All of the New England distributors report similar conditions. Many Overland dealers have offered to increase their orders if they could obtain early deliveries. Maxwell signed more orders before the new sixteen was shown than they had taken a year ago, and 24 hours after the car was exhibited it would have been possible to have had 500 sales for immediate delivery had the cars been obtainable. Studebaker would require 1000 cars to meet its immediate demands and dealers are going direct to the factory with the hope of getting quicker deliveries. Briscoe and Inter-State has had two big weeks, business being 50 per cent greater than in the entire preceding month. Buick is vastly behind in deliveries.

In the truck field improved conditions are noticeable. Autocar reports that while July is ordinarily a quiet month, business is holding up well. Mack and Saurer are making steady deliveries. Some of the other truck makers are not pushing the local market because of apparent heavy war orders which they are filling.

A New Six for $1,000

$750,000 Sun Motor Car Co. Enters Field—Secures Factory in Buffalo

BUFFALO, N. Y., July 27—The Sun Motor Car Co., has been incorporated with a capital stock of $750,000 to manufacture a six-cylinder car to list at $1,000 or less. The James silk mill property located in Buffalo and Lackawanna at the junction of the Buffalo, Rochester & Pittsburgh Railroad with parkway has been secured, the Sun company purchasing the entire property which embraces 4 acres. The Sun company will immediately occupy one story of this building which covers 17,000 sq. ft. In addition 6 acres of land adjoining this property has been purchased, and contracts for a new factory 600 by 150 ft. let. The new factory will be of reinforced concrete construction, is to be completed in 90 days and will employ 500 men.

The Sun Motor Car Co. has as its leading spirit R. Crawford, until recently sales manager of the Haynes Automobile Co., and also associated with him is R. C. Hoffman from the same concern. Mr. Crawford conceived the plan for a small six a year ago, and later organized the Automobile Engineering Co., an Illinois corporation, for the purpose of designing and building experimental cars.

The Sun six is fitted with a high-speed motor claimed to develop 55 hp. The company plans to build 2000 of these in the twelve months following the completion of the factory.

Already a selling organization has been developed and distribution will be largely confined to such centers as New York, Chicago, Boston, Philadelphia, Pittsburgh, Cleveland, Buffalo, Detroit, Cincinnati, Indianapolis, St. Louis, Kansas City, New Orleans, Minneapolis, Milwaukee, Omaha, Denver, Salt Lake City, San Francisco, Los Angeles, Dallas and Atlanta.

No Changes in Chalmers Co.

DETROIT, MICH., July 27—At to-day's annual meeting of the Board of Directors of the Chalmers Motor Co. no changes were made in the personnel of the company. Hugh Chalmers remains president, which thus quiets the recent rumors that he was to retire from the company. The other officials are: Lee E. Olwell, general manager; C. C. Hinkley, chief engineer; C. A. Pfeffer, secretary and assistant general manager; S. H. Humphrey, vice-president and works manager; C. A. Woodruff, purchasing agent.

Truck and Passenger Car Exports Gain $7,570,770 Over May, 1914

Trucks Jump from 99, Worth $127,024 in May, 1914, to 2426, Valued at $6,583,912 for This Year— Passenger Car Increase Is 1664, Worth $1,113,882

WASHINGTON, D. C., July 24—Details of the exports of motor cars during May and the 11 months of the fiscal year ending May, together with figures for comparative periods, just made public by the Department of Commerce, are of widespread interest. The figures show that the exports of commercial cars increased from ninety-nine, valued at $127,024, in May, 1914, to 2426, valued at $6,583,912, while during the 11 months' period these exports rose from 694, valued at $1,061,354, in 1914, to the tremendous number of 11,006, valued at $30,561,880 in 1915. The astounding increase in the exports of commercial cars since the outbreak of the European war has called attention anew to the wonderful productive capacity of the United States.

Passenger Cars Gain

The exports of passenger cars in May last amounted to 4821, valued at $3,971,483, as against 3157, valued at $2,857,601, exported in May a year ago. During the 11 months' period these exports declined from 26,324 cars, valued at $23,522,981, in 1914, to 19,462 cars, valued at $16,327,955, in 1915.

The exports of parts, not including engines and tires, increased in value from $600,793, in May, 1914, to $789,826, in May last, and from $6,150,264 to $6,714,001 during the 11 months' period.

Exports of motor car tires likewis show a healthy growth, the exports show ing a gain from $368,745, in May a yea ago, to $671,757, in May last, and fro $3,052,089 to $4,224,408, during the 1 months' period.

United Kingdom Best Customer

The United Kingdom still leads a nations in the importation of America motor cars. During May the exports cars to that nation amounted to 40 machines, valued at $5,895,856, while May a year ago the number was 663 a the value $556,753. During the months' period the exports rose fr 6982, valued at $5,613,853, in 1914, 11,688, valued at $16,736,165, in 1915.

France's Contribution

France's contribution to the mot car manufacturers of the United Stat in May last was $1,106,572 for 521 n chines. The exports to that country May a year ago amounted to 275 ca valued at $146,785. During the months' period the exports to France

Exports and Imports of Automobiles and Parts for May and Eleven Preceding Months

EXPORTS

Automobiles

	May 1914 Number	May 1914 Value	May 1915 Number	May 1915 Value	Eleven Months ending May 1914 Number	Eleven Months ending May 1914 Value	Eleven Months ending May 1915 Number	Eleven Months ending May 1915 Val
Commercial	99	$127,024	2,426	$6,583,912	694	$1,061,354	11,006	$30,561,
Passenger	3,157	2,857,601	4,821	3,971,483	26,324	23,522,081	19,462	16,327,
Total	3,256	$2,984,625	7,247	$10,555,395	27,018	$24,583,435	30,468	$46,889,
Parts of (not including engines and tires)	.....	$600,793	.....	$789,826	.....	$6,150,264	.....	$6,714,
Total automobiles and parts of	.....	$3,585,418	.....	$11,345,221	.....	$30,733,699	.....	$53,603,

EXPORTS BY COUNTRIES

Automobiles

France	275	$146,785	521	$1,106,572	1,286	$835,256	4,472	$11,142
Germany	206	162,552	.....	.....	1,391	1,003,000	20	20
Italy	33	25,846	23	17,004	326	228,894	111	75
United Kingdom	663	556,753	4,036	5,895,856	6,982	5,613,853	11,688	16,736
Other Europe	445	356,091	699	1,638,709	2,686	2,133,917	2,817	7,768
Canada	764	941,345	838	630,990	4,111	5,277,752	3,606	3,796
Mexico	4	3,601	3	4,407	164	252,098	67	68
West Indies and Bermuda	34	31,374	262	131,779	491	468,467	1,383	827
South America	180	169,107	165	88,631	1,909	1,888,529	1,071	583
British Oceania	466	416,259	256	212,316	3,819	3,325,902	2,727	2,271
Asia and other Oceania	118	124,910	241	588,116	1,993	1,927,157	1,581	2,708
Other countries	68	50,002	203	241,015	1,860	1,628,610	925	892
Total	3,256	$2,984,625	7,247	$10,555,395	27,018	$24,583,435	30,468	$46,889

Tires for Automobiles

Belgium	.....	$301	.....	.....	.....	$15,730	.....	.....
Germany	.....	20,341	.....	.....	.....	125,595	.....	$
England	.....	148,512	.....	$380,054	.....	1,310,930	.....	2,28
Canada	.....	112,365	.....	120,322	.....	792,961	.....	66
Cuba	.....	.....	.....	22,170	.....	.....	.....	16
Mexico	.....	3,483	.....	17,916	.....	109,371	.....	9
Australia	.....	.....	.....	19,985	.....	.....	.....	18
Philippine Islands	.....	5,808	.....	16,368	.....	127,165	.....	22
Other countries	.....	77,935	.....	94,942	.....	570,337	.....	60
Total	.....	$368,745	.....	$671,757	.....	$3,052,089	.....	$4,22

IMPORTS

Automobiles No. dut.	18	$18,912	23	$47,968	278	$588,747	300	$49
Parts of (except tires) dut.	.....	131,776	.....	40,080	.....	715,344	.....	76
Total automobiles, and parts of	.....	$150,688	.....	$88,048	.....	$1,304,091	.....	$1,25

BY COUNTRIES

Automobiles

France	7	$9,971	10	$17,527	124	$287,351	57	$1
Germany	2	2,559	.....	.....	19	43,387	6	
Italy	3	3,407	.....	.....	50	73,475	107	1
United Kingdom	2	1,485	8	23,408	40	115,042	72	1
Other countries	4	1,490	5	7,033	45	69,492	58	
Total	18	$18,912	23	$47,968	278	$588,747	300	$4

creased from 1286 cars, valued at $835,256, in 1914, to 4472 cars, valued at $11,142,414 in 1915.

Under the heading "other Europe," the figures show that the exports of cars increased from 445, valued at $356,091 in May, 1914, to 699 cars valued at $1,638,709, in May last. The 11 months' period shows an increase from 2686 cars, valued at $2,133,917, in 1914, to 2817 cars, valued at $7,768,101. Truck exports undoubtedly helped to swell the total for the 11 months of 1915.

Germany failed to import any American-made cars in May last, but in May a year ago 206 machines, valued at $162,552 were shipped there. During the 11 months' period Germany imported 1391 cars from this country in 1914, the value of which was $1,003,000, while during the same period of this year the number was twenty and the value $20,164.

Italy is the only other European nation that figures in the export returns and the figures show that only twenty-three cars were shipped there in May, the value being $17,004. In May a year ago the number was thirty-three and the value $25,846, while during the 11 months' period the number decreased from 326, valued at $228,894, in 1914, to 111, valued at $75,372 in 1915.

During May a year ago Canada imported 764 cars from the United States, the value being $941,345 and this number was increased to 838 in May last, although the value dropped to $630,990. A decline is also noticed in the 11 months' figures, the number in 1914 being 4111, valued at $5,277,752, while in 1915 the number was 3606 and the value $3,796,729.

West Indies and Bermuda

Surprising gains are shown in the exports to the West Indies and Bermuda. In May, 1914, there were thirty-four cars, valued at $31,374, shipped to those countries, while in May last the number had increased to 262 and the value to $131,779. During the 11 months' period the number increased from 491, valued at $468,467, in 1914, to 1383, valued at $827,989, in 1915.

Exports to South America show a decline from 180 cars, valued at $169,107, in May, 1914, to 165 cars, valued at $88,631, while during the 11 months' period the exports decreased from 1909 cars, valued at $1,888,529, in 1914, to 1071, valued at $583,119, in 1915.

During May, 1914, there were shipped from this country to British Oceania 466 cars, valued at $416,259. In May last the number had fallen to 256 and the value to $212,316, while during the 11 months' period the exports fell from 3819 cars, valued at $3,325,902, in 1914, to 2727 cars, valued at $2,271,349, in 1915.

Two hundred and forty-one cars were shipped to Asia and other Oceania in May last, the value being $588,116, while in May a year ago the number was only 118 and the value $124,910. During the 11 months' period the exports were 1993 cars, valued at $1,927,157, in 1914, and 1581 cars, valued at $2,708,004, in 1915.

"Other countries" imported from the United States in May last a total of 203 cars, valued at $241,015, while in May a year ago the number was sixty-eight and the value $50,002. For the 11 months' period the exports were 1860 cars, valued at $1,628,610, in 1914, and 925 cars, valued at $892,362, in 1915.

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Chalmers Opens Suggestion Contest

DETROIT, MICH., July 23—The Chalmers Motor Co. has promoted a suggestion contest which is open to every one of its employees, except officials, and will close Dec. 24. The winner will receive $100. There are two prizes of $50 each, five of $20, twenty of $5, twenty of $2.50 and fifty of $1.00.

The intention of president Hugh Chalmers in inaugurating such a contest is to have every member of the Chalmers force try and find something which will bring about or will lead to some improvement no matter in what department of the plant and no matter whether it applies to head or hand work, to shop work or office work. It may concern improvements in machinery, how to increase sales, how to reduce mailing or transportation cost, precautionary health and fire measures, advertising ideas, reduction in costs in any department, substitution of machinery for manual labor, etc.

Suggestions from heads of departments, superintendents, foremen, engineers, designers and inventors relating to other work than their own will also be considered.

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Two S. A. E. Men for Advisory Board for United States Defense

NEW YORK CITY, July 24—Considerable interest is felt by members of the Society of Automobile Engineers because of the fact that Secretary of the Navy Daniels has requested the organization to designate two representatives to serve on the Advisory Board, of which Thomas A. Edison will be chairman, as announced some time ago. The Council of the Society has the matter of selecting the two members of the Committee before it and has asked for suggestions from the Governing Committees of the Society sections.

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Kuqua Visits Southern States

INDIANAPOLIS, IND., July 24—S. J. Kuqua, vice-president of the Cole Motor Car Co., is making an extended trip through the Southern States investigating business conditions.

No Tires on Cars for Export

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British Gov't Concerned Over Violations of Rubber Guarantee by a Few Makers

NEW YORK CITY, July 27—The British government has recently warned the Rubber Club of America in this city that it is greatly concerned over the violation of the rubber guarantee by a few car manufacturers who persist in shipping automobiles fitted with rubber tires to neutral countries, this shipping of cars with tires being a violation of the guarantee. According to the guarantee, tires can be shipped only to neutral countries such as Spain, Portugal, Greece, Holland, Norway, Sweden and Denmark by way of the United Kingdom, and by licenses obtained from the British War Trade Department in London.

Up to the present the agreement between the British government and the individual rubber manufacturers in America has worked out most satisfactorily and America is getting all of the crude rubber she wants, in fact the imports are in excess of a year ago. The present guarantee arrangements by which the British government permits rubber to be shipped to American makers dates to the end of January and up to the present time approximately 30,000 tons of plantation rubber coming from the Federated Malay States and Ceylon have been received. Since the opening of the war not a pound of rubber has been lost due to destruction of vessels carrying it and the price is remaining steady.

The present guarantee arrangements permit of all rubber manufacturers who sign the guarantee obtaining practically all the rubber they require, this rubber being consigned to the British Consul General in New York and only handed over to the importers with the necessary guarantee, the Rubber Club of America taking care of the necessary clerical work in connection with all imported rubber. Under the present arrangements motor cars shipped to the neutral countries mentioned must not be equipped with rubber tires, but the tires must be shipped separately by way of London, the matter resting with London whether the tires eventually reach their destination or not.

At a hearing last week before the Federal Trade Commission in Detroit, which was attended by many representatives from factories building automobiles and parts, the government was urged to take some action to bring about relief to American makers owing to the present rubber situation, this applying particularly to rubber export troubles.

Accessory Makers Can Join N. A. A. J.

Jobbers' Assn. Provides for Associate Membership—To Fight Mail Order Houses

CHICAGO, ILL., July 21—After a two-day session, the first mid-summer meeting of the newly-formed National Association of Accessory Jobbers, closed here to-day after more than 100 representatives of the accessory business, including makers and jobbers, discussed the evils now existing in their business. The first day's meeting was for members of the executive committee only but on the second day two open meetings were held and it was during one of these that a most important move was made to change the by-laws so as to provide for an associate membership to which accessory manufacturers are eligible. This caused many of those manufacturers present to sign application blanks for membership, thus making the association one containing makers and jobbers.

Fight Mail Order Houses

In the open meeting of to-day there were taken up a number of subjects which are of vital importance to everyone in the legitimate accessory business. Heading this list comes the recommendation that the Association start a campaign against manufacturers offering standard goods to mail order houses and leagues who list them in their catalogs at cut prices.

Dead Accounts Loss

It was pointed out by a number of members present that there is a tremendous yearly loss in the accessory business due to dead accounts, so it was recommended that a credit bureau be established to assist members in avoiding bad accounts and in making collections of those which were taken and are unpaid. W. K. Norris, of the McQuay-Norris Co., piston ring maker of St. Louis, Mo., brought to light some methods used by the dealers of St. Louis. He stated that in his city 10 per cent of the car owners buying accessories are "dead beats," which means that each one has beaten more than two firms. When a man refuses to pay one firm he still is in a position to purchase of another, but when two concerns have unpaid bills against a man that man cannot get credit in any member's house. The recommendation of establishing a credit bureau to assist the members of the N. A. A. J. was left over to be discussed at the next meeting in October.

One of the most difficult tasks the association must cope with is the defining of jobber and dealer, so it was deemed advisable to appoint a committee of ten consisting of five jobbers and five accessory manufacturers to formulate a list of jobbers, to be presented at the next meeting.

Other subjects discussed were: Reversed telephone charges and how this evil may be eliminated, so as to make it equally fair for dealer, jobber and maker. Parcel post shipments it was ordered should be sent with a lump charge for carriage and insurance. Uniform terms have been adopted and these are not to exceed 2 per cent cash, ten days, thirty days net. A standing committee of three was appointed to be known as the railroad committee and that this should handle all matters relating to rates, freight shipments and similar matters.

Return Goods Evil

The return goods evil was another taken under consideration and it was ordered that when a bill is correctly filled by the jobber no credit will be allowed for return goods unless a full explanation has been made and the consent of the association obtained and with this done, a charge of 10 per cent will be made for service and shipping expenses and the credited amount for the goods will be based on the prevailing price when the goods are returned.

Fees Reduced

The initiation fee has been reduced from $500 to $100 and the annual dues not to exceed $300 which are to be paid in the form of assessments. The manufacturers taken as associate members are to pay $100 yearly dues and no initiation fee.

The following jobbers were present at the meeting to-day: Julius Andræ & Co., Milwaukee, Wis.; Automobile Supply Co., Detroit, Mich.; Fred Campbell, St. Louis, Mo.; Electric Appliance Co., Chicago, Ill.; Philip Gross Hardware Co., Milwaukee, Wis.; Herring Motor Co., Des Moines, Iowa; Weinstock-Nichols Co., San Francisco, Cal.; Motor & Machinists Supply Co., Kansas City, Mo.; Excelsior General Supplies Co., Chicago, Ill.; Nebraska Buick Auto Co., Lincoln, Neb.; Nichols, Dean & Gregg, St. Paul, Minn.; Weinstock-Nichols Co., Los Angeles, Cal.; Kansas City Automobile Supply Co., Kansas City Mo.; Minneapolis Iron Store Co., Minneapolis, Minn.; Motor Car Supply Co., Chicago, Ill.; Reinhard Brothers, Minneapolis, Minn.; General Sales Co., Detroit, Mich.; Western Motor Car Supply Co., Minneapolis, Minn.; Gibson Co., Indianapolis, Ind.; Interstate Electric Co., New Orleans, La.; Walkerville Hardware Co., Walkerville, Ont.; Sieg Iron Co., Davenport, Iowa; Weinstock-Nichols Co., Oakland, Cal.; Washington Auto Supply Co., Washington, Ill.

Chicago Fights Fenders for Trucks

Owners, Dealers and Manufacturers Claim They Are Unnecessary Expense

CHICAGO, ILL., July 20—Chicago's truck fender situation bobbed up again to-day, when the reports of the big truck users, truck manufacturers and the local motor trade association, were presented to Chief of Police Healy for consideration. It will be remembered the chief received on July 6 the reports of the three men acting for the city in the testing of these fenders, and because of lack of knowledge of the situation, took the suggestion of one of the local dealers to postpone the meeting for two weeks before making any definite decision.

Fender Makers Organize

To-day's discussion brought no definite results. There were present representatives of such large establishments as Armour & Co., the Consumers Co. and the Chicago Telephone Co. also members of the Chicago Assn. of Commerce and the Chicago Automobile Trade Assn. The makers of the six truck fenders were there and they have themselves formed an association calling it the Fender Manufacturers' Assn.

There were arguments from both forces and a fair judge of the situation does not have to go deeply into technicalities to hand over a decision in favor of the truck users and makers and against the fender makers and others who would have commercial vehicles equipped with costly, unnecessary front fenders.

Pedestrians' Negligence

Perhaps the pro-fender contingent was hit hardest by the words of Russel Huff, consulting engineer for the Packard Motor Car Co., and nominee for president of the Society of Automobile Engineers. Mr. Huff stated in a letter to the Chicago Automobile Trade Assn., which was read at the meeting, that front fenders do not protect, do not save lives and that of all the accidents due to the wheels passing over a body 90 per cent are caused by the rear wheels, and not the front, striking the person. Also that trucks are responsible for less than 50 per cent of the motor vehicle accidents and 10 per cent of these are caused by front-wheel contact. Also that of this 10 per cent the majority of accidents is caused by negligence on the part of the pedestrian.

"Why should Chicago manufacturers and merchants spend more than $2,000,000 for an accessory for motor trucks which does not do that which we would have it do—eliminate the larger number

of accidents? Why should these business men spend a vast amount of money for something which is in its experimental stages?" These were two strong questions asked of those who wish the fenders adopted. The fenders do not protect and this is proved by statistics and if the fenders did protect pedestrians and save lives, then they certainly are desirable.

Practically every representative at the meeting stated that his concern would most willingly buy fenders and pay more than for the present makeshifts, if the fenders would save lives. But the fenders submitted to the city, for application to the front of the truck, do not save lives, as coroners' statistics show, is the contention of one of the men opposed to the adoption of the present contraptions.

As the situation now stands the ordinance provides that commercial cars only be equipped with fenders.

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ArBenz Has New Four

CHILLICOTHE, OHIO, July 26—The ArBenz Car Co. has placed on the market a new four-cylinder model which is to sell for $675. It is fitted with a 3¼ by 5 block motor with a removable cylinder head which is cooled on the thermo-syphon plan. The transmission elements include a cone clutch, three-speed selected gearset and full floating rear axle. The wheelbase is 108 in., and tires are 30 by 3½. Equipment includes a one-man top, electric horn, Stewart speedometer and electric starting and lighting apparatus.

Menominee Electric at $1,250

MENOMINEE, WIS., July 24—The Menominee Electric Mfg. Co. has completed the first of the electric carbriolets which it intends to manufacture to sell at $1,250, an unusually low price for an electric. The car has a wheelbase of 108 in., is fitted with Exide batteries and Goodyear cord tires. It can be charged for a distance of 50 to 60 miles and is capable of 18 to 20 m.p.h. The car weighs approximately 1800 lb. Doors are wide and the leather top can be let down. The body is painted a royal blue with black hood and back. A charging outfit it furnished with the car by which it is possible to charge the batteries direct from an electric light socket. The company expects to make 150 cars the first year.

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Maurer Amplex Factory Manager

SOUTH BEND, IND., July 24—LeRoy F. Maurer, formerly chief engineer of the Amplex Mfg. & Machine Co., Mishawaka, Ind., has been appointed factory manager. The company is evolving a valveless two-cycle motor along the lines of the old Simplex, designed by Mr. Maurer.

Olds 8 Will Be Different

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Appearance Varies from Other Models—120-In. Wheelbase and Delco Electric System

LANSING, MICH., July 26—First details of the new $1,295 eight-cylinder model which has been added by the Olds Motor Works reveal that the car is strikingly different in appearance from other Oldsmobiles. The hood, which covers the conventional V-type motor with cylinders 2⅞ by 4¾ in., is rounded at the top with the radiator in the form of a half ellipse. Side lamps are eliminated and for city driving smaller lamps are mounted on top of the headlamps.

The wheelbase is 120 in., tires being 33 by 4 straight side, and the transmission elements include a cone clutch, three-speed gearset and floating axle with spiral type gears. Engine and gearset are a unit. Springs are semi-elliptic front and three-quarter elliptic rear. Equipment includes Delco lighting, starting and ignition, electric horn, Stewart speedometer and clock.

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Velie to Sell Direct Through Car Dealers

MOLINE, ILL., July 24—The Velie Motor Vehicle Co., this city, which heretofore has distributed its products largely through the implement dealers which handle products of the John Deere Plow Co., with which the Velie company is closely allied, has altered its policy and henceforth will contract direct with responsible motor car dealers and distributers, eliminating the Deere Plow branches. This change presages no segregation from the John Deere Plow Co. interests insofar as the factory, directors or stockholders are concerned, the manufacturing influence and backing remaining the same.

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Stutz Adds Two-Passenger Roadster

INDIANAPOLIS, IND., July 22—For all-around work the Stutz Motor Car Co., this city, has brought out a roadster model which is one of the series C designs produced at the present time by this concern. The roadster is a two-passenger car designed for those wishing a comfortable, roomy, easy-riding car of inclosed door type. It is fitted with a slightly lower gear than the Bearcat model and is therefore not as fast, being designed more for all-around use than for high speed. The body is of semi-streamline design with the cowl dash merging into the hood lines providing an attractive appearance. The door hinges are concealed.

The specifications of this car show that it is only manufactured with a four-cylinder motor. The motor dimensions are 4¾ by 5½ and the other important data regarding the chassis features include pressure oiling system; Remy electric lighting and starting; Stutz gearset and rear axle; Timken front axle; semi-elliptic front and rear springs; 34 by 4½ tires and 56-in. tread. The wheelbase of this tire is 120 in., and the price $2,100. If wire wheels are desired a set of five will be furnished for $100. Other than this the equipment is complete, at the purchase price.

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Reo Adds 3-4-Ton Truck

DETROIT, MICH., July 27—The Reo Motor Truck Co. is bringing out a ¾-ton truck styled Model F which sells at $1,075, completely equipped. The chassis only, less express body, driver's seat, canopy top and windshield, but otherwise completely equipped, lists at $1,000. The truck, which is specially made for grocers, butchers, bakers and department stores, has a wheelbase of 120 in. The inside length of the standard express body is 96 in. and the width 44 in.

A four-cylinder, 4⅛ by 4½, motor cast in pairs provides power. The carbureter is a Johnson and ignition is provided by a Remy generator. The starting and lighting system is also Remy. The clutch is a dry disk type; gearset is selective. Hyatt Roller bearings are used throughout. The rear axle is a floating and Timken bearings are used on the front axle. The artillery wheels have 34 by 4½ pneumatic tires, plain in front and knobby tread on rear. Springs are semi-elliptic. The gasoline tank holds 11 gal., the water tank 3 and the oil tank ¾ gal. included in regular equipment are head, tail and instrument lights, speedometer, ammeter, horn, tools, etc.

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Carlston Kingston Chief Engineer

KOKOMO, IND., July 23—William S. Carlston, who during the last eight years has been assistant to George Kingston of Byrne, Kingston & Co., manufacturers of Kingston carbureters and mufflers, has been appointed chief engineer. He had charge of the experimental work and was active head of the engineering department during the past six or seven months, owing to the condition of Mr. Kingston's health.

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Five Armored Trucks a Day

HARRISBURG, PA., July 26—The Motor Truck & Tractor Co., this city, is at present manufacturing five armored trucks daily for the Russian government, these being on a contract for 1400 recently received. Part of the contract has been sublet to the Baldwin Locomotive Works.

1915 Goodrich Profits $4,000,000

First 6 Months Show Gain of $1,348,922 Over First Half of 1914

NEW YORK CITY, July 28—The B. F. Goodrich Co., Akron, Ohio, issued its statement to-day for the first half of 1915 which shows that the net profits for the period amounted to approximately $4,000,000, after making proper allowances for maintenance, depreciation, bad debts and all outstanding liabilities, etc.

This is a very large gain over the corresponding period of 1914 when the net income of the company, after maintenance, depreciation and other charges had been provided for was $2,651,278. In other words the balance in favor of the first half of 1915 is $1,348,922.

Preferred stock to the value of $2,000,000 has been redeemed and canceled by the company out of surplus, leaving $28,000,000 outstanding. Quick assets show a gain over current liabilities of approximately $3,016,866.16 for the period.

The officers of the company have recommended to the board of directors that no dividend be declared on the common stock at this time.

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No 30% Studebaker Dividends

SOUTH BEND, IND., July 24—Estimates of business done by the Studebaker Corp. that have been rumored about in Chicago and New York have been declared incorrect by A. R. Erskine, president of the corporation in an interview. "Referring to the estimated sales, earnings and financial condition of the Studebaker Corp. for the year 1915 and especially to the fact that the corporation might pay 30 per cent dividends as a result thereof," said Mr. Erskine, "most of the estimates given were highly exaggerated. It is true that the regular business of the corporation in the automobile division is greater than last year, but the vehicle business is running at a considerable reduction in volume. The war orders which amounted to approximately $20,000,000 have practically all been completed and shipped so that while the total business of the first six months shows an increase over last year, that of the next six months is unlikely to equal it and is dependent upon developments which none of us can foresee. The profits of the corporation for the first six months are running at the rate of about 20 per cent per annum and the dividend rate on the common stock is 5 per cent and will continue at that rate in the immediate future. The payment of any such dividend as 30 per cent is entirely out of the question."

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Steel Prices Higher

NEW YORK CITY, July 27—The heaviest trading is shown in the metal markets. The steel markets for the past week continued an upward tendency in prices on all grades of steel, practically every department of the trade experiencing heavy demand for its products from abroad, structural steel being included in the lists of products sought. The total gain in price is given at $1.50 for both Bessemer and open-hearth steel.

Copper shows a downward trend and very little trading is done, the market being influenced by the severe break in London and the continued lack of buying on this side. As anticipated, the tin market continued to decline yesterday, spot lots being sold at 36 cents against previous sales of 36½ cents. Heavy arrivals and further increases in stocks afloat to this country are expected to keep the market in a weak condition for some time to come. The rest of the markets show very little trading and no increase in demand. Cottonseed oil was exceedingly dull during the session, but in face of the weakness in provisions showed comparative steadiness. The rubber markets were somewhat steadier with no material change in the crude rubber situation.

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May Increase Paige-Detroit Capital to $1,000,000

DETROIT, MICH., July 22—At a special meeting of the stockholders of the Paige-Detroit Motor Car Co. to be held Aug. 2, it will be proposed to increase the capital stock of the company from $250,000 to $1,000,000. It is expected that at the same meeting a stock dividend of 100 per cent, or thereabouts, will be declared. It is further rumored that half of the increased capital, that is $500,000, will not be issued for the time being but will remain in the treasury.

On Aug. 1 the monthly dividend for July, amounting to 10 per cent, will be paid to stockholders of record July 24. The company's books will be closed from July 24 to Aug. 9. The stock of the Paige-Detroit company is held by eighteen stockholders.

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Stewart-Warner Earnings Gain $271,000

CHICAGO, ILL., July 26—Stewart-Warner Speedometer Corp. completed its half year on June 30 with an increase in net earnings over the first six months of 1914 of $271,000. In addition to declaring the regular quarterly dividends at the rate of 7 per cent on the preferred and 6 per cent on the common, the directors decided to anticipate the sinking fund requirements on the preferred stock to the extent of setting aside $46,500 in addition to the regular $65,000 for the year, making the total sum devoted to the sinking fund this year $111,500.

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Dividends Declared

Pyrene Mfg. Co., New York City, 1½ per cent, payable Aug. 2.

YOUNGSTOWN, OHIO, July 26—Republic Rubber Co. quarterly dividend on common stock, payable Aug. 2 to stockholders of record July 20.

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Kelly-Springfield Wins Old Suit

NEW YORK CITY, July 27—For infringement of the Grant patent on an imbedded-wire solid tire the Diamond Rubber Co. of New York, must pay the Kelly-Springfield Tire Co. $212,376.29. The Federal court has just confirmed the accounting. This marks the end of eighteen years of litigation, since the beginning of which both parties have changed. When the suit was brought Kelly-Springfield was the Consolidated Rubber Tire Co. and the defendant is now a Goodrich property. The patent, No. 554,765, expired Feb. 18, 1913.

The accounting is made up as follows: Damages, $130,391.75; extra award by

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.31	.31	.31	.31	.31	.31	.....
Antimony	.35½	.35½	.35½	.35½	.35½	.35½	.....
Beams & Channels, 100 lb.	1.36	1.36	1.36	1.36	1.36	1.36	.....
Bessemer Steel, ton	20.00	20.00	21.50	21.50	21.50	21.50	+1.50
Copper, Elec., lb	.19	.19	.18¾	.18⅞	.18⅞	.18½	—.00½
Copper, Lake, lb.	.19½	.19½	.19¼	.19¼	.19¼	.19	—.00½
Cottonseed Oil, bbl.	6.00	6.05	5.99	6.03	6.08	6.03	+.03
Cyanide Potash, lb.	.24	.24	.24	.24	.23	.23	—.01
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lb.	5.55	5.55	5.55	5.52½	5.52½	5.50	—.05
Linseed Oil	.57	.57	.57	.54	.54	.54	—.03
Open-Hearth Steel, ton	21.00	21.00	22.50	22.50	22.50	22.50	+1.50
Petroleum, bbl., Kan., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	.....
Rubber, Fine Up-River, Para	.62	.61	.61	.61	.61	.61	—.01
Silk, raw, Ital.	..	..	3.75	..	..	3.75	.....
Silk, raw, Japan	..	..	3.40	..	..	3.42½	+.02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	30.37½	36.75	36.87½	36.25	36.25	36.00	+6.37½
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

the court, $50,000; interest, $28,709.60; costs, $3,274.94. Other suits in the accounting stage are against Goodrich and Republic, in Chicago, and against the Pennsylvania Rubber Co., in Pittsburgh.

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Briggs-Detroiter Creditors to Receive $103,000

DETROIT, MICH., July 22—The creditors of three concerns for which the Detroit Trust Co. is trustee, will shortly receive a total of about $103,000, as follows: 10 per cent to the creditors of the Briggs-Detroiter Co., or approximately $40,000; 2 per cent, or about $50,000 to the creditors of the Michigan Buggy Co., this making thus far a total of 22 per cent dividends paid; 4 per cent, or about $13,000 to the creditors of the American Voiturette Co. which makes a total to date of 24 per cent to the latter's creditors.

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Field Opening in Russia

PETROGRAD, RUSSIA, July 10—The Pobeda Commercial House, this city is announcing that there is a large field in Russia for the sale of automobiles, trucks and motorcycles which will be open as soon as hostilities have ceased. The business formerly done with Germany, it is pointed out, will be transferred to other countries and the United States should get its share. The Pobeda house, whose address is 61 Moika, Petrograd, and whose American agents are Ladenburg, Thalmann & Co., New York City, state their intention of taking the agency of low, medium and high-priced cars at this time.

Tire Stocks Firm in Tone

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Show Some Gains—Car, Truck Accessory Securities Show Little Change

NEW YORK CITY, July 27—Tire stocks were the only ones on the local automobile securities market to show particularly strong gains during the past week. Comparatively few changes of importance are recorded for any of the other issues, the general tone of the market seeming to tend toward dullness with some of the securities half a point or a point higher than last week, though some of them were lower. Kelly-Springfield common is ten points above last week's level, while its first preferred has gained a point and its preferred five. Miller common rose six points though the preferred is nine points lower than last week. U. S. preferred shows a gain of a point while Swinehart lost two. Goodrich preferred gained a half point and Goodyear common declined a point and the preferred a half point. Portage common added a point.

Of the car stocks, General Motors common is eight and a half points lower and the preferred a point higher than last week. Packard, Studebaker and the Reo stocks are half a point higher. White preferred is four points lower and Willys-Overland common five.

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Gramm-Bernstein Gets Big Orders

LIMA, OHIO, July 26—The Gramm-Bernstein Co. is shipping trucks at the rate of 125 per month. After accepting an offer for 500 vehicles, the company was compelled to turn down two other orders, one for 200 3-ton machines and the other for 200 2-tonners, owing to lack of production facilities, although the plant is running to capacity and is being quadrupled in size to meet the demand. The company is finding a large market for its product in England and France.

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A. R. Pardington of L. H. A. Dead

DETROIT, MICH., July 28—A. R. Pardington, vice-president and secretary of the Lincoln Highway Association, of this city, who for the past two years looked after the management of the association, died at Parker Hospital today, where he had been ill for some weeks. For several years Mr. Pardington has suffered with a malignant disease which had seriously handicapped him. Mr. Pardington's associations with the automobile industry have extended over many years. He was instrumental in the building of the Motor Parkway, Long Island, and has long been connected with automobile sports, having refereed all of the 500-mile races on the Indianapolis Speedway.

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Cole Closes Prosperous Year

INDIANAPOLIS, IND., July 24—At the annual stockholders' meeting of the Cole Motor Car Co. held to-day, the usual cash dividend was declared and a satisfactory amount carried into the surplus account. The company's annual statement shows that the last year has been one of the best in the history of the company.

Automobile Securities on New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	220	..	300	..	..
Ajax-Grieb Rubber Co. pfd	99	..	100	..	—1
Aluminum Castings pfd	98	100	98	100	..
J. I. Case pfd	82	85	70	79	..
Chalmers Motor Co. com	97	101	89	92	—2
Chalmers Motor Co. pfd	94	96	95	98	..
Electric Storage Battery Co	50	51	52	53¼	—1
Firestone Tire & Rubber Co. com	305	312	506	512	..
Firestone Tire & Rubber Co. pfd	108	110	109	111	..
General Motors Co. com	87½	89	179½	181	—8½
General Motors Co. pfd	91	93	105	107	+1
B. F. Goodrich Co. com	24	24½	50	51	..
B. F. Goodrich Co. pfd	88⅜	90	104½	106	+ ½
Goodyear Tire & Rubber Co. com	174	178	269	272	—1
Goodyear Tire & Rubber Co. pfd	97	99	105	106½	— ½
Gray & Davis, Inc., pfd	98	102	..	..	..
International Motor Co. com	..	3	17	19	..
International Motor Co. pfd	3	9	40	44	—3
Kelly-Springfield Tire Co. com	51	53	165	168	+10
Kelly-Springfield Tire Co. 1st pfd	75	80	86	87	+1
Kelly-Springfield Tire Co. 2d pfd	90	100	160	170	+5
Maxwell Motor Co. com	14¼	14¾	35½	37	— ½
Maxwell Motor Co. 1st pfd	43½	45	84	86¾	+1
Maxwell Motor Co. 2d pfd	17	19	31	33	—1
Miller Rubber Co. com	..	..	196	199	+6
Miller Rubber Co. pfd	..	..	94	96	—9
New Departure Mfg. Co. com	124	127	..	..	..
New Departure Mfg. Co. pfd	105	108	..	..	..
Packard Motor Car Co. com	..	112	110	115	..
Packard Motor Car Co. pfd	97	99	97	..	+ ½
Peerless Motor Car Co. com	10	17	..	70	..
Peerless Motor Car Co. pfd	..	50	..	87	..
Portage Rubber Co. com	..	30	36	38½	+1
Portage Rubber Co. pfd	..	90	92	95	..
*Reo Motor Truck Co	12½	13½	15½	..	+ ½
*Reo Motor Car Co	20½	21½	30	31	+ ½
Splitdorf Electric Co. pfd	40	50	..	..	..
Stewart-Warner Speed. Corp. com	48	49½	65½	66½	— ½
Stewart-Warner Speed. Corp. pfd	99	101	105	107	+1
Studebaker Corporation com	32	33	81½	83	+ ½
Studebaker Corporation pfd	82½	86	99	101	..
Swinehart Tire & Rubber Co	85	87	77	78	..
Texas Company	130	131	130	132	—2
U. S. Rubber Co. com	56½	57½	43½	45	..
U. S. Rubber Co. pfd	101¼	102	102	104	+1
Vacuum Oil Co	208	212	199	202	+1
White Co. pfd	107	110	99	103	—4
Willys-Overland Co. com	88	88½	132	133½	—5
Willys-Overland Co. pfd	93	95	102	103¾	..

OFFICIAL QUCTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	102	..	91	—1
Chalmers Motor Co. pfd	94	96	94½	97	..
Continental Motor Co. com	155	180	205	..	..
Continental Motor Co. pfd	..	75	82	86	+2
General Motors Co. com	88½	90½	178	183	—9
General Motors Co. pfd	90¼	91½	105½	107½	+1¼
Maxwell Motor Co. com	13½	14½	35½	37½	— ½
Maxwell Motor Co. 1st pfd	42½	45	82½	84½	..
Maxwell Motor Co. 2d pfd	15	19	31½	34	—1¾
Packard Motor Car Co. com	..	112	110	115	..
Packard Motor Car Co. pfd	97	..	98	100¼	+1¾
*Reo Motor Car Co	20¾	21½	30¼	31½	+ ½
*Reo Motor Truck Co	12¾	13	17	..	+1¾
Studebaker Corporation com	..	..	81½	83½	+1
Studebaker Corporation pfd	..	..	99	101	..

INACTIVE STOCKS

*Atlas Drop Forge Co	19	..	..	26	..
Ford Motor Co. of Canada	..	..	1475	..	+125
Kelsey Wheel Co	185	..	205	..	..
*W. K. Prudden Co	..	20½	19½	21	..
Regal Motor Car Co. pfd	20	..	15	25	..

BONDS

General Motors, notes, 6s, 1915	100	101¼	..	..	..
Packard Motor Co. 5s, 1916	95	98½	98¼	..	..

*Par value $10; all others $100 par value.

Match Race Aug. 7 in Chicago

Resta, DePalma and Cooper Take Up Oldfield's Challenge for 100-Mile Contest

CHICAGO, ILL., July 27—As a result of a challenge hurled at Dario Resta and Ralph DePalma last week by Barney Oldfield, the Chicago speedway will be the scene of a 100-mile match race Aug. 7, when four, and perhaps five, of the most noted drivers in the country will meet to settle a much-mooted question of supremacy. Resta already has accepted Oldfield's challenge and Bob Burman and Earl Cooper have challenged the challenger in turn and they will be accommodated by Barney. Ralph DePalma has not been heard from as yet but it is thought that the winner of the 1915 International Sweepstakes is too good a sportsman to decline the issue and that he will participate in the match race.

In his challenge, Burman offered to give Oldfield and Resta a 2-mile handicap if they would permit him to drive his 350-in. Peugeot, but neither would accede to such a request and consequently Burman will drive his 300-in. car. Cooper will be at the wheel of a Stutz and claims the title of America's champion in an American car.

Oldfield will enter the lists at the wheel of the Grand Prix Delage that David G. Joyce, the local sportsman, imported recently from France for Barney's use.

The management of the Chicago speedway has hung up $7,500 for the race, the purse to be divided as the contenders see fit. The contest will be made an annual event and a silver trophy will be awarded the winner. According to the deed of gift, any driver capturing three 100-mile races will come into permanent possession of the challenge cup.

The winner of the Aug. 7 race probably will crowd the 100 miles inside of an hour. The 100-mile record for the Chicago track is 99.08 m.p.h., established by Porporato's Peugeot in the first century of the 500-mile derby of June 26. There were twenty-two cars on the track and he was forced to stop for a tire change before he completed the first 100 miles. It is thought that with only four or five cars on the course, much faster time will be made.

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Plan Speedway for Dallas

AUSTIN, TEX., July 24—Plans are being laid by a number of the leading automobile men of Texas for the inauguration of a movement to build a first-class speedway at some point in the State. It is probable that Dallas will be decided upon as the location of the new racing course. While the plans for the enterprise have not as yet taken definite shape, it is stated that the Indianapolis speedway will be largely patterned after. A partial canvass of automobile manufacturers and racing men has been made with the view of sounding their sentiment toward the project and it is stated that it promises to meet with universal cordial support. It is expected that public announcement of the preliminary plans will be made soon.

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Allison Buys Two Peugeot Racers — Aitken in Charge

INDIANAPOLIS, IND., July 26—James A. Allison, secretary-treasurer of the Prest-O-Lite Co., and one of the four owners of the Indianapolis Speedway, has purchased two Peugeot racing cars which are to be raced in American speedway events, the cars in all probability to be entered in the Minneapolis and New York speedway races this fall. John Aitken, well known in racing by his connection with the National cars, will have charge of the two Peugeots which are described as the machines driven by Goux and Boillot in the 1914 French Grand Prix road races. This is the first step taken by the speedway people in the possible solution of the present difficulty of not having enough cars for the present speedway circuit. Mr. Allison during the recent Indianapolis Speedway meet suggested the possible necessity of the different speedways purchasing cars until such time as American makers can build to meet speedway requirements.

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Two Stutz and Mercer for Elgin

CHICAGO, ILL., July 27—Two Stutz cars with Cooper and Anderson as drivers, have been entered in both races at Elgin. Henning's Mercer has also been entered in Friday's race, so the entries total ten to date.

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Speedway for Cleveland

CLEVELAND, OHIO, July 23—A 2½-mile speedway is to be built near Cleveland by a company which filed incorporation papers in Columbus recently. The speedway is to cost $700,000. Four hundred acres near the city limits have been acquired. M. L. Yuster, founder of the Yuster Axle Co., is the promoter of the project.

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Sheepshead Speedway Ticket Office

NEW YORK CITY, July 25—The Sheepshead Bay Speedway Corp., is preparing to open an office for the sale of tickets at 1696 Broadway, this city. The executive offices remain at 17 Battery Place.

Detroit Speedway Hits a Snag

Little Progress Made on Stands or Track—No Race for Labor Day?

DETROIT, MICH., July 26—The Detroit Motor Speedway, which has for several months been in the public eye, by its broadly advertised plans to build a speedway here, and for which it has been selling admission tickets for a Labor Day meet Sept. 6, has made little progress to date and it is almost impossible to have a meet on that date. The track has been advertised as a 2½-mile cement oval, 90 ft. wide. None of the cement has been laid and it would be a physical impossibility to have such a track completed by Labor Day. The erection of grandstands has not yet been started, although it has been stated in publicity that work has been started on the stands to seat 100,000 people. Widespread publicity has been sent out to the effect that the track had received sanction for a Labor Day meet, but this is not true, as the American Automobile Assn. has not granted such sanction.

Up to the present the speedway organization has been expending large efforts in selling stock, and has disposed of $103,330 worth of stock at $10 per share to over 300 small investors in Detroit, this being exclusive of stock sold to the officials of the organization. Holdings run from two shares to 200. Aver $72,000 has been secured in cash by this stock sale and the remainder taken in notes. These figures are based upon a report from the Michigan Sureties Commission, and refer to the original stock issue of $500,000. After the balance of this issue was turned over to the contractor, the stock was increased to $800,000, so that there would be some to sell on the same basis as before but it is understood little of this has found a market.

When asked concerning the situation, S. D. Maddox, general manager and vice-president of the speedway organization, gives his explanation of the matter by saying that any reports circulated have been just publicity. Detroiters began to get skeptical of the speedway advertising and publicity as there were only thirty-six working days in which the track could be completed. Examinations of the speedway property showed that the entire gradings of the turns had not been completed and that there were not 500 men at work as stated. Recently John B. Whelan, president of the Detroit Motor Speedway, when interviewed by THE AUTOMOBILE representative, declared that he had every reason to believe the track would be ready for a

Labor Day meet, but concrete experts state that it would be a physical impossibility to have a cement track ready by that time or for weeks afterward.

The main difficulty with this speedway matter has been the lack of capital. When the present organization took over the work of its promotion, it was expected that Detroit people would respond readily but it was not easy to sell stock, and the work of grading the track proceeded slowly. Some time ago the contractor agreed to take the balance of stock remaining unsold in lieu of cash for his work, thinking that he could dispose of the stock and thus get sufficient funds to complete the work. Things have proven otherwise and to-day the contractor has the stock on his hands, being credited with figures 33,682½ shares worth at par $336,825.

President Whelan declares that in the event of no race money collected on the sale of tickets will be refunded.

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Practice Begins at Des Moines

DES MOINES, IOWA, July 25—Five thousand people saw Barney Oldfield set new mile course records at the formal opening of the new Des Moines Speedway here to-day. Oldfield negotiated 2 miles in 1:10 1/5, 105 m.p.h. in his front-drive Christy. He went the 5 miles in his Fiat in 3:01 4/5, 100 m.p.h. It was announced that both of the marks are new world's records for a 1-mile course.

Preliminaries for the 300-mile event of Saturday, July 31, will be staged on Wednesday and Thursday of this week. Only the twelve cars making the fastest time will be eligible. Entries are:

Driver	Car
O'Donnell	Duesenberg
Chandler	Duesenberg
Henderson	Duesenberg
De Palma	Stutz
Scott	Anderson
Strunk	White
Mulford	Mulford
Cooper	Sebring
Brown	Du Cheyne
Burman	Peugeot
Jones	Clergy
Donaldson	Emden
Vail	Mulford
Oldfield	Delage
O'Connell	O'Connell

—

Denver-Cheyenne Record for Cadillac

DENVER, COL., July 24—Harold Brinker, of Cheyenne, Wyo., drove a Cadillac eight from this city to Cheyenne, 112 miles in 2 hr., 17 min. to-day, breaking the previous record of 2 hr., 43 min. Eleven cars started in an unofficial race between these two cities, promoted by the Denver *Post*. Leon Nelson of Denver was second in a Metz, in 2 hr. 53 min.

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10,450 Cars in Dallas County

DALLAS, TEX., July 24—Dallas County is now said to lead any county in the South for the number of automobiles. The 10,450th number was issued this week.

100-Mile Race for Providence

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$10,000 Race on Narragansett Park Speedway Sept. 18 for 300-Cu.-In. Cars

PROVIDENCE, R. I., July 24—The Narragansett Park Speedway, Inc., will open its new 1-mile cement track which has been built for automobile and motorcycle racing on Saturday, Sept. 18, when $10,000 in prizes will be offered for a 100-mile race open to cars of 300 cu. in. piston displacement and with a maximum weight not exceeding 2500 lb. Fourteen cars will be permitted to start, according to A. A. A. rules, and these will have to qualify at an average speed of 70 m.p.h. for two laps of the track.

Work on the track is being hurried at present, 100 men being employed, and it is expected that in 2 weeks the track surface will be completed. The surface is special asphalt mixture, resting on a deep layer of rock asphalt. In shape the track is an oval, varying in width from 75 to 81 ft. Inside of this track proper is an asphalt safety apron on which the cars can go in case of accident or if repairs have to be made. This apron is 14 ft. wide. The track is banked throughout its entire length, on the straightaways 4 to 6 per cent and on the curves 10 to 31 per cent.

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Allentown Race Meet July 31

ALLENTOWN, PA., July 24—A race meet is scheduled for the Allentown Fair race track July 31, when seven events will be run off under the management of the Matty Matthews Racing Association of New York under the sanction of the American Automobile Association.

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Packard Tests at Indianapolis

INDIANAPOLIS, IND., July 24—J. G. Vincent, vice-president of the Packard Motor Car Co., accompanied by a corps of assistants has been here for the past week experimenting with twin-six models. It is understood that hereafter all Packard experimental work of consequence will be completed on the local speedway.

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Show at Michigan State Fair

DETROIT, MICH., July 26—At the annual Michigan State Fair which will be held here Sept. 6 to 15, the automobile show will again be a feature. Most of the local automobile dealers have already taken space, it is said, by the fair officials, and like last year the Ford Motor Co. will have a miniature Ford assembling plant in operation.

Among the passenger cars thus far on the list to be shown are: Ford, Dodge King, Haynes, Grant, Reo, Mitchell, Cadillac, Hudson, Studebaker, Buick, Ross, Overland, Oakland, Chandler, Hupmobile, Chalmers, Chevrolet, Willys-Knight, Ohio electric and Maxwell. There are the following makes of trucks: Standard, Kalamazoo, Kosmath, Signal, Federal. Accessory dealers are applying for space.

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Apperson Adds Four-Passenger Roadster

KOKOMO, IND., July 25—The Apperson Bros. Automobile Co. is placing on the market what it styles a four-passenger roadster. The driver's seat is divided from that of his companion by an aisle and directly behind there are two cornering seats with ample leg room in the aisle. The top covers all four seats but when two are not in use they are covered by the dust hood.

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Fall Show for Denver

DENVER, COL., July 21—A two weeks' motor car and accessory show is being planned for Denver by the Automobile Trades Association of Colorado, to be held in connection with the International Soil Products Exposition Sept. 27 to Oct. 10. The exposition is expected to draw a large attendance from a wide territory, and consequently is counted upon as a substantial aid to the motor show.

The Denver dealers held a fall show last September in connection with the Denver Motor Club's two-day race meet.

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Dallas to Have Fall Show

DALLAS, TEX., July 24—Plans are being made by Dallas Automobile Dealers' Association to have the greatest automobile exhibit at this year's Texas State Fair in October that has ever been seen in the South.

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Hostetter Leaves Prest-O-Lite

INDIANAPOLIS, IND., July 24—Stuart S. Hostetter has resigned as head sales correspondent of the Prest-O-Lite Co. to become a member of the Hurst & Company's wholesale purchasing department. He will serve as manager of the sales and advertising department.

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Pathfinder Prepares to Expand

INDIANAPOLIS, IND., July 27—The Pathfinder Co. has plans drawn for an addition 60 by 400 ft. to its plant to take care of the 3500 cars production for 1916.

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New Trailer on Market

COLDWATER, MICH., July 20—A new trailer for automobiles is being manufactured by J. F. Laura, who has secured a patent for a connector used to join the trailer to the automobile. The trailer is made to carry a load of 1000 lb.

Lincoln Highway Route Changed

Washington and Baltimore To Be Included—Hercules Plant Auction Aug. 14

WASHINGTON, D. C., July 27—*Special Telegram*—Washington and Baltimore are to be on the Lincoln National highway. President Joy of the Lincoln Highway Assn., after having turned a deaf ear to appeals made more than a year ago by citizens of Washington and Baltimore, by a congressional delegation, and lastly by President Wilson to vary the course of the highway so that it might touch the national capital has notified Robert N. Harper, chairman of the committee selected last year by the District commissioners that he has found it possible to change the original plans and place both cities on the route.

Route Through Washington

Colonel Harper already has advised the commissioners of Joy's decision and the work of marking the city streets which will constitute the portion of the highway running through the district and obtaining the improvements necessary in Maryland will be taken up immediately. The highway will enter the district by way of Maryland Avenue, northeast, swing through Potomac Park past the Lincoln memorial, and then proceed westward by way of the Rockville Pike to Gettysburg.

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Prest-O-Lite Increases Facilities for Drawn Steel Demand

INDIANAPOLIS, IND., July 21—As announced in THE AUTOMOBILE for July 22, the Prest-O-Lite Co., Inc., this city, has turned its attention to the manufacture of cold drawn steel parts and has now outfitted one of the largest plants in the country to take care of this work. At the present time the Prest-O-Lite concern has in service three 400-ton hydraulic presses, one 300-ton hydraulic press, and is at present engaged in installing what is probably the largest hydraulic press in the country, having a capacity of 800 tons. This new press is large enough to break down 60 in. in diameter steel circles ⅜ in. thick, according to officers of the Indianapolis concern. In fact, it is claimed that with this press it will be possible to draw by the cold drawing process cylinders of approximately 20 to 22 in. in diameter, 48 in. in length from ⅜ in. stock. With the present equipment cylinders 12 in. in diameter and 44 in. long from stock 0.260 in. thick are being drawn by 400-ton pressure. With the 800-ton press cylinder ends, etc., of larger diameter than 20 in. on thinner than ⅜-in. stock will be handled.

With this large capacity the ability to meet large orders on such parts as brake drums and axle housings will be readily handled on the smaller-sized hydraulic presses. On small pressed or drawn steel parts of the shallow types the Prest-O-Lite equipment includes a large series of geared presses ranging from 100 tons down to 10 tons. The equipment is such that small work can be handled practically as readily as the larger work. In fact, an order has just gone through the factory for 25,000 stampings so small that twenty-five separate pieces were required to make an ounce.

New Battery Plant

In addition to this line of work the Prest-O-Lite concern has under construction a new building 100 by 400 ft. for use as a battery factory. It is also stated by the engineers of the company that another building of this same size will probably prove necessary. The company feels that the field for drawn steel cylinders is a large one and that with the equipment and present capacity of the plant, orders of any nature may be dealt with.

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Hercules Plant to Be Sold Aug. 14

LOUISVILLE, KY., July 23—In accordance with a judgment granted against the company at the last court term, the real estate, buildings and equipment of the defunct Hercules Motor Car Co. will be sold at auction on Aug. 14. The total amount of judgments against the company is $110,325. It is rumored that an effort is being made to interest capitalists for the purchase of the plant and continue its operation on an entirely new basis.

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Lucas Moves to Lagrange

SOUTH BEND, IND., July 24—The Lucas Mfg. Co., manufacturer of electrical supplies and automobile accessories, which has been located in Chicago, for the last year, has decided to move the factory to Lagrange, Ind., where stock has been acquired by a number of Lagrange residents.

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Elston Westcott Service Manager

RICHMOND, IND., July 22—C. J. Elston of Flint, Mich., has been appointed service manager of the Westcott Motor Car Co., this city. It is intended by the Westcott company to reorganize the service department completely and to thoroughly establish a policy which will follow the cars after they have left the factory. Mr. Elston was connected with the service department of the Buick Motor Co. for four years and later with the service department of the Hudson Motor Car Co.

Blue Book to Add a Volume

Will Cover Territory Below Potomac and Ohio Rivers —New Index Maps

NEW YORK CITY, July 26—The Automobile Blue Book Publishing Co., 239 West Thirty-ninth Street, this city, is going to add a new volume to its present series of Blue Books on road directions covering the territory in the Southeast below the Potomac and Ohio Rivers. Up to the present this territory has been covered partially by Vol. 3, covering New Jersey and Pennsylvania, Delaware and Maryland, and Vol. 4 covering the Middle West, but the increase in touring in the Southeast and because of greater road activity, the Dixie Highway being a typical example, a separate Blue Book will cover this territory in 1916. The Blue Book cars have already started out over the roads in this territory to get the exact road conditions and to write road guide information and will continue this work until late in the fall, thus adding route information on thousands of miles of highway in this section that have heretofore not been routed.

In this route work, the leading thoroughfares between large centers will be covered with odometer mileages, some of these being Washington to Atlanta, Jacksonville, New Orleans; Louisville and Nashville to Chattanooga, Atlanta, Florida and Gulf of Mexico; Richmond to Asheville, Chattanooga, Knoxville, Nashville, and Memphis; and New Orleans to Mobile and Jacksonville. After this secondary connecting routes will be gone over and odometer mileages written so that the tourist will be able to reach the majority of places without having to make any local inquiries. The Blue Book company is also preparing a series of general index maps, by reference to which the smallest villages in this territory can be located.

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New Case Farm Tractors

RACINE, WIS., July 24—Several new types of gas power farm machinery were introduced to the public at the annual convention of branch managers and salesmen of the J. I. Case Plow Co., Racine, Wis., last week. Field demonstrations of the new Wallis Fuel Saver Tractor Cub and the J. I. Case power life engine gang plow were given on the big Case farm just outside of Racine.

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To Build $500,000 Ford Assembling Plant in Omaha

OMAHA, NEB., July 22—A site, a block long, between Cuming and Izard and Fifteenth and Sixteenth Streets, has

been purchased in this city by the Ford Motor Co., on which will be erected a building a block long and six stories high for use as an assembling plant, general service quarters and offices.

The building will have more than 200,000 sq. ft. of floor space and will cost $250,000, and with machinery installed will represent an investment of $500,000. The ground, on which the building will be erected, was bought last Saturday, the price, about $105,000, being paid by Manager Charles Gould of the Ford company, Fred C. Shields, realty broker, and ex-Lieutenant Governor McGilton, attorney for the Ford company, to the various owners.

Three hundred men will be employed in the salesrooms, service station and assembling plant at the outset, after next April, when the building is expected to be finished. The Ford Motor Co. minimum wage of $5 per day will be applicable to all.

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Continental Adds to Muskegon Plant

DETROIT, MICH., July 24—The Continental Motor Mfg. Co., this city, is making extensive additions to its Muskegon, Mich., plant, which is devoted almost exclusively to the production of four-cylinder motors. Two reinforced concrete buildings, four stories in height will be constructed, one being 54 by 150 ft. and the other 70 by 330. Production of four-cylinder motors will be increased from 4000 to 6000 per month.

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Studebaker Not to Move Plant

SOUTH BEND, IND., July 24—President Erskine of the Studebaker Corp. denied the report from New York concerning the probable extension of the home plant in South Bend by the purchase of $800,000 worth of property here. "We have more room than we need here. We will positively not move the Detroit force here, and I cannot account for a rumor concerning the purchase of land," said Mr. Erskine.

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Miller Rubber to Build $50,000 Addition

AKRON, O., July 23—The Miller Tire & Rubber Co. will build a $50,000 addition. It will be six stories and 109 by 154. Another smaller building, one story and basement, 57 by 40, is also to be a part of the extension. The company has made extensions during the year which, with the proposed building, will bring its building expenditures close to $200,000.

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Haynes Not to Move

KOKOMO, IND., July 27—General Manager Sieberling of the Haynes Automobile Co. emphatically denies the rumor that his company will move to Lackawanna, N. Y. Rumors to this effect were circulated around Buffalo some weeks ago but are entirely false.

32,000 Cars in Oklahoma

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New Law Works Out Well—$40,000 Fees Collected—Oklahoma City Statistics

OKLAHOMA CITY, OKLA., July 23—Oklahoma's new law has been in effect since July 1, and during the first three weeks of the month, the State highway department has collected nearly $40,000 from automobile owners for licenses for their cars.

State Highway Commissioner A. N. Leecraft estimates there are 32,000 automobiles in the State.

Under the new law car owners must pay the State a license tax for their car, based upon the horsepower. For every horsepower the owner must pay 50 cents. This tax is in lieu of all other taxes, and is in great favor with automobile owners who compare the new tax with the tax under the old law. Ninety per cent of the money collected goes to the county from which it was originally collected and 25 per cent of the 90 per cent goes to the city where the car owner resides.

There are now 1900 automobiles in Oklahoma City worth approximately $700,000. The horses number 1343 and are valued at $66,350. The mules number seventy-five with a value of $4,435. The total number of horses and mules is 1418 and the value of both but $70,785. These figures were obtained from County Assessor J. S. Morrow.

The motor car has not made rapid gain in the county outside the city. The automobiles in the county, exclusive of Oklahoma City, number less than 100. The bad roads are largely responsible for this condition. Yet the total value of horses in the county, including Oklahoma City, is less than the value of the motors.

There are 9600 horses in the entire county worth $553,092 as compared to $717,915, the value of all the automobiles in the county.

On the basis of 75,000 population an average of one person in 39 owns an automobile in Oklahoma City.

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To Build Hearses and Ambulances

GRAND RAPIDS, MICH., July 24—The Michigan Hearse & Motor Co. has been organized to succeed the Michigan Hearse & Carriage Co., which has been in business during the last twelve years. As the name indicates the new concern has done away with carriages and horses and will now build motor-driven hearses. These will be made at its own plant, as well as ambulances. The old plant of Walter Poor and Harry Yeider, on Wealthy Street, has been secured, and there, temporarily, the chassis will be built. They will have a wheelbase of 148 in. and carry a six-cylinder motor. The capital stock of the company is $150,000 of which $25,000 is preferred. A two-story plant, 45 by 125 ft. is to be erected at Cottage and Grove Streets and Union Avenue.

—

Republic Truck to Add Again

ALMA, MICH., July 24—Although the Republic Motor Truck Co. made additions to its plant several months ago, the growing business has again made it necessary to further increase its size. At the present time two one-story buildings are being constructed. One is to be 30 by 450 ft. and will be used as a storeroom. The other, 50 by 100 ft., is to be the body shop. The total floor capacity of these buildings will be 18,500 sq. ft. Further extensions are contemplated which will add 20,000 more sq. ft.

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Select Ford Nashville Site

NASHVILLE, TENN., July 24—For the purpose of selecting a site for the new assembling plant of the Ford Motor Car Works of Detroit, to be established in Nashville, M. N. A. Hawkins, an official of the company, was in Nashville Monday. Mr. Hawkins inspected some half dozen prospective sites for the new plant, which is to have a capacity for 15,000 cars annually, and which will give employment to about 700 men.

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Lawrence Wants Austin Plant

LAWRENCE, MASS., July 24—The Industrial Committee of the Lawrence, Mass., Chamber of Commerce, having succeeded in getting the Lenox Motor Car Company to move to that city is now after other motor concerns, and an offer has been made to the Austin Automobile Co., Grand Rapids, Mich., to move East.

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Nicholson Regal Asst. Sales Manager

DETROIT, MICH., July 26—E. W. Nicholson has been appointed assistant sales manager of the Regal Motor Car Co. During the last two years Mr. Nicholson had charge of Chalmers district sales work.

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Buller Joins Apperson

KOKOMO, IND., July 22—H. L. Buller is now connected with Apperson Bros. Automobile Co. in charge of advertising.

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$15,000 Fire in Fisk Plant

SPRINGFIELD, MASS., July 23—Fifteen thousand dollars worth of building materials and four freight cars were destroyed by fire and a gasoline explosion in the yard of the Fisk Rubber Co., Chicopee Falls, late last week.

Jitneys Win in Indiana

P. S. C. Refuses Trolley Co. Petition That Commission Take Control and Regulate

INDIANAPOLIS, IND., July 24—The public service commission to-day entered an order dismissing the petition of the Terre Haute, Indianapolis and Eastern Traction Co., which sought to bring all jitney buses in the State under the control of the commission and subject to regulation by the commission.

At the hearing attorneys for the traction companies argued that the jitneys were common carriers and public utilities within the meaning of the utility law, and ought, therefore, to be regulated.

The commission's order was brief. It simply set out that the body had no jurisdiction and therefore dismissed the case. While the original petition related only to Terre Haute, the hearing on the proposal to place all jitneys under the regulation of the commission brought in the entire question of jitney competition with electric roads throughout Indiana. The commission was in session practically all day and prominent public utility magnates from all over the State attended the hearing.

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Kansas City Jitneys Raise and Lower Fares

KANSAS CITY, MO., July 24—The jitney bus died, was born again, died again and was born once more all in the course of two days here last week. The Green Bus Line, outfitted with fifteen of the Studebaker medium-priced buses, went out of the hands of the company that has been operating them, through foreclosure. The Studebaker Corp. sold the buses on what its manager here described as a "shoe-string capitalization." The promoter of the company had no money to begin with and the Studebaker company sold the buses largely with a view to encouraging the industry. But the officials of the company lacked the business instinct and the payments fell behind. When the fifteen green buses went out of business, the White Star Line, a co-operative company, immediately announced that it would charge 10 cents and that action was followed by the other buses and dozens of the smaller touring cars. They were stampeded by the fate that had overtaken the green bus line. However, the competition of the small jitneys that had not changed from 5 cents and the fact that the women preferred the street cars at 5 cents, brought a change the day following and the buses and the smaller jitneys that had changed their price all went back to 5-cent fares. The days the buses were charging 10 cents found them filled only in the rush hours, when the men were going to and from work.

There are practically as many buses and small jitney cars on the streets as there were earlier in the season. The Studebaker company is reselling its cars that were taken out of service as rapidly as possible.

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Erdman-Guider Co. to Make Bodies

DETROIT, MICH., July 26—The Erdman-Guider Co. has been organized to make special automobile bodies and do a general automobile trimming, repairing and painting business. The concern has leased the old Herreshoff Motor Car Co. plant 2290 Woodward Avenue. Those interested in the new concern are A. R. Guider, president and business manager, who during the past 10 years was manager of the R. Herschel Mfg. Co., Saginaw, Mich.; Charles Erdman, vice-president who was vice-president and assistant general manager of Seivers & Erdman; H. L. Morrison, secretary-treasurer, who was connected with the accounting department of the Riverside Storage Co.

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Weatherproof Body Co. Organized

DETROIT, MICH., July 26—The Detroit Weatherproof Body Co. has been organized and incorporated, its capital stock being $10,000. The officers of the new concern are C. Haines Wilson, president and treasurer; Lawrence Moore, vice-president and general manager; George D. Wilson, secretary. Temporarily the headquarters of the company will be at 500 Clay Avenue. The new concern will make limousine tops, commercial car bodies and will also market a special Ford body.

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Smith a Regal Sales Manager

DETROIT, MICH., July 27—H. H. Smith, formerly sales manager of the Diehl Mfg. Co., Elizabeth, N. J., and recently with the Triumph Electric Co., Cincinnati, O., has become district sales manager for the Regal Motor Car Co. with headquarters in San Francisco, Cal.

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Denby Truck Reduces Prices

DETROIT, MICH., July 23—The Denby Motor Truck Co. has reduced prices from $115 to $215 on its three models of trucks. The trucks themselves have not been altered.

The 1-ton or model B is now listed at $1,475, $125 less than formerly; model D, 1½-ton, lists at $1,685 or $215 less than heretofore, and the 2-ton model E at $1,985, which is a cut of $115 from the former price.

These lower-price Denby trucks have the same constructional features a equipment as before the new prices we into effect; in fact, there are no chang of any kind excepting the price.

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A. S. Bowser Goes to Albany

SOUTH BEND, IND., July 24—A. Bowser, formerly secretary of the S. Bowser Co., Fort Wayne, Ind., has be transferred to the position of assist general manager of the Albany, N. office. President Bowser said no p manent secretary will be appointed the home office for the present and transfer of the president's son to Eastern office is not the first of a change in Bowser officialdom.

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Bourquin Leaves Paige-Detroit

DETROIT, MICH., July 27—Jas. Bourquin, general manager of the P Detroit Motor Car Co., has resigned. was formerly with the production partment of the Chalmers Motor C

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Hood Detroiter Sales Manager

DETROIT, MICH., July 26—Walla Hood, who was sales manager o former Briggs-Detroiter Co. has appointed to a similar position i new Detroiter Motor Car Co. Mr. previous to his connection with Briggs-Detroiter Co. was sales ma of the Standard Motor Truck Co Everitt Motor Car Co. and als Chalmers Motor Co.

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Pierce-Arrow Agency Officials M

BOSTON, MASS., July 24—The o of the leading Pierce-Arrow a east of the Mississippi held a tw meeting at Boston, Mass., this w W. Maguire, the Boston agent, the part of host. They discussed matters of interest to the busine between times played golf and There were present Col. Charle ton of Buffalo; R. D. Gerton and Cady of New York; Charles Han Cincinnati; D. E. Odell of Minn Grant Waldraf, St. Paul; C. ford and E. H. Stoddard of Spr Mass.; H. Paulman of Chicago; Ellis of Newark, N. J.; Herman Pittsburgh; Samuel Berdeaon Louis; J. B. Westefeld, New Conn.; W. J. Foss and W. R. F Philadelphia; E. C. Bull, W. and R. Patten of Buffalo.

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Post Stearns New York Sales

NEW YORK CITY, July 25—T Stearns Co. of New York has F. W. Post, Jr., sales manage secretary Thomas R. Jacobs, he out the duties previously perf William Arthur Lesser, who in an automobile accident last n

Orr Plant at Yazoo City—The Orr Modern Motor Co., recently organized, will construct a plant at Yazoo City, Miss., for the manufacture of automobiles.

Auto Crank Shaft to Add—The Auto Crank Shaft Co., Piquette Avenue, Detroit, Mich., has awarded the contract for the construction of a one-story brick addition to its factory.

Toledo-Ford Tire Addition—Plans are being made for the construction of a new addition to the Toledo-Ford Tire Co.'s factory on Western Avenue, Findlay, Ohio. It will be 50 by 130 ft. and four or more stories high.

Wilson Foundry to Double Plant—The Wilson Foundry & Machine Co., Pontiac, Mich., expects to double its plant within the next few months. For this purpose about 10 acres of land have been purchased recently. The present force of 600 will be doubled, it is said.

Saxon Ships 11,000 Cars—During the first six months of 1915 the Saxon Motor Co., Detroit, Mich., has shipped about 11,000 Saxon fours and sixes. Production is being increased gradually and it is expected by officials of the company that the output for the remainder of this year will be at least equal to that of the first half.

To Enlarge Building—The Gas Power Engineering Co., operating a large garage and machine shop at North Avenue and Second Street, Milwaukee, is about to increase its capacity by the construction of a complete third story. The original building consisted of one story, and a year and a half ago a second story was added. The building is 60 by 150 ft.

Des Moines Co. to Build—The Clemens Auto Co., Des Moines, Iowa, has bought an eighth of a block on Eleventh and Mulberry Streets at a cost of $40,000 and will build a four-story, fireproof brick building thereon to cost $40,000. It will house the business of the company after Jan. 1, 1916. The company handles the Overland car for the Des Moines territory.

To Make Piston Rings—The Continental Piston Ring Co., Memphis, Tenn., has been incorporated with a paid in capital of $100,000. It will manufacture piston rings for locomotives, engines, automobiles and pumps of various kinds. The officers are B. H. Mason, president; W. P. McCadden, vice-president; R. E. Brown, secretary and treasurer, and C. R. Bryant, chief engineer.

Bulford to Enlarge Plant—The Bulford Truck Co. has decided to erect a large addition to its factory in Fremont. H. G. Bulford, the president, who leaves this week for England, announces that the company will turn out a large number of motor ambulances for Red Cross service in Belgium and France. As soon as the addition is completed, a large increase in the working force will be made.

Victor Tire to Build Again—The Victor Rubber Co., Springfield, Ohio, will erect another building, to be two stories, 30 by 108 ft. It will be erected on the ground between the two wings of the main factory building. The addition will be much like the one which was completed a few weeks ago. A mileage capacity test is now being made of the new pneumatic tire made by this concern. An automobile has been equipped with a set of these tires and will be run 300 miles a day while they last.

American Brass Adds—The American Brass Co., Kenosha, Wis., has just completed a large brass foundry addition in record time. Just thirty days after the contract for the erection of the shop was signed by the American Bridge Co. the building was turned over to the owners for installation of equipment. The shop is of steel and sheet iron, 330 ft. long, 60 ft. wide and 27 ft. high. The extraordinary demand for brass goods, particularly from the automobile trade, made the erection of the addition imperative.

Wisconsin Breaking Records—The Wisconsin Motor Mfg. Co., Milwaukee, is working the longest hours and the largest force of workmen in its history, due to the extraordinary demand for motors from car and truck manufacturers. The company some time ago reached the highest production it has ever known, but this was insufficient to meet specifications and schedules have been extended to the full limit of the plant's capacity. It is likely that additions will be made during the winter months in anticipation of a continuance of the demand for 1916.

Kansas City Ford Expands—The Ford Motor Co. is preparing to make an addition to its plant in Kansas City, Mo., to cost about $175,000. The addition will be two buildings, one 54 by 75 ft., the other 120 by 400 ft., both three stories, of reinforced concrete and tile roof. The work will be completed by Dec. 31.

The Automobile Calendar

July 31	Des Moines, Ia., Speedway 300-Mile Race.
Aug.	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 7	Chicago, Ill., 100-Mile Match Race, Chicago Speedway.
Aug. 7	Rockford, Ill., Hillclimb, Rockford Motor Club.
Aug. 20-21	Elgin, Ill., Road Races.
Aug. 30	Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept.	Peoria, Ill., Second Northwestern Road Congress.
Sept. 4	Minneapolis, Minn., Track Race; Twin City Motor Speedway Co.
Sept. 6-10	Indianapolis, Ind., Show, Indiana State Fair.
Sept. 6-15	Detroit, Mich., Show, Michigan State Fair.
Sept. 8-11	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13	Oakland, Cal., Pan-American Road Congress.
Sept. 17-18	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18	Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Sept. 18-25	Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Sept. 24	Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 27-Oct. 10	Denver, Col., Show, International Soil Products Exposition, Automobile Trades Assn. of Colorado.
Oct.	Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct. 1-2	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2	New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 2-9	Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 3-10	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 16	Chicago, Ill., 350-Mile Race, Chicago Speedway.
Nov. 18	Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4	Electric Prosperity Week.
Dec. 31	New York City, Show; Grand Central Palace.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Rogers Forms New Co.—Mason T. Rogers, up to the present time manager of the Buffalo, N. Y., branch of the Packard Motor Car Co., has resigned to enter business for himself. He has formed a firm styled M. T. Rogers & Co. and has associated with him C. W. Burton, formerly of the Daniel Green Felt Shoe Co., L. E. Moore, formerly connected with the Packard Philadelphia branch, and E. C. Fish, recently connected with the Buffalo Hudson company. The new company will gradually absorb the business of the Universal Equipment Co., supply dealer.

Jones Represents Midgley—Temple Jones, who has been connected with the Tire Sales Company, 204 St. Paul Street, Baltimore, Md., representatives of the Midgley and Republic tires, has become the direct representative of the Midgley company.

Dealer

Opens New Salesrooms—The Collins-Clem Auto Co., agent for the Studebaker in San Antonio, has opened new salesrooms and service station at the corner of Navarro and Crockett Streets.

Fanning to Handle Apperson—Frank Fanning, local distributor of the Marmon in Philadelphia, Pa., and W. T. Taylor, wholesale representative of the Apperson, have entered into an agreement whereby the Philadelphia Apperson retail trade will be handled by the Fanning company.

Maxwell Dealers Gather—Ralph Coburn, Eastern district supervisor of the Maxwell Motor Car Company, had the New England dealers as his guests at a meeting in Boston last Wednesday and Thursday, when he showed them the new 1916 Maxwell car. There were more than fifty present.

Overland Dealers Meet—The seventy-five Overland dealers in Eastern New England met at the Hotel Lenox last Friday night at a dinner as guests of the Connell & McKone Co., Greater Boston distributors of the Overland products. Joseph McDuffie, assistant sales-manager of the Willys-Knight, was guest of honor.

Used Car Week—The Rooke-Osmond Motor Co., Milwaukee, Wis., State distributor of the Jeffery, repeated its Used Car Week selling campaign last week and disposed of practically its entire stock of used cars, many for jitney purposes.

Motor Men in New Roles

Talbot Pathfinder Mgr.—W. E. Talbot, 408 Sumpter Bldg., Dallas, Tex., has been appointed Southern district sales manager for the Pathfinder Motor Car Co. of Indianapolis.

Austin Metz Sales Mgr.—Harry D. Austin has been made sales manager for the Seattle Metz factory branch, after a year's absence with the Metz company in California.

Fick Monarch Purchasing Agent—F. B. Fick, formerly with the Abbott Motor Car Co., has been appointed purchasing agent of the Monarch Motor Car Co. Detroit, Mich.

Knaus Makes Change—A. H. Knaus, formerly district manager for the Chalmers in southern California, has been made sales manager of the Braley Auto Co., Franklin distributors in Portland, Ore.

Abel Houk Agent—George I. Abel, western agent for the Houk Mfg. Co., has opened a branch in San Francisco to handle the Houk wire wheel. Abel is the representative for seven western States.

Kidd Paige District Mgr.—S. W. Kidd has been appointed district sales manager by the Paige Motor Car Co. with headquarters in St. Louis. He was formerly connected with the Detroiter Kansas City Co.

Chandler Noxall Distributor—W. R. Chandler, president of the Spar-East Co., eastern distributor of Sparton horns and other Sparton products, has become the eastern distributor for the Noxall Shock Absorber made by the Baker-Duffy Co., Chicago.

Donovan in Business—Frank B. Donovan, long associated with the Donovan Motor Car Co., Boston, has entered the trade in Baltimore, Md., as Studebaker distributor under the style Frank B. Donovan, Inc. Frank Carthew is president of the concern, and Donovan is treasurer and general manager. An office, salesroom and service station will be opened at 10-20 East North Avenue.

Ridenor with Madison—K. A. Ridenor, for several years in charge of the Louisville office of the Waverley Electric Co., has resigned to become assistant to Roy Potts, vice-president of the Madison Motor Co., Anderson, Ind. Mr. Potts formerly was sales manager of the Waverley Co. at Indianapolis. George Cheschire, southern representative of the Waverley Co., is temporarily in charge of the Louisville office of the Indianapolis concern.

Balough's Headquarters in Springfield—Charles Balough, who has been identified for the last five years with The Kelly-Springfield Motor Truck Co., Springfield, Ohio, as chief engineer and works manager, resigned from that company last June to take up the development of a new proposition in the commercial car field. Mr. Balough announces his headquarters as Columbia Street and Dakota Avenue, Springfield, Ohio, where he is conducting the development work of his new connections.

Kenny Returns to St. Louis—F. C. Kenny, who for four months was manager of the Studebaker branch at Memphis, Tenn., has returned to St. Louis and resumed the duties of assistant manager of the St. Louis Studebaker branch, which position he held before going to Memphis.

Garage

Garage and Repair Shop—John Gumb is erecting a $12,000 garage and repair shop building at Teutonia Avenue and Alten Street, Milwaukee, Wis. It will be 30 by 125 ft.

New Baltimore Garage—The Central Automobile Co. has opened a large garage in Baltimore, Md., in a place which was constructed by the city as a market house. The company can care for seventy-five cars. Twenty-four-hour service and accessory service is maintained.

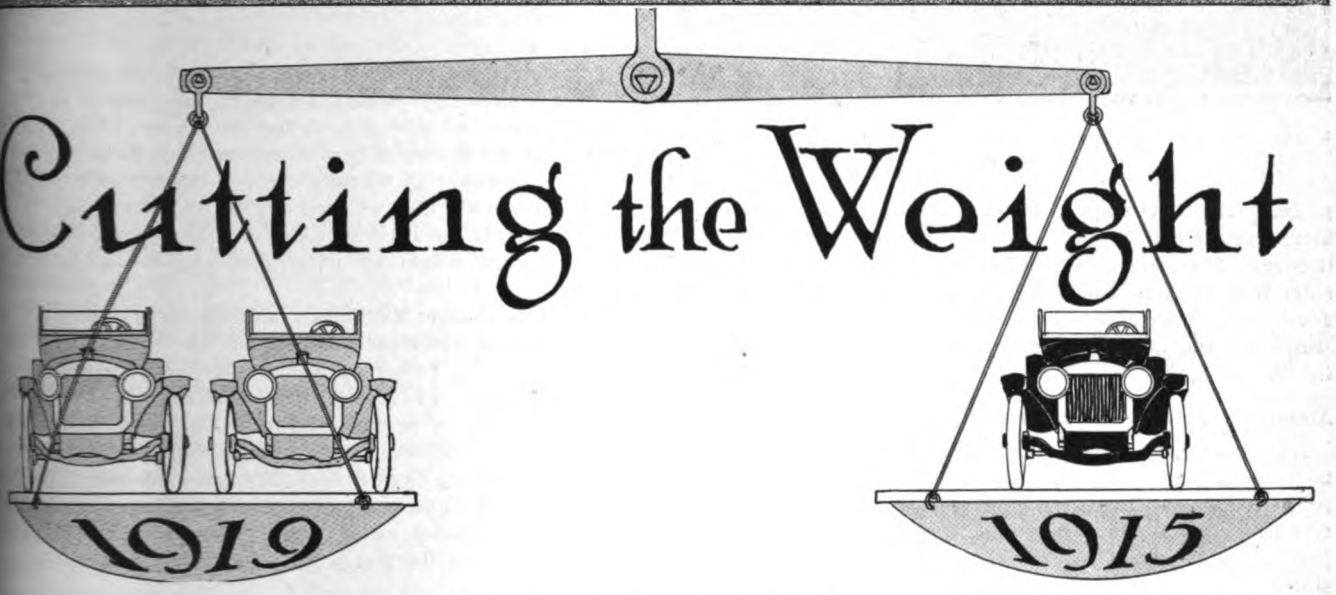
Build New Garage—Dvorak & Gaynor, Kewaunee, Wis., have broken ground for a new garage 40 by 120 ft. The business was established by the late John Gaynor in the spring of 1912 and is being continued by his son and J. F. Dvorak. The concern represents the Chalmers and Dodge.

Recent Texas Garage Happenings—The Lone Star Motor Co., El Paso, Tex., has moved into its new building, at Chihuahua and Overland Streets. It now has 24,000 sq. ft. of floor space at its disposal. The company has secured the Southwestern distributing agency for the Chalmers and handles Dodge, Hupmobile and Chandler. The Federal Tire Co. has opened an agency at El Paso, in the Overland Building, with F. M. Bannell in charge. The Federal Motor Truck Co. has placed the distributing agency for its products in Houston with the Houston Motor Truck Co.

Vol. XXXIII NEW YORK—THURSDAY, AUGUST 5, 1915—CHICAGO No. 6

The AUTOMOBILE

Cutting the Weight



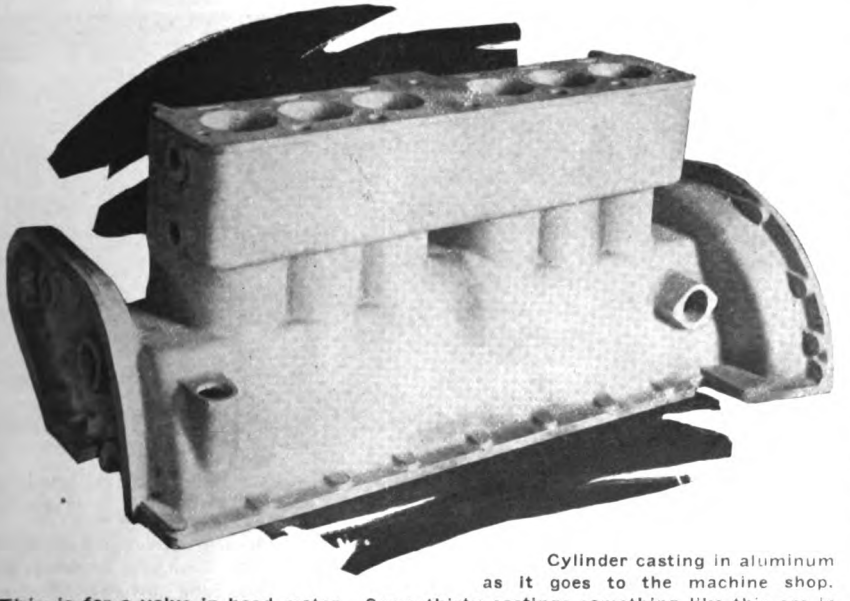
How Scientific Design and Use of Aluminum Alloys Will Cheapen Motoring

By A. Ludlow Clayden

THE automobile of 1918 ought to be 30 per cent lighter than the automobile of 1916.

Correspondingly it ought to be anything from 20 to 40 per cent cheaper to run, but it may cost a little more to buy. Surely, however, a matter of a few hundred dollars ought not to be considered if they are to be saved over and over again in the first year's use of the car.

Weight which is not doing work is dead weight and there is no place for anything but live parts in an automobile. Dead weight cannot ever be cut out entirely, but in most cars there is a great mass of needless metal of which the only effect is to eat up tires and gasoline. We know now the sort of road performance expected of the modern automobile and we cannot look for anything greater in the way of ability than is given by a good six, eight or twelve, but we could get the same ability with much less weight and so be able to utilize it for much less money. Engineers have worked for twelve years upon little else besides the motor so would it not be reasonable to turn to a new problem for a while and apply the same brain effort to improving the whole of the chassis?

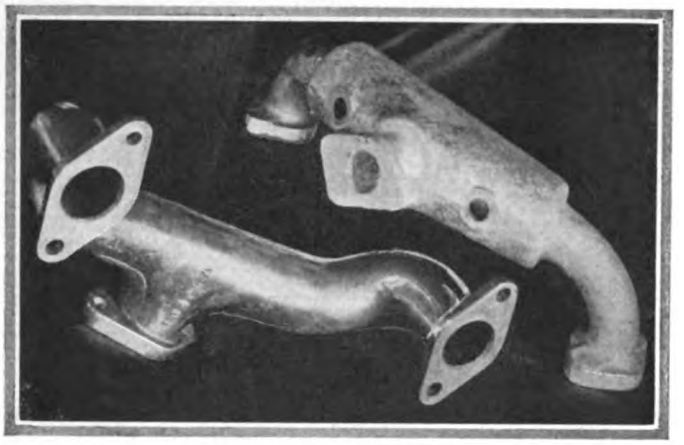


Cylinder casting in aluminum as it goes to the machine shop. This is for a valve in head motor. Some thirty castings something like this are in service in the hands of private owners throughout the country

How to Reduce Weight

There are two ways of reducing the weight of a car. One is to dispose the material more scientifically. The other is to use much more aluminum alloy of one sort or another.

In the following it is purposed to give attention principally to the latter possibility, using more aluminum and to show how much more extensively aluminum could be used with



Everyday aluminum pieces. A plain and a water-jacketed intake manifold

nothing but advantage. To cut the weight by using light metal means thinking of ounces here and odd pounds there, it means that with every detail of a chassis we must consider how light it can be made, taking nothing for granted from past experience. But before going into detail a few words on the history of aluminum in the automobile may be said.

Aluminum Returns from Obscurity

Aluminum was such a weak metal when automobile engineers first began to use it that it had to be extremely massive in order to obtain the necessary strength. Thus we found frequent claims that a crankcase, for example, could be made just as light of cast iron; with the gearbox it was not possible to house bearings directly in the aluminum, because the soft metal would gradually sink away and leave the ball race loose and rattling, and it was not safe to use aluminum for the middle part of a rear axle, as it was liable to bend out of shape and then crack. Also aluminum cost a good deal of money so altogether it was not a very encouraging material ten years ago.

Then came a slow change as founders discovered how to alloy the light metal with copper, zinc and other substances, but the engineers who had turned to the use of iron and steel for parts once made of aluminum were satisfied with what they had done and did not feel inclined to give aluminum another chance.

This brought us to the stage where the unit power plant appeared and this weighed altogether too much if the base was anything except aluminum, so engineers then discovered what a vastly different sort of metal aluminum had become. To-day it is almost as strong as cast iron and can be stronger. It has a high power of resistance to shock, can be cast very accurately, machines more easily than any other metal and its quality is regular while its quantity is infinite.

There is practically no *cast* portion of an automobile which cannot be made of aluminum with utterly satisfactory results both in the shops and on the road, and we may soon see some forged parts replaced by the lighter metal.

Aluminum Cylinders to Be Used

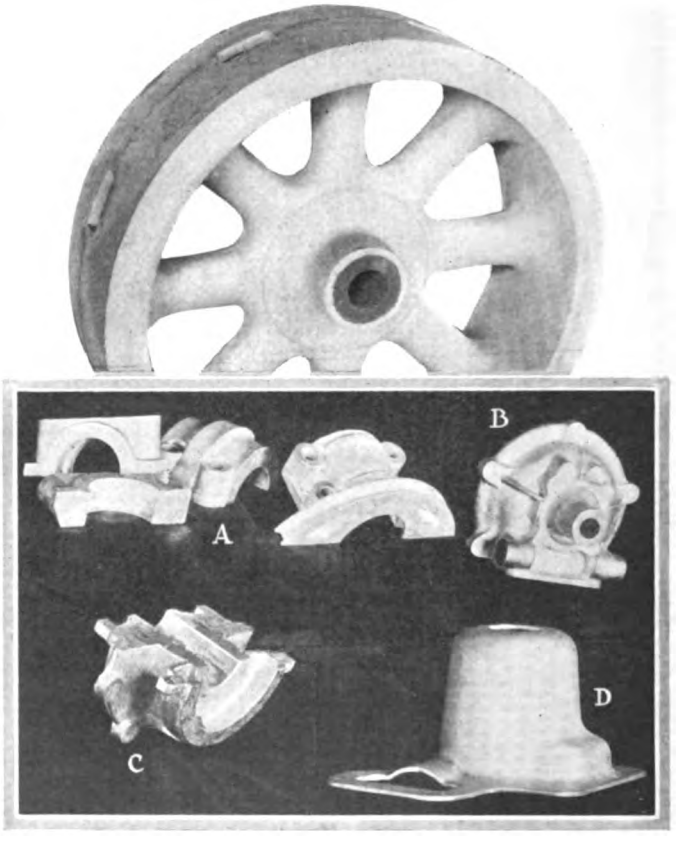
Having said that there is no casting in an automobile chassis that cannot be made of aluminum let us begin with the cylinders, the largest cast part and the one which seems the least susceptible of aluminumizing. Next year there will be several cars in regular use with cylinders of aluminum and one of the biggest motor builders actually sent out a dozen or more motors this spring with cylinders of this metal, painting them so that the fact was hidden to the buyer. The results have been so satisfactory that more than one prominent engineer is preparing to start in with aluminum cylinders as standard.

Here let it be explained that there are two parts of the cylinder which cannot be aluminum, the valve seats and the wall against which the piston works. In the motors already made up a very thin iron liner has been used to make the piston working surface, and a little iron plate is cast in to form the valve seatings. The cylinder liner is as thin as the machine shop can make it, as thin or thinner than a sleeve of a Knight motor, and there is even a possibility that it *may* be found possible to run the piston in a cylinder of unlined aluminum. This is a matter of experiment, calling for investigation with different alloys, but even with the compound construction the weight of the iron is very little indeed.

The aluminum cylinder block can be cast with walls of exactly the same thickness as would be used for cast iron, because an iron cylinder's dimensions are determined by the limit of thinness to which a foundry can work and not by considerations of strength, so the weight saved is directly in proportion as the weights of aluminum and cast iron.

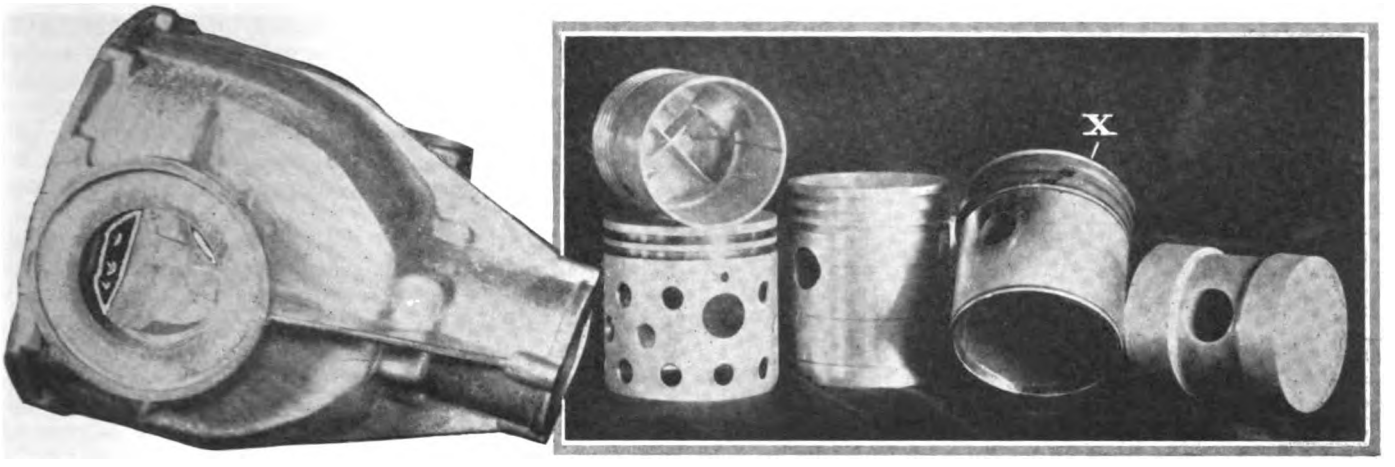
As an example let us take a six-cylinder block casting for a 3 by 5 motor. One of good design by actual test, weighed 119 lb. and as the ratio of weights is between 2.5 and 3 to 1 the saving in weight by using aluminum would be 72 lb. at least.

There is another advantage too, which is often forgotten in thinking of aluminum pistons, and this is the much better heat conducting power of aluminum. Heat conductivity is often measured by taking that of silver as 100. On this basis iron has a conductivity of 11.6 and aluminum 31.3 which means that heat flows through aluminum nearly three times more easily than it does through cast iron. The effect of this is that aluminum pistons and cylinders part with their heat to the cooling water much more quickly. In a motor that is running, the piston and the inside cylinder wall are



Above—A sand cast aluminum truck wheel. Many of these are in use and are said to save as much as 1000 lbs. on the whole weight of the vehicle

Below—A—Permanent mold bearing caps. B—Permanent mold pump casing. C—Sand cast cover showing how thin sand casting can be done. D—Sand cast bearing cap which compared with those from the molds shows the machining saved by the latter process



Left—An elaborate permanent mold job. A differential casing which needs hardly any machining. Right—Pistons cast by the permanent mold process. That marked X ran for 490 consecutive hours at 1300 r.p.m., equivalent to 17,000 miles on the road at 35 m.p.h.

a good deal hotter than the water in the jackets and with aluminum cylinders there is still a temperature difference, but it is not so great. Now, as it is the temperature of the piston and cylinders which controls that of the valves, and also influences the efficiency of the lubrication, it follows that the aluminum motor will run cooler at high speed than the iron engine. This is what might be called an accidental advantage, for the weight saving is the really important thing, but it is an added reason for using the better material.

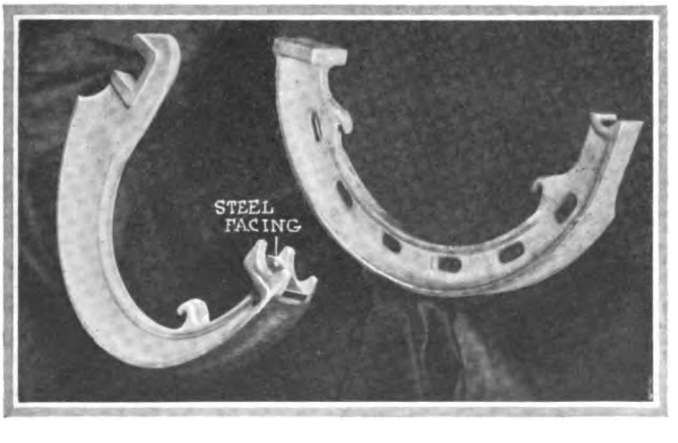
200 Pounds Saved

Several good engineers have been drawn to the extended use of cast iron, because a cylinder block which has the top part of the crankcase integral with it gives a very rigid support to the crankshaft. Now, just the same rigidity can be had with aluminum cylinders and crankcase in one integral piece and the weight saved, as compared with integral cast iron would be probably 200 lb. or more on a 3 by 5 six-cylinder motor. On an eight it would be almost as great proportionally and similarly on a twelve.

The little Sterling motor, illustrated by a sectional drawing, is said to weigh nearly 100 lb. less than the standard model. Not only is this immense saving an advantage when the car is completed and tire wear or gasoline consumption come to be considered, but it makes a perceptible difference in the cost of freight on the rough castings, and still more in the machine shops. A six-cylinder block which can only be handled with great difficulty by three men becomes light enough for two to play with or for one to carry a short distance, and in a big production shop this would cut the labor cost by an appreciable amount as well as speed up the handling. Also, apart from handling, the machining of the aluminum is a vastly quicker job than with cast iron.

So there is plenty to be said in favor of aluminum on the cost side, which goes to offset the slightly greater expense of the casting in the first instance. No doubt aluminum cylinders would cost more than iron at the present time, but there is no reason why they could not become as cheap if a large plant was organized on an aluminum basis.

With connecting rods the experimental stage has not yet been advanced very far. Two kinds are possible, those made up from pressings of sheet metal welded together, and those cast or die-cast. The former have been tried out in one or two aeroplane motors with success and the latter have been tried in some small cycle motors, also with encouraging results. It remains for the future to show whether the metal is easily applicable to ordinary automobile work but there seems no fundamental reason against its ultimate success.



Two aluminum brake shoes. The part indicated on the left one is a bit of steel cast in to take the cam wear

Untried Possibilities Numerous

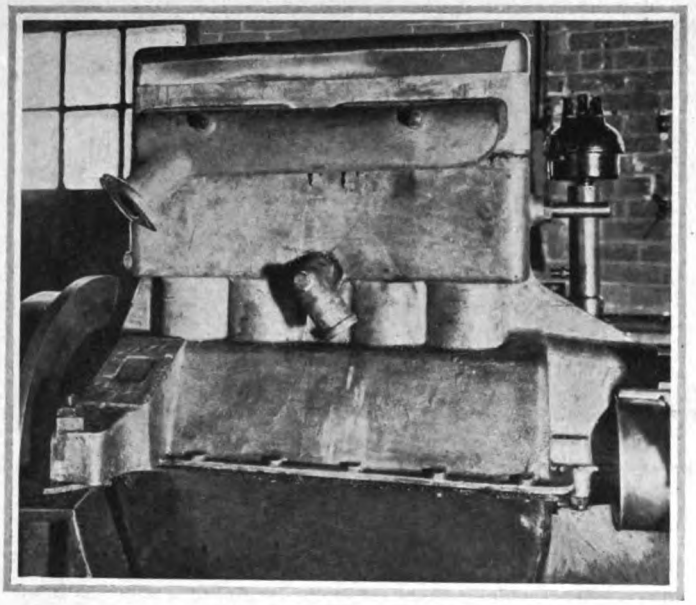
In a motor the crankshaft, camshaft, tappets, valve seats, cylinder liners and distribution gears must be iron or steel.

Crankcase, cylinder block, pistons, connecting rods, pumps water header and carbureter, intake manifold, piping and the metal parts of ignition apparatus can be aluminum.

This is speaking broadly, for aluminum could easily be compounded with the steel parts in several instances. Take the timing gears for example, or the sprockets, if chain distribution is employed. There is no reason why these should not consist of aluminum centers having a steel rim on which the teeth are cut. Compound casting could produce such a wheel, and it would not be difficult to devise a method of attaching a steel ring to an aluminum blank by other means. It may even be possible before long to make a die casting wherein a *finished* ring gear of steel is filled with a ribbed aluminum center and turned out of the mold ready to go on the shaft. Of course, it sounds as though going to an extreme of this sort would be absurd, but the saving in weight might easily be 5 or 6 lb. or even more and it is by detail cuts of this sort that the total chassis weight must be reduced in the future.

As another instance take the steel parts of a leather ring or other form of coupling used to drive a generator or a magneto, for these are designed for convenience and not for strength and might just as well be aluminum. Probably, allowing for the saving in machining cost, they would come out actually cheaper.

Other parts which might advantageously be of aluminum are such things as starter brackets, the small levers used in the control mechanism, fan, fan bracket and fan driving pulley, all cover plates, breather or oil filler caps. Other details will suggest themselves as soon as this line of thought is followed and it is a conservative estimate that a motor with aluminum used to



An aluminum Sterling motor which has been running for weeks on the block in the manufacturer's plant. This motor is 100 lb. lighter than the cast iron equivalent and keeps much cooler. It is expected that a large number of aluminum Sterling engines will be used next year

the practical limit would weigh little more than 50 per cent as much as a similar motor with much cast iron in its make up.

Attention may be drawn to the undoubted fact that the die cast, or permanent mold, aluminum piston is far past the experimental stage and it is within measurable distance of being as cheap as cast iron, while being much cheaper than steel. Its lesser weight reduces the total weight of the motor, the vibration stresses and the wear on bearings, while its better conductivity causes it to keep cooler and so allows a higher piston speed without ill effects. In a year from now or even less, it will be possible to say the same of aluminum cylinders, save that their use does not affect vibration or bearing stresses.

With the small, and less important parts, the designer who is seeking to save weight should consider each piece to make up his mind whether it would be strong enough in aluminum. On most good motors there are many pounds of steel and brass parts which would do their work just as well whatever they were made of, and when we get a piece like this it ought to be aluminum.

Let it not be forgotten either, that aluminum exists in sheet as well as in ingots and that its great ductility enables it to be pressed or spun into elaborate shapes. For strength it can be corrugated or ribbed and the necessary dies for making parts of simple contour can be prepared from cheap castings.

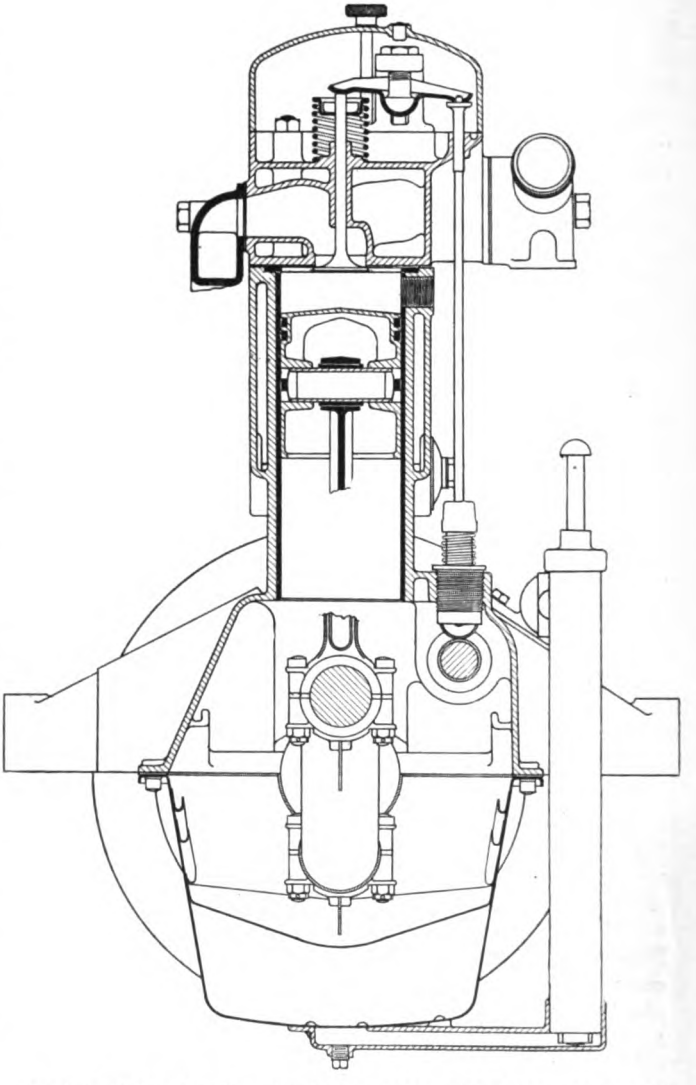
No mention has been made of the exhaust manifold but this is a part which must be of some material capable of withstanding high temperature long continued. Aluminum deteriorates slowly if used for the exhaust branch, unless it is water cooled, and if it is jacketed the extra weight of the larger amount of water necessary in the system would more than counterbalance the saving on the part itself.

Small Parts in Transmission

Now coming to the clutch if it is a cone type we can obtain the lightest center by using aluminum, and if it is a plate pattern with fabric facing there is a possibility of using aluminum to carry the fabric. Probably the clutch is one of the parts least susceptible to the introduction of light metal, and it is certainly the part where weight matters least, as it all goes to make up flywheel mass which is controlled by the needs of the motor. We must have enough weight here in any case and cannot cut it out. Almost the only opportunity for introducing aluminum in the clutch operating gear appears to be the foot plate of the pedal. Pedals in which the foot plate is a separate part adjustable to suit drivers of different stature are becoming increasingly popular, and there is no possible objection to the use of a light alloy for the actual pedal, though it could not be employed for lever parts.

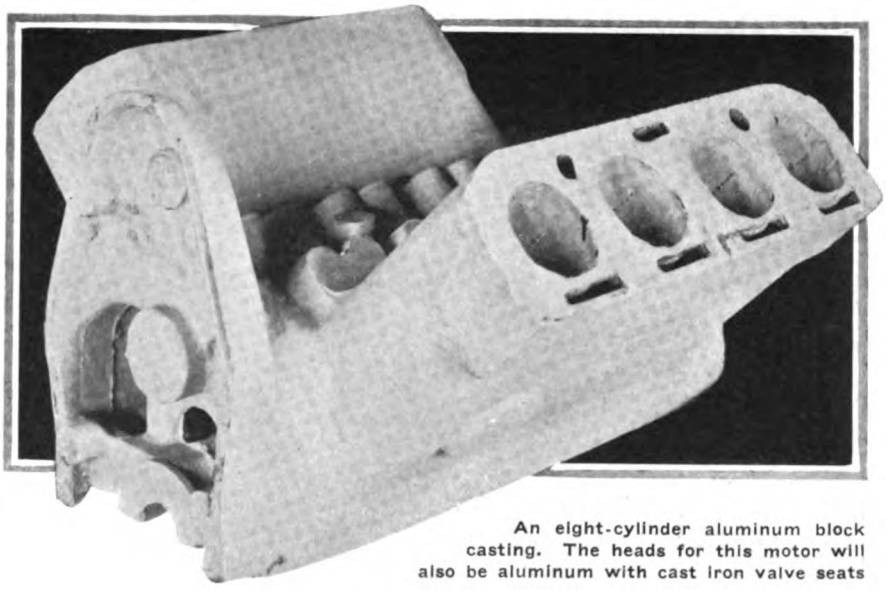
Transmission, in so far as the gearbox is concerned, can have an aluminum case for practically the same cost as cast iron, and, of course, it usually does so. Neither shafts nor gears could be anything but steel, and the shifting mechanism must be steel also. There should be no need for brass parts. Aluminum can be employed for the quadrant, if such is used, or for the spherical housing for the foot of the gear shift lever. The levers themselves for gears or emergency brake can be lightest if of steel, but they are almost always needlessly heavy. Some most excellent and very light levers have been made from drawn steel tube with aluminum handles and drop forged lower end brazed in. No doubt they cost more than the plain type, but there is a chance of dispensing with several pounds on these two levers.

Where pressed parts are used, such as cover plates, protecting shields for the quadrant and so on, they are better of sheet metal than castings as a rule, but they might be



Section of the Sterling aluminum motor. The black parts show the iron which remains. The liner is pressed in and is previously turned up, the bore being ground after assembling in the aluminum. To make the valve seats a thin steel plate is used, also shown in black section. The connecting-rod has been cut and the upper half turned round to show the section of the Lynite piston

pressed aluminum just as easily as pressed steel and with very little extra cost. Another use for sheet aluminum where it effects a great saving is in the bonnet, and to show how great is the difference between steel and the lighter material, it may be mentioned that a Ford hood in aluminum weighs just 16 lb. less than the same thing in sheet steel.



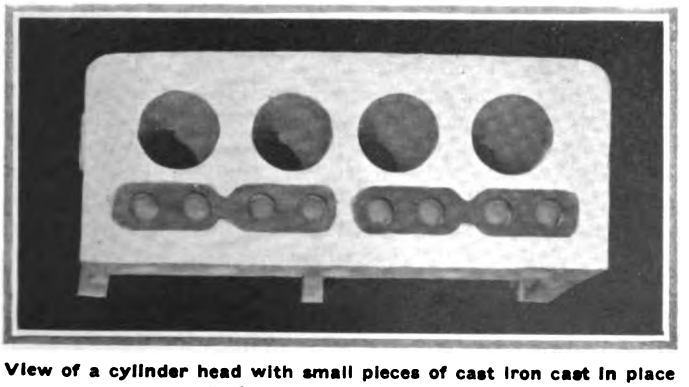
An eight-cylinder aluminum block casting. The heads for this motor will also be aluminum with cast iron valve seats

Cutting Unsprung Weight

After much argument there seems now to be agreement that light axle weight is an advantage from every viewpoint. Obviously the front axle can be made lightest by using the strongest possible material—steel, but this hardly applies to the rear axle. Here we have both strength and accommodation to consider, and the actual axle sleeves must be either steel or reinforced with steel. No other material will withstand the violent shocks for long. Of course, it is possible to make the driving shafts take the whole weight, as was done many years ago, but this calls for very massive shafts. Apart from the sleeves of the axle, however, there is no need for immense strength, and the center part of an axle is designed more to contain the differential and bevels than to act as a bridge between the two sleeves. Of course, it must have strength enough to serve this latter purpose, but the job is well within the power of aluminum, as has been shown by its successful use at this point on many different cars.

This is a debatable point, of course, and many engineers prefer to have a single steel member, either pressing or forging, extending from wheel to wheel without any separate center case. When this style of axle is used the actual differential container is already frequently aluminum as it should be, together with cover plates, etc. An unusual application of aluminum to axle parts has been tried out lately by one of the big axle manufacturers, this being the use of aluminum, permanent mold castings for the shoes of the internal brakes. It is advantageous to have a good rigid support behind the brake facing or asbestos material, and this is given very readily by the aluminum shoe. To provide a working surface for the spreading cam a small piece of steel, already machined, is embodied in the casting and the shoe needs no machining save the drilling of holes for the facing attachment rivets.

On road wheels the hub caps can be aluminum, or very light pressings in brass or steel, and do their work just as well as the all too common heavy brass casting. The wheels themselves are so very delicate a subject that the writer will leave them out of the discussion save for the remark that demountable rims are commonly heavier than the demands of strength necessitate. It is not easy to see how a light metal could be used at all widely in their construction, but weight can be saved by simplicity of design.



View of a cylinder head with small pieces of cast iron cast in place to form the valve seatings

Reducing the Odd Ounces

So far the main units of the chassis have been touched upon and the details left, but, though the big savings of weight will be found in the main parts like the motor, there are many small things on a car which weigh hundreds of pounds altogether.

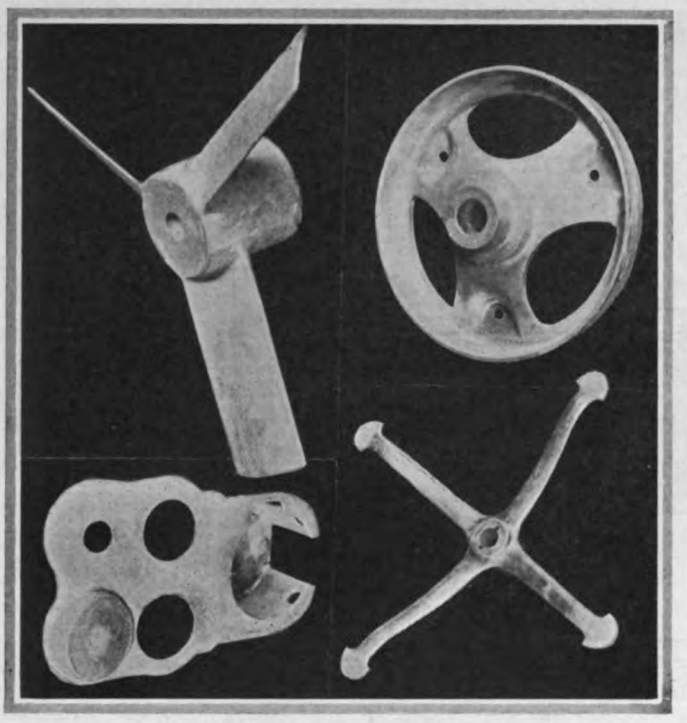
Let us start with saying that except for the radiator and bearing bushings there is no excuse for the use of brass anywhere. Take the radiator cap, for example, and consider a neat design where the cap is a brass casting secured by a quick detachment clip; substituting aluminum would cut out perhaps 6 or 8 ounces.

Again, take all the greasers and lubricators; at present these are not, so far as the writer is aware, made in any material but brass; yet why should they be so heavy? *All* the greasers on a chassis must total to a very substantial number of pounds, and brass weighs more than three times as much as aluminum. What about door handles, switches, control levers, tool box hinges, top fittings and windshield parts?

Then, turning to the body proper, this can be lighter if aluminum is used for the panels, and strength with lightness are combined to a wonderful degree if the whole body is cast. Still if the more usual system is followed it seems reasonable to suppose that much weight could be saved by substituting aluminum castings for some of the concealed parts of the body. Here we normally have heavy ash strapped and bracketed together with iron plates and forgings, and the same strength could be had from aluminum castings with a great weight saving. It would certainly cost more, but so do all novelties till they are brought down to a manufacturing basis.

Better Use of Steel Possible

It would be possible to elaborate this argument for many pages more, but enough has been said to direct attention to the possibilities for weight saving by the substitution of aluminum for other metals. In this way alone it is likely that a 4000-lb. car could be cut down to 3000 or even less, and there is still the chance of further saving by alteration of design to make better use of the steel where steel is the only choice. How we can cut weight in frame and fenders has been suggested in the paper read by A. P. Brush before the Detroit section of the S. A. E. last May, and one might add that a propeller shaft brake is lighter than two brakes on the rear wheels, a Hotchkiss drive is lighter than any other layout,



Sundry small pieces of aluminum which all help to cut the weight

that some forms of springs are lighter than others. No doubt, if lightness becomes the next big boom, as appears very probable, some people will go too far and carry weight saving to the point where convenience or safety begin to be endangered. But even if this should happen we shall settle down eventually with the average automobile a better article from the viewpoint of the millions of people to whom it has become a daily necessity.

War Raises Price

The writer is indebted to The Aluminum Castings Co. for the photographs which have been used for illustration. Most of the aluminum cylinders in use have been cast at the Detroit plant of this company, while the permanent mold work is done chiefly at Buffalo. The Detroit foundry is preparing for a considerable demand for aluminum cylinders and the Buffalo plant is daily increasing its facilities for piston production, the demand for this part having grown at a very great rate. It is unfortunate that one of the effects of the war should have been greatly to increase the price of raw aluminum so that all aluminum parts are now much more costly than they will be when conditions return to normal. Just now the producers of aluminum have their electric furnaces taken to the limit and are still quite unable to cope with the demand; none the less it is expected in many quarters that a drop of 30 per cent may be looked for within a year, and if the prophecy proves to be true the use of aluminum in automobile work will receive much encouragement.

Chasing Aeroplanes with 5-Ton Trucks

PARIS, July 18—Chasing aeroplanes with an American 5-ton truck is a job which delights the hearts of the lads of the Royal Navy operating from the Belgian coastline to bombarded Arras. Early in the present year the British authorities took delivery of a fleet of Pierce-Arrow 5-ton trucks—stock chassis without a bolt or a nut differing from those delivered to clients in America. When they reached England a number of the trucks were fitted with special chrome-nickel steel bodies, the plates being 5/16 in. thick, and each truck received a powerful high-angle anti-aircraft gun. The load was more than the trucks were theoretically designed to carry, being well over 6½ tons, and the recoil of the gun is equivalent to a couple of tons, but this has not prevented them from giving every satisfaction.

Half of Brigade Armored

The first half of the Pierce anti-aircraft brigade has been in active service in France and Belgium for four months. There are eighty-five trucks in the brigade, half of them being armor-plated and carrying a heavy gun, and the remainder having an ordinary body. Since they came across the Channel the trucks have been in service every day and have already accounted for the total destruction of six aeroplanes. After four months' service there has been no trouble in the axles or chassis and not a spring shackle or clip has loosened. This statement is only of value when consideration is taken of the conditions under which the trucks have to work. Unlike the ordinary convoys, these armored trucks have to operate right up to the firing line, many of the journeys being made at night, when not a glimmer of light can be shown for fear of attracting the enemy's fire, and over roads where the artillery had pounded great shell holes, or while the roads were actually being shelled.

Near Hill 60

This brigade got out in time for the great German attack at the end of April and early May, when asphyxiating gas was used for the first time, and the French line was pierced, putting the English and Canadians in a very perilous position. Staff-Sergt. Granville Pollock, an American who volunteered to serve with the English on the Pierce armored car brigade, has supplied a few particulars of the work done by this brigade in that great battle. One of the Pierce armored trucks was stationed by the side of the famous hill 60, near Zillebeck, and within 300 yd. of the first line German trenches. According to a recent statement in the English Parliament, this hill was practically blown out of existence during the great battle.

Asphyxiating Gas and Carbureters

"In order to reach the car," relates Pollock, "we had to make a night trip along the communication trenches as far as possible, then crawl across country lying as if dead whenever illuminating fuses were sent up. The air was so heavy with asphyxiating gases that respirators had to be used most of the time. The driver and gunners of the armored car were found to be in good spirits and resolved to hold the ground and pound the enemy, which they did with deadly effect. Owing to the amount of gas in the air, it was feared that the carbureter might be affected, so every quarter of an hour the motor was started up and allowed to run for a few seconds. In every case a start could be made on the switch. Some of the cars have interesting souvenirs stuck in them: bits of shell and driving bands of copper around the spokes and rims where the 'whiz-bangs' have landed after bursting; some of them have big dents from large lumps of common shell, and one truck has a huge hole as the result of a direct hit. Nevertheless, every truck that came out is still on active service and going strong."

Granville Pollock, who has had war experience in Mexico, and aviation experience in America, slipped across the Atlantic last December with the intention of getting into the aeroplane corps. The Royal Marine Artillery was then forming its anti-aircraft brigade with the Pierce trucks and Pollock was offered the rank of staff-sergeant. He accepted, donned the blue uniform of the British marines, helped to prepare the first batch of armored trucks in England, came across with them, and has been living to the sound of guns ever since.

Passenger cars and commercial cars doing their share of the work at the National Guard Encampment at Hopewell Junction, N. Y.

U. S. Army Needs Motor Transports

Few Trucks at National Guard Encampment Do Excellent Work in Handling Supplies for Commissary Department

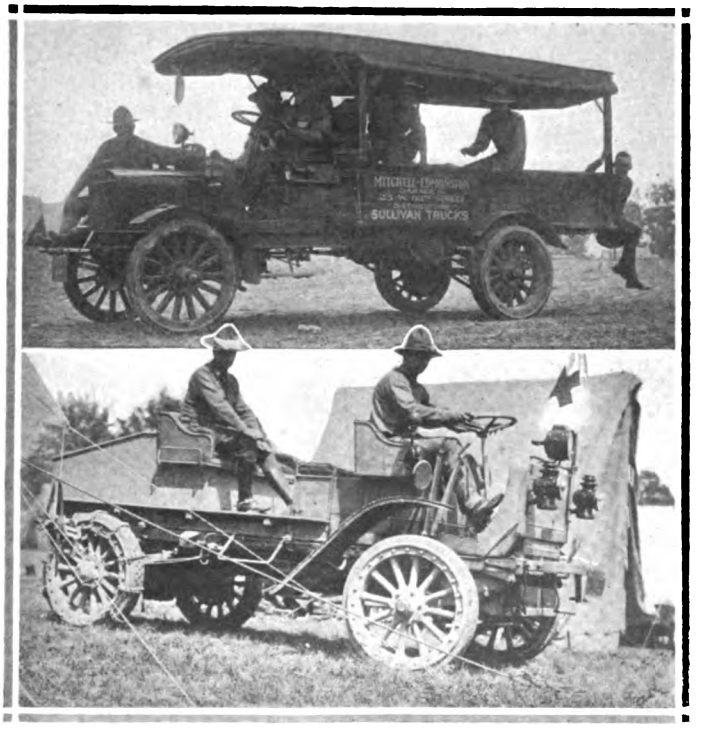
By J. Edward Schipper

WITH the business of war engaging the attention of almost half the population of the earth, it is but natural that the eyes of the people of the United States turn with interest on the military forces of their own country. We are only emerging from the first feeling of stunned surprise which swept over the whole country when the vastness of the scale on which the conflict is waged in Europe struck us with the force of a blow. For years talk of the military preparedness of the great European countries was known to every schoolboy in the country, and yet, when the enormous war machinery was taken from its warehouses and put to the business for which it is intended it could not but cause a feeling akin to dismay in a country in which the war trade is not even a secondary consideration.

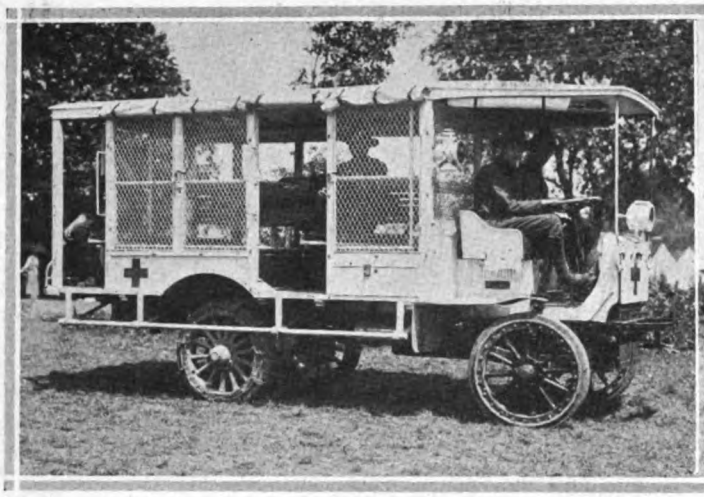
Our strength is the National Guard. That is the expression with which thousands of citizens dismiss the idea that this country would not be able to face in conflict one which has made a study of war for generations. This being the case, it is but natural that the efficiency of the militia becomes of intense interest to the citizenship of the country at large. We have three lines of defense. A small regular army, which is at best but a nucleus; the National Guard, which must in time of war, or at least for the first year or two, be the backbone of our forces, and the volunteers.

Gasoline in War

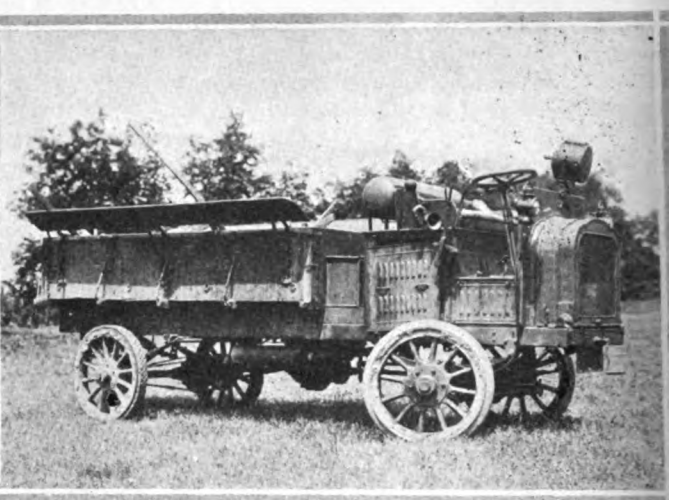
An armed crowd is not an army. An army to be efficient must be well officered and trained, and by arms is not meant guns and ammunition alone, but the thousands of other details which go to make up the equipment of a mobile force. It has been said in Europe that this is a war of gasoline, and in the early stages of the combat where the world was electrified with the stories of quick movements of thousands of troops, this undoubtedly was true. It was gasoline which carried the German armies across Belgium. It was gasoline which carried the French army out of the gates of Paris to oppose the invader and drive him back from the capital of France. It is gasoline wherever quick mobilization becomes necessary. The transportation of heavy guns, of large quantities of ammunition, of machine guns, food, clothing and all the necessities of an army operating some distance from its base of supplies depends on gasoline and the machinery which it drives. Therefore, when talk of training more soldiers and of developing greater efficiency in the National Guard spreads from one border of the country to another, it is the gasoline-driven machinery which we must develop



Sullivan truck and Autocar officers' vehicle used at maneuvers at National Guard encampment at Hopewell Junction



Autocar ambulance similar to the type which went with the Canadian contingent to the front



Flareboard bodies on 1½-ton chassis are most popular for a around army use

along with all the other modern equipment if we wish to put ourselves on a par with other first-class powers.

Throughout the country in various states the National Guard organizations are holding their summer encampments and military maneuvers. Here men who spend the major part of the year in clerical or other sedentary pursuits are taken from their offices and put through the rigid exercises of a military encampment. This week or two of training per year is intended to put the men in touch with the development of military art and to accustom them to the elements of field work which it is not possible to bring out in the armory. It is here that the opportunity arises to demonstrate the advance made in the use of the accoutrements of warfare. It is now that some of the lessons which we learn from the conflict on the other side of the water should be absorbed and kept for future use.

New York Militia Maneuvers

During the last few weeks the army maneuvers of the New York State militia have been held at Camp Whitman, Hopewell Junction, N. Y. During the week of from July 10 to 17 approximately 5000 men were in this camp. These were made up of the Quartermaster's Corps, which acted as a central supply depot, and four regiments. The Seventh, Twelfth, Sixty-ninth and Seventy-first. In addition, there were three troops of cavalry, composed of a squad of the Second United States cavalry regulars and Squadron A; a hospital corps and four companies of regular infantry.

The work of this body of men is of particular interest, since the New York State militia make up an entire division in the army, and is supposed to be as efficient as any state militia in the country. The work of the officers and men individually can be dismissed as enough is said when it is stated that they are all members of crack organizations and can be relied upon to go through the manual of arms and field maneuvers with great éclat. In point of equipment, however, outside of a few machine guns and modern small arms, a wide chasm exists between what our men had and what would have been a part of the organization of one of the up-to-date foreign forces.

For the entire force of 5000 men but twelve motor trucks were supplied, and of these only five were owned by the organizations in camp. Four of the trucks were owned by the Quartermaster's Department and the fifth by the Seventh Regiment. The other trucks were merely loaned by companies for demonstration purposes or hired from civilian owners. A few of the officers brought their private passenger cars, but there was no organized arrangement of these. There were a few motorcycles used by the provost guard, but no motorcycle scouting corp was on hand. The

Some of the roads at the maneuvers resembled what might expected in campaign work

camp kitchens were pulled by mules and horses, as were camp equipment and supplies of the men. If the army had to make a forced march of 48 hours across country would have been at the mercy of the said mules and horses

Motor Trucks Necessary

Of course this was merely a practice camp, the main p pose being to train the men, but there is no doubt but t we should go farther than this in our maneuvers if t are to be of value in bringing the citizen soldiery of country up to a state of such preparedness that should arise they would be able to take immediate advantage the lessons to be learned from the fighting on the other s When we learn that one of the belligerents has for the year or two been arranging the motor trucks of one of largest concerns so that at a moment's notice the bodie peace times may be removed and guns and armor which already been prepared fitted instead, we get a small ink of the detail to which attention has been paid in fitting mobile equipment for possible war times.

Although consisting of but 5000 men, the New York S militia did not have a sufficient number of trucks to ha

the situations which develop in camp. The trucks attached to the Quartermaster's Department were not sufficient to meet the requirements of bringing in provisions for the men and horses. Each regiment is allowed, by army regulations, four escort wagons. These are supposed to take care of the needs of the regiment. Generally, each of these wagons is hauled by four horses or four mules, and they have the advantage of being able to go through practically any kind of country. In the short-haul work between the last possible stretch of road for motor vehicle and a camping spot they are indispensable. In other words, they fill the gap between the motor truck and the pack mule.

Want Motor Equipment

Officers and men on every side stated their belief at the encampment in the value of a motor transport service. In fact, in view of what it has done in other countries, its value cannot be denied. The armored car, the motor camp kitchen, the scout car, the motor tractor for heavy guns, the motor-equipped wireless telegraph, field telephone, field observation post, searchlight service, ambulance service, medical supply service, ammunition supply and numerous other gasoline-driven vehicles are a matter of life and death to the fighting men of Europe. It is time that we, in training our soldiers, should teach them the use of these modern implements of warfare as much as we do the use of the machine gun, automatic revolver and developments in actual armament.

Of the four regiments in Camp Whitman only one, the Seventh, had motor trucks in addition to the four army transport wagons and sixteen horses. This regiment had five trucks, a 1½-ton White owned by the regiment, a 2-ton Pierce-Arrow and a 2-ton Mack hired from civilians at Newburgh, a 1½-ton Sullivan and a Morton tractor which were demonstrated at the camp. The Morton tractor was tried out, hauling five of the regular army transport wagons at a time over all kinds of roads, and with its large steel-studded tires was able to secure good traction and made a favorable impression.

In the hospital corps there were three 2-ton Autocars on demonstration. One was a two-seated officers' car used by the chief surgeon, another an ambulance and the third a searchlight truck. The ambulance was of the same type as that furnished to the Canadian contingent which left for the scene of war last year. It has stretchers for six wounded and can carry six prone or eight sitting.

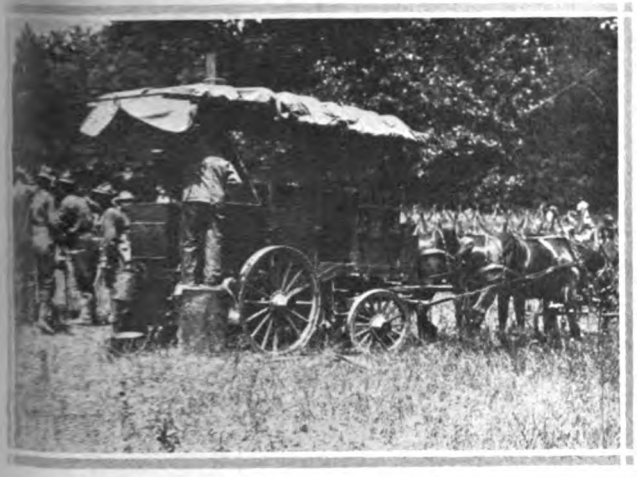
The Motor Searchlight

The searchlight truck is provided with a direct connected generator driven by a motor which is the same as that supplied for power purposes for the car. A hand cart carries two reels of wire, each ¼ mile long, permitting the searchlight to be wheeled a half-mile away from the source of power. In this way light can be played on the enemy from over the brow of a hill while the power plant is safely hidden beneath the shelter of the slope. The generator is operated at 110 volts, 45 amperes, and the lamps are of 5000 candlepower.

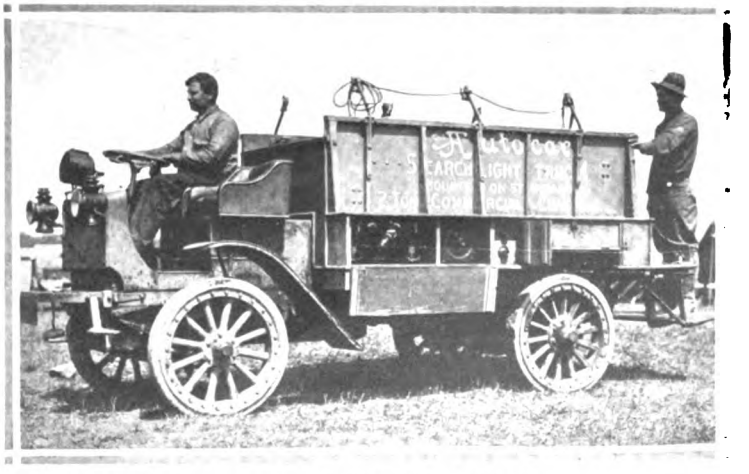
The searchlight truck and the ambulance were the only two bright spots which showed modernness or any tendency toward that state in the motor equipment. The 1½-ton Whites which were owned by the Quartermaster's Department and the Seventh Regiment have come to be old standbys and proved themselves to be of great use three years ago in the Connecticut maneuvers. Beyond this the motor equipment did not exist, unless the few motorcycles and privately owned touring cars which, it must be admitted, were of great utility, be included. The equipment which would enable the soldiers to practise moving large bodies of men over great distances was lacking, as was the motor-driven trench-digging apparatus and the various other up-to-date equipment which has come to be regarded as essential.

1½-Ton Truck Favored

Nowhere was anything heard against the use of motor-driven apparatus wherever it was possible to carry it. It is the consensus of opinion that the 1½-ton truck is the best all-around vehicle because it is fast and light, comparatively speaking. It does not become readily bogged, keeps up with the line of march readily, and can be converted to practically any use which the needs of the moment demand. The principal uses of the truck are in transporting supplies from the railroad base to the nearest accessible point to camp, and where large bodies of men are to be moved across country there is no doubt but that the use of motor vans, wherever the roads permit, would greatly increase mobility.



The camp kitchens were of the horse-drawn variety, these being handy for short marches



Searchlight apparatus on Autocar truck which can be hauled ½ mile away from source of current

Connecting-Rod Design for V Motors

Advantages and Disadvantages of the Side-by-Side Construction and the Forked End Rod—Why the Separate Arm Type Is Not Adopted—Movement of Rod Ends on Bushings

By Chester S. Ricker
Consulting Engineer

AT the February meeting of the Indiana Section of the Society of Automobile Engineers the question of connecting-rod design on eight-cylinder V motors was discussed. There were three types of motors mentioned: those with separate rods side by side on a common crankpin, those with a yoked-rod end on one side and a tanged end on the other rod which fitted inside of the yoke and took bearing on the yoke rod bushing; and lastly those in which a separate rod of shorter length was used and which bore against a special pin located on the side of the other rod.

The first of these constructions is exemplified in such eight-cylinder motors as are built by Herschell-Spillman and Buda companies. The second construction seems to be the most popular and is standard construction on Cadillac, Cole, King Ferro and Detroiter eights. The third form was used on the Schebler twelve-cylinder motor that was built about seven years ago.

The side-by-side construction has nothing against it practically but does have the disdvantage that it necessitates the offsetting of the two-cylinder blocks so that the axes of the opposite cylinders will not pass through the same point on the crankshaft. This adds to the length of the motor slightly and does not make the motor absolutely symmetrical. It has the advantage that it permits the same adjustment of the rods after long usage just as one has on an ordinary motor of the vertical type.

The forked-end rods make for the shortest eight or twelve V-motor as the axes of the opposite cylinders are directly in line and the two connecting rods are likewise in the same line. The usual construction is to have the forked rod carry the bushing which runs on the crankpin. This bushing is in most cases made from a hard bronze and lined with an anti-friction metal. The rod from the opposite cylinder has a bearing on the outside of this bushing, frequently the former is case hardened steel and the latter hard bronze. The object has been to give this bearing the same kind of surfaces as have been found satisfactory on piston pin bearings. In the S. A. E. meeting referred to one person stated that the movement of the connecting-rod end on this bearing was no more than on an ordinary piston pin. The purpose of this article is primarily to show just how much that movement really is on V motors and also to consider the reasons why the third type of connecting-rod has not been found satisfactory and has not been adopted on any of the most successful and up-to-date motors.

Piston-Pin Movement

It has not been customary to provide adjustment for piston pin bearings, although some manufacturers, notably Apperson, have done so for fifteen years. The question is, why have most manufacturers not done so? The connecting-rod does not revolve on this bearing b merely oscillates and for this reason do not move either rapidly or to any gre extent. That is why the wear on pist pins is so slow and why no adjustment usually considered necessary.

The movement of the piston pin e of the connecting-rod with reference the piston can easily be determir trigonometrically. It varies with length of the connecting-rod and stroke. If we express these variables a single factor we can readily comp the total angle through which the up end of the rod moves. The maxim angle B_p formed between the connecti rod and the vertical or axis of the cy der is determined immediately by formula $\frac{R}{L} = \tan B_p$. The angle B_p

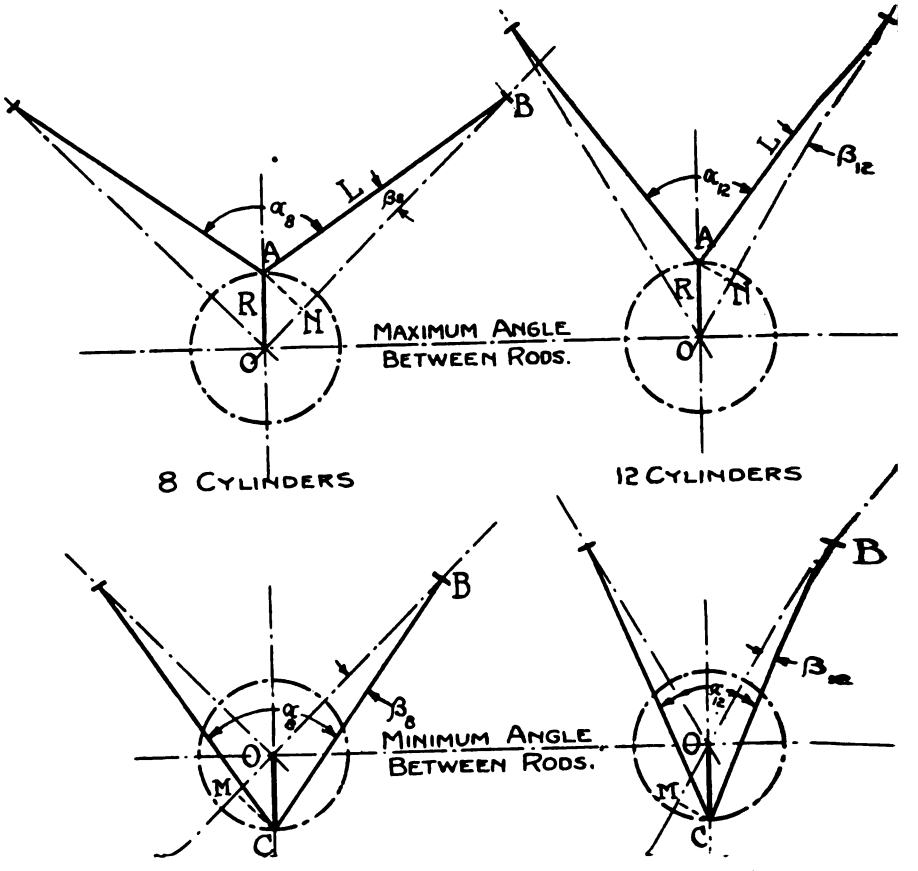


Fig. 1—Maximum and minimum angular positions between the connecting-rods i eight and twelve-cylinder motors

been computed for several values of $\frac{R}{L}$ in the appended table. The total or maximum movement of the rod end with respect to the piston is just twice B_p. This has also been computed and is found under $2B_p$. The values of R, which represents the crank length and L which is that of the connecting-rod are both transferred to an abstract quantity by using the ratio so motors of any size may be checked up from this table which is between the limits of 1:4 and 1:5. From this it will be seen that 28 deg. 6 min. is about the maximum angle in good practice and that it may be reduced to 22 deg. 36 min. if the connecting-rod is made long enough.

Movement of Rod Ends on V Motors

The computations made in these tables are not confined to the eight-cylinder motor but include data on twelve-cylinder motors with the cylinders at 60 deg. A number of such motors are on the road so that this information will not be amiss at this time.

In the accompanying diagram, Fig. 1, the maximum and minimum angular positions between the connecting-rods in both eight- and twelve-cylinder motors are shown. In the table which accompanies this article the maximum and minimum angles are not tabulated as they do not have anything to do with the computation of the difference between the maximum and minimum angles. In the diagrams the angles B_8 and B_{12} have been computed because it can be easily proved in the following tabulation that the difference in angles between the rods is equal to four times B_8 or B_{12}. In the table it will be seen that maximum movement of the rods on an eight-cylinder motor varies from 40 deg. 44 min. to 32 deg. 32 min. On the 60 deg. twelve-cylinder motor it is considerably less, varying from 28 deg. 44 min. to 23 deg. 0 min.

Angular Movement of Connecting-Rods Relative to One Another

$\frac{R}{L}$	Eight cylinder: $.707\left(\frac{R}{L}\right)$	Eight cylinder: β_8	Eight cylinder: $4\beta_8$	Twelve cylinder: $.5\left(\frac{R}{L}\right)$	Twelve cylinder: β_{12}	Twelve cylinder: $4\beta_{12}$
.250	.1768	10° 11′	40° 44′	.1250	7° 11′	28° 44′
.245	.1732	9° 58′	39° 52′	.1225	7° 2′	28° 8′
.240	.1698	9° 46′	39° 4′	.1200	6° 54′	27° 36′
.235	.1660	9° 33′	38° 12′	.1175	6° 45′	27° 0′
.230	.1627	9° 22′	37° 28′	.1150	6° 36′	26° 24′
.225	.1590	9° 9′	36° 36′	.1125	6° 28′	25° 52′
.220	.1555	8° 57′	35° 48′	.1100	6° 18′	25° 17′
.215	.1520	8° 44′	34° 56′	.1075	6° 10′	24° 40′
.210	.1485	8° 32′	34° 8′	.1050	6° 1′	24° 4′
.205	.1450	8° 20′	33° 20′	.1025	5° 53′	23° 32′
.200	.1414	8° 8′	32° 32′	.1000	5° 45′	23° 0′

Angular Movement of Piston Pin End of Connecting-Rod

$\frac{R}{L}$	Bp	2 Bp
.250	14° 3′	28° 6′
.245	13° 46′	27° 32′
.240	13° 30′	27° 0′
.235	13° 14′	26° 28′
.230	12° 57′	25° 54′
.225	12° 41′	25° 22′
.220	12° 24′	24° 48′
.215	12° 8′	24° 16′
.210	11° 51′	23° 42′
.205	11° 35′	23° 10′
.200	11° 18′	22° 36′

Computations

$$\frac{A-N}{R} = \text{sine } 45°. \quad A-N = .707\ R$$

Hence,

$$\text{sine } B_8 = .707\left(\frac{R}{L}\right)$$

After computing B_8 it is easy to find that

$$\alpha \text{ max.} = 90° + 2B.$$

Similarily it may be proven that

$$\alpha \text{ min.} = 90° - 2B.$$

The difference

$$\alpha \text{ max.} = \alpha \text{ min.} = 4B.$$

For the twelve-cylinder motor

$$\frac{A-N}{R} = \text{sine } 30°. \quad A-N = .5R.$$

Hence

$$\text{sine } B_{12} = .5\left(\frac{R}{L}\right)$$

After computing B_{12} you find that α max. for twelve-cylinder motor will equal $60° + 2B$, and similarly α min. $= 60 - 2B$, making α max. $- \alpha$ min. $= 4B$.

From the tables included it will be seen that the maximum movement of the rods on an eight-cylinder motor is between 44 and 45 per cent greater than that of the piston pin. On the twelve-cylinder motor this is much less varying from 2.5 to 1.75 per cent. Hence it is evident that the twelve-cylinder motor practically duplicates the piston pin bearing conditions at the big end of the forked rod.

Assembling the Forked Rods

One of the best-running motors of the eight-cylinder, forked-rod variety has the rods assembled in the following manner: Two of the forked rods are attached to the pistons in the first and fourth cylinders of the left hand block. The other two forked rods are attached to pistons in the two middle cylinders of the right cylinder block. In this manner the centrifugal effects upon the crankshaft and the balance of the motor is equalized, so it is claimed. This is the construction of the latest Northway

(*Continued on page 237*)

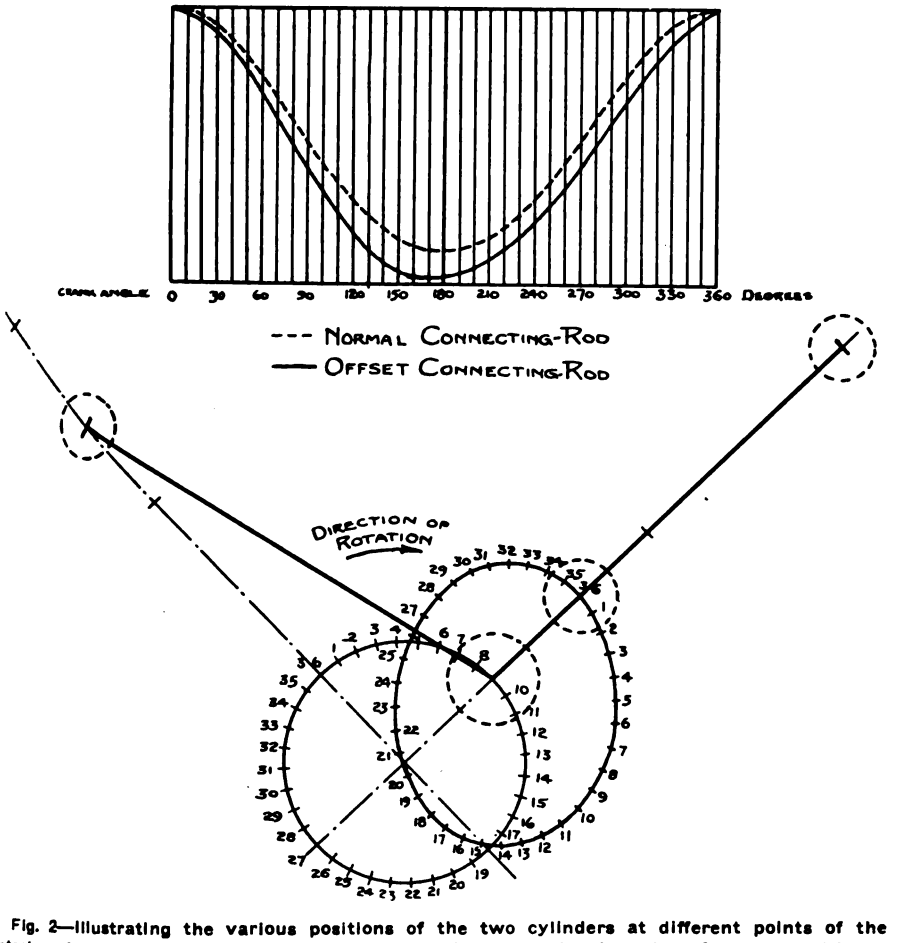


Fig. 2—Illustrating the various positions of the two cylinders at different points of the stroke. Note that the right-hand cylinder has a longer stroke than the left, besides differing in the general characteristics of its movement

Group of S. A. E. members in attendance at the meeting of the nomenclature division of the standards committee in Detroit

Standardizing Names of Parts

S. A. E. Starts Scheme for Universal Nomenclature—Will Save Time and Money in Replacement Work

IT has long been an ideal of the S. A. E. to determine a standard nomenclature for all the parts of an automobile so that confusion between the owner who wants the part, the dealer who has to fit it, and the manufacturer who supplies it may be avoided. At present the amount of time and money wasted every day by the difficulty of understanding what it is that the customer is writing about is immense, but to discover a way of cutting out redundant names has proved very much more difficult than anyone would imagine it could be.

Some Data Collected

The nomenclature committee has labored without producing any very tangible results, but the work done has been sufficient to demonstrate the great importance of the subject, and enough data have been collected to enable a fresh start to be made along a sounder line.

With this idea in view a meeting of sundry engineers and service men was called at Detroit last Friday, July 30, and the meeting was presented with a list of suggested names for a majority of the parts in a gasoline engine. Coming straight to detail these were taken item by item and the fitness of each term thrashed out. At the end of three hours the fifteen men present had agreed upon the names of some twenty simple parts only, and in one or two cases half an hour or more was occupied in the discussion of a single word.

Small Committee and Salaried Secretary Proposed

This sufficing to show the real practical difficulty of pleasing the ideas of everyone, Howard E. Coffin, vice-president Hudson Motor Car Co., proceeded to explain that the Society as represented by the Council thought the subject too difficult for handling by a committee. He pointed out the extremely small amount of progress made in a whole morning's work and said that the new idea was to create a small committee and provide a competent, salaried secretary who would spend a year or two on nomenclature work exclusively, taking constant mail votes and calling upon the committee to an extent which the members would not feel made an excessive demand upon their time.

There is not an owner of an automobile, a dealer or a manufacturer who would not feel the benefit of a successful conclusion of this work, and the enthusiasm of the service men at this preliminary meeting showed in unmistakable terms what it will mean to them.

That the men present were representative of all classes of the industry and all types of chassis may be seen from the list following. Representing the S. A. E. were Howard E. Coffin, K. W. Zimmerschied, Coker F. Clarkson and A. C. Woodbury, who has collected the data which the meeting discussed by searching manufacturers' replacement parts lists. Representing the industry were: E. E. Sweet (Cadillac); H. W. Booth (Dodge Bros.); H. H. Barrows (Maxwell); H. W. Drew (Marmon); J. S. Smith (Moline); R. E. Marston (Packard); G. S. Mather (Paige); W. B. Stout (Scripps-Booth); E. J. Chase (Studebaker); E. W. Vultrie (Hudson); C. W. McKinley (Overland); A. L. Clayden (THE AUTOMOBILE).

Half an Hour on One Subject

To give an example of the sort of difficulty which has to be overcome, one-half hour was spent without any very definite results in discussing what was a bearing and what was a bushing and what can be done with the nomenclature of bearing caps, carriers, housings, retainers, cages, etc. Water pipes and passages are another trouble, for there is an infinite variety. They may be top or bottom pipes, inlet or outlet manifolds, etc. Also a pipe which is an outlet from the cyl-

...der jacket is an inlet to the radiator, and vice versa, which ...gives a magnificent opportunity for confusion. The main ...idea in developing this works is to divide the whole car into ...groups and classify under a series of group headings. Be... the suggested general divisions and part of the ...of Group 1, which shows the idea of the pro... it is intended to follow; it must be understood ...are dealing with suggestions only, though it is ...that another few months will show some real ...difficulty is a natural effect of the wonderfully ...of the automobile industry and it is character... industry to get together and straighten out the ...rms which they have created individually.

GENERAL DIVISIONS

...Plant — III. Running Gear
...mission System — IV. Body

...ENERAL DIVISION I—POWER PLANT
F—Starting and Lighting System
...stem — G—Clutch
...stem — H—Accessories
... System

...AL DIVISION II—TRANSMISSION SYSTEM
B—Control

...NERAL DIVISION III—RUNNING GEAR
E—Springs
F—Steering Gear
G—Muffler

GENERAL DIVISION IV—BODY

A—Body
B—Top
C—Hood
D—Running Boards
E—Fenders
F—Tire Carriers
G—Windshield
H—Lamps
J—Accessories

GENERAL DIVISION I—POWER PLANT

Sub-Division A—Engine

Group 1. Cylinder—Includes all parts usually assembled therewith, such as studs, valve caps, wire brackets, gaskets, water header.

Group 2. Crankcase—Includes all parts usually assembled therewith, such as studs, bearings, gaskets.

Group 3. Crankshaft—Includes all parts usually assembled therewith, such as timing gear, flywheel, oil connections.

Group 4. Camshaft—Includes all parts usually assembled therewith, such as timing gear, oil pump gear, pressure pump cam.

Group 5. Connecting-Rod and Piston—Includes all parts usually assembled therewith, such as bearings, shims, pin, rings.

Group 6. Valve—Includes valve-lifting mechanism above cam, tappet, spring, etc.

Group 7. Ignition Drive—Includes parts used to drive ignition devices, up to and including coupling.

Group 8. Auxiliary Drive—Includes parts used to drive electric lighting and starting system, tire pump, etc., up to and including coupling.

Group 9. Water Pump.

Group 10. Oil Pump.

Group 11. Starting Crank.

Group 12. Fan—Includes bracket, drive pulley, belt.

Group 13. Intake Manifold—Includes cylinder gaskets, nuts.

Group 14. Exhaust Manifold—Includes cylinder gaskets, nuts.

Group 15. Fuel Pressure Regulator.

Connecting-Rod Design for V-Motors

Methods of Timing Eight-Cylinder Motors

(*Continued from page* 235)

...product in which experiments have been ...made with the forked rods all on one ...side. This has been found the most de...sirable combination.

Offset Connecting Rods

In order to illustrate the inherent disadvantage of the third type of V motor connecting-rod design the writer has drawn an accurate diagram, Fig. 2, showing the various positions of the pistons in the two cylinders at different points in the stroke. From this it will be clearly seen that the right hand piston which is attached to the short connecting-rod does not move in the same manner as does the normal piston. The path of the lower end of the short connecting-rod is an ellipse instead of a true circle. As a result the piston movement in the right hand cylinder has an entirely different characteristic from that in the left-hand side, in fact it is not like that of any conventionally connected motor. For example it reaches the lower dead center at about 160 deg. movement of the crank instead of 180. It has a considerably longer stroke than the left hand cylinder. This difference in characteristics should cause valve trouble unless a special camshaft were made and designed for this side of the motor. On account of the different timing necessary and the difference in stroke it probably will give a greater or less amount of power and so upset the balance of the motor. The rotational balance is probably very bad compared with either of the other types of connecting-rods so that we may expect to see much worse vibration from this type of motor than from the standard motors of any type.

Twelve-Cylinder Possibilities

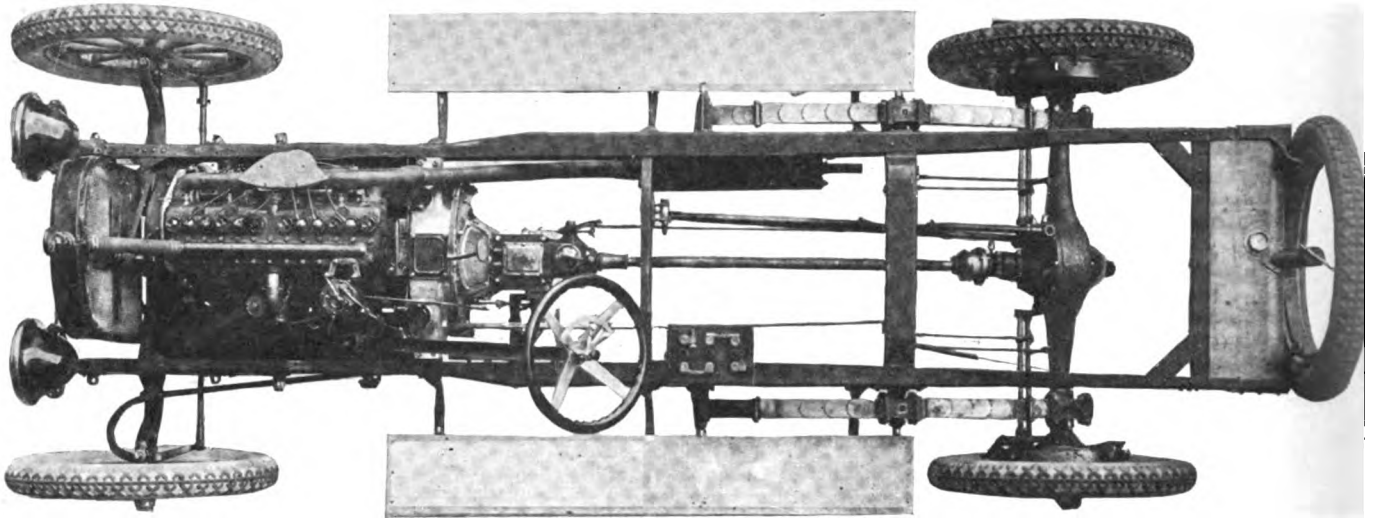
As to the power obtained and the smoothness of operation that may be expected from the twelve there is little to be said. The eight is good enough in performance and if it were not for some other reasons, sales or mechanical, there ought to be no reason for the twelve-cylinder motor's existence. The writer was of that opinion until the other day when he saw a twelve-cylinder, 60-deg. motor with 2¾ by 4½ in. cylinders. It was not a question of operation with that motor that made a decided impression but its accessibility as compared with the eight. Both blocks of cylinders were of the "L" head design. Two camshafts were used so that the valves might be placed on the outside of the job instead of inside of the "V." This made the most accessible motor of the "V" type that the writer has ever seen whether eight or twelve. This was the first commercial design of the twelve-cylinder motor that the writer has ever seen although he understands that there are two or three others on the road, being thoroughly tested out by companies of the highest reputation. It is quite possible that one or more will be announced this fall.

V-Motor Timing

There are two general ways of timing the eight-cylinder motor as practiced today. One is to fire the diagonally opposite cylinders; for example: 1/8, 3/6, 4/5, 2/7. The other is to fire opposite cylinders, 1/5, 3/7, 4/8, 2/6. This counts the cylinders from 1 to 4 in the right-hand block and 5 to 8 in the left-hand block, starting at the forward one in each case. The first firing order can easily be remembered in either one of two ways: first, the sum of the numbers of each pair of cylinders is nine. For example 1/8 equals nine, or 2/7 is nine. The other way of remembering it is by drawing the diagonals from the cylinders firing in consecutive order. Thus the diagonal from 1/8 passes through the center of the diagonal from each of the other three pairs, 3/6, 4/5, and 2/7. In other words they have a common center. Try it and see. The same rule holds good for the twelve-cylinder motor. For example the firing order of one twelve is 1/12, 5/8, 3/10, 6/7, 2/11, 4/9. The sum of the cylinder numbers in each pair is 13. Here again the cylinders fire diagonally, as mentioned above, and they may be checked up in the same manner.—CHESTER S. RICKER.

12,000 Cars Estimate for Arizona

PHOENIX, ARIZ., July 31—It is estimated that more than 12,000 automobiles will be registered in Arizona during the year 1915. This estimate is based on the fact that during the first six months of the year there were 5851 automobiles registered. Mining and industrial conditions generally are highly satisfactory.



Westcott six chassis showing new Continental power plant with Warner disk clutch and three-speed gearset

Westcott Concentrates on Two Sixes

New Edition of the Seven-Passenger Model and a New Small Six Similar in Design— Power Plant and Body Lines Entirely New

FOR 1916 the Westcott Motor Car Co., Richmond, Ind., offers a new edition of the six-cylinder, seven-passenger, model U-50, at $1,595, and a brand new small six like the other in appearance and design, at $1,295. Thus, the four of 1915 has been discarded. The U-50 now is called the model 51 and is selling at a price only $10 higher than the 1915 car, but with considerably more than that amount of improvement.

The whole car has been gone over and where a betterment could be made, while keeping the weight, appearance, strength, etc., to the company's standards, it has been done. The power plant is new, the body also, the springs are stronger and longer, the radiator has better lines, the frame has been altered, the wheels made stronger, the tire size increased, the wheelbase increased, and any number of other changes made.

Power Plant Entirely New

The Westcott model 51 power plant is entirely new, being composed of a Continental 3½ by 5¼ motor instead of that used in 1915, a Warner, Muncie, disk clutch instead of a cone, and a Warner three-speed gearset instead of that employed previously. These changes have resulted in more power, the old motor having dimensions, 3 by 5, better throttling, because of the new type of clutch and more efficient all-around performance.

There is nothing in the power plant which is out of the ordinary. The motor has its L-head cylinders cast in block with the exhaust manifold on the right, with the valves and the carbureter on the left, feeding through cored passages. The carbureter is a new type Rayfield. Directly behind the carbureter is a Stewart vacuum feed tank bolted to the cylinder casting by a small bracket. The Delco cranking, lighting and ignition unit is on the right at the rear so as to start the motor through the toothed flywheel and in front on the same side is a Stewart tire pump driven from the water pump shaft. The tire pump is added equipment for 1916. This model Continental motor uses a three-bear crankshaft with bearing sizes as follows: Front, 2 3 diameter by 2⅞ long; center, 2 7/32 by 2½; rear, 2¼ b It drives a three-bearing camshaft through helical gear The camshaft bearings have the following dimensic Front, 2 19/32 by 1½; center, 2⅝ by 1⅛; rear, 1½ by the first dimension given being diameter. There is notl of unconventional design about any of the other parts, as pistons, rods, etc. The former carry three rings, 3/1 wide. Valves are 1 11/16 in. diameter.

The oiling system is the same as in other large C nentals—force feed and splash using a horizontal plu pump driven from the camshaft by eccentric action for oil through copper pipes to the timing gears and rear bearing. The oil drains back to the oil pan where it is for splash for the cylinders and pistons.

In the power transmission system there is a tubular fitted with Spicer joints and a Timken rear axle with sp bevel gears, these members having been used in the 191 in practically the same form. There has been a slight ch in the torque member which now has a steel hanger in instead of one made of malleable iron.

Cantilevers of Chrome-Vanadium Steel

The cantilever rear springs, while they are of the design as in the 1915 car, now are made of chrome-vana steel instead of carbon steel in order to obtain stronge struction. The front springs are unchanged.

The frame has been altered in the rear so that it ex beyond the rear cross-member so as to form a gasoline support. In the older models brackets were riveted frame and the tank suspended from the brackets. Th construction is much stronger than that previously use there is not as much strain on the frame cross-member. the tire carrier is incorporated in the frame extensio the gasoline tank now has a gooseneck filler so that will be no inconvenience in pouring gasoline even f

large container. This is a small feature of convenience which is indicative of the thoughtful design characterizing the cars.

The steering post is of Gemmer make for 1916, the fenders are heavier and slightly broader, the foot control pedals have been made easily adjustable and all the sheet metal work on the car securely bolted so as to prevent rattling.

Wheelbase 1 In. Longer

The rear wheels are stronger and in order to insure rigidity alternate spokes are bolted to the brake drum. The wheel rims are now Firestones instead of the straight side, one-piece variety, and carry 35 by 4½ tires instead of 34 by 4, the tires being Kelly-Springfield non-skids all around. The wheelbase now is 126 in. instead of 125.

Body Entirely New

The body is an entirely new job, larger than the previous one with additional equipment, and with better lines. In order to get a better slope from cowl to radiator the latter has been made 1 in. narrower and 1 in. higher and there has been a rounding out of the sides just back of the hood. This rounding out has been extended to the rear of the body.

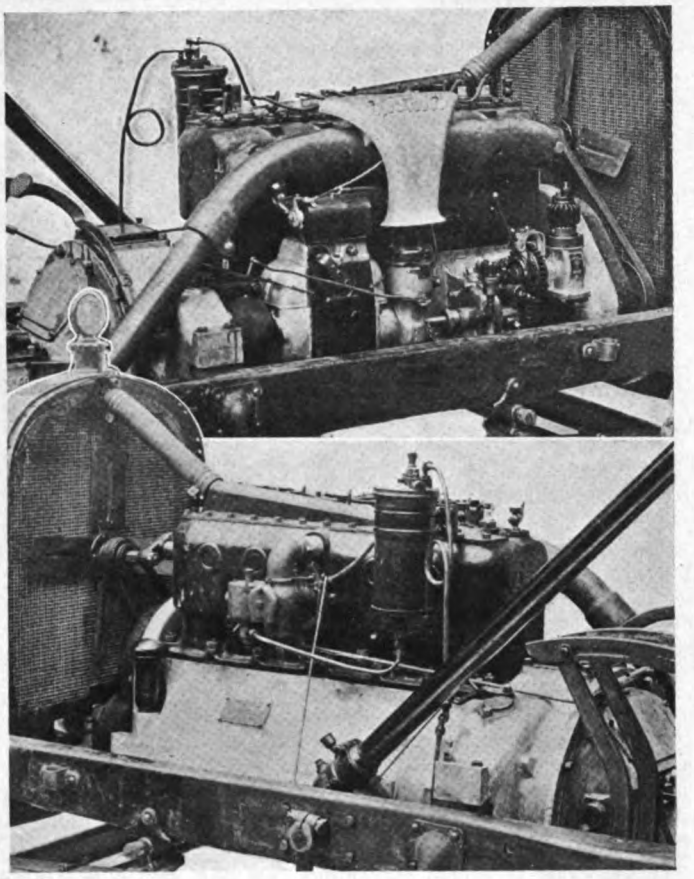
In order to do a better job of the divided front seats the backs of these now run into the body moulding which is of black wood. The seat moulding at the top also is of this wood and at the junction of seat and body moulding, the two are gracefully curved into one another. These seats now are hollow underneath, so as to accommodate the two extra folding chairs which when placed away may be covered by a neat flap. Also when the extra seats are not in use the floor slots are completely covered by carpet.

While there has been a tonneau light in the back of the right front seat in the older models, the 1916 cars have this, and in addition, a cigar lighter in the back of the left seat.

Under the rear seat there now is an easily-removable plate so that when the rear seat cushion is removed it is an easy matter to get at the differential housing to fill or drain it.

The upholstery is of new design and is called straight piped. In this the leather is formed into folds which are stitched, thus doing away with buttons and making a more sanitary method. The upholstery now is of bright leather instead of dull.

Two views of the Westcott six-cylinder, seven-passenger touring car for 1916



Both sides of the Westcott six power plant for 1916 showing mounting of the Delco electric system

The cowl has been changed so as to accommodate the new instruments necessary with the changes in the power plant. There now is an oil pressure gage instead of a sight feed, and a new ammeter.

In the equipment there is a new type of windshield with overlapping halves and a Boyce Motometer, which was not used on the 1915 cars.

The top is a new one-man type with the rear portion of one piece with an oval window, and extending part way around the body. The Jiffy curtains furnished are fitted with springs to prevent flapping.

Small Six Similar in Design

To describe the small six would be to repeat the information just given relating to design. The only differences between the large and small models are in the wheelbase, which on the latter is 120 in., the tires, which are 34 by 4, the motor, which is 3¼ by 4½, but of the same make and design, and in the body capacity and equipment. The body is a five-passenger and is not fitted with a cigar lighter, nor is a Motometer given.

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Dunwoody Adds Automobile Course

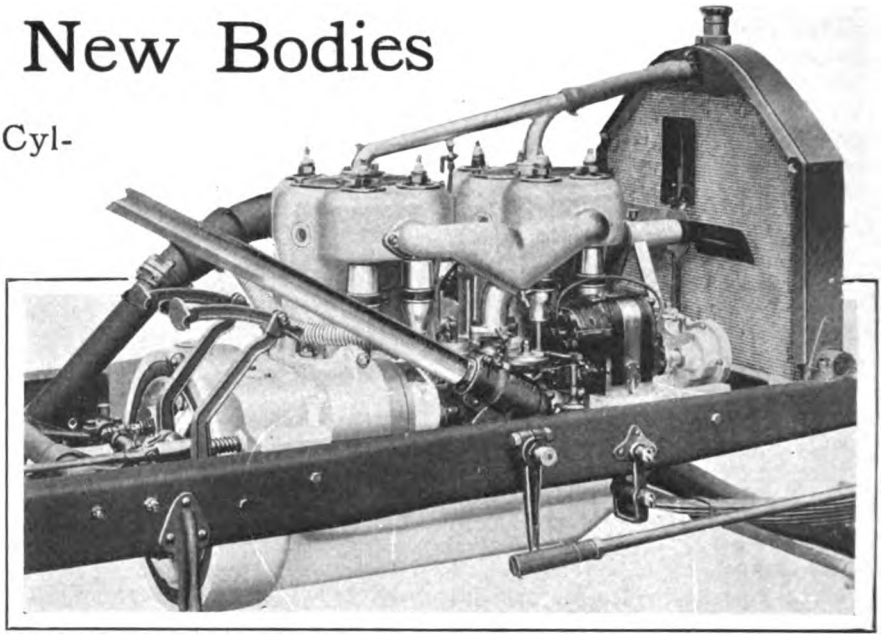
MINNEAPOLIS, MINN., Aug. 1—The Dunwoody Institute, endowed at about $2,000,000, has added automobile mechanics and is erecting a garage and shop adjoining the main building. It is the plan to negotiate with garage proprietors to take over the graduates as fast as they are turned out. The school plans to raise the standard of motor car mechanics. A course for inexperienced men will be two years of theory and practice. For a diploma a graduate must spend a satisfactory year as an employee.

Stutz Features New Bodies

Mounted on Two Four-Cylinder Chassis

IMPROVEMENT of body design will strike the average observer as the most noticeable change in the line of the Stutz Motor Car Co., Indianapolis, Ind., although there have been minor chassis changes of interest. The new bodies are mounted on four-cylinder chassis only and these are the same in every respect with the exception of the wheelbase, one being 120 and the other 130 in. as in 1915.

There are three body styles for the smaller car as follows: Bearcat at $2,000, roadster at $2,100 instead of $2,000 and Bulldog at $2,250. On the 130-in. car there are two standard bodies, a newly-designed four-passenger Bulldog special having a double cowl and selling at $2,550 and a four-passenger touring car at $2,300 instead of $2,275.



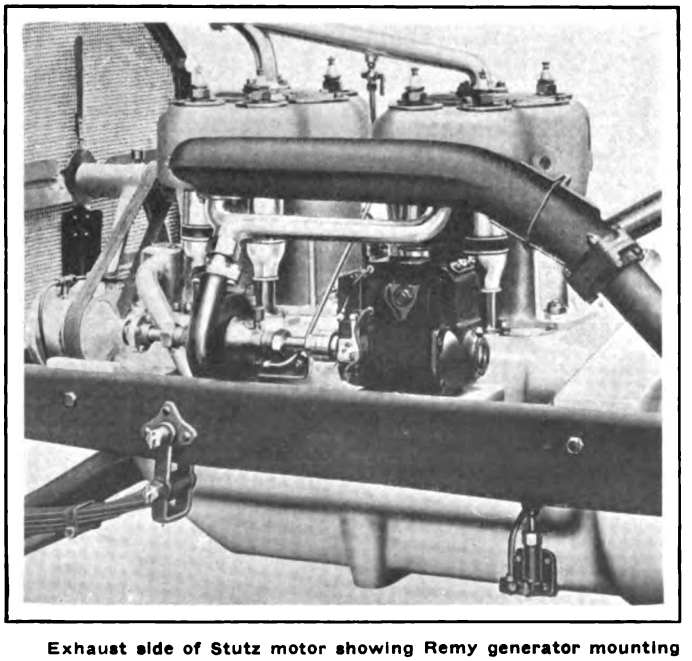
Intake side of Stutz power plant for 1916 showing mounting of the Remy starting motor and Stromberg carbureter

While the general features of Stutz design are generally known and the changes made are of no radical nature, admiration attaches principally to the new bodies, especially the Bulldog special. This has an unusually low-hung appearance with the passenger seats lower than usual. The whole body is a neat streamline job with almost a straight line from windshield to radiator, flush doors and symmetrical sides.

Side Lamps Eliminated

The general smoothing out of the front of the car has been assisted by eliminating dash lamps and using headlights with dimmers. Instead of using wood strips to finish off the upholstery, the new body uses aluminum moulding which not only makes a better appearing finish but is more serviceable.

The tonneau cowl has two compartments, one being designed for carrying a lunch kit and the other for two Thermos bottles which are part of the equipment. The cowl material is Circassian walnut.



Exhaust side of Stutz motor showing Remy generator mounting

This car comes regularly equipped with wire wheels and Silvertown cord tires which add to its racy appearance, a new type of windshield which is not as high as the ordinary type and a searchlight.

The other touring car body, while it has the same general lines as the Bulldog special, has low individual front seats which make front seat riding extremely comfortable. There are only two doors and these are in front so that tonneau passengers must pass through the aisle between the front seats in order to get to the rear seat. The elimination of the doors in the rear and the removal of dash lamps, as in the special, has offered the designer a means of getting a well-rounded out streamline body with no eccentric design and yet giving a low, rakish appearance. The upholstery in this model is finished as in the other and the equipment is the same with the exception of the wire wheels, tires and Thermos bottles.

Roadster Now Fully Equipped

The roadster now comes fully equipped and this is largely responsible for the increase of $100 in the price. The body has been improved by bringing the seat upholstery flush with body sides and increasing the length of the cowl line. The back of the seat has been rounded more, and as in the others, the dash lamps have been abandoned. There now are doors on either side instead of on the left side only as in the 1915 model.

In the Bearcat model there have been no apparent body alterations.

The most important mechanical change is the enlarging of the oil receptacle in the crankcase so that it now holds 2½ gal. instead of 1½, this having been made so that less oil changing is needed. The crankcase has been increased in size and at the same time it has been given a more symmetrical appearance.

Stutz springs, while they are of the same design as heretofore, semi-elliptic all around, now are made of alloy-steel instead of carbon-steel in order to obtain greater strength and longer life.

Accelerator pedal operation is facilitated by the addition of a heel pocket in the front floorboard. In the equipment changes made on all models, there is the substitution of Hartford racing type shock absorber for the automatic type, and also the fitting of a Motometer to the radiator.

Stutz cars for 1916 in their general makeup comprise a

four-cylinder, pair-cast T-head motor, a leather-faced cone clutch and the characteristic Stutz rear axle gearset which has been used by this company since its inception. Tires are 34 by 4½ on all except the Bulldog special which uses 33 by 5. As in the past all Stutz cars use right drive and right control and it is one of the few makes adhering to this construction.

The motor is a 4¾ by 5½ with three-bearing crankshaft and camshafts.

The two latter operate roller type push rods, and the valves, which are tungsten steel 2¼ in. in the clear, have the mechanism inclosed by individual housings. The camshaft drive is by helical gearing. There is nothing unusual in the piston or rod construction.

Lubrication is by force feed through a hollow crankshaft, carburetion by a Stromberg model H and ignition by Bosch high-distributer magneto on all models except the touring car which uses Bosch single point.

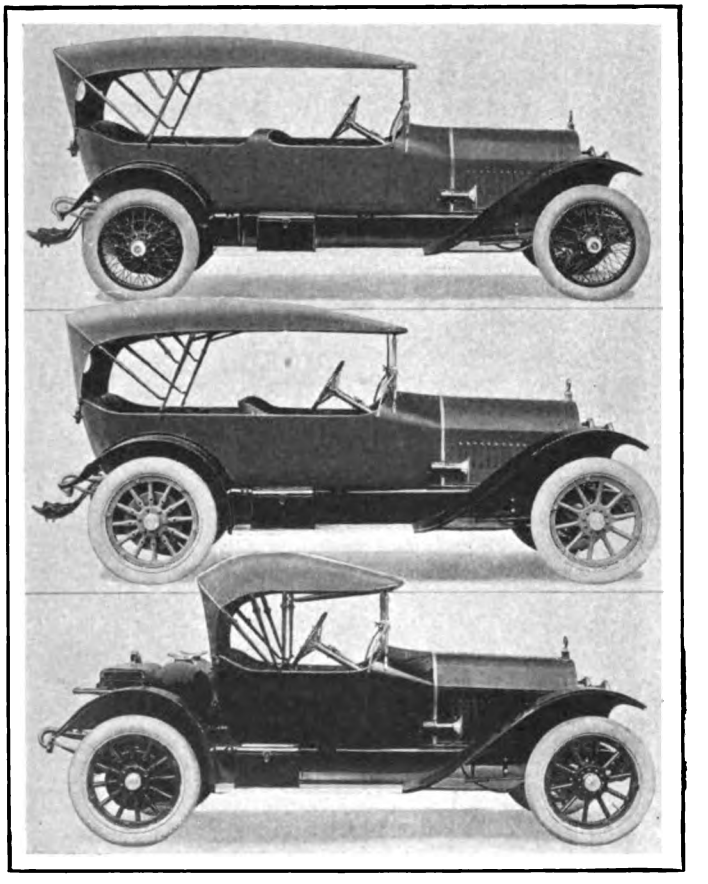
On the right side there is the carbureter feeding through a two-branch manifold to each cylinder block, and the magneto which is driven directly from the timing gears. The carbureter is mounted on a platform which is part of the aluminum crankcase. Also on this side but in the rear is a Remy cranking motor.

On the left is the Remy generator driven from an extension of the water pump shaft as illustrated, and the exhaust manifold which has a hot air attachment feeding through flexible tubing to the carbureter.

The Transmission System

The cone clutch, with springs beneath the leather to effect easy engagement, is continued unchanged. The pedal may be adjusted to suit the driver's requirements, the length of motion being 2½ in. Continuing in the drive, there is an inclosed propeller shaft, the torque tube surrounding it attaching to a face plate back of the clutch. A three-speed gearset is mounted on the rear axle the gearset bearings being balls. The rear axle, which is a semi-floating design has tapered-roller bearings on the inner ends of the shafts and ball bearings on the outer ends.

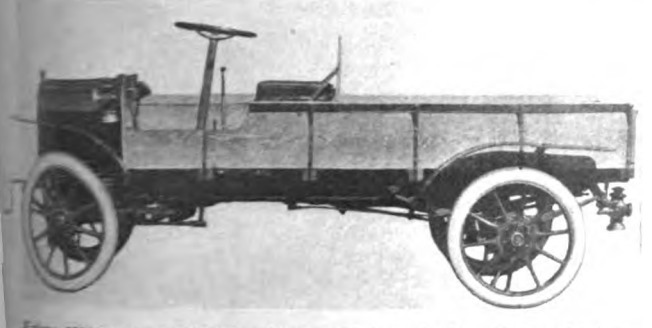
The Stutz company offers many color options for its bodies, these being, vermillion, Monitor gray, Mercedes red, yellow and white for the Bearcat; Red, blue, battleship gray and white are offered on the Bulldog; vermillion, gray, white and red on the roadster and red, blue, white and gray on the Bulldog special. Upholstery color options for the coming season are red, green and black.



Top—Stutz four-passenger Bulldog special which sells for $2,550. Middle—Bulldog model which lists at $2,250. Bottom—Roadster marketed for $2,100

Falcon Truck of 1000 Lb. Capacity

One of Detroit's most recent additions to the commercial vehicle field is the Falcon Motor Truck Co., which has been organized by A. B. Mallow of Detroit; F. B. Houston of South Charleston, Ohio, and A. B. Hazzard of Detroit. The Falcon will be a truck of 1000 lb. capacity with 1200 lb. capacity as a maximum. The price will be $750. A. B. Hazzard, well known as an efficiency engineer in the East and Middle West, is the designer, and the first vehicle has been under thorough road test for some time. The company has engaged factory quarters at 811 West Jefferson Avenue, Detroit. A. B. Hazzard, engineer of the Falcon company, was general manager of the Morton Poole Co. of Wilmington, Del., from 1906 to 1914, manufacturing high-grade machine tools. Previous to going to Wilmington he was one of the department engineers of the Rand Drill Co. of New York. The Falcon has a four-cylinder motor with 22 hp., cooled by the thermo-syphon system. The radiator is set in a pressed steel shell. Ignition is Atwater Kent and the clutch is a cone. The carbureter has a final set adjustment and is a Modern with a hot air connection. Lubrication is constant level maintained with positive action pump. This is connected with the dash where there is a sight feed. The selective sliding gearset is in unit with the motor and control is from the center. There are three speeds forward and reverse. The springs are semi-elliptic in front and full platform rear. Artillery pressed steel wheels are 30 in. with 3½-in. pneumatic tires. Steering is on the left and is very rigid and adjustable to wear. Wheelbase is 106 in. and tread is 56 in. The Falcon has a pressed steel frame of heavy channel section and the body is 40 in. in width and 9 ft. in length, with a single seat for the driver. The front axle is I-beam, forged and heat-treated. The Falcon has a capacity of 1000 to 1200 lb., and the price will be $750.



Falcon 1000 lb. truck fitted with express type body. This vehicle is sold by the Falcon company for $750

Why Two Brakes Are Necessary

EDITOR THE AUTOMOBILE:—In THE AUTOMOBILE I have noticed that M. P. B. of Beacon, N. Y., wants to know why two two sets of brakes are used on a car. If he would borrow his neighbor's car and drive it up an incline, apply the service brake till the car comes to a standstill, then release the brake and see how nicely the car starts to roll down the hill, he would know.

Like many others, M. P. B. seems to have the wrong idea of an emergency brake. A great many people think this brake should be used only in case a terrible accident were impending.

A young man in Dallas last week, driving for the third time, applied the so-called emergency on a short curve in Cliff Park so tightly that it took two men to release it. It turned the car completely over, killing him and his wife.

Dallas, Tex. D. C. E.

—There is no doubt but that in many respects the words "emergency brake" are a misnomer. The emergency brake is not primarily intended for short stops in dangerous situations, as the name would imply, but rather, as you suggest, to hold the car stationary on an incline. It is unfortunate that the name "emergency brake" ever became applied to the hand brake of an automobile because the very name has caused people to misuse it with disastrous results to themselves, as you suggest in your communication.

It must be remembered that to bring the car to a stop in a most efficient manner it is not necessary to lock the wheels; in fact, a car will stop quicker if the brakes hold the wheels just short of locking them than if they are locked. The reason for this is simple. When the wheels are locked the car becomes virtually a sled, sliding along the ground with nothing to stop it except the frictional resistance between the glazed tire and the road or any obstacle which it may hit. Once the wheels are locked the brakes are of no more effect. The motion of the car has passed beyond the control of the driver because neither the ordinary stopping mechanism nor the steering gear has any more effect. He is powerless to alter the direction or speed of the car, and when the brake is locked on, as it sometimes is, in a moment of panic where the hand brake is jerked back with the power lent by fear, the car is apt to turn across the road or into a ditch without any means of stopping it.

Unless the car is standing still the wheels should never be locked. Not only does it put the car out of control, but it acts in such a way on the tires that their life is considerably shortened. A driver who dashes along at 20 or 25 miles an hour toward the curb and then brings up his car short by jamming on his brakes, is not only a poor driver but is extravagant and uneconomical in the handling of his car. In the same manner the driver who approaches a sharp curve at a high rate of speed and does not stop until he suddenly throws on his brakes within a few feet of the danger spot, is courting disaster.

The so-called emergency brake has many uses and it could not be dispensed with, but at the same time it should not be misused. One of the places where a hand brake is a matter of almost necessity is in starting a car on an incline. Without the brake to hold the car in position it would be apt to roll backward, rendering it impossible to put the gears in mesh. It is also of use where the service brake becomes so worn as to be unreliable, but in these cases the hand brake should only be used long enough to enable the operator of the car to bring it to a place where he can have the service brake renewed.

Preventing Clutch from Grabbing

Editor THE AUTOMOBILE:—I have just bought a 1912 Herreshoff roadster. The clutch grabbed very viciously and on inspection I found that the previous owner had been running it dry. I filled the car with thin oil, but with the oil in I cannot throw the clutch out completely. I drew off the oil and thoroughly cleansed the clutch with kerosene. With the kerosene in the case the clutch works all right, but grabs very little. On putting back the oil again the clutch still pulls when thrown out. Would it matter if I ran the clutch dry or in kerosene? What would you advise?

Philadelphia, Pa. O. S. R.

—If the clutch works satisfactorily with kerosene as a lubricant it would be very good practice to keep the kerosene in the housing. Quite frequently a half-and-half mixture of kerosene and light cylinder oil is employed to hold the good qualities of a clutch. The half-and-half mixture would probably work very well in your case. If the clutch drags somewhat the pedal throw adjustment should be altered so that the clutch is removed further from engagement.

Setting Up Connecting-Rod Bearings

Editor THE AUTOMOBILE:—Will you kindly describe the best way to set up connecting-rod and main bearings for casing? If possible give illustrations thereof.

I refer mainly to such bearings that overlap the sides the bearing cap as is common in die-cast bearings.

Babylon, L. I. P. K

—The common method of procedure is to set up the connecting-rods in a fixture, which is fitted with a mandrel little smaller than the inside of the finished bearing. The fixture has a recess at the top and bottom, which allows metal to partially flow over the sides of the connecting-forming the flanges on the finished bearing.

The babbitt is poured through a hole in the top p Upon removing the connecting-rod from the fixture the bitt lining is found cast in place. A swedge is then fo through the bearing in order to make sure that the li is in perfect contact with the connecting-rod at the back. bearings are then scraped or reamed in the usual manne fitting bearings.

Suggestions regarding the manner of carrying out this work have been given by one of the large manufacturers of babbitt as follows:

1—Use an absolutely clean ladle and pot. When the metal is hot enough to brown a piece of paper or white pine stick, stir thoroughly and remove any skimmings caused by oxidation.

2—Be sure the faces of boxes and mandrels are clean and free from grease or dampness.

3—Pour rapidly into the box, holding the ladle as closely to the work as possible to avoid air bubbles, until it is half full; then pour gradually until filled, allowing large enough gate to take up shrinkage. When pouring castings with wide surface use ladle with wide lip.

4—To insure perfect boxes in pouring large bearings it is advisable to run chalk on mandrel or shaft and to have the mandrel hot. Mandrel and box should be about same temperature.

5—Do not keep babbitt metal at the melting point longer than absolutely necessary, as the chemical action of extreme heat tends to oxidize a composite alloy, causing deterioration, disintegration, addition to its brittleness, and materially affecting its anti-friction qualities.

6—When necessary to peen, it is best to commence up and down a center line, extending blows right and left of this line until tightened in place.

7—Finally, when you have a good metal, treat it as such and you will have no occasion to complain of the results obtained.

How to Splice Inner Tubes

Editor THE AUTOMOBILE:—I have several good inner tubes with some bad tears in them. What repairing outfit and what materials do I need for cutting out a section, say 6 in. long, and inserting a new section?

Batesburg, S. C. A. E.

—The large car concerns can supply you with a pair of mandrels for making this repair. The sections to be inserted may be either secured from old tubes of the same size, if any can be found which are in good condition, or when these cannot be secured the larger tire concerns can supply you with tubing of the proper diameter. The set of mandrels for splicing the tubes consists of a pair of these devices, one fitting within the other. They are shown at *A* and *B*, Fig. 1. One end of the tube is pulled through the mandrel at *A* and turned back over the edge about 4 in. The other side of the tube to be spliced on is pulled through the mandrel *B* and turned back over the edge about 8 in. It is then pulled back toward the other side a distance of about 4 in. The edges are then beveled and buffed, as shown in the illustration, and one heavy coat or two light coats of pure gum cement are applied. The cement is then allowed to dry thoroughly, a condition which can be determined by the tackiness of the cement to the touch.

Caution should be taken in joining the tubes that the inner tube is not twisted, but that the ends meet correctly so that when joined there will be no twist in the tubes. Acid curing solution is applied with a wide, soft brush to the part which has been cemented, and then the end of the tube on mandrel *A* is transferred to the end of the tube on mandrel *B*. The spliced ends are then immediately wrapped with strips of muslin or strips of inner tubing. From 15 to 20 min. is sufficient for the acid curing solution to form a perfect union. When the joint is unwrapped the tube is removed through the slots in the mandrels and the splice is complete.

It is stated that acid-cured splices will not loosen and are not affected by heat from the tire. On this account they have a distinct advantage over the old method of splicing with cement only, a process which is known as the cold method. If the splice does not cure together it is an indication that the work has not been done quickly enough after applying the acid solution, or that certain solvents in the acid solution have evaporated. To avoid this latter trouble the acid solution should be kept in a glass bottle, jug or earthenware vessel and tightly corked when not in use.

The Firestone company gives the following advice after making a repair on an inner tube: First, see that the washers on the valve are screwed down tightly at the base so that they don't leak. Two, see that the plungers or valve insides are not worn and that they are in good working condition. Three, inflate the tube, testing it in water to see that there are no small leaks which may have been overlooked during the work. Four, see that the proper length of valve is used with the tube. Short valves are used for regular clincher tires or quick detachable, and the long or extension valves when the tires are used on demountable rims such as are on the late cars.

Misalignment Causes Grind in Differential

Editor THE AUTOMOBILE:—How fast should a 1912 Buick model 36 roadster be able to travel?

2—Would oversized tires help to run it any faster?

3—What would cause a grind in the differential when the car is coasting? It is all right so long as it is pulling.

4—How fast should a 1914 Maxwell 25 travel when in good condition?

5—What would you recommend to increase the speed of the Buick car?

Hartford, Conn. L. H. S.

—This car should be able to travel 50 m.p.h.

2—Oversized tires would not help the car to go any faster; in fact, the tendency is to reduce the speed somewhat when oversized tires are used.

3—The only cause of a grinding noise in the differential would be first, a serious misalignment or maladjustment of the two gears, and second, a foreign substance in the gear-case. Any such noise as this is more apparent when the car is coasting ahead of the motor, as this allows the rear wheels to take up the back lash in the driving gears. This should be taken to a first-class garage where a mechanic can take up the play and put the gears in proper mesh.

4—These cars can probably travel 50 m.p.h., although the speed will depend so much upon the condition of the car and motor that it is not possible to say definitely.

5—The speed could probably be increased by advancing the timing and increasing the gear ratio between the motor and the rear wheels.

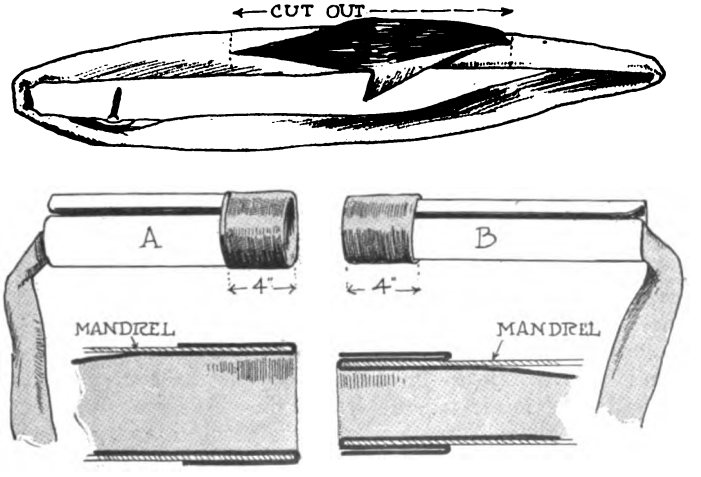


Fig. 1—Diagram illustrating method of splicing an inner tube with a mandrel. Mandrel A is pushed up close to the mandrel B and the turned over portion on A is turned over onto the doubly turned portion on B to make the splice

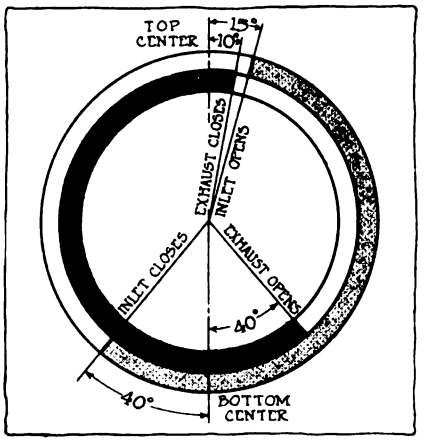


Fig. 2—Timing diagram in common use

Horsepower and Torque Curves of Moon 6-40

Editor THE AUTOMOBILE:—I note in the last issue of THE AUTOMOBILE in the Rostrum that a number of horsepower curves of different makes of motor are furnished together with the torque curves. I have a model 6-40 Moon car which has a 3½ by 5 motor and I would like to know the brake horsepower developed at different speeds, together with the torque.

New York City. J. E. S.

—The horsepower and torque of the Moon model 6-40 are shown in Fig. 3. These curves indicate the brake horsepower and torque at the different r.p.m. between 600 and 2000. It will be noted that the horsepower is just above 15 at 600 r.p.m and at 2000 it is above 47. The torque is at a maximum between 1000 and 1200 r.p.m. The torque is measured in pounds at a radius of 15 in. and to reduce this to foot pounds it is necessary to multiply by fifteen and divide by twelve.

The S. A. E. horsepower of this motor is 29.40 which, according to the curve is developed at about 1050 r.p.m. The point of maximum torque coincides with about the point of S. A. E. horsepower although the torque curve is quite flat between 1000 and 1200 r.p.m.

Has Difficulty in Changing Gear

Editor THE AUTOMOBILE:—I have a 1915 Oldsmobile, model 42, and have never been able to change gears from high back to intermediate without slowing down to 5 or 6 m.p.h. I have tried every way. By throwing the lever back in second very quickly at the same time the clutch is thrown out, also to hesitate a very short time in neutral, also to speed up the engine a little while in neutral, and none of these ways help.

My garage man says my clutch does not stop quick enough and has no adjustment on it. He can change gears backward better by not throwing out the clutch at all.

Tyler, Tex. O. M. B.

—The fact that the car has to be slowed down to such an amount before you can change gears shows that there must be some binding in the gearbox which immediately checks the speed of the gears to such an amount that you have to slow down in order that they revolve at the proper rate of speed to engage themselves. In view of this it would be well to examine the gearbox and see if the gears are properly lubricated, and especially if the layshaft is bound in any way which prevents it from rotating freely. It is evident that one gear is rotating so much more slowly than the gear which you desire to mesh with it that it is necessary to reduce your speed almost to a stop before you can engage the gears. This should not be the case on intermediate gear, although it very often happens on low gear where the reduction is so great that the relative car speed must be quite low. On intermediate speed you should be able to drop into gear at 20 m.p.h. without any appreciable clash. It may be that you can overcome the trouble to some extent by making your changes exceedingly quick, being careful to throw the gear over swiftly at the same time that the clutch pedal is depressed.

No Intake Charge Is Lost

Editor THE AUTOMOBILE:—I have noticed that the inlet valve of a motor remains open some 30 to 50 deg. past bottom center. I should think this would allow some of the charge taken in to be expelled. Why is this?

Pelham, N. Y. J. F. B.

—The reason for the intake valve remaining open beyond lower dead center is to take advantage of the inertia of the incoming gases which have been set in motion by the piston on its suction stroke. As the piston descends on the intake stroke with the intake valve open it tends to pull the gases in the intake manifold after it. This suction starts the intake gases in motion, with the result that they pour rapidly into the cylinder to fill the partial vacuum in the combustion space. When the piston reaches the bottom of its stroke these gases are still in motion, pouring into the cylinder, and contain a certain amount of energy which causes them to continue in that direction. In addition to this there still remains a partial vacuum in the cylinder which aids in maintaining the entrance of the gases.

It takes an appreciable time before the pressure in the cylinder reaches atmospheric pressure and before the inertia of the gases has dropped to such a point that they no longer tend to rush into the cylinder. For this reason in arranging the valve timing engineers leave the valves open for some distance past lower dead center. It must be remembered that, for a crank angle of 30 deg., the piston only travels on the upstroke about 5 per cent of the total distance. In other words, for a motor with 4-in. stroke, the upward travel of the piston for a crank angle of 30 deg. will only have been 0.2 in. For the angle of 50 deg. the travel of the piston on the upward stroke is about 14 per cent of the total travel, or in other words, in a motor of 4-in. stroke the travel at the extreme angle of 50 deg. would be just a little over ½ in. It can readily be seen that this small travel of the piston would not begin to drive the gases out of the valve on account of the inertia of the incoming charge and the partial vacuum still remaining.

This upward travel of the piston with the intake valve open undoubtedly represents a loss of volumetric efficiency in the motor, but there are no motors in existence which have perfect volumetric efficiency, and the 5 per cent loss with a 30 deg. angle of valve closure would not make any material difference.

Explanation of High-Mica Trouble

Editor THE AUTOMOBILE:—Would you be kind enough to explain through THE AUTOMOBILE the reason for the action of the Wagner motor generator and cut-out due to high mica as explained in your answer to H. Eulburg in the June issue?

I am not familiar with the machine or its means of regulation but, comparing your answer with the conditions, there are a few things which are not clear to me.

If the brush contact was so poor that the machine did not generate enough voltage to close the cut-out, closing it by hand would allow the battery current to excite the field, raising the armature voltage high enough to support it and charge the battery; but if the speed of the machine was lowered so its voltage dropped to zero, I do not see how the cut-out could close by itself even if the speed were again raised, for the conditions would be the same as when it was first started. Also I should think there would be bad flickering of the ammeter at low speed and a very noticeable falling off of the charging current at high speed, due to very poor brush contact caused by the action between the brushes and the mica. Please state regulation used.

Bronx, N. Y. A SUBSCRIBER

—Assuming that the brush contact was so poor that the machine did not generate enough voltage to close the cut-out, closing it by hand would allow the battery current to excite

the fields, raising the armature voltage high enough to support itself and then charge the battery. If the speed of the machine was lowered so that its voltage dropped so low that the relay opened itself, and then the machine was again speeded up, there would be a small amount of residual magnetism which would assist the dynamo to pick up and start generating again. The residual magnetism would not be sufficient if the machine had been shut down for any length of time, and, therefore, when first starting the engine, it might be necessary to close the relay by hand and allow the battery to excite the generator field in order to make the generator pick up. No external regulating devices are used in these outfits. All the regulation necessary is secured from the inherent regulation of the generator itself.

Trucks Used by U. S. Quartermasters

Editor THE AUTOMOBILE:—What are the different makes of automobile trucks used by the United States Army, Q. M. D.?

Fort Warren, Mass. W. S.

—The following tabulation shows a total of sixty-one motor trucks used by the U. S. Army Q. M. D., and is complete up to June 30, 1914:

MAKE	STATION	BY WHOM USED
Alco, 1912	West Point	Quartermaster Corps.
Alco, 1912	West Point	Quartermaster Corps.
White, 1911	West Point	Quartermaster Corps.
[illegible], 1913	Galveston	Quartermaster Corps.
[illegible], 1913	Galveston	Quartermaster Corps.
*White, 1914	Galveston	Quartermaster Corps.
White, 1913	Galveston	Quartermaster Corps.
White, 1913	Galveston	Quartermaster Corps.
Automatic, 1912	Philadelphia	Quartermaster Corps.
Electric, 1907	Philadelphia	Quartermaster Corps.
4-Wheel drive, 1912	San Diego	Signal Corps.
White, 1912	San Diego	Signal Corps.
[illegible]	San Francisco	Quartermaster Corps.
[illegible], 1910	San Francisco	Quartermaster Corps.
Packard, 1910	San Francisco	Quartermaster Corps.
Packard, 1910	San Francisco	Quartermaster Corps.
White, 1910	San Francisco	Quartermaster Corps.
*White, 1914	San Francisco	Quartermaster Corps.
Mack, 1911	Washington	Quartermaster Corps.
White, 1912	Washington	Quartermaster Corps.
White, 1911	Washington	Quartermaster Corps.
[illegible], 1911	Washington	Quartermaster Corps.
White, 1913	Washington	War College.
[illegible], 1910	Fort D. A. Russell	Stored.
[illegible], 1910	El Paso	Quartermaster Corps.
White, 1913	El Paso	Quartermaster Corps.
*White, 1914	El Paso	Quartermaster Corps.
[illegible], 1911	Fort Sam Houston	Quartermaster Corps.
White, 1913	Honolulu, Hawaii	Quartermaster Corps.
White, 1913	Vera Cruz, Mexico	Quartermaster Corps.
White, 1912	Fort Huachuca	Quartermaster Corps.
White, 1913	Fort Sill	School Fire.
White, 1911	Washington Barracks	Quartermaster Corps.
*White, 1914	Marfa	Quartermaster Corps.
[illegible], 1910	Fort Leavenworth	Quartermaster Corps.

TRUCKS PURCHASED DURING FISCAL YEAR 1914

MAKE	CAPACITY, TONS	WHERE USED
White	5	San Francisco, Cal.
White	1½	Marfa, Tex.
White	1½	Galveston, Tex.
White	1½	El Paso, Tex.
[illegible]-Seabury	2	New York
Federal	1½	El Paso, Tex.
[illegible]	1½	Eagle Pass, Tex.
[illegible]	1½	Sam Houston, Tex.
[illegible]-Springfield	2	St. Louis, Mo.
[illegible]-Stewart	1½	Rio Grand City, Tex.
[illegible]-Stewart	1½	Brownsville, Tex.
[illegible]-Stewart	1½	Fabens, Tex.
[illegible]-Baltimore	1½	Washington Depot
Mack	1½	El Paso, Tex.
Mack	1½	El Paso, Tex.
Studebaker	1½	Fort Rosecrans, Cal.
Studebaker	1½	Fort Rosecrans, Cal.
[illegible]	1½	Hachita, N. M.
[illegible]	1½	Douglas, Ariz.
[illegible]	1½	Nogales, Ariz.
[illegible]	1½	Marfa, Tex.
[illegible]	1½	Marfa, Tex.
[illegible]	1½	Galveston, Tex.
[illegible]	1½	Galveston, Tex.
[illegible]	1½	Galveston, Tex.
[illegible]	1½	Galveston, Tex.
[illegible]	1½	Honolulu, Hawaii
[illegible]	1½	Honolulu, Hawaii
[illegible]	1½	Sam Houston, Tex.
[illegible]	1½	Sam Houston, Tex.

*Included in list of those purchased in 1914.

Probably Carbureter Needs Adjustment

[illegible] THE AUTOMOBILE:—Can you tell me what is the [illegible] with my Cutting 1913 model B-40? The car runs well and has just been overhauled, but I can only get 20 miles and then it will start to spit and miss and lose speed and I will have to take it easy for another half-mile, and then it will run all right again until I reach the 25-mile mark again. I have had a Stewart system put on but it does not do any good. The gasoline is good and clean.

Is the carbureter on this car large enough? The motor is a 4 by 5, Wisconsin. What is the speed of this car and the S. A. E. horsepower?

Carver, Minn. C. E. D.

—The carbureter should be a 1¼-in. size, or, in other words, if it is a Rayfield design, as is standard equipment on this make of car, it should measure 1½ in. across the manifold connection. With this size carbureter and with the motor in good condition it is only a matter of adjustment to get the motor operating properly.

The S. A. E. horsepower of this car is 25.6, and it should be able to travel up to 60 m.p.h. with everything in first-class condition.

Wants Parts for Halladay Car

Editor THE AUTOMOBILE:—Where and of whom can I get clutch repairs, also steering device repairs, gears, etc., for a Halladay touring car? It was made in about 1908 or 1909, and has a Rutenber motor.

Buhler, Kan. L. P. B.

—Repairs for the Halladay touring car can be secured from A. C. Barley, Trustee of the Streator Motor Car Co., Streator, Ill.

Interested in Gasoline Substitutes

Editor THE AUTOMOBILE:—I would appreciate if you would send me the names of people or companies who manufacture a fuel that takes the place of gasoline.

Some time ago I read about a party in THE AUTOMOBILE who was trying out some fuel at the Indianapolis Speedway.

Henderson, N. C. G. E. B.

—The fuel you refer to is undoubtedly Zoline, which was experimented with by a number of engineers at the Indianapolis track. It was found that the fuel was not practicable and it is no longer in existence.

No Motor Interchangeable with Ford

Editor THE AUTOMOBILE:—Can you give me the name of some manufacturing concern which could build a motor for a Ford that will speed up to 3000 r.p.m.?

Pilot Rock, Ore. E. R. R.

—We do not know of any concern making a motor which is interchangeable with that of the Ford. If you were to have a special one made by some concern, it would cost such an amount of money, that it would be quite an outlay.

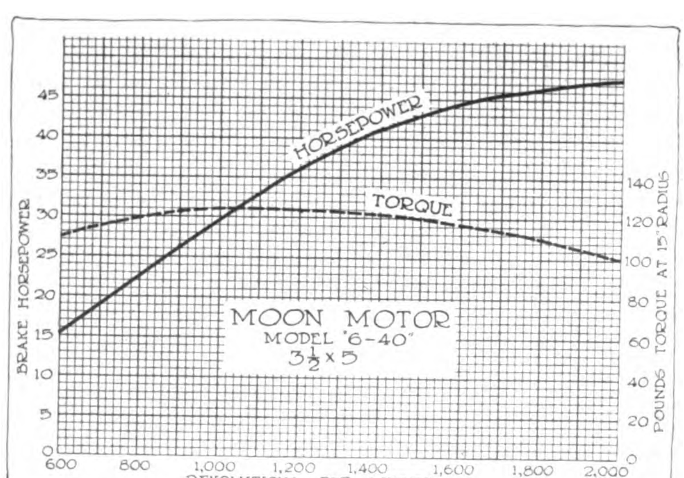
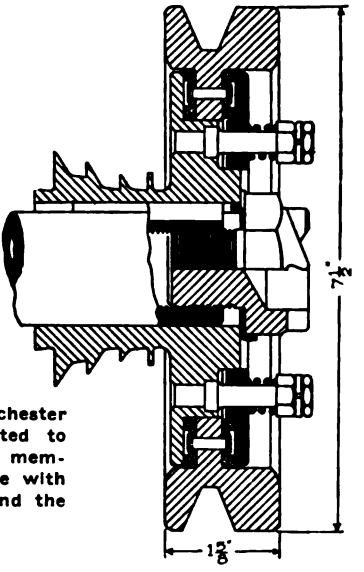


Fig. 3—Horsepower and torque curves of the Moon model 6-40 showing pounds torque at a 15-in. radius

Packard Uses Vibration Damper

American Patent Rights for Lanchester Invention Acquired—Device To Be Used on Twin Six



Section of Packard-Lanchester vibration damper as fitted to the twin six. The inner member is made in one piece with the oil throwing rings and the starting crank jaw

DETROIT, MICH., Aug. 2—The Packard Motor Car Co. has purchased the American patent rights for the Lanchester vibration damper, buying outright patent No. 1,085,443, granted to F. W. Lanchester Jan. 27, 1914, the Packard company also holding two other patents of a somewhat similar character obtained by Haydon, these being Nos. 795,698 and 800,572.

To Grant Licenses

It is the intention of the Packard company to grant licenses to other manufacturers who may desire to use the damper, and it is understood that the royalty asked would not be very large. As can be seen from the drawing, the damper is small and is quite cheap to manufacture. In the Packard case the loose rim is employed to drive the fan belt and there is only one inner member of the clutch instead of the several used in the original devise. Also dry surfaces of asbestos fabric are used instead of lubricated steel plates.

How the Damper Works

With a six-cylinder crankshaft, whether there be six pistons or twelve, one of the commonest forms of vibration is that produced by the twisting of the shaft at certain speeds. The shaft has a natural period of vibration if deflected torsionally, and when the sequence of explosions coincides with the natural vibration period the pendulum effect causes the violence of the vibration to be increased. The matter was explained fully in THE AUTOMOBILE for Feb. 18, 1915; the vibration which is perceptible to the passengers in the car is due to the front crank throw twisting with each explosion, and then the spring of the crank jerking the piston back as soon as the power stroke is over. Elasticity of the steel causes oscillations to take place, so the crank flies back too far, springs forward again and so vibrates many times before returning to its proper position, by which time the succeeding explosion again displaces it.

Resists Return Spring of Crank

The oscillation of the piston disturbs the center of gravity of the whole piston mass much more than the first deflection does, and the object of the Lanchester damper is to resist the return spring of the crank so that the twist caused by the explosion is made "dead beat."

Lanchester's Original Design

The original design of F. W. Lanchester, a leading British automobile engineer, was to mount on the front end of the crankshaft a little flywheel and disk clutch. The inner member of the clutch was secured to the shaft and the flywheel rim rode loose. Thus when the crank twisted forward the inertia of the flywheel rim caused it to try to maintain a steady speed and the clutch slipped a little, and when the crank tried to twist back at the end of the power stroke the flywheel rim again resisted the tendency to oscillate. The sum total of effect is that the energy of the twisting crank is absorbed by friction between the clutch surfaces and the rapid oscillations are prevented. Something depends upon the strength of the clutch spring in the damper, as the little flywheel rim must be sufficiently loose to be able to act as described, but not so loose that the friction will be too small to absorb the energy of torsion. The adjustment is not delicate and once the proper strength for the clutch spring has been found the damper can be made on a production basis and fitted complete without any further attention.

When first tried out the effect of the damper was amazing, turning a six-cylinder motor with a weak crankshaft and two bad vibration periods into a smooth and almost vibrationless engine. Broadly, it may be said that a 2-in. crankshaft with the damper is the equivalent of a 2½-in. shaft without the device.

Packard Tries It Out

In developing the twin six the Packard Motor Car Co. tried a 2.125-in. crankshaft and found that there was a periodic vibration at a certain speed that could just be detected by an experienced engineer who watched for it, though the ordinary man would never have discovered it. It was not sufficient in force or in duration to warrant the use of a larger crank, so an experimental Lanchester damper was made up and fitted to an experimental chassis. The effect was entirely to remove the "period" and also it seemed to make the engine smoother than ever throughout the whole wide range of its speed. Accordingly the Packard company purchased the American rights of the invention.

Nine Possible S. A. E. Candidates for National Advisory Board

NEW YORK CITY, July 31—The members of the council of the Society of Automobile Engineers met to-day at the headquarters of the society for the purpose of selecting the two members of the society to serve upon the advisory board for national defense which is operating with Secretary of the Navy Daniels and will be headed by Thomas A. Edison. Although it was first thought that the council would directly appoint the members of this committee after a meeting lasting from 10 o'clock this morning until after 4 this afternoon, without recess, it has been decided to present the names of the candidates to the voting members of the society for a secret mail vote. There are nine of these candidates and they have been written for their consent, after which their names will be inscribed upon the ballots and forwarded to the voting membership. It has been aimed to expedite the selection, and to this end the prospective nominees have been asked to wire their acceptance. Immediately upon receipt of this the ballots will be sent out.

Analysis and Valuation of Motor Fuels —14 Methods of Examining Them

FROM GERMAN DATA

(Continued from last week)

ONE of the effects of mixing volatile and less volatile components may be noticed in the case of the mixture of 50 per cent gasoline and 50 per cent benzol. By figuring from the evaporation time for 100 per cent benzol, 2 hours 23 minutes, and that of pure gasoline, 57 minutes, the evaporation time for the 10 cubic centimeters of the mixture should be 1 hour 40 minutes, but the actual time, as given in the list, is 1 hour 56 minutes. The evaporation is not uniform, but the lighter component evaporates rapidly carrying with it a portion of the heavier component, and thereafter the remaining heavier portion evaporates slowly. For this reason mixtures of very light and heavy components are not good motor fuels despite their relatively low specific gravity. [Compare for figures test No. 12.]

The following observation throws more light upon this rule. A light gasoline of .660 specific gravity and boiling point limits 45 and 80 degrees C., showed an evaporation period of 30 minutes, and a heavy gasoline of .750 specific gravity and boiling points 120 and 130 degrees showed a period of 7 hours. When these are mixed, producing a fluid of .700 specific gravity, every motorist will from this indication take the mixture to be a first-class gasoline. But its evaporation period is more than 5 hours, while the mean of the periods of its components would make only 3 hours 45 minutes. As gasoline of this order causes the motor to skip and leaves some of its least volatile portions in the carburetor [compare provisions made in some modern carburetors to drain off all liquid surplus or lead it to the point of strongest suction], the time test for evaporation gives a valuable clue to the dependability of the fuel for motor purposes. [The test might be expedited by having a definitely determined cold draft pass over the fluid or pumped against it from above, but not by raising the temperature of the air. —Ed.]

5. Behavior Toward Litmus

Gasoline or benzol can be tried for acidity with litmus paper. In the case of gasoline, it may also be shaken up with tincture of litmus. Even after standing for some time no change in the coloration of the litmus should take place. Most gasolines are found to be neutral, but a few of the heavy gasolines show a faint acid reaction. The benzols show usually a trace of alkaline reaction, but this may be due to a removal of pigment cells by solution, causing a faint bluish tint. Motor alcohol reacts with weak alkaline effect due to the pyridine used for denaturing it.

6. Color Reactions with Sulphuric Acid

A high-class cylinder with a ground stopper is first rinsed with sulphuric acid to remove all impurities, is then partly filled with the acid, whereafter the motor fuel is poured in and shaken up with the acid. When the two fluids have separated, the colors and actions of both are observed with a sheet of white paper for background. Where gasoline is brought according to specifications it is usually demanded of a high-class light gasoline that no change in coloration shall take place, while a yellowish coloring of the acid is permissible with heavy gasolines. The tables [of 92 fluids in the German market; here omitted] show that even the best gasolines nearly always color the acid with a faint yellowish tint and that the heavy gasolines color it yellow to yellowish-brown. The demands should probably not be made more severe.

How it comes that some of the best gasolines lose in clearness by the test with sulphuric acid it has not been found possible to explain decisively.

For "90 per cent" benzols yellow coloration of the acid must also be accepted as admissible.

In the case of motor alcohol a marked rise of temperature with change of volume occurs at once through formation of ethyl ether, and any admixture of alcohol produces the same indications in lesser degree.

7. Benzol Test with Isatine-Sulphuric Acid

The sulphuric acid test just referred to shows in general if there are impurities due to unsaturated combinations of the order C_nH_{2n} and aromatic hydrocarbons. Quantitatively such impurities are shown, by Kraemer's and Boettcher's method, by weighing the amount absorbed in a mixture of 80 volumen per cent concentrated sulphuric acid and 20 volumen per cent fuming sulphuric acid. This process is applicable within the limits of 10 to 12 per cent of the impurities mentioned, but for larger percentages it is found [by Dr. Dieterich] that the sulphuric acid does not suffice for producing a quantitative transformation into sulphurous acids, and, as the amount of admixtures is not known in advance, the test can be only conditionally decisive.

Test 6 can be supplemented by adding isatine (.1 gram isatine to 30 grams sulphuric acid) to the mixture of gasoline and sulphuric acid, shaking the new mixture carefully and, after a short rest, observing the coloration. This done, the mixture is left standing 1 to 2 hours and the final coloration is then observed.

The object is to show the possible presence of thiophene which is a sulphurous impurity of benzol and with the isatine produces a pretty greenish-blue to midnight-blue coloration. But the test shows only thiophene with certainty and the benzol merely by an inference which is not quite safe, while benzol, on the other hand, is not shown if it is free from thiophene. It is due to this imperfection of the test that gasolines with strong benzol admixtures do not show the characteristic greenish-blue coloration but only greenish-violet or brownish shades. If the test is employed it is important to leave the isatine mixture standing for some length of time, as the true isatine coloring does not develop at once.

In practice the test can only be recommended when the purpose is to examine benzol for sulphurous impurities, especially thiophene.

8. Benzol Test by Nitration with Nitro-Sulphuric Acid

To isolate the nitro-combinations of benzol, the toluols and xylols, which constitute the aromatic hydrocarbon impurities of gasoline, the following process is employed.

Ten grains of the gasoline to be examined is mixed in a large retort with ten times as much of ice-cooled mixture of one part sulphuric acid and two parts crude nitric acid, and

the odor which is shortly noticed, if aromatic combinations are present, is tried for nitrobenzol, nitrotoluol, etc. With frequent stirring the mixture is left cold for one to two hours; thereafter it is heated slowly for several hours in a steam or hot-water bath and finally the retort is heated more strongly in an oblique position until the brownish-red vapors disappear and the mixture assumes a light yellow color. It is then allowed to cool, the odor is again examined and the mixture is diluted with an amount of water 10 to 15 times as large. When this has come to rest, it is observed whether larger or smaller amounts of light yellow or orange oily liquid or crystals are segregated. If a very violent reaction arises at the beginning of the mixing, with immediate boiling of the fluid, the presence of a readily nitratable substance, such as denatured alcohol, is indicated.

If the test fluid is free from aromatic hydrocarbons, no odor and no coloring occurs; neither does of course any isolation of a nitro-compound take place. Nitrobenzol shows the well known oily consistency and intense odor of bitter almond oil. If nitrotoluol is present, the nitration product (also the watery liquid) shows after a few minutes a brown coloring when treated cold with melted sodium hydroxide. If the nitration product is nitrotoluol only, it takes crystalline form, while preponderance of xylol is shown by dark yellow coloring.

By nitrating once in the manner described, the benzol is mainly turned into nitrobenzol, $C_6H_5NO_2$, and the toluol forms, aside from small quantities of the meta [isomeric] combination, both the ortho and the para modification. Of these only the latter is crystalline, in long light yellow needles. The nitrotoluol, $C_6H_4CH_3NO_2$, does not smell of bitter almonds but has a special nitrous odor. Nitroxylol has a similar odor and is an oily liquid resembling in color the yelk of an egg. By the cold treatment with sodium hydroxide the nitrotoluol gives, as mentioned, a brown coloring, but this becomes blood red if nitroxylol is present in considerable quantity, especially by heating. Nitrobenzol remains perfectly unaffected by this test.

A quantitative determination of the nitrated products by means of ether has been repeatedly proposed, but is uncertain by reason of the high volatility of the ether and dangerous on account of the poisonous vapors. Giving products varying in quantity and composition it has not been found useful.

Very little information is found in technical literature with regard to the amount of aromatic hydrocarbons contained in the commercial gasolines. The chemical testing bureau of the city of Dresden notes, however, that three samples each showed 10 per cent of benzol. The present series of examinations has shown that even the best gasolines of Class A can contain small percentages of benzol and that those of class B almost without exception contain aromatic ingredients, while the heavy gasolines may not show benzol but always toluol and xylol and usually some unsaturated (olefine, C_nH_{2n}) combinations. When a large number of gasolines are tested at the same time, the colors and segregations alone indicate plainly enough the motor fuel values of the different fluids.

The fact that most of the motor gasolines in the market now contain aromatic hydrocarbons shows that the raw materials, the petroleums from which they are distilled, have undergone a change. To ask that a motor gasoline shall be quite free from benzol is therefore to go too far. A small and natural percentage of the aromatic hydrocarbons does no more harm in gasolines than in benzol, and is unobjectionable if the price is in accordance with the amount of these irregular components which to some degree indicate how far refinement has been carried in the manufacture of the fuel. [The indication is uncertain unless the composition of the raw petroleum used in the production is known.]

What quota of aromatic hydrocarbons should be allowed in each of the three classes of gasoline is a question referred to under No. 9.

9. Test with "Dracorubin" Paper

For distinguishing gasoline and benzol the use of iodine is well known. Dissolved in gasoline it becomes raspberry red, in benzol violet and in alcohol (making tincture of iodine) brown. But it is not suited to show an admixture of benzol in gasoline, as the colorations become too indefinite.

HOLDE'S test depends on the use of a specially treated asphaltum which affects gasoline very little but is solved in benzol with dark coloration. It shows benzol in gasoline, but the production of the asphaltum directly from petroleum and the leaching of it in different fractions of the gasoline are rather complicated processes. A more suitable substance has been found [by Dr. Dieterich] in the gum of the dragontree of Sumatra. The sap of this tree, as obtained by incisions, is called dragonblood and is a resin containing a red gum which is isolated by hot treatment of the resin with petroleum ether. The pure gum is thereafter insoluble in petroleum ether and in the form of a red powder which has been shown to be an ester of benzoic acid [a *Dracoresinotannolester*, Dr. Dieterich terms it]. This pure gum yields somewhat to hot gasoline but leaves only traces in cold gasoline, while in alcohol and benzol it is at once dissolved with magnificent blood red coloration. To produce this gum of dragonblood so pure that it gives up nothing whatever to cold gasoline of any of the three classes but immediately reacts to traces of benzol, 10 kilograms of dragonblood (of the best grade which comes packed in bast) was dissolved in 25 kilograms of petroleum ether, the residuum was again lixiviated in 15 kilograms of ether and from this solution the dragonblood-alban ($C_{16}H_{16}O$) was precipitated with 25 kilograms of absolute alcohol. The filtrate, after being steamed off, was boiled in 30 kilograms of petroleum ether and successively in hot petroleum, hot benzine and, finally, hot light gasoline. Some of the gum goes into the solvents, but after the last boiling the gum remains unaffected and insoluble in gasoline. The red gum powder obtained in this manner is what is termed "*Dracorubin.*" It is eminently adapted for demonstrating the presence of benzol in gasoline, and *vice versa*, and also for determining the values of different gasolines, benzols and motor alcohols.

This product has been placed in the market in the form of a reaction paper which is made by solving 2 kilograms of dracorubin in 8 kilograms of benzol and soaking filter paper twice in the solution. When dried the dracorubin paper is dark red and waxy in appearance. It is sold in packages containing 80 strips each at the Helfenberg Chemical Works Co. (at Helfenberg, Saxony, Germany). It is employed as follows:

Four strips of the paper are placed in a high clear and uncolored glass cylinder with stopper and the motor fuel is poured in till the papers are immersed. This is left standing, well stoppered, in ordinary indoor temperature till the next day. After shaking the cylinder, one removes the papers, and places a sheet of white paper under and behind the cylinder. For comparison a second cylinder is filled with ordinary gasoline. Two observations are now made, one relating to the color of the fluid and the other to the color of the four strips of paper after they have been dried. [Dr. Dieterich gives here a table showing the reactions with 33 fluids of interest in the chemistry of motor fuels, their impurities and adulterations. With regard to the sensitiveness and general usefulness of the paper, it is noted, for example, that the reactions for American, French and German turpentine are markedly different, indicating that this new testing preparation might be found of use in the paint industry as well as for detecting variations in the quality of motor fuels.]

In general, the results of tests of motor fuels with dracorubin paper are indicated in the following table:

REACTIONS OF DRACORUBIN PAPER

Color of Fluid	Color of Paper	Nature of the Fuel
No color at most faint rose pink green.	The dark red paper unchanged, when dried.	Class A gasoline, free from benzol and aromatic hydrocarbons; at most traces of these.
Dark to light [illegible]	Red.	Gasolines of class B or C or mixtures of gasoline and benzol or Class A gasoline with admixture of class C gasoline, containing benzol.
[illegible] with yellow- [illegible]	Lighter red than before used.	Class C gasoline with little benzol, but much toluol; high specific gravity.
[illegible] to dark [illegible]	Red to light red, finely mottled.	Mixtures of gasoline and benzol or gasoline with strong natural benzol content.
[illegible] red.	Pale mat tile, finely mottled.	Good "90 per cent" benzol.
Dark brownish [illegible]	Dark splotches on tile red.	Heavy benzol with toluol and xylol or heavy gasoline with toluol, but little benzol.
[illegible] red.	Light rose pink.	Denatured 95% motor alcohol.
[illegible] red.	Rose pink.	Denatured 90% alcohol.

To use the dracorubin test for an approximately quantitative determination of benzol in gasoline, the best method is to add 10, 20, 30, 40 per cent or more of benzol to normal gasoline ["normal" gasoline can be obtained in Germany issued by the Royal Bureau for the Testing of Materials at Berlin Lichterfelde and corresponding to close specifications, such as: Specific gravity .695 to .705, boiling limits 65 and 85 degrees C., free from benzol, does not color sulphuric acid], place dracorubin paper in these samples, and compare the different shades obtained with the color of the fuel under examination. Air and light gradually affect the colorations, however, and the sample solutions should therefore be renewed from time to time.

From the many dracorubin tests made it has become evident that nowadays even the finest gasolines contain small percentages of benzol, and it can be inferred from this fact that more petroleums containing benzol are being refined now than formerly; also that refinement of the gasolines is in part less thorough than in the earlier years of the automobile movement.

10. Nitrate of Silver Test

Adulteration of gasoline with volatile components of coal tar oils or lignite tar oils, which always contain sulphurous substances, is detected by the nitrate of silver test. Five cubic centimeters of the gasoline is mixed with one-fourth of this volume of alcoholic solution of ammonia and a few drops of nitrate of silver solution. Placed in a long test tube, this is dipped a few times in hot water and it is observed whether a brownish coloration occurs or not. With gasoline of class A there should be no such reaction, with those of class B a light coloration is admissible and with class C a light blackening. Benzols all show blackening, as they naturally contain sulphur combinations.

11. Calcium Carbide Test for Water

Any considerable quantity of water in gasoline or benzol appears in drops which can be seen without difficulty at the bottom of perfectly clear glass bottles and still easier in colored bottles. While neither of the fluids is miscible with water, both can absorb a certain amount of moisture, especially benzol. (Bright iron parts rust more readily in benzol than in gasoline.) To distribute whatever water may be contained in the fluid under test and thereby make sure of getting it in contact with the carbide, the fluid is first carefully shaken. A couple of pieces of perfectly dry calcium carbide are then added, and one observes by the odor if only air bubbles are the result or a strong development of acetylene occurs.

Motor alcohol of the 95 per cent grade gives scarcely any acetylene, while cooking-alcohol of 90 per cent gives a very strong development.

12. Fractional Distillation

While for commercial distillation it is important to determine the whole curve of boiling points of a fluid, the matter of most direct interest for judging motor fuels is to ascertain how much of the fluid in each case evaporates below 100 degrees C. and how much requires a higher temperature. To make sure of the figures on this point some departures from the usual methods were made in this series of examinations. The quantity of the test material was made larger, 250 grams being used in each case, and volume measurements were discarded in favor of weights. To get exactly the percentages passing over below 100 degrees C., the following method was followed.

In a calibrated fractional distillation retort holding 500 grams and made of Jena utensil glass (*Jenaer Gerätglas*) 250 grams of the motor fuel was weighed in, glass beads and a couple of glass capillaries being added to promote boiling, and was heated on the wire net over a small flame. The retort was also protected by wire caging at the sides and above, for security in case of breakage and fire. Without considering the momentary barometric pressure, the lower boiling point was taken as that thermometrical degree at which the first drop of distillate trickled from the lower end of the condenser to the receiver. The distillation was continued till the thermometer showed 85 to 90 degrees C. Then the retort was imbedded as deeply as possible—up to the point where the distillation tube branches off—in a chloride of calcium water bath arranged to have a boiling point of 110 degrees C., and with this bath held exactly at 100 degrees the distillation was continued so long as anything passed over. (About 66 to 67 per cent of crystalline $CaCl_2 + H_2O$, or else 34 per cent of melted $CaCl_2$ in a solution of 1.3124 specific gravity makes the required bath.)

By switching the chloride of calcium bath into the process it is possible to hold the temperature more exactly constant at 100 degrees than with the customary continuous distillation, and certain errors are thereby avoided, especially in the case of the heavy gasolines.

After cooling of the retort the weights were determined and thereafter the process was continued with direct flame above 100 degrees until the retort was empty or only filled with vapor. At this moment the second boiling point was noted. Each of the two fractions was kept and served subsequently for the optical test, No. 13.

Barometer readings were recorded for each test but no allowances for the variations were figured.

The usual conception of gasoline comprises those components of petroleum which boil below 150 degrees C. But it is seen from the detail tables [here omitted] that the actual motor gasolines of the present day go far beyond this limit. And as petroleum ether, with boiling points 28 and 40 degrees, does not come into the question for motor fuel purposes (being applicable only as an admixture to benzols, to increase the velocity of flame propagation), the motor gasolines can now be taken as including the distillation products from about 45 to 160 or 170 degrees C. Contemporary technical literature [HEFTER, HOLDE and UBBELOHDE are the authors mentioned] gives the boiling limits for first-class gasoline as 80 and 110 or 120 degrees, but it is apparent from the present series of analyses that motor gasolines must have wider limits in order to be recommendable. The best class A gasolines show boiling limits of about 45 and 110 degrees, and in accordance herewith it is especially the lower limit which must be drawn back to 40 degrees. A gasoline

(*Continued on page* 267)

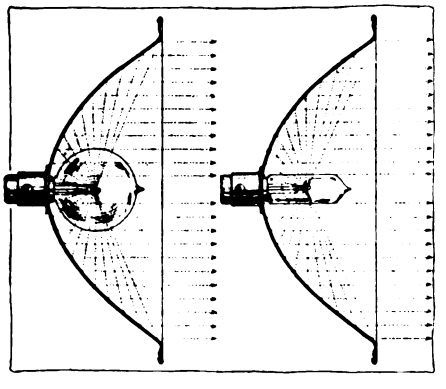
ACCESSORIES

Perfection Car Heater

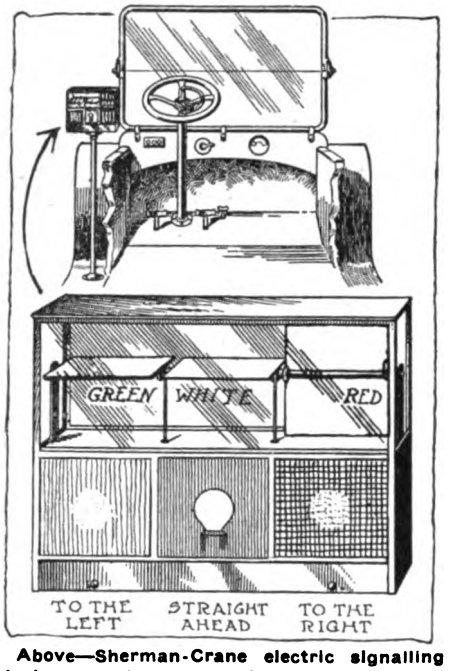
THE Perfection heater which radiates exhaust heat utilizes energy which otherwise is wasted and operates entirely without maintenance cost. A small valve on the exhaust pipe deflects about one-eighth of the hot burnt gases through a flexible steel hose to the heater where it warms the air in the car which circulates around the hot copper tubes of the heater. The heater is made in two types, one for passenger car use and the other for commercial vehicles. The passenger car type consists of a series of seamless copper tubes assembled into a manifold at each end, these radiating parts being carried in a rust-proof under-casing. The 9¼ by 13½ in. top plate which is mounted flush with the car floor is buffed and polished. The heater is 2½ in. deep and provides over 200 sq. in. of radiating space. A small lever projecting through the floor plate provides regulation of the amount of heat taken from the exhaust pipe. The second type of heater occupies only 3¼ by 15⅞ in. of floor space and is constructed in the same way as a passenger car heater except that the heat control lever is made as a separate unit and can be located wherever desired.—Perfection Spring Service Co., Cleveland, Ohio.

Electric Direction Signal

An electric signaling device to indicate the direction an automobile is going at street intersections has a double-deck arrangement, with flag and lantern effect, and is attached on the left side of the car near the edge of the windshield in such a manner that it can be seen easily from both front and rear. Green, white and red squares of glass are thrown to an upright position in the upper portion for the respective signals desired, and



How the Argon headlight bulb obviates obstruction of the reflected rays



Above—Sherman-Crane electric signalling device mounted on running board of a car. Below—Section through the device

lights of the same color are flashed in the lower part, thus making the invention suitable for use in both daylight and darkness. It is also equipped for having the horn sounded whenever the button is pressed for any signal. It is made of a metal frame, with glass sides, and is attached to the running board by a piece of ¾-in. iron pipe and flanges.

Green, the left or outside color, means a turn to the left; white, the middle color, means straight ahead; red, the color next to the car, means a turn to the right; while a combination of either side color with the middle color means a turn around in the direction of the respective green or red of the combination, all three are flashed together for stopping and the red and green are shown together for backing up. Signals are visible from any direction. The device sells for $15.—Sherman-Crane Automobile & Signal Co., Denver, Col.

Argon Headlight Bulbs

A new type of headlight bulb is the Argon which is filled with nitrogen gas, put into it by pressure. This gas contains a small percentage of argon, about 2 per cent, which, the maker claims permits the use of a higher voltage for a given filament. The filament is of drawn tungsten wire and is so coiled that when properly focused the lamp does not produce dark rings.

The bulb, which is elongated, will pass through the opening in practically any reflector and the bulb can be put in place from the back. Obstruction of the reflected rays from the part of the reflector nearest the center is obviated by the form of the bulb.

Another Argon type has a double filament, the main filament being for full lighting and the supplementary filament, which is placed back in the base so that it does not cast any rays on the reflector. This is especially adaptable for city use.

The candlepowers of the regular type Argon tubular bulbs are from 16 to 24 and the voltages are 6, 7, 8, 9, 12 and 18. Price, $1 each.—Wood Mfg. Co., Fairfield, Conn.

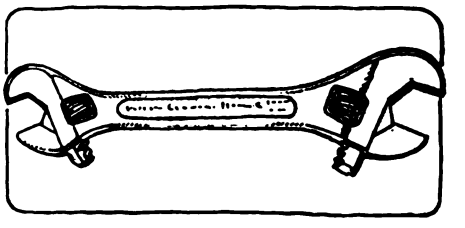
Noncarbene Fuel Improver

Noncarbene is a preparation designed to remove carbon from the cylinders and to keep this part of the engine always in efficient condition by its lubricating and cleansing action when mixed with the gasoline in the fuel tank. It is also claimed to increase the power of the motor and to effect a considerable economy by increasing the mileage per gallon of fuel. Noncarbene comes as a liquid in cans, together with complete directions for mixing with gasoline and a small metal cup measure for insuring the proper proportion, which is a ratio of ½ pint to 4 gal. of gasoline. It sells for 50 cents a quart, $1.50 a gal., $6.25 for 5 gal., $12 for 10 gal. and $50 for 50-gal. barrel. There is also a Tourist Package of sixteen half-pint cans for $2.—The Noncarbene Co., New York City.

Automobile Wiring Harness

A wire harness for the purpose of protecting the electric circuits from oil, water, grease, dirt, etc. which are apt to cause power leaks and short circuits has recently been brought out by the Breeze company. The wires are housed in the Breeze flexible metal wiring cover which acts as the armoring agent. This harness comes in a complete outfit containing sufficient material to cover all the wires to lamps, generators, batteries, starter, spark plugs, magnetos, dash equipment, etc., and the wires from different directions which come together in two-to-one and three-to-one joints at a common center can be readily drawn through the conduit.

Any number or lengths of wire can be used. The armor for the rear lamp is



Crescent wrench with 22½ deg. adjustable head at each end

black enamel for 3 feet, that for the front lamps is nickel-plated brass for 6 feet. The average total length needed for the largest cars is about 30 feet, but the outfit as put up comprises 45 feet of the covering, four two-to-one joints, two three-to-one joints, 20 feet of 5-16-inch inside diameter flexible wiring covering, 10 feet of 7-16-inch; 8 feet of 5-8-inch and 7 feet of 1-inch. The price of the outfit is $6.—Breeze Carbureter Co., Newark, N. J.

Double-End Adjustable Wrench

A double-ended and adjustable wrench, modeled after the solid engineer's wrench, is the latest Crescent model. A single-ended adjustable wrench is also produced. The adjustment is obtained by means of a screw and rack bar.

Two sizes are made: one has heads for 15/16 and 1⅛ nuts and the other ¾ and 15/16 nuts. The double ended pattern weighs but an ounce more than the single end tool of the larger size. Price, small size, polished, $1.25 each, $15 per dozen; nickeled, $1.60 each, $19.20 per dozen. Large size, polished, $1.50 each, $18 per dozen; nickeled, $1.90 each, $22.80 per dozen.—Crescent Tool Co., Jamestown, N. Y.

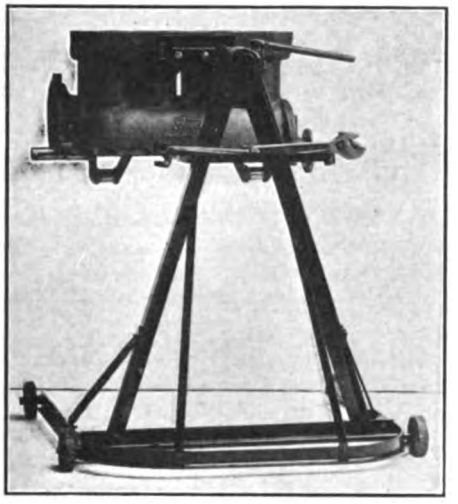
Ekern's Ford Products

A special stand for Ford motors is of great assistance in repair shops. The Ekern stand carries the motor attached to the stand by two bolts which screw into the sides where the water connections are bolted on when the motor is mounted in the car. The clamp and motor can be rotated together to any position and secured there by means of a split clamp. The stand is provided with small wheels which render it easy to move it around the shop. A tray on the stand holds tools and small parts which may be taken off the motor. The stand is 34 in. in height and takes up floor space 32 by 30 in. It weighs 50 lb. and sells for $20.

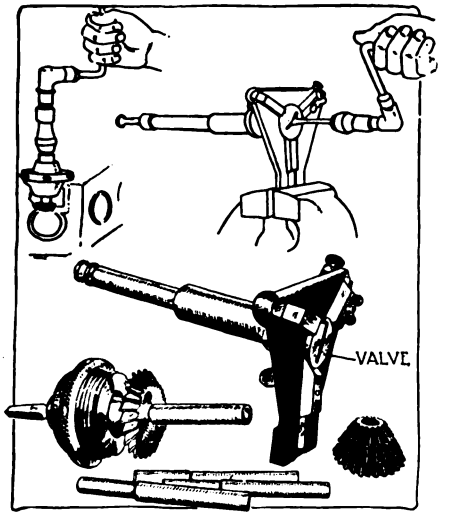
Another Ekern product is an attachment which renders it possible to tow in a Ford car with a broken axle drive shaft on its own four wheels. A frame carrying a stub axle is hooked on the housing flange at the bottom and held in place by tightening a set-screw at the top. The broken end of the shaft is removed from the wheel hub and the wheel slipped on the stub of the attachment. The car can then be towed in as well as if the axle were intact. The attachment weighs 6 lb. and sells for $5.—Ekern Bros., Flandreau, S. D.

Healy Valve Tools

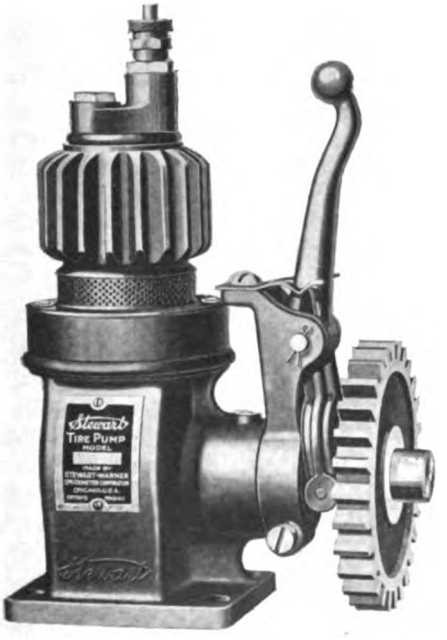
For refacing valves and valve seats a complete set of tools is put out by the Healy organization. The valve tool consists of a frame plate carrying three adjustable cutters with a guide extension to take the valve stem and hold it steady.



Ekern stand which permits mounting of Ford motor in any position



Healy set of tools for refacing valves and valve seats of any size



Stewart single-cylinder tire pump. The piston is fitted with one large ring and a unit of five small rings. The pump is furnished complete with fittings for any car at $15

The tool is held in the vise and the valves turned with a brace. There is an interior chuck which closes on the valve so that it cannot chatter while turning and an adjustable bearing takes the end thrust. Both are adjustable.

The cutters are 45 deg. at one end and 60 deg. at the other, being adjusted by means of a micrometer screw. The seating cutters, of milling cutter type, have from sixteen to twenty-four teeth, according to size, and are so constructed that a cutter ¼ in. larger than the valve will enter the port; the large size permitting the removal of shoulders. The guides are of hardened steel set in a taper. With the port steadyrest having a running thread on a taper which will allow for any size port. The cutter is held in alignment by six ball bearings. The price is $35. For a special Ford set the price is $10.—Healy Tool & Appliance Co., Buffalo, N. Y.

Stewart Tire Pump

The improvements in the Stewart single-cylinder tire pump were described in these columns last week, but through an error the illustration appearing with this article was not that of the Stewart pump, which is reproduced in its improved form herewith.

Chicago Flexible Tubing

A comparatively new product is the Everlasting gasoline hose, which is built up of no less than eight layers. The inner lining is of flexible steel, over which is a layer of fiber, then a layer of braid, one of a special gasoline-resisting composition, another braid, then a second gasoline-proof coating, a third braid and finally the waterproof outer jacket, which is woven on. No rubber is used. Other products include hot air hose for carbureter connections, oil, air and steam tubing, acetylene tubing and connectors, etc.—The Chicago Tubing & Braiding Co., Chicago, Ill.

Coronum Metal Cement

To stop leaks in pipe connections, radiators, boilers, heaters, flanges, etc., Coronum metal cement has been introduced. This cement can be successfully applied without experience by following the directions printed on the cans and is claimed to repair any leak and harden thoroughly within 30 minutes. It is put up for the trade in 1, 5, 10 and 25-lb. packages with the necessary liquid for making the mixture.

It is not affected by vibration and is tested to 500 lb. hydraulic pressure to the sq. in.; on live steam to 250 lb.; on gasoline to 200 lb.; and on hot oil to 500 deg. To repair a hole or small leak in a pipe, fill up the hole or leaking part with a mixture of the cement as thick as putty. Price per pound, $1, including can of cement and can of liquid.—Coronum Equipment Co., New York City.

Los Angeles Sales Gain 117½ Per Cent

Maximum Increase of Individual Dealers' Business Over First Half of 1914 Is 5.38 Per Cent, with 5 Per Cent Gain as the Minimum

By A. G. Waddell

LOS ANGELES, CAL., July 30—An increase of 117½ per cent in the volume of business done from Jan. 1 to July 15 of this year over the same period of 1914 is reported by the motor car dealers of Los Angeles. The minimum increase of the Los Angeles dealer is slightly under 5 per cent. The maximum increase for the period is 538 per cent.

In estimating the increase in the volume of automobile business, fifty-five different makes, forty-six of which are pleasure cars, were used as a basis for the figures. The nine commercial cars figured separately, show an increase of 135¼ per cent, which proves the claim to prosperity made by practically all lines of wholesale and retail trade in southern California. But the gain in the sale of pleasure cars is of the greatest importance. This remarkable gain in pleasure car sales represents $10,000,000 since Jan. 1.

47,000 Cars in Los Angeles County

Los Angeles county owns 33¾ per cent of the cars and commercial vehicles registered in the State of California. There is an increase of 4758 cars in Los Angeles county for the first 6 months of 1915 over the first 6 months of 1914, which is a gain of 48 per cent. There are approximately 47,000 automobiles owned in Los Angeles county to-day.

In California, during the first 6 months of 1915, 137,500 cars were registered. This shows a gain for the entire State of almost 50 per cent.

There is not one county in Southern California which has not gained from 30 to 80 per cent.

Control Southern California and Arizona

The Los Angeles automobile dealers control most of the Southern California and Arizona territory, with sub-agents representing them in the cities and larger suburban towns.

The Chevrolet branch here sold more cars at retail last month than in the whole first six months of 1914. In June, 1915, sixty-four Chevrolet models were sold at retail by the Los Angeles branch of the Pacific Coast agency. With 1200 cars contracted for 264 have been sold out of the local house during 1915 against forty cars delivered during the same months of 1914.

The Overland shows an increase of 77 per cent over last year's business to July 15. The J. W. Leavitt Co. branch here has sold and delivered 1172 cars this year.

The Winton Motor Car Co. shows an increase of 50 per cent for the Los Angeles factory branch.

The Chandler agency shows an increase of 108 per cent which represents $225,000 in sales.

An increase of 37 per cent has been made by Don Lee, Cadillac and Paige dealer. This is a gain which is expressed as $280,000 on the books of the agency.

A remarkable gain of 112 per cent is shown by Lord Motor Car Co., Maxwell dealer, which has all of Southern California and Arizona. Both the National and Oakland sales of Hawley, King & Co. have increased 35 per cent.

The Peerless and Premier being handled by the same firm, Smith Bros., the figures of the two makes are together and an increase of eighty-one cars for 1915 over the 1914 period gives a percentage as ninety-eight in the increase column.

For the Bekins-Spears Motor Co., Haynes dealer, the gain has been 101 per cent.

The Beardsley Electric Co.'s books show a gain in sales of 60 per cent and the Benrich Motor Co., Moline dealer, has a gain of 50 per cent.

The Apperson Motor Car Co. sold and delivered fifty-four cars in the period last year, and up to July 15 of this year 151 cars had been sold. The Apperson's territory has just been increased to embrace the three States, California, Arizona and Nevada and for the past thirty days the salesmen have been taking orders only, as no cars were to be had for delivery.

One of the chief difficulties of the Los Angeles automobile man is the scarcity of cars. The demand greatly exceeds the supply. On the sales floors of many of the largest houses in this city, there is but one show car and some dealers have sold even their show cars and demonstrators.

For some of the early season models owners have paid bonus prices and for one car delivered among the first of the 1916 arrivals, $350 was added to the original price as the dealer wished to retain the car for a demonstrator.

F. R. Cryiacks, Buick dealer, now has more than 800 orders on file and cars are coming through from the factory at Flint, Mich., in four, five and six-car-load lots every day or so; but the orders continue to roll in ahead of the deliveries.

The Cole Motor Co. shows an increase of 65 per cent but the increase would have been greater had the agency been able to deliver the cars. Four car-loads arrived here July 19 and there was but the one demonstrator at the agency the next afternoon. There is almost a motor car panic on in Los Angeles to-day.

Great Gain in Truck Business

Among the truck agencies showing a great increase in business during the early months of 1915 is the local Moreland factory. This concern has doubled its business twice during the past year and the capacity of the plant is now being enlarged to accommodate a 100 per cent increase in business. The month of June, 1915, was the greatest month of the Moreland plant. During the month there were fifty-seven trucks built and delivered.

For the periods of the two years, the Mack Motor Truck Co., agents for Mack, Saurer and Republic trucks, shows an increase of 133½ per cent.

The Commerce truck has increased the truck total for Los Angeles this year. H. G. Pendell, local distributor, has an increase of 150 per cent to his credit but this cannot be taken into consideration in the general average as he did not have the agency during the first months of 1914.

White deliveries have not increased at the same rate as other makes but in volume of business the White shows a 50 per cent gain with a business here as solid as a national bank. Kissel and Federal have a joint increase of 47 per cent which means a great deal for such heavy sellers in this territory. The Kelly-Springfield has an increase of 71 per cent this year which is due to a steadily advancing demand for commercial vehicles of the type in Southern California.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, August 5, 1915 No. 6

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
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SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Determining What's What

IT needs a gathering of service men and a few hours' talk to understand how many pieces of an automobile can be called by half a dozen names or more. It needs a discussion to show how many reasons there are why each name is the best from a particular automobile manufacturer's viewpoint, and, one may add, it needs some very progressive men to make as much progress as was made by the informal nomenclature meeting held in Detroit last week.

There is a sufficient similarity between each detail of any one automobile chassis and any other to make possible the use of the same name for the same part, or for the part which does the same work. To settle on one name and discard a dozen alternatives means time and concentrated effort by those intimately interested, but if twenty men gave six months entirely to the subject their aggregate labor would be less than that which is wasted in a week by the thousands of people who handle replacement parts.

The nomenclature work of the S. A. E. has not made the progress it might have made, on account of the tremendous difficulty of the subject, but the new scheme of working should clear the matter up quickly. We look forward to an early future in which the chaotic terminology of the present will be replaced by the most complete and perfect technical language possessed by any industry.

Provoking Invention

WHEN the Knight sleeve-valve motor was first taken up and standardized by a British maker it provoked a tremendous boom in invention and experiment with gasoline engines having sleeve, piston or rotary valves. It is safe to predict that the adoption of the Knight motor for a car which will be produced in large quantities is sure to have a similar effect. The stimulus to inventive thought created by the Knight motor's first appearance as a European product spread all over the mechanical world, and was not confined to Europe, by any means; so there are many half-developed ideas lying dormant in America which have never been exploited or even tried out.

A boom in any sort of invention is usually productive of a few excellent things, even though the mass of boom inventions are utterly worthless; so it seems likely that a re-awakened interest in motor valve systems may lead some of the languishing ideas to be resuscitated. With the valve situation so shaken up as it has been by the success of multi-valve racing motors the whole subject is ripe for renewed experiment. We know much more about materials and about lubrication than we did in 1906, and it is possible that some good motors which were impracticable then would be satisfactory now.

Useless Metal

WHAT man would try to ride a bicycle weighing 100 lb.?

Surely, only a crazy man, and yet many a gasoline motor is being asked to do something equally absurd. The motor does it because it is strong enough, but it does it only at the cost of more fuel, oil and tires than would be used to carry a lighter load. Carrying on the bicycle analogy, the vehicle here weighs less than one-fifth as much as the load it carries. The automobile, on the other hand, weighs more nearly five times as much as the load.

Of course, the cases are different, as the automobile load does not supply its own power, but the fact remains that only one-fifth of the power of an automobile engine is available for the transport of the passengers, the other four-fifths goes to the transport of the car itself. Surely four-fifths is a very large fraction?

The automobile has been given reliability and a wonderful flexibility of power that is best called roadability. Throughout its development the word efficiency has been used loosely with reference to all sorts of things, but we have now reached the stage where the only real efficiency may be studied. Real efficiency in the broadest sense means work done by comparison with cost of doing it, and the first step along the road of progress is to cut out some of that four-fifths of dead metal. It is no impossibility; merely it means the use of more suitable materials and a better proportioning of stresses throughout the structure as a whole. Let every part help to carry itself instead of having some other part to bear its weight.

Overland Forced to Expand

To Add 23 Acres of Floorspace —New Office Building —Orders Plentiful

TOLEDO, OHIO, Aug. 2—Additions more than equalling the size of the average American automobile plant are being started at the Overland factory here. According to officials of the company, the additions to the factory alone will be equivalent to almost 23 acres of floorspace. In addition to the factory extensions, there will be a new office building 63 by 373 ft.

One of the new factory structures will contain 20 acres of floorspace and will be nearly three times the size of the original Pope plant, when taken over by John N. Willys, president of the Willys-Overland company. This building will be five stories high, 400 ft. wide and 400 ft. deep. It will be used for final testing, body assembling and finishing and will contain 800,000 sq. ft.

The enameling department will have an extension put on it containing 3500 sq. ft. of floorspace.

The pattern shop will be enlarged by a three story, fireproof addition, 83 ft. wide by 100 ft. long. This new building will add 25,000 sq. ft. of floorspace to the department. The dry kiln building will be increased in size by a two story, fireproof extension 145 ft. by 107 ft. containing 31,000 sq. ft. of floorspace.

The original Pope buildings facing Central Avenue will be rebuilt and enlarged by 53,000 sq. ft. of floorspace. They will be made fireproof throughout.

The old wooden buildings will give way to a new administration building. The plans call for a seven story fireproof structure, made of steel and tile throughout and containing 165,000 sq. ft.

Although the production of the Overland company is larger than ever before in its history, and is steadily increasing, the factory finds it impossible to gain on the orders pouring in from all sections of the country.

McDuffee Overland Sales Mgr.

TOLEDO, OHIO, July 31—Joseph H. McDuffee, who was recently put in charge of the Willys-Knight division of the Willys-Overland Co., has been appointed assistant sales manager of the entire organization.

Richman Cole Factory Manager

INDIANAPOLIS, IND., Aug. 2—J. F. Richman, formerly factory production manager of the Cole Motor Car Co., has been promoted to factory manager. Mr. Richman has been with the Cole company for almost three years, coming from the Hudson Motor Car Co. after being with that concern for four years. Previous to that time he was with the Oscar Lear Co., Springfield, Ohio, since changed to the Kelly-Springfield Motor Truck Co. Prior to that time he was connected with the Oldsmobile company for a number of years.

S. A. E. Standards Committee Meeting Scheduled for Oct. 14

NEW YORK CITY, Aug. 3—The date for the standards committee meeting which, as has been announced in THE AUTOMOBILE, will be held in Chicago, has been set for Thursday, Oct. 14. The meeting will occupy but one day and will be in the nature of a convention, as members of the society from all over the country will be in attendance. All members of the society are welcome to these meetings and this one will be of particular interest to those around Chicago as it will probably mark the introduction of a Chicago section of the Society which will have its own meeting place and officers.

Paterson Has New Six

DETROIT, MICH., Aug. 4—*Special Telegram*—The W. A. Paterson Co., Flint, Mich., is bringing out a new light six at $985 for the five-passenger and $1,060 for the seven-passenger model.

The motor is a Continental, 3¼ by 4¼ in. Wheelbase is 117 in. and tires are 32 by 4. The carbureter is a Stromberg.

The four-cylinder model will be continued and is the same, except in minor details. The price of this car is reduced from $1,095 to $985.

Grant Brings Out New Six

FINDLAY, OHIO, Aug. 2—The Grant Motor Co. has brought out what is known as model TT Grant six. It is not a 1916 model but rather a summer series model. The only difference between the TT and the T model is that the former has a motor with 3 in. bore while the latter has 2⅞ in. bore. In the model T a Mayer carbureter was used, but the TT has a Rayfield. In other constructional or equipment features the two cars are alike and the price also is the same.

Rumely Co. to Enter Small Tractor Field After Reorganization

SOUTH BEND, IND., July 31—It has been announced by J. W. Toone, treasurer of the M. Rumely Co. of Laporte, that after the reorganization of the company it will enter the small tractor field, and Mr. Toone also took occasion to deny the rumor that Henry Ford of Detroit was negotiating for the Rumely oil pull plant.

Timken Axle Officers Promoted

H. H. Timken Is Board Chairman—Alden and Lewis Vice-Presidents

DETROIT, MICH., Aug. 2—Promotions and changes have taken place at the Timken-Detroit Axle Co. recently, among the officers. Former Vice-President H. H. Timken has been appointed chairman of the board; W. R. Timken remains president of the company; A. R. Demory, production manager; H. V. Alden, chief engineer and Eugene Lewis, formerly secretary-treasurer, are appointed vice-presidents, and Mr. Lewis is also made general manager. Assistant Treasurer C. W. Dickerson is now treasurer; F. C. Gilbert, who was assistant secretary and sales manager, is promoted to be secretary and retains his other title; W. H. H. Hutton, Jr., who was purchasing agent, director of purchasing.

E. B. Lausier, who represented the Timken-Detroit Axle Co. in the East has resigned and George L. Bitting, who formerly traveled the central States, has taken his place. He has his headquarters in Buffalo and covers the territory including Cleveland, New York and Eastern Canada.

P. W. Hood, with headquarters in Chicago and Detroit, continues to represent the Timken-Detroit Axle Co. and the Timken Roller Bearing Co. in the West, but in addition he will represent the Timken-Detroit Axle Co. in Southern Michigan.

Harry J. Porter, Detroit, formerly representing both Timken companies in Southern Michigan now represents the Timken Roller Bearing Co. in that territory, Ohio, Indiana and the South.

C. E. Gordon, Indianapolis, formerly representing the two Timken concerns in the Central West now represents the Timken-Detroit Axle Co. only, with headquarters in Toledo, Ohio.

Willems Off to Antipodes

DETROIT, MICH., Aug. 2—E. G. Willems, foreign district representative of Dodge Bros. will start shortly on his second extensive foreign tour which will extend over a period of at least six months. Sailing from San Francisco Mr. Willems will first go to the Hawaiian Islands, then to Australia, New Zealand and other countries in that vicinity.

Kiser Chalmers General Auditor

DETROIT, MICH., Aug. 2—William P. Kiser, formerly secretary of National Cash Register Co., Dayton, Ohio, has been appointed general auditor of the newly organized general auditing department of the Chalmers Motor Co.

Foreign Field for Parts Makers

Maxwell Export Representative Says Europeans Are Taking to Assembly

[illegible], MICH., Aug. 2—J. B. Crock[illegible] export representative for the Max[illegible] Motor Co. in the Orient, and who [illegible] represents some British motor car [illegible] manufacturers, has returned after hav[illegible]ent some time in Europe trying to [illegible] manufacturers abroad in Amer[illegible]ase parts, motors, transmissions, [illegible]etc.

[illegible]American method of purchasing [illegible]nts from parts makers and then [illegible]ing cars has never met with much [illegible] in Europe until the present war. [illegible]e to the exceedingly great need of [illegible]ars some of the leading British [illegible]kers have decided to try the [illegible] idea and if these manufactur[illegible] successful in their experience [illegible]erican parts, it is thought that [illegible] new field will thus be open for [illegible]rican parts makers.

[illegible] present time there is no credit [illegible]tion and the purchases made [illegible] Crockett are paid for in New [illegible]. One of the principal things which [illegible]rican manufacturers must bear [illegible] in order to get the business and [illegible]faction, is to make deliveries [illegible]d and also to adapting their [illegible] as far as that is possible to the [illegible] requirements. The matter of [illegible] up with promises of deliveries [illegible]portant. Manufacturers inter[illegible] communicate with THE AUTO-[illegible].

—

[illegible]oreign Trade Department

[illegible], MICH., July 29—No special [illegible] been made thus far by the Olds [illegible]rks to get foreign business [illegible]e demand by American deal[illegible]ve always taken practically the [illegible]al output. Since the begin[illegible]e European war automobile [illegible]oreign countries have inquired [illegible]d a good many have even [illegible]e factory to try and secure [illegible]hat the Lansing concern has [illegible] reserve part of its production [illegible]r foreign markets. A special [illegible] department has been estab[illegible]hat purpose. It is in charge [illegible] Zimmerman.

—

[illegible]es Scarce in Norway

[illegible]IA, NORWAY, July 30—Rub[illegible]me so scarce in Norway that [illegible] public automobile traffic is [illegible]mpered and a great number [illegible]ve had to be taken off the roads [illegible] arrangement can be made for obtaining tires from abroad. On several routes the tourist service by motor omnibus has been stopped entirely.

The Royal Automobile Club and the Foreign Office are endeavoring to obtain permission from England to purchase limited quantities of manufactured rubber in London.

—

International Motors Raises Wages 20 Per Cent.

PHILADELPHIA, PA., Aug. 2—An eight-hour day and a 20 per cent. increase in wages to the 1200 employees of the International Motor Car Co., has been announced at the company's offices at Allentown, Pa. This big concession has come in the form of a "war bonus" because of the large orders, said to aggregate $5,000,000, the company has for motor trucks for use in the war. Approximately 600 men are employed at the Allentown plant, and about the same number at the works in Plainfield, N. J.

—

Locomobile Will Share Profits

BRIDGEPORT, CONN., July 31—Notice was given to its workmen by the Locomobile Co. of America, to-day, that a plan has been adopted to share the profits of the company with its workmen by means of wage increases in proportion to the increase of product.

The plan of the Locomobile company embraces all the workmen, from the sweepers to the departmental foremen and is said to be arranged on a bonus system of $60 per car. The scale is a sliding arrangement which allows each of the workmen a pro rata percentage. Thus for fifty cars there would be $3,000 distributed among the men. In case of turning out more than sixty cars per week the bonus changes. For sixty-one cars it would be $61 per car and for seventy cars it would be $70 per car and so on.

—

Ten Per Cent Wage Increase for 500 Men in Autocar Plant

PHILADELPHIA, PA., July 31—According to a notice posted about the factory buildings of the Autocar Company of Ardmore, Pa., to-day, and signed by Walter Norton, vice-president and production manager of the company, employees of the concern are to receive a voluntary increase of average 10 per cent in wages accompanied by a reduction in working time of forty-five minutes daily. All overtime work will be recompensed on the basis of time and half time. About 500 men are affected.

—

Monahan Leaves Gibson Co.

INDIANAPOLIS, IND., Aug. 2—J. R. Monahan who has been closely affiliated with the Gibson Co. here, in an official capacity has resigned to become a commission broker.

Canadian Ford Cars $60 Lower

Runabout $480, Touring $530, and Town $780—No Rebate Up to Aug. 1

DETROIT, MICH., Aug. 3—For 1916 the new Canadian Ford prices are reduced $60, the prices now being $480, $530 and $780, respectively, for the runabout, touring car and town car. No speedometer is included at these prices. During the three next months no rebates are given but if conditions change and warrant it a rebate may be announced later.

Because the Ford Motor Co. of Canada, Ltd., sold only 18,774 cars during the fiscal year ending Aug. 1, the buyers of these cars will not receive a rebate which had been made conditional upon the sale of 30,000 cars during the fiscal year. While the Canadian business was practically uniformly good during the year, the foreign business which has always been a very important part of the Canadian plant, has dropped considerably, owing to the European war.

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Knox Resigns from Lyons Atlas

INDIANAPOLIS, IND., July 31—H. A. Knox has severed his connection as general manager of the automobile department of the Lyons Atlas Co., and temporarily will return to Springfield, Mass.

—

Wheeler Paige Production Manager

DETROIT, MICH., July 30—W. A. Wheeler has been appointed production manager of the Paige-Detroit Motor Car Co., succeeding James F. Bourquin, who resigned last week, as reported in THE AUTOMOBILE for July 29. The Paige company has a production schedule of 20,000 cars for this year.

—

Scheu with Star Refining Co.

NEW YORK CITY, Aug. 3—E. A. Scheu, recently connected with the sales departments of Charles F. Kellom, Philadelphia, and the Invader Oil Co. of New York, has joined the sales department of the White Star Refining Co., Detroit. Mr. Scheu will make his headquarters at the Detroit office.

—

Hawkins Goes West for Midgley

LANCASTER, OHIO, July 31—The Midgley Tire & Rubber Co. this city has made arrangements with C. A. Hawkins of San Francisco to make an extensive tour throughout Western Coast States in its interests. Mr. Hawkins was for several years western representative of the White Co.

It is expected that agencies will be established in all of the principal cities on the Western Coast.

A. A. A. Gasoline Price Inquiry

Nation-Wide Investigation Planned—Report in October—Oppose Intercity Speed Tests

ERIE, PA., Aug. 2—At the conference of the executive committee of the American Automobile Association held here a nation-wide investigation of the price of gasoline was determined upon and Louis R. Spear, of Boston, was appointed to conduct the inquiry with instructions to report in October.

Gasoline made its first jump in several months on the New York market this week, going up 1 cent. This rise the Standard Oil officials ascribe to increased summer demand and market conditions.

The committee also recommended that the by-laws of the organization be revised to conform with State regulations and declared itself opposed to speed tests between cities, principally Philadelphia to New York and Boston and from Chicago to San Francisco. The committee also approved reciprocity with Canada on the question of allowing American registered cars to be operated in Canada without taking out a Canadian license. Representatives from Massachusetts, New York, New Jersey, Pennsylvania, Ohio, Indiana and Illinois attended.

Uniform Gasoline Prices in Oklahoma

OKLAHOMA CITY, OKLA., July 30—Gasoline retailers must establish uniform prices throughout the state, according to an order issued by the corporation commission in which citizens of Poteau charged the Pierce Oil Corp., the Gay Oil Co., The Texas Co. and the Magnolia Petroleum Co. with discriminating between cities in the eastern part of the state. When gasoline was selling for 16 cents a gallon in Poteau in May it was alleged by the complainants the same companies were marketing it at McAlester for 12 cents, at Muskogee for 12 cents, at Hugo for 12½ cents, at Bartlesville for 11 cents, and Fort Smith and Greenwood, Ark., for 12 and 11 cents respectively.

Hartford Electric Brake $90

JERSEY CITY, N. J., July 29—The Hartford Suspension Co. has materially reduced the price of its Hartford electric brake. The complete apparatus heretofore was sold for $150, but hereafter the price will be $90.

Hoosier State Association Formed

INDIANAPOLIS, IND., Prominent citizens of Indianapolis, most of them members of the Hoosier Motor Club, Friday filled papers of incorporation for a new organization to be known as the Hoosier State Automobile Assn. The new body plans to organize the motorists and good roads enthusiasts in all of the principal cities and towns throughout the State into local clubs. It will be affiliated with the American Automobile Assn. H. W. Patton, recently elected to the position of secretary of the Hoosier Motor Club, is the prime mover in the new organization.

Motion Pictures Show Bearing Manufacture at SKF Plant

NEW YORK CITY, July 29—P. G. Prytz, a representative of the board of directors of the Swedish factory of the SKF Ball Bearing Co. has brought over to this country a reel of motion pictures showing the buildings and work at the Aktiebolaget Svenska Kullagerfabriken, which is the Swedish name of the factory known in this country as the SKF Ball Bearing Co.

The pictures were shown to-day to a number of the American officials of the company and a group of representatives of THE AUTOMOBILE, and are remarkable in that they show that rapidity of development and system in plant layout are not peculiar to America. Since the route of travel between Sweden and this country lies outside the war zone none of the difficulties that have beset many of the importers of ball bearings have troubled the SKF company. Not indirectly due to this the plant is at present working at its full capacity and is constantly adding new buildings. The present force of men numbers 3000, and the small building which in 1907 represented the SKF factory is now almost lost to sight among the rows of huge buildings which are devoted entirely to the manufacture of ball bearings. The bearings are made for practically every use to which ball bearings can be put.

Invents Four-Wheel-Drive Truck Using Chains

GOSPORT, IND., July 31—Claude Hoadley, of this place, has built a four-wheel-drive gasoline truck on which he holds U. S. Patent No. 1,027,730. The four-wheel-drive feature as incorporated in this truck employs chain-drive to each of the four wheels, all of which are used for steering. Each axle and jackshaft group is mounted on a fifth wheel device, the same as the front axle of a horse-drawn vehicle, the conventional motor truck steering knuckle not being used. When either axle is turned the complete jackshaft and transmission system turns with it. The motor is carried in front and there is an ingenious system of power transmission from it to the front and rear jackshafts employing four universal joints and bevel and spur gearing. The steering of the front fifth wheel is through a rack and pinion.

Registrations Reflect Sales Boom

Ohio Has 161,700 Cars and California 144,500—Other States Show Gains

COLUMBUS, OHIO, Aug. 2—W. H. Walker, Ohio registrar of automobiles, has made a report covering the present year up to July 30, showing a total of 161,700 motor cars registered since the first of the year. The total registration for the whole of 1914 was approximately 122,500 which shows quite an increase for the present year. It is estimated that 175,000 cars will be registered in the Buckeye State this year.

Chauffeurs to the number of 13,643 have been registered by the department.

144,500 Cars in California

LOS ANGELES, CAL., July 27—California's motor car registrations for 1915 have reached a total of 144,500 according to the latest figures announced by the State motor vehicle department. It is claimed that this number will be greatly increased next month when the license fees are reduced 50 per cent. W. S. Goble, superintendent of the Southern California branch of the State motor division with offices in Los Angeles, predicts 150,000 registrations for the State before fall.

21,305 Is Washington's Total

OLYMPIA, WASH., July 30—The 21,305 licenses thus far issued by I. M. Howell, Secretary of State of Washington, are classified as follows: 15,842 privately owned automobiles; taxicabs, jitneys, etc., 1690; privately owned trucks and delivery cars, 1071; trucks and delivery cars for hire, 153; automobile stages, 183; dealers' demonstration machines, 183; exempt cars owned by State or cities, 49.

15,925 Cars in Kentucky

FRANKFORT, KY., July 29—Since the first of the year 15,925 automobile licenses have been issued in Kentucky, 4168 more than during the entire year 1914. Applications for licenses continue in large numbers. Motorcycle licenses to date number 1185.

208 Postal Automobiles Start

WASHINGTON, D. C., Aug. 2—Two hundred and eight automobile rural postal delivery routes distributed among eight States will start operation to-day. This means that approximately 11,440 miles of rural roads will be traveled six days a week during August by postal automobiles. In all orders have been issued authorizing 298 motor routes, varying from 50 to 64 miles.

Plants Rushed—Sales Boom Continues

Car and Accessory Factories in Detroit Report Orders Pouring In—Retail Sales Gain in Nearly All Quarters in Spite of Rainy Weather Though Chicago and Kansas City Markets Are Slowed Up

DETROIT, MICH., Aug. 2—Last week, not only was there no falling off in the demand for automobiles and parts in the Detroit district, but the pressure seems actually to be increasing. Many of the parts plants are running almost continuously, as instance the Detroit Steel Products Co., which is working three shifts with a total loss of time of only 33 min. in twice around the clock.

Automobile makers continue to be far behind on shipments and orders are still pouring in by every mail. The conditions in New England seem to be restored to normal, by proportion with the rest of the country, and it is to be noted that the South is noticeably waking up and demands are coming in from the cotton districts in a most encouraging way.

Continental Motor is commencing to occupy the new building at Muskegon, but despite this, and the second building to be ready next month, the company has orders on hand to keep the plants at full capacity till well into the winter. Bower roller bearings are being called for at double the rate for the corresponding period last year and the Gemmer Mfg. Co. considers trade to be 80 per cent better, the factory running night and day to meet the demand.

The King Motor Car Co. reports a particularly strong demand for eights from England and is shipping cars abroad every day. This experience tallies with that of the Cadillac company which has found the eight much appreciated in England and is doing an extremely satisfactory business through its London representative.

Metropolitan Territory Wants More Cars

NEW YORK CITY, Aug. 3—If it were possible to get all the cars that could have been sold in the metropolitan district during the month of July, that month would have broken all previous records for motor car sales, according to the sales managers of the representative local branches and agencies. All the well-known concerns in all price classes are selling all the cars they can ship and while deliveries are not in such bad condition that the purchaser has to wait more than three or four weeks, still the lack of facilities for deliveries on the spot has prevented a number of sales that could have been made.

Sales Ahead of 1914

With this condition of a steady rush to fill the incoming orders, it is small wonder that sales are ahead on all sides as compared to what they were a year ago. Furthermore, July, instead of being far below June as a selling month, as has been the case in previous years, is practically on a par with it.

Speaking of Overland sales, for instance, officials of the C. T. Silver company state that they can sell all the cars that can be shipped by the hard-pressed factory. July, they state, is somewhat below June in the total volume of sales, as would be expected, but the percentage of business as compared to a year ago shows a strong advance. Ford is 135 per cent ahead of a year ago in volume of sales, Buick is 300 per cent of a year ago, according to sales manager Newton, and the cars coming through this month will probably number 400. The largest demand is of course for the smaller of the two sixes, the proportion of sales being about the same as the factory manufacturing schedule, i.e., five small to one large car. Hupmobile estimates that the metropolitan sales are just double what they were a year ago, with July as the best month ever had by the local distributer, Chas. E. Riess. At the present schedule of orders 100 cars a month are being shipped. Chalmers is doing at least one-fourth more business now than a year ago.

Delivery the Big Problem

It is not only in the lower and medium-priced cars that the sales are booming. The Pierce-Arrow states that the business of July compares favorably with that done a year ago, the question of delivery being the only one which concerns the company at the present time. The cars ordered now are delivered in September and if they could be delivered more quickly sales would be correspondingly higher. The same story is told by the dealers in higher-priced cars as in the lower: The buyer of to-day is demanding quicker delivery and the reason for this is given by many as directly traceable to the time of the 1916 announcements. However that may be, the fact remains that everyone in the metropolitan district who has cars to sell and can deliver the goods is getting the business and getting all that he can handle. No one is complaining of having been assigned too heavy selling schedule by the home plant.

Rains Slow Up Chicago—Damage Crops

CHICAGO, ILL., Aug. 3—*Special Telegram*—Automobile trade conditions in Chicago territory have slowed up perceptibly during the past week due to heavy rains throughout the territory. For three months unusual rains have fallen, but it is becoming quite serious, as should these continue much longer, the corn crop will be injured. Hot dry weather is needed. Numerous sales in the territory are being held up and several of the Chicago distributors are getting more stocked up with cars than they have been for many months. July was a remarkable month for business with many distributors. Tire business is slower, as touring has been very much slowed up by rain, and the general accessory trade is also beginning to feel the effects of the continual rains. A still more serious aspect of the rains is that in some sections of Illinois the oat crop is being injured, much farm land being under water. In some sections where the crops are harvested, but are still in the field, it is impossible to thresh the grain. Many local dealers with 1916 lines are losing sales every day by not being able to make local deliveries, and this is giving weaker lines a favorable selling season.

Kansas and Missouri Buy Cars in Rain

KANSAS CITY, MO., July 31—What the automobile trade would have been this summer had the weather been normal, is beyond imagination. With rain practically every day, a large portion of the territory overflown by rivers, thousands of acres of crops ruined by floods or rains, roads impassable, and conditions such that cars could not be demonstrated—nearly every line of automobiles reports gains over last year.

Where the cars went to, how they did it, the agents and dealers are unable to say. But the records show for them-

selves—the cars are sold; and the factories know of the insistent demands that could not be met for automobiles, for Kansas and Missouri farmers evidently bought automobiles in the rain, to be prepared to use them when the skies cleared. City people bought machines in the rain and used them on the boulevards.

Largest Sales to Country

Many other lines of business send gloomy reports from the small towns and agricultural districts because of the water damage and consequent general depression. Yet, strangely enough, the largest gains in automobile sales seem to have been in sales to the country. It probably would be a fair statement, based on many inquiries, that the lighter and less expensive cars have been the more popular for the farmers. The Maxwell agency at Kansas City, for instance, seems to have fairly definite data that those light and inexpensive cars have gone with a rush into the country, for the gain in sales is over the whole southwest territory, being a gain of at least 50 per cent over the last two weeks of July in 1914. The Ford gain, too, has been very general over the territory. The Bond Motor Company had a hard record to beat in its tremendous sales of July, 1914—but it has exceeded them. It rather seems that the largest advances over 1914 have been made in the medium-priced cars, however; and this extends to both country and city. The Overland has been selling double the number of cars sent out last year, with a slight advantage for the rural trade. The reduction of price is considered one factor. The Studebaker agency was in its usual fix—sold far ahead, and held back for delivery. The Studebaker office has a close line on territory conditions; one phase of the report is enlightening—that in the spots actually flooded there has been a decrease in sales, but those spots constitute a small section of the territory. One might judge by newspaper reports that both the States were entirely overflowed; but there were many districts practically unaffected by floods. The continued rainfall damaged crops and set back business, but did not cause serious discouragement. The increases were less pronounced in the higher priced cars; but the Oldsmobile showed a steady advance; the Hudson agency is now enlarging its accommodations because of growing business.

Many Substantial Gains

As the prices rise the percentage of increase decreases. Most of the agencies of more expensive cars have held their own, many showing substantial gains. The Buick agency had a 50 per cent increase over last year's business and reports that it might have been 100 per cent had the cars been available. The Chalmers people also report a 50 per cent increase. The Cadillac sold in excess of 25 per cent over last year's deliveries. The Hupmobile agency does not give out definite information, but declares that the sales increase is equal to if not above that of any previous year for five years past.

Of the more expensive cars the Packard people report a 25 per cent increase of sales over the 1914 season, with a tendency to greater demand at this time, during the last days of July, than has been realized earlier in the present season. The Locomobile reports a 35 per cent increase and the Marmon about the same. The Pierce-Arrow has a little better than held its own with last year's record, which those concerned seem to think was very satisfactory considering the financial situation.

The feeling all around is that the past thirty days have shown a marked improvement over sales earlier in the present year.

$600,000,000 Crops in the Minnesota Section

MINNEAPOLIS, MINN., July 31—Figures almost unbelievable in the crop estimates for Minnesota, for the four Northwestern States, and for the ninth federal bank district, will sound as sweet music in the ears of the automobile manufacturer and distributor and the accessory dealers. They give chance for an estimate of what the automobile trade for 1916 will be, considering that the Northwestern farmer is the heavy purchaser of motor cars in this trade section.

Listen to this: The government estimate July 1 of the total of all crops in the ninth district is $600,000,000, or 800,000,000 bushels. This district centers at Minneapolis, where the bank is situated, and extends from the middle line of Wisconsin and Upper Michigan west to Washington State.

$300,000,000 for Wheat

Fully $300,000,000 will be paid to the farmers of Minnesota, the Dakotas and Montana this year for wheat alone. It is expected to be the greatest small grain crop in the district's history, passing even the bumper yield of 1912. With better weather later in the season it is a question whether the corn crop will not be enormous. Rains in even the near-arid districts of the States mentioned have rushed the wheat crop along fast, have prevented rust, and in every way lent aid toward an enormous yield of grains.

The government crop statement for 1912 placed the four-State wheat yield at 282,389,000 bushels and the estimate for July 1, 1915, was 257,402,000 bushels, but experts find there has been a great improvement since the first day of the new fiscal year. The wheat acreage sowed in the four States is 17,330,000 bushels, and would require only a small improvement per acre to make an enormous gain over the federal estimate.

The oats estimate is 266,747,000 bushels, under the 1912 figures, but an improvement has been marked in this grain also since July 1, 1915. The total barley yield is estimated at 87,668,000 bushels, and the flaxseed yield at 15,799,000.

$410,624,000 from Farming

In this connection it must be remembered that the prices for grains are higher than last year, so that the farmer is to receive a sum total in cash greater than last year, both because the prices and the crop are much greater. Wheat, instead of being 70 to 75 cents per bushel, as last year, ranges just now well above the $1 mark. Bumper crops and war time prices furnish the glowing outlook in which the automobile dealer is to participate.

As for Minnesota, farm experts figure that the agricultural returns in new wealth this year will be $410,624,000. This should mean financial and industrial peace and purchasing power. Farming is well diversified in this North Star State. William Magivny, president of the Union Stockyards, South St. Paul, puts an estimated value on hogs to come in in 1915 at $33,000,000. Most of them will come from Minnesota. The estimate is 2,250,000 hogs. Last year the record was only 1,500,000. The cash estimate last year was $19,000,000 at this time, so the present ontlook is for nearly double the valuation of a year ago in live pork. In cattle and calves the expected gain is $11,000,000 for 1915.

In the State the corn valuation loss will be $5,000,000, or 15 per cent, as compared with last year. Increased acreage of wheat reduces barley, rye and hay, and leaves oats at the same as last year. The wheat crop will be $63,000,000. In Minnesota there are 1,186,000 milch cows. It is the bread and butter state of the Union, and to an even greater extent in 1915, because there are 26,000 more milch cows than last year. Low prices will permit an advance of only $1,000,000 in dairy products for this year for the State, but the production is to be $70,000,000.

In potatoes alone the yield is expected to be $10,000,000. The crop has just begun to move. The crop is being financed just now on the basis of 35 cents per bushel to the farmer. Quality and quantity are good. The government estimate July 1 was 275,000 acres planted, which gives a total of 28,303,000 bushels.

Bank Deposits Increase

On top of this the net increase in deposits in State banks for the year ending July 1, 1915, was $10,291,510, to a

total of $49,822,205, to which may be added $12,815,376 savings deposits, $101,195,450 time certificates and $468,-599 in demand certificates.

Population Gains

The directory estimates of the populations of Minneapolis and St. Paul show an increase in one year of 15,319, making Minneapolis a city of 360,357 and St. Paul 276,140. The government census in 1910 placed the population of Minneapolis at 301,408 and St. Paul at 214,744. To give another angle, the government estimate of population for July 1, 1915, is as follows: Minneapolis, [illegible]; St. Paul, 241,999; Duluth, 91,-[illegible]. These are gains respectively of 17.2 per cent, 12.8 per cent and 17.04 per cent. These are the largest of the cities of the State and reflect the gain average prevailing throughout the Northwest. The State's gain in five years is 171,053, or a total of 2,246,761.

Another form of prosperity is to be felt in the State when the Minnesota [illegible] Co. opens its new plant near Duluth, Nov. 1. It is an enormous institution which is to manufacture Minnesota's ore into pig and other products right on the ground. The coke ovens will be in operation Sept. 1.

Cars in Minnesota

In Minnesota, by July 31, a total of 82,-[illegible] motor cars were registered with the Secretary of State at St. Paul, and many more are in sight as the 1916 models are distributed to owners. South Dakota will increase between 20,000 and 30,000 cars, and other Northwestern States correspondingly. In Minnesota this year the Secretary estimates 100,000 cars will be registered. The licenses are for three years.

These figures of new wealth coming are impressive, because the Northwestern farmer finances his own crops now, collect, and having about paid up his indebtedness for land and machinery and cattle, will be ready to buy automobiles again in September, after a drought through July and August while he harvests his crops.

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Republic Truck Business Grows

ALMA, MICH., July 30—General Manager F. W. Ruggles of the Republic Motor Truck Co. of this city reports that during the fiscal year the company's truck sales increased over 800 per cent, 90 per cent of the total output of the factory being consumed in the United States.

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August 7 Ford Day in Venice

VENICE, CAL., July 21—The 72 Ford dealers of southern California are to join with the city officials of Venice in making the first annual Ford Day at Venice, August 7, the greatest automobile celebration ever held in this end of the State.

Washington and Oregon Market Good

TACOMA, WASH., July 30—Automobile business throughout the Pacific Northwest, which includes the large centers Seattle, Portland, Spokane and Tacoma, for the week ending July 31, showed a substantial gain over the same period during 1914. The dealers in these centers have looked to the surrounding country for the bulk of their business and have not been disappointed.

In the low-priced field dealers report an increase of 50 per cent over the previous year's business with the Ford car leading, the increase being between 75 and 100 per cent. These dealers are most optimistic, and being able to make prompt delivery, many actual sales result.

Medium-priced cars are finding a ready market, the increase being in excess of 50 per cent over last year's business. The Overland and Dodge are tied for first place in the amount of sales. Although a number of dealers in this class have been forced out on account of conditions, those remaining are staple and their only handicap is slow deliveries. In many cases deposits have been made on Dodge cars ninety days in advance of deliveries.

In the higher-priced field the demand has been limited. The increase, if any, is small. However, buyers with means are investing in cars instead of loaning their surplus money as heretofore. The Cadillac eight has proved most popular in this section.

Improved road conditions in both Washington and Oregon, good prices obtained for berries and wheat, and a slightly better lumber market, have been the chief causes for increased automobile sales in this section. The optimistic reports of dealers have been checked by the increased number of licenses issued to date. Used car dealers report that the demand exceeds the supply. Banks in all large centers have placed their indorsement on automobile paper.

Rocky Mountain Dealers Want Cars

DENVER, COL., July 31—Sales increases ranging from 40 to 300 per cent over the second half of July, 1914, and a common cry on part of dealers that they can't get enough cars to fill their orders, are the leading features of the automobile trade situation in Colorado and adjacent territory in the Rocky Mountain region. And prospects are considered as being highly encouraging for the 1916 season, with a favorable crop outlook in general and a gradual revival of the mining industry in progress. The 1915 season in general shows a business running as high as four times that of the 1914 season for some makes, and several dealers predict another doubling of their sales during the 1916 season. This condition holds true throughout the Rocky Mountain territory covered by Denver distributors generally, which includes Colorado, Wyoming, New Mexico and parts of Utah, Arizona, Kansas and Nebraska.

Gains 25 to 300 Per Cent

In the low-priced field, the last half of July this year shows a sales increase of 25 per cent for the Studebaker and Reo, 50 per cent for Overland, 60 per cent for Ford, 100 per cent for Maxwell, 150 per cent for Metz, 200 per cent for Buick and 300 per cent for Chevrolet. All these lines also show a substantial increase in the total 1915 business over 1914, ranging from 50 per cent for the Studebaker up to 300 per cent for the Metz.

In the medium field, the July comparison shows a gain of 25 per cent for the Franklin, 40 per cent for the Hudson and 80 per cent for the Cadillac. On the entire season basis, the gain has been about 40 per cent for the Hudson, 43 per cent for the Cadillac and 50 per cent for the Franklin.

In the high-priced field, the Pierce business is practically the same as last year and the Packard sales have doubled during the last half of July. Sales in both these lines have been held down seriously by a shortage of cars, the Pierce people getting this week the first car they had been able to place on their floor since April. On the yearly basis, the Pierce has made a gain of 40 per cent and the Packard business has doubled.

Cars Scarce—Orders Many

The Ford assembling plant in Denver has been unable to get enough parts to keep running, and the reduced price announcement is counted upon to give August a heavy gain over the July orders. Prospective buyers have been holding off for this new price. The Buick, Maxwell, Chevrolet, Overland, Studebaker, Reo, Franklin and Hudson are also handicapped by inability to get cars fast enough, and all figure on a heavy business on the 1916 models. There were 652 Buicks sold in Colorado for 1915, as against 370 for 1914, and the 1916 forecast sets the mark at 1000. Similar illustrations of gains and prospective gains could be furnished by several other makes.

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Disco to Increase Output

DETROIT, MICH., Aug. 2—The Disco Electric Starter Co. has taken necessary steps for increasing its output. Additional machinery is to be installed and the working force increased. Recently the company received a contract for its starters from the Lycoming Foundry & Machine Co., Williamsport, Pa., which makes automobile motors.

Denby Buys Briggs Factory

Truck Maker Secures Buildings and 6 Acres for $63,500—To Move in Soon

DETROIT, MICH., Aug. 2—The Denby Motor Truck Co. has purchased from the Detroit Trust Co., trustee, the property of the bankrupt Briggs-Detroiter Co. for $63,500. This property consists of the factory buildings and about 6 acres of land. The Denby company will move into this plant within the next few weeks.

Detroit Co. Personnel Complete

DETROIT, MICH., Aug. 2—The personnel of the newly organized Detroit Motor Car Co. is now completed, and consists of Alfred O. Dunk, president and general manager; Wallace C. Hood, general sales manager; H. B. Merrill, assistant general manager and factory superintendent; Robert T. Yeats, director of exports; Frank M. Eldredge, advertising manager; T. J. Holihan and W. S. Yale, purchasing agents.

Can't Use Akron Tire Co. Name in Pennsylvania

PHILADELPHIA, PA., Aug. 2—Judge Sulzberger in Common Pleas Court No. 1 issued a preliminary injunction restraining the Akron Tire Co., of New York, from using that name within the State of Pennsylvania. The suit was brought by the Akron Tire Co., Philadelphia, dealer in tires made at the factory at Akron, Ohio.

Pennsylvania Wins Vacuum Tread Suit

WILMINGTON, DEL., July 31—The Pennsylvania Rubber Co., Jeannette, Pa., won its suit here this week in regard to the sale of Dreadnaught Vacuum Tread seconds. Judge Bradford held that the Pennsylvania concern was entitled to an injunction prohibiting the sale of Dreadnaught Vacuum Tread seconds without the words "Made by the Dreadnaught Tire & Rubber Co." in raised letters on the side of each tire unless the words "Vacuum Tread" be obliterated. The Dreadnaught interests are also enjoined from directly or indirectly stating that their seconds are those of the Pennsylvania company.

The vacuum tread of the Dreadnaught tires differs from that of the Pennsylvania in the design of the cup, the latter being shallower than the Pennsylvania cup and having a bar across the depression. The suit was in the U. S. district court for the district of Delaware.

Steel Market Strong

NEW YORK CITY, Aug. 3—The steel market for last week continued strong, with a large demand for high-grade steel for war munitions more pronounced. There was heavy trading and on Thursday the prices on steel made an upward trend. Bessemer steel made a small gain of 50 cents while that of open-hearth steel rose from $22.50 to $25, a total rise of $2.50. The operations of the steel mills are above 90 per cent capacity. The copper markets still remain dormant with very little trading going on. There are no inquiries from either domestic or foreign sources. The production is expected to be maintained over the month of August. In some quarters it is expected that the record-breaking figures of July will be excelled by the August output. Gasoline market prices took a jump of 1 cent a gallon, making local deliveries 13 cents. This is the first jump gasoline has taken in several months. The tin market advanced a quarter of a cent yesterday on heavier deliveries on consumption. The upward tendency noted yesterday caused some consumers to cover, but buying did not reach large proportions, most of the consumers being fairly well supplied. The rest of the metal markets remained dull with very little trading. The market for crude rubber lacked new features yesterday. Trading continued quiet.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.31	.31	.31	.31	.31	.31	.....
Antimony	.35½	.35½	.35½	.35½	.35½	.35	—.00½
Beams & Channels, 100 lb.	1.36	1.36	1.25	1.25	1.25	1.25	—.11
Bessemer Steel, ton	21.50	21.50	21.50	22.00	22.00	22.00	+.50
Copper, Elec., lb.	.18½	.18¼	.18¼	.18¼	.18¼	.18¼	—.00½
Copper, Lake, lb.	.19¼	.19	.19	19¼	.19	.19	—.00¼
Cottonseed Oil, bbl.	6.00	5.96	5.96	5.92	5.85	5.94	—.06
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.12	.12	.12	.13	.13	.13	+.01
Lard Oil, prime	.87	.87	.87	.87	.87	.87	.....
Lead, 100 lb.	5.50	5.47½	5.45	5.37½	5.37½	5.25	—.25
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	22.50	22.50	22.50	25.00	25.00	25.00	+2.50
Petroleum, bbl., Kan., crude	.40	.40	.40	.40	.40	.50	+.10
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	.....
Rubber, Fine Up-River, Para	.60	.59	.59	.58	.58	.58	—.02
Silk, raw, Ital.	..	..	3.75	..	..	3.80	+.05
Silk, raw, Japan	..	..	3.40	..	..	3.40	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	36.00	35.75	35.75	35.00	35.00	35.25	—.75
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

$4,467,453 for Paris Bus Co.

French War Dept. Compensates for Vehicles Requisitioned—No Buses in Paris

PARIS, July 18—The sum of $4,467,453 is the global indemnity paid by the French War Department to the Paris General Omnibus Co. for vehicles requisitioned since the outbreak of war. As the omnibus company had 1120 motor omnibuses in its eleven garages at the outbreak of war, and as all of these were seized immediately, the average price per motorbus works out at $3,988.80. In reality, however, the price per bus is lower than this, for the army seized the bus company's big stock of benzol, spare parts and spare tires.

The arrangement between the French government and the Paris General Omnibus Co. was that as soon as mobilization was declared the entire fleet should pass into the hands of the military authorities. Thus, when the army order was posted on the afternoon of Aug. 1, 1914, the whole of the buses on the streets returned to their depots and were converted into meat wagons. This work was done in the omnibus company's own body shops and was carried out with such rapidity that within 48 hr. not a motor bus remained in the city of Paris. After a year's active service the army authorities declare themselves thoroughly satisfied with the results obtained from the Paris bus.

Holds Exclusive License

As the Paris General Omnibus Co. holds an exclusive concession for motor bus and trolley car service in Paris, it has been impossible to run any motor bus service within the city since the outbreak of war. A new type of bus has been designed and 100 have been built, but they were immediately requisitioned by the army authorities. There is no hope of the bus service being re-established before the beginning of next year.

Up to the year ending Aug. 1, 1914, the Paris motor buses carried 151,919,920 passengers, being an increase of more than 5,250,000 over the previous year. The bus mileage was 14,513,029, an increase of 382,372 miles, and receipts were $4,268,912, the receipts per mile being 29.414 cents.

Kalb a Kelly-Springfield Engineer—Guilder Factory Manager

SPRINGFIELD, OHIO, July 31—Louis P. Kalb has joined the engineering department of the Kelly-Springfield Motor Truck Co., this city and Walter C. Guilder has been appointed factory manager.

Mr. Kalb was in the designing and experimental department of the Pierce-Arrow Motor Car Co. for the past three and a half years and before that with the Garford Co.

Mr. Guilder was with the Mack Motor Car Co., now the International Motor Co., for several years and more recently with the production department of the Timken-Detroit Axle Co.

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Paige 5 per Cent Dividend — Capital Increased to $1,000,000

DETROIT, MICH., Aug. 3—The Paige-Detroit Motor Car Co. has declared a cash dividend of 5 per cent for August, to be paid on the total new capital of the concern, that is $1,000,000. This dividend will be paid Sept. 10 to stockholders of record Aug. 31. Officials of the company hope that the company will be able to pay a similar monthly dividend, or higher, hereafter. Thus far this year the Paige company has paid 40 per cent on its original capital stock of $250,000.

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Dividends Declared

AKRON, OHIO, July 31—The B. F. Goodrich Co., has declared the regular quarterly dividend on the preferred stock which amounts to 1¾ per cent, payable Sept. 1 to stockholders of record Sept. 20.

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Emerson Business Gains 55 per Cent

NEW YORK CITY, July 30—The Emil Grossman Mfg. Co.'s business this year is running ahead 55 per cent more than in any previous year. Plans are being laid for increasing its output.

Securities Markets Are Dull

Tire Issues Are Lower—Changes Range from Quarter to Eleven Points

NEW YORK CITY, Aug. 3—The securities markets were in a sensitive condition throughout last week as a result of the passing of the U. S. Rubber dividend on Friday. The markets were in a very weak and dull condition all of last week. The gains were few and small, ranging up to 11 points, this being Swinhart's figure. Losses were also small, ranging to 2½ points. Tire issues last week were somewhat lower, Goodrich, Miller and Swinehart being the only ones to show increases. Miller Rubber preferred rose 8 points, with no change in common. Swinehart showed the largest gain when it took a rise of 11 points above that of last week. U. S. preferred shows a gain of a quarter of a point, while Firestone common and preferred and Goodyear preferred remained the same with no change.

Of the car stocks General Motors common is 2½ points lower and the preferred also 2 points lower than last week. Reo Motor Truck stock rose 1½ points, while that of the Reo car company rose 3¼. Studebaker and White made a rise of 2 points. The rest of the securities made no, or very little, change.

The Detroit issues were steady with a few gains. Continental Motors common showed a gain of 20 points in sympathy with the Wall Street prices. Its preferred remained the same as last week. The rest of the changes ranged in gains from ¾ to 2¼ points. In the inactive stocks the only change that occurred was that of W. K. Pruden company with a gain of 75 points. The rest of the stocks remained dull with very little bidding going on.

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McKee with Pathfinder

INDIANAPOLIS, IND., Aug. 2—The Pathfinder Co. has retained Homer McKee as advertising counsel, the new arrangement to take effect at once. W. C. Teasdale retains the presidency of the Pathfinder Co., with W. K. Bromley as secretary and treasurer.

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Dalrymple with Standard Truck

DETROIT, MICH., July 30—G. H. Dalrymple, who has been connected with the automobile industry for the past nine years, and who was formerly with the Speedwell Co. of Dayton, Ohio, has joined the sales staff of the Standard Motor Truck Co. of Detroit, Mich., and will travel in Indiana and Ohio.

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Turner Leaves Lovell-McConnell

NEWARK, N. J., July 30—W. O. Turner has resigned as secretary and director of the Lovell-McConnell Mfg. Co. Mr. Turner has been in poor health for over a year and will take a rest of one or two months.

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Burpee Splitdorf Branch Assistant

PHILADELPHIA, PA., Aug. 2—Thomas F. Burpee has been made assistant manager at the Philadelphia branch of the Splitdorf Electrical Co.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Goodrich Rubber Co. com	220	..	300	..	..
Goodrich Rubber Co. pfd	99	..	101	110	+1
Grossman Castings pfd	98	102	98	101	..
Hupp Car pfd	82	85	70	79	..
Jeffery Motor Co. com	..	102	90	92½	—1
Jeffery Motor Co. pfd	93	96	96	97½	—1
Kelsey Storage Battery Co	50	51	52	53	..
Lee Tire & Rubber Co. com	300	325	506	512	..
Lee Tire & Rubber Co. pfd	107	110	109	111	..
Maxwell Motors Co. com	57	60	177	179	—2½
Maxwell Motors Co pfd	78	80	103	105	—2
B. F. Goodrich Co. com	19	21	51	53	+1
B. F. Goodrich Co. pfd	88	90	103½	104½	—1
Miller Tire & Rubber Co. com	170	185	268	271	—1
Miller Tire & Rubber Co. pfd	97	100	105	106½	..
Moon & Davis, Inc., pfd	97	102½	..	..	..
National Motor Co. com	..	3	15	17	—2
National Motor Co. pfd	3	9	38	42	—2
Springfield Tire Co. com	48	52	..	..	..
Springfield Tire Co. 1st pfd	70	75	84½	86	+ ½
Springfield Tire Co. 2d pfd	85	92	160	170	..
Stewart Motor Co. com	9	10	33	34½	—2½
Stewart Motor Co. 1st pfd	25	30	82	83	—2
Stewart Motor Co. 2d pfd	12	14	29	31	—2
Studebaker Co. com	..	..	196	199	..
Studebaker Co. pfd	..	..	104	106	+8
Submarine Mfg. Co. com	124	127	..	..	..
Submarine Mfg. Co. pfd	105	108	..	..	..
Thomas Motor Car Co. com	..	112	110	115	..
Thomas Motor Car Co. pfd	95	..	..	100¼	..
Velie Motor Car Co. com	10	17	..	70	..
Velie Motor Car Co. pfd	..	50	..	86½	..
Waterloo Rubber Co. com	..	30	36	38½	..
Waterloo Rubber Co. pfd	..	90	92	95	..
White Car Co	19	21	30¾	32	+ ¾
White Truck Co	11	13	17	18½	+1½
Wisconsin Electric Co. pfd	40	50	..	..	..
Warner Speed. Corp. com	40	45	63	64½	—2½
Warner Speed. Corp. pfd	97	98½	105	107	..
Willys Corporation com	27	29	84	85	+2½
Willys Corporation pfd	80	84	101	102½	+2

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Swinehart Tire & Rubber Co.	84	86	88	92	+11
Texas Company	130	131	131½	133	+1½
U. S. Rubber Co. com	44	46	45	46	+1½
U. S. Rubber Co. pfd	96	98	101¾	103	— ¼
Vacuum Oil Co	208	212	204	210	+5
White Co. pfd	107	110	103	108	+1
Willys-Overland Co. com	80	85	134	135½	+2
Willys-Overland Co. pfd	..	93	103	105	+1

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com	..	101	..	90	—1
Chalmers Motor Co. pfd	94	96	95½	97½	+ ¾
Continental Motor Co. com	155	180	225	..	+20
Continental Motor Co. pfd	..	75	82	86	..
General Motors Co. com	74	77	176	181	—2
General Motors Co. pfd	86	88	104	106	—1½
Maxwell Motor Co. com	..	12	32	35	—3
Maxwell Motor Co. 1st pfd	..	41	81½	84	— ¼
Maxwell Motor Co. 2d pfd	..	16½	29	31	—2¾
Packard Motor Car Co. com	..	112	110	115½	+ ½
Packard Motor Car Co. pfd	97	..	..	100¼	..
*Reo Motor Car Co	20¾	21½	32¼	33½	+2¼
*Reo Motor Truck Co	12¼	12⅞	..	18	—1
Studebaker Corp. com	..	..	83½	86	+2¼
Studebaker Corp, pfd	..	..	100	103	+1½

INACTIVE STOCKS

*Atlas Drop Forge Co	19	..	25½	..	— ½
Ford Motor Co. of Canada	..	..	1475	..	..
Kelsey Wheel Co	185	..	205	..	..
*W. K. Pruden Co	..	20½	20¼	..	+ ¾
Regal Motor Car Co. pfd	23	..	..	21	—4

BONDS

General Motors, notes, 6s, 1915	100	101¼	..	..	..
Packard Motor Co., 5s, 1916	95	98½	98¼	..	..

*Par value, $10; all others, $100 par value.

France Orders Machinery Declared

Lathes, Presses, Hammers, Etc., Must Be Brought to Authorities' Attention

PARIS, July 24—A law just passed by the Chamber of Deputies declares that all metal-working lathes, hydraulic and other types of presses, and steam hammers must be declared to the military authorities. A period of ten days is allowed for making the declaration, which is binding on all owners, hirers, or in cases where the owner is absent on caretakers and landlords. The penalty for failing to declare is a fine of $10 to $200, and $10 to $400 for a false declaration.

Affects Automobile Industry

This new law particularly affects the automobile industry of Paris and surrounding district. There are around Paris hundreds of small shops doing work for the big automobile factories or building a small number of automobiles. Many of these shops are well equipped and undertake really high class work. As an instance, practically the whole of the machining of the parts for the Peugeot racing cars is done in the small outside shops and only assembled in the Peugeot racing department. The parts for Panhard motors for racing motorboats are machined outside; much of the special and experimental work for Delaunay-Belleville and Hispano-Suiza, to mention only two high-class firms, is undertaken by the small machine shops. With the large amount of experimental work always in progress in the French automobile industry, this system has become very extensive and has been found to give good results, for it does not disturb the normal output of the factory.

As the tendency of the war department is to attach themselves to the big firms, it is felt that sufficient use is not being made of the small shops. There are also cases where owners of machine shops have been called up for military service, causing their establishments to be closed and the machines to stand idle. The object of the law is to discover exactly what number of lathes, presses and steam hammers is standing idle and to put this machinery into use as early as possible. As it is difficult for a big corporation like the war department to deal with a multitude of small shops possessing two or three lathes each, there will be formed a series of co-operative societies, each under the control of an experienced manager. Where necessary, machinery will be removed from the shops in which it is now inactive and installed in a co-operative workshop. It is considered by the ammunition section of the war department that this system of industrial organization is almost as important as the creation of new shops equipped with new machinery brought from America.

The scheme has already been tested with satisfactory results among the small metal working firms attached to the automobile body building industry. These firms, which specialized in fenders, sheet iron work for automobile bodies, forgings for carrying fenders, windscreens, lamps and searchlights, were individually unable to do any effective work for the army, or to get material for executing private orders. In most cases, too, the owners were unacquainted with the routine necessary to get into touch with the department of the war office responsible for giving out orders. By forming them into co-operative groups, each one under the control of a competent business manager, they have been able to do very valuable work in the production of army field kitchens, mountings for anti-aircraft guns, army wagons, and different kinds of military equipment.

There is little or no change in the French automobile factories, which continue to work at high pressure on army orders: shells, guns, darts, bombs, and special types of automobiles for military purposes. Practically no cars are being produced for the French private trade.

A batch of 500 Jeffery ¾-ton trucks has been received in the French depots. These have come in chassis form, equipped with twin pneumatic tires at the rear. Bodies are to be built and fitted in the French bodymaking shops.

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$216,027 for United States Metal Products Co. Assets in Sale

NEW YORK CITY, Aug. 2—The property and assets of the United States Metal Products Co., this city were sold at auction yesterday under the direction of John J. Townsend, referee in bankruptcy. There were forty-seven parcels in the sale and the total amount realized was $216,027. The creditors' committee bid $204,000 for most of the parcels and the rest went to outsiders for $12,027.

Among the parcels sold were the right, title and interest in the real estate and buildings at College Point, $40,000; patents, trademarks and welding contracts $10,000; recorders and motor trucks, $2,600; office equipment, $2,000. A petition in bankruptcy was filed against the company Nov. 13, 1914, and liabilities were $1,008,550.

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Christensen for Navy Board?

MILWAUKEE, WIS., Aug. 2—Nels A. Christensen, president of the Christensen Engineering Co., and one of the foremost inventors of compressed air appliances in America, may be appointed a member of the new United States naval advisory board.

Pa. Horn Trap Is Hard Hit

Court Orders Verdict of Not Guilty for Harrisburg Club Secretary in Test Case

HARRISBURG, PA., Aug. 2—The horn trap in Pennsylvania was given a hard blow by a decision of Judge Johnson in the Dauphin county court at Harrisburg last week when a verdict of guilty was set aside and a verdict of not guilty ordered by the Court.

Secretary J. Clyde Myton, of the Motor Club of Harrisburg offered himself in the case against a constable and justice of the peace at Middletown, Pa. where a horn trap was maintained during the summer for several years. Each Sunday hundreds of motorists would be caught and notified to pay a fine or costs and the constables and justice made a big "killing." The case was not fought in the court, Mr. Myton pleading guilty but then the case was argued on the grounds that the constables had no jurisdiction to erect the signs and make arrests without the sanction and action of the township authorities.

The victory for the Motor Club shows that "horn traps" cannot be maintained unless signs are regularly authorized by borough or township official boards. Action will likely be taken against the constables and the justice of the peace to recover all money paid to them in the past and it is possible that other more serious charges will be preferred.

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Ban Horns Near Churches

RED BANK, N. J., Aug. 3—Automobilists operating their horns within 500 ft. of any of the local churches during Sunday morning service will be arrested.

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Edenburn A. A. A. Mich. Representative

DETROIT, MICH., Aug. 3—W. D. Edenburn has been appointed Michigan representative of the contest board of the A. A. A.

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License Revoked for Intoxication

HARRISBURG, PA., July 30—State Highway Commissioner Cunningham has revoked the automobile license of Grover Zeller of Warren on information from District Attorney Frank J. Lyon that Zeller had been operating an automobile while intoxicated. Zeller was notified to appear for a hearing but failed to do so.

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Wisconsin May Order Dimmers

MILWAUKEE, WIS., Aug. 2—It is likely that a law requiring every motor car to be equipped with a device for dimming the headlights will be passed by

the Wisconsin Legislature, which is still in session. A bill of this kind was killed in the State Senate, but reconsidered and is now slated for passage. The bill provides that no light shall be used which dazzles the eye, and each car must have a device whereby the light can be dimmed reasonably when within 250 feet of an approaching vehicle. The bill also has a provision that it shall be unlawful to drive a car at such speed that it cannot be stopped within the distance ahead that the driver can see an object the size of a person.

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To Change Drivers' License Requirements in Massachusetts

BOSTON, MASS., Aug. 1—As a result of criticism by Judge Bryan and coupled with several serious accidents the Massachusetts Highway Commission plans to change the system of granting motor licenses to private owners in the future. Judge Bryan, in dealing with a recent case before him, said that he had issued a license to drive any kind of a motor car when, as a matter of fact, the only thing he knew anything about was an electric. He said the system was all wrong. So the commission took the matter up, and it will put into force a ruling that an owner must specify what kind of a machine he wants to drive and will be limited solely to that type.

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Jitneys Stopped in Richmond

RICHMOND, VA., July 30—The jitney ordinance requiring a bond for each car operated in Richmond has driven all the jitney buses from the streets except one, which is testing the validity of the ordinance in the courts. As a result of the suppression of jitney traffic the street cars are packed and many persons were late getting to work.

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1000 Arrests in Pittsburgh

PITTSBURGH, PA., July 30—At least 1000 alleged violators of the traffic and speed laws of the city were served with summons as a result of a crusade instituted by Mayor Armstrong against speed-mad drivers.

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Speed Trap in Orange County

WALDEN, N. Y., July 30—When touring through Orange County beware of the speed trap at Walden. The police are arresting on first offense, giving no warning. The speed limit is 15 m.p.h.

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Disco Gets Two Contracts

DETROIT, MICH., July 29—The Disco Electric Starter Co. has recently closed contracts with the Bimel Buggy Co., Sidney, Ohio, and the Canadian Regal Motor Co., Berlin, Ont., whereby the cars built by these concerns will have the Disco starter equipment on their 1916 models.

New Georgia Law Proposed

Bill Introduced Providing for $4 to $10 Fees on Hp. Basis—Dealers $30

SAVANNAH, GA., July 30—Representative Jones, Coweta County, introduced in the House a bill designed to remedy the defects of the present motor vehicle tax law as emphasized particularly in the recent decision of Judge Charlton in Chatham Superior Court. The bill was drawn following a conference with Secretary of State Cook and Attorney-General Clifford Walker. Its substantial provisions are that each motorcycle shall pay a license fee of $2, automobiles up to 25 hp., $4; from 25 to 40 hp. $7; over 40 hp. $10. Electrics are $5 when used as pleasure vehicles. Commercial vehicles are taxed $10 and automobile and truck dealers $30. From each fee $1 is to be retained as an adminstration fund, and the balance is to be paid into the State treasury as a public road fund which the Legislature may distribute either through a State highway commission or in such other way as it deems proper. The law provided for duplicate numbers to dealers on payment of $2; replacing of lost number for 50 cents and transfer of number to new owners for $1.

It is believed it will be satisfactory to the automobile owners of the State and comply with the defects in the present law as pointed out by Judge Charlton. Estimating upon the basis of the number of automobiles owned in Georgia, as shown by the records of Secretary of State, the adminstration fund would amount to some $30,000. The general road fund would amount to approximately $150,000.

The law will give the Secretary of State the power to appoint inspectors, whose duty it will be to see that the law is enforced.

The feature of the present law which provides for a distribution of the fund by counties according to rural delivery mileage is retained. This will probably have to be changed to conform to the opinion of Judge Charlton.

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Wagenhals Co. Bankrupt

DETROIT, MICH., July 30—The Wagenhals Motor Co. which has been making gasoline and electric three-wheel delivery cars, many of which are being used by the Detroit postoffice department, was declared bankrupt a few days ago in the U. S. district court. The liabilities, according to the concern's schedule, total $13,673.91 of which $3,858.45 is recorded as a priority claim as salary due to General Manager W. G. Wagenhals. The concern claims assets having a total value of $15,100, consisting principally of machinery, tools, equipment, stock and also U. S. letter patent No. 1,030,357.

The first meeting of the creditors is to be held in the bankruptcy court Aug. 12.

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To Reorganize Jagers Manufacturing Co.

RACINE, WIS., July 24—The George W. Jagers Mfg. Co., Racine, Wis., gasoline engines, is about to be reorganized by a committee of creditors. The company ceased operations about three weeks ago because of lack of working capital. It holds a large contract to furnish motors for the Argo Motor Co., Jackson, Mich., and under the reorganization plan new capital will be introduced to fulfill a large number of orders now awaiting production. The creditors' committee has requested all claimants to accept a part-cash, part-note and part-stock settlement of accounts payable and it is expected that with the business in sight there will be no objection to the plan by any of them.

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Hawkeye Tire Co. Formed

DES MOINES, IOWA, Aug. 3—The Hawkeye Tire Co., has been organized here and will build a factory as soon as arrangements can be completed. The company was formed by I. V. McLean who will be its first president. On the board of directors are E. Raffensperger, O. B. Hextell, T. H. Dexter and J. T. Christie. The company will place $200,000 of preferred and $300,000 of common stock on the market. A full line of tires will be manufactured.

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Standard Tire Co. Organized

KEOKUK, IOWA, Aug. 2—The executive council has issued an order authorizing the Standard Tire Co. of Keokuk to issue its stock. This is a new corporation organized here for the manufacture of automobile tires. It expects to operate upon a fairly large scale as soon as its plant is ready.

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Studebaker to Buy Elkhart Plant

SOUTH BEND, IND., July 30—The Conn Musical Instrument factory at Elkhart, Ind., is to be taken over by the Studebakers of South Bend. Colonel G. M. Studebaker and Clement Studebaker, it is stated, have arranged to purchase the property for $800,000.

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Ford Plant for Oklahoma City

OKLAHOMA CITY, OKLA., July 30—An assembling plant that will employ between 300 and 500 men is to be built in this city by the Ford Motor Co. within the next six months. The plant will be situated on the block of ground west of the court house.

Oldfield Breaks Four Records

Cuts Times for 1, 3, 4 and 5 Miles in Exhibition Trials at Cleveland

CLEVELAND, OHIO, Aug. 2—Four world's records for a dirt track are reported broken by Barney Oldfield in an exhibition trial for records held here yesterday under the sanction of the American Automobile Assn. The new times are: 1 mile 0:46¼; 3 miles, 2:25 2/5; 4 miles 3:13 3/5 and 5 miles 4:03 1/5. The former mile mark held by Oldfield was 0:46 2/5. Disbrow held the other records in 2:27.81; 3:17.2 and 4:06.58.

The rules of the American Automobile Assn. provide that all records established for distances under 5 miles shall be timed by an automatic timing device.

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Twin City Speedway Progresses

TWIN CITY, MINN., July 31—The Twin City Motor Speedway work progresses rapidly. Nearly 1 mile of concrete is completed, which is one-half the length of the track. One grandstand is completed, there are to be six and two bleachers. The grading of the track and inclosure is completed and the subways are being built. Two more entries have been made for the 500-mile Derby on Sept. 4, those of Resta and DePalma. The street railway company will construct lines to the grounds if the association will get right-of-way across Fort Snelling reservation from the government and grade it. The speedway location adjoins Fort Snelling, which is between Minneapolis and St. Paul.

Three Peugeot cars have been entered for the World's Derby, Sept. 4, on the Twin City Motor Speedway. They will be driven by Ralph Mulford, Johnny Aitken and Howard Wilcox. The Mulford car was entered by Luther Brown of Orange, Tex., and the other two by the Speedway Association of America. Seat sales for the race are going along rapidly and work is progressing, so that it will be completed by Aug. 15 for the preliminaries.

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Los Angeles Show in October

LOS ANGELES, CAL., July 25—California's greatest automobile show is to be held in Los Angeles the latter part of October. The event is to be known as the Broadway Automobile and Flower Show and is to be held under the auspices of the automobile dealers of Los Angeles.

Councilman J. S. Conwell has been named as manager of the show, and the committee appointed from the motor car dealers includes Ralph C. Hamlin, P. H. Greer and Earle C. Anthony.

In the entire building, which is located in the very center of the business district of Los Angeles, there are 60,000 ft. of floor space. A large share of this has already been sold.

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Parade to Sheepshead Practice

NEW YORK CITY, Aug. 2—Practice for the forthcoming race on the Sheepshead Bay Speedway will be inaugurated by a parade Sept. 18, which will be promoted by the Motor Club of New York, and in which it is expected many New York and Brooklyn dealers will participate. One section of the parade will be for decorated cars for which prizes will be offered. There will also be a prize for the dealer having the greatest number of owners' cars in line. Participants in the parade will be permitted to view the practice free.

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Kokomo Man Wins Saxon Fuel Economy Prize

DETROIT, MICH., July 29—The jury of local newspaper representatives has awarded first prize in the Saxon Motor Co. economy run to C. E. Seaward, Jr., Kokomo, Ind., who covered 327.2 miles, averaging 26.2 miles to the gallon of gasoline and consuming 1 quart of oil.

J. S. Hoffman, Sharon, Pa., averaged 26 2/3 miles to the gallon of gasoline, or better than the winner's record, but he covered a shorter course and had better roads. William P. Knipper, Rochester, N. Y., made a non-stop run of 462 miles, it is said, averaging 24 miles to the gallon of gasoline. Another long run was made by Miss Edna Riesenthal, Milwaukee, Wis., who, it is said, drove 480 miles at an average of 24 miles to the gallon.

A total distance of 26,377 miles was covered by the 105 contestants, who averaged 252 miles each. The average consumption was 1 gal. of gasoline per 21 miles and 1 quart of oil for a distance of 152 miles.

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Portland Plans October Show

PORTLAND, ME., Aug. 1— Maine will probably have the honor of opening the 1916 show season in New England if plans discussed by the Portland dealers go through. They met a few days ago and began arrangements to have a motor show in the Exposition building on Park Avenue in October.

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Lawrence Takes Velie in Chicago

CHICAGO, ILL., Aug. 4—The Velie agency in Chicago has been taken over by J. V. Lawrence who has opened salesrooms at 2530 Michigan Avenue. Mr. Lawrence has for years been a partner with H. Paulman & Co., Pierce-Arrow agent, and will retain his connection with this organization, dividing his time between the two concerns.

Eight Qualify for Des Moines

DePalma Nearly Breaks Record for 5 Miles—More Elimination Trials

DES MOINES, IOWA, Aug. 2—Ralph DePalma and his "Stuttering Stutz" came within 5.6 sec. of the world's record for 5 miles and eight cars and drivers qualified for the Des Moines Speedway races on Aug. 7 at the elimination trials held Saturday. Two cars and drivers failing to qualify were Barndollar with a Clergy Special and Lombardi with an O'Connell Special. Fred J. Wagner was official starter and timer.

97 1-3 M.P.H. by DePalma

DePalma lengthened his elimination mile to a 5-mile exhibition. His first lap, the elimination mile, was in 36.98 sec. or at the rate of 97 1/3 m.p.h. and was the fastest mile of the day, in the eliminations. In the last four laps of his 5-mile exhibition he made three laps in 36.9 each and his time for the 5 miles was 3 min., 4.65 sec., or at the rate of 97.5 m.p.h. Bob Burman made an exhibition 5 miles in 3 min. 8.33 sec. or 95.4 m.p.h. Later he stretched his elimination mile, made in 37 sec., to a 5-mile exhibition which was halted when he blew his outer rear tire in the last lap. He kept the car on the track.

Eddie O'Donnell of the Duesenberg team qualified in two cars, one for himself and one for Ralph Mulford who had not arrived and who will drive one of the Duesenbergs in the big race. Elimination miles were as follows:

Driver	Car	Seconds	M.P.H.
DePalma	Stutz	36.98	97.33
Burman	Peugeot	37.00	97.00
Cooper	Sebring	38.60	94.00
Alley	Ogren	40.20	89.20
Brown	DuChesnau	50.00	77.50
Barndollar	Clergy Spl.	50.00	77.50
Strunk	White Spl.	40.40	89.00
Chandler	Duesenberg	42.33	84.25
O'Donnell	Duesenberg	42.60	84.00

O'Donnell also qualified a Duesenberg car for Mulford. Starter Wagner fixed a minimum speed of 80 m.p.h. for one lap as necessary to qualify for the race. Those which failed to qualify Saturday have two more trials to make good. A. F. Scott, pilot of an Anderson Special, deferred his tryout because of damage to his car.

The ranking of the drivers who qualified Saturday is as follows: DePalma, Burman, Mulford (by O'Donnell), Cooper, Chandler, Alley, Strunk, O'Donnell.

Additional elimination trials will be held on Tuesday and Wednesday afternoons of this week. Indications are that ten cars will qualify for the main event which will be for a distance of 300 miles and for prizes aggregating $10,000.

Thrills at Rose City Speedway

Parsons, Elliott and Lentz Stars in 2-Day Race Meet —Small Attendance

PORTLAND, ORE., July 28—In the Northwest automobile events held here July 24 and 25 the winners were James Parsons, Frank Elliott and Ray Lentz before a crowd of 1500 who gathered at the Rose City Speedway.

The fastest mile of the afternoon, 53 sec. flat was credited to Jim Parsons when each of the drivers were sent away separately with flying starts, but the best time in racing fell to the honor of Frank Elliott, in his Gordon Special, who made the twenty-first and twenty-second laps of the 25 mile event in 54 3/5 sec. each.

In the 25 mile event it was nip and tuck between Parsons and Elliott for most of the distance; Elliott leading for the first 10 miles when Parsons was a nose ahead and it looked as if he was a possible winner, but tire trouble slowed him up and the white Gordon won by inches. Harry Stratton's Mercer, which was piloted by Sig. Tafil, lagged woefully in the rear. The time for the event was 23 min. 23 1/5 sec.

The record time for Portland was established last year when Percy Barnes with the eight-cylinder Romano made the quarter century in 22 min. 7½ sec.

Some of the real thrills of the day resulted when the Gordon Special, Parsons Special and Schneider and Stutz specials were turned loose on the 10-mile event. After grabbing the pole at the start and keeping it for seven laps Elliott was bettered by Parsons, who had to make four consecutive laps in less than 56 sec. to turn the trick. The total time for the event including the start was 9 min. and 25 sec., and the fastest lap was the final one done in 55 1/5 sec. Gus Duray got the upper hand with his Schneider Special, beating Oral Palmer to third place, the latter driving the Stutz piloted by Earl Cooper in 1913.

In the 15-mile event Lentz with Barsby's Velie won easily in 15 min. and 8 sec. Fred Forbes finished second in his Buick.

After winning the first two races in the first day's events in very exciting finishes, Jim Parsons was forced to withdraw from the 50-mile contest, and left Frank Elliott driving his Gordon Special complete master of the situation. Elliott ran away from the balance of the field and finished the 50 miles in 50 min. 27 4/5 sec.

This time would have been very much faster had it not been for the fact that a drove of horses were allowed by the groundkeeper to get out on the track. Harry D. Stratton driving a Mercer special finished second, and Gus Duray, in Schneider special, third. Fred Forbes, driving his Buick Special, was a close contender for second honors for twenty-four laps, when he was forced to the pits with valve trouble.

Parsons took the special match race of 3 miles from Ernest Schneider after being forced to drive the fastest three laps made during the meet. Parsons finished in 2 min. 51 3/5 sec.

The Velie special driven by Ray Lentz was the star performer in the second flight of cars, winning both the 5-mile and 10-mile race, but was forced out of the big race in the sixth lap on account of engine trouble.

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Properly-Designed Muffler Can Increase Power Output

LONDON, ENGLAND, July 30—Increasing the horsepower of an engine by adding a properly designed muffler is proven in a recent issue of *The Autocar* in which experiments are described by one, C. J. Booth, who with a standard four-cylinder engine, 100 by 140 mm. (3.93 by 5.51 in.), was able to show an increase in horsepower by fitting satisfactory mufflers, as compared with the power generated when neither muffler nor exhaust manifold was fitted. With the engine operating at 1750 r.p.m., the horsepower obtained without a muffler or exhaust pipe was 41.75; when long straight exhaust pipes which ran with easy sweeps into one exhaust pipe were added, the power was raised to 44.5 hp.; when the standard muffler used on the car with the standard exhaust pipes was fitted the horsepower was 36.75, or less than without exhaust pipes or muffler; and finally when this standard muffler was taken and modified the horsepower output was increased to 42, which was in advance of that obtained without muffler of exhaust manifold.

At lower crankshaft speeds similar results were obtained, although not so prominent. The accompanying table shows the results at different crankshaft speeds. The tests were made with an ordinary electrical dynamometer. The type of muffler used was a simple one, having an expansion chamber divided by three baffle plates. By removing two of the baffle plates, it was possible to obtain increased power as shown in test 4 in the tabulation.

Power Tests With and Without Muffler at Different Speeds

Engine r.p.m.	Test No. 1 with Standard Silencer Hp.	Test No. 2 without Silencer or Exhaust Pipe Hp.	Test No. 3 with Exhaust Pipe Only Hp.	Test No. 4 with Standard Silencer Modified Hp.
500	14	14¼	14¼	14¼
750	22½	23½	23½	23½
1000	28½	30¼	30½	30¾
1250	33¼	36½	37¼	36¾
1500	36	40½	42	41
1750	36¾	41¾	44½	42

Europe Developing 8's and 12's

To Appear on Market After the War—Aviation Practice of Value

PARIS, July 26—If the war had not intervened, it is certain that the 1915 European shows would have marked the appearance of twelve-cylinder motors. In England the Sunbeam company has produced a twelve for aviation purposes, and is already supplying this type of motor in big quantities to the British and French flying corps. It is understood that Sunbeam has made all arrangements for producing a car with a twelve-cylinder motor, but this cannot be offered to the public, for the entire output of the factory has been requisitioned for military purposes. It is declared that the car is fitted with two speeds only, the low gear being for starting away and emergency service, for the motor will be capable of doing 99 per cent of its work through direct drive.

Renault is also credited with the production of a twelve-cylinder motor which will first be used on aeroplanes. Up to the present Renault has devoted all his attention to the building of eight-cylinder V-type air-cooled aviation motors, in which field he has been very successful. The demand is for bigger and more powerfully armed aeroplanes, necessitating the use of motors from 200 to 300 hp. In very many cases these new flying machines have been fitted with two purely aeroplane type motors of 120 to 150 hp. each, the type of motor most commonly used being those with seven or nine fixed cylinders around a circular crankcase. The value of the big, heavily armored aeroplane having been proved, the call now is for very big light-weight, water-cooled twelve- and eight-cylinder motors. It is not known whether Renault has any intention applying his twelve-cylinder motor to cars, but there is no doubt that the experience gained in the air will be useful on the road.

What Makers Are Doing

Engineer Henry, who was responsible for the design of all the Peugeot sixteen-valve racing motors, has presented to the army his first series of eight-cylinder thirty-two-valve aviation motors of the

same general design as the four-cylinder motors used in European and American races the last two or three years. Henry has produced these motors in conjunction with Despujols and Barriquand, having severed his connection with the Peugeot company. Lorraine Dietrich is producing a six-cylinder aviation motor of the same general design as the Mercedes engine. Fiat has built a large number of motors of this type. Clerget, a leading French aeroplane motor specialist, has opened a big factory in Italy for supplying aeroplane motors to the Italian army. Canton-Unné, another aeroplane motor specialist, is now building in Russia, in addition to running a French factory which has been tripled since the outbreak of war.

Not on American Scale

Several French car factories have studied the eight-cylinder situation very closely and have practically decided to put an eight on the market as soon as the war is over. At the present time it is impossible to do more than the experimental work. Although the eight and the twelve are attracting interest, it is certain that they will not be built in Europe in anything like the same proportion as in America. The point is that aviation developments are tending toward the eight and twelve fixed cylinder motor, in preference to the seven and fourteen rotary, and this tendency will have its influence on the automobile situation.

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Many Sales on Ohio Tour

COLUMBUS, OHIO, July 31—A booster automobile tour under the auspices of the *Ohio State Journal* was pulled off last week with excellent results by a general committee representing car agents and dealers in accessories. Stops were made at Lancaster, Circleville, Washington Court House, Chillicothe, Springfield, South Charleston, London, Plain City, Marysville, Delaware, Marion, Mout Gilead, Fredericktown, Mount Vernon, Utica and Newark.

From the business standpoint all of the agents who participated believed it was a good thing. Many prospects were secured, and it is planned to run such a tour each year. About a score of cars were represented in the tour.

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Carolina's Wholesale Supply House

CHARLOTTE, N. C.—The Carolinas Automobile Supply House, Inc., has been formed to handle automobile accessories in a wholesale way throughout the two Carolinas. The company will make a specialty of parts and accessories for Ford cars. Joseph G. Fitzsimons is president and general manager, William A. Graham, vice-president, and Wade A. Montgomery, secretary and treasurer.

Dealer to Pay Car Freight

Los Angeles Distributor Will Sell for Cash Only—No Used Cars

LOS ANGELES, CAL., July 27—Lynn C. Buxton, distributor of the Moon and Lexington lines in southern California, has created a sensation throughout the automobile industry of this section by announcing that he will pay the freight on all cars sold in his territory. Buxton further announced that in the future he will sell for cash only, making no time deals and taking in no used cars on new models.

In the past the freight has always been added to the purchase price of cars sold in southern California and on the large machines this has meant a great increase in first cost. Selling for cash, the local dealer is selling all cars at the factory price, something unheard of before in southern California.

The majority of the Los Angeles dealers operate used car departments, but Buxton intends to eliminate the used car from his business through his cash sales system.

—

Packard Takes Over Boston Service Station and Salesrooms

BOSTON, MASS., Aug. 1—Papers were filed in the registry of deeds at Boston this morning transferring from Alvan T. Fuller to the Packard Motor Car Co. of Detroit, Mich. the big service station and salesrooms of the Boston Packard branch. The stamps on the papers indicated that the sale represented $285,000. That is about the value of the building.

Mr. Fuller could not be seen all day, and at the office of his company when it was stated that the inference from the sale would be that the Packard Motor Car Co. of Detroit had taken the business over as a branch some of the subordinates stated that such was not the case. But they would go no further in saying anything.

In taking over the Boston business the Packard company would also have to take over the Providence and Portland business controlled by Mr. Fuller to make the matter complete. So the entire transaction would represent at least a deal involving $1,000,000.

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Capt. Ryus Heads California Oldsmobile Sales Forces

LOS ANGELES, CAL., July 26—Capt. Harmon D. Ryus, one of the oldest men in the automobile industry of California in point of service, who for the past five years has been manager of the Oldsmobile factory branch at Los Ang is now president and general man of the Oldsmobile Co. of California.

With F. G. Seager of New York Pasadena, Cal., Captain Ryus purch the Los Angeles and San Francisco tory branches and the Pacific Co agency for the Oldsmobile. This age territory includes California, Oreg Washington, Arizona, Nevada, the waiian Islands and western half Idaho.

The San Francisco branch will be charge of Captain Ryus, and the m offices of the Oldsmobile Co. of Cali nia will be located in San Franci The branch and agency connections now being completed.

With the exception of Larson, N York distributor, the company of wh Ryus is now head is the largest O mobile distributing organization.

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Limousine Top Co. Formed

KALAMAZOO, MICH., July 31— Limousine Top Co. has been formed to manufacture demountable tops in for manufacturers of automobiles, ers and distributors of certain mak cars and for individual car owners. company is capitalized at $30,000, a composed of James D. Bobb, Loren Bennett, David H. Harris, Frank H. ham, W. D. Milham, Burton E. Ba W. E. Kidder, Glenn S. Allen, Har Vander Horst, George J. Putt, Jam Dewing, Dr. W. E. Upjohn, Frank ner and Vernon T. Barker. The com has already secured a number of tracts and expects to increase its fo mechanics to 100 or 150 in the future. In addition to making dem able tops the concern plans the m facture of bodies and a line of sories. Factory quarters are in th Michigan Buggy Building.

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Don Lee Gets Oakland

SAN FRANCISCO, CAL., July 29- Lee, who long has represented the lac in northern California, has been distributor for the same territor the Oakland. The branch which th land company has maintained i Francisco will be discontinued. Roberts, Pacific Coast sales manag the Oakland company who w charge of the branch, will maint office at the Don Lee headquarters

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$200 Fee for Filling Station

DENVER, COL., July 29—A license fee of $200 for motor car stations is provided by an ord just passed by the city council. new law is interpreted as applyin to the regular filling stations th exclusively in gasoline and oil, a to garages. Denver now has six these filling stations, which ha

been installed during the last two years. Some of the filling station proprietors claim the law is unjust and that it involves class legislation. Little hope is expressed of getting the measure set aside, however. The new ordinance is regarded generally as likely to prove a benefit to garages.

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To Distribute Dolly Madison

INDIANAPOLIS, IND., Aug. 2—The Darmie Motor Sales Co. has been formed here to take over the distribution of the Dolly Madison car manufactured by the Madison Motors Co., Anderson, Ind.

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Retlaw Sales Co. Formed

DETROIT, MICH., Aug. 2—The Retlaw Sales Co. has been organized with offices in the Dime Savings Bank Building, to act as distributor for the Retlaw Mfg. Co. manufacturer of gasoline and oil gages and special gasoline gages for Ford cars. Frank J. Burrows, who was purchasing agent for the Briggs Detroiter Co. and F. W. Marschner are interested in the sales company.

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More Territory for Haynes Distributor

ST. LOUIS, MO., July 31—All of Arkansas and part of Kentucky have been added to the territory in which the Newell Motor Car Co. of St. Louis represents the Haynes factory. The local company already has the agency for Missouri and southern Illinois.

President James E. Newell says he will establish a branch at Little Rock, Ark., soon and will put several additional salesmen on the road.

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To Distribute Reo in Nevada

RENO, NEV., July 31—The Durham Sales Co. was organized July 10 with a capital of $25,000 with the following officers. C. W. Mapes, president, J. C. Durham, vice-president and general manager, T. R. Gibson, secretary, Washoe County Bank, treasurer. The Durham Sales Co., Inc., is direct factory distributors for Reo cars and trucks in Nevada, Mono, Alpine, Plumas, Sierra, Nevada, Lassen and Modoc Counties in California and Klamath and Lake Counties in Oregon. A complete line of accessories and parts will be carried.

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Pullman New York Agency Discontinued

NEW YORK CITY, Aug. 3—The Kent Motors Corp. has been formed to take over the Pullman Sales Co., 1704 Broadway, the Pullman agency having been discontinued. The Kent concern will handle the Abbott and Marion and will continue Pullman service work until other arrangements are made.

Fourteen Methods of Examining Motor Fuels

(*Continued from page* 249)

with the lower boiling point at 80 degrees lacks the volatile components which make the motor responsive to acceleration. The conception of an ideal motor gasoline should be changed in the way of modifying the demand for narrow boiling limits by insisting on light components, which means with boiling points 40 and 100 or 110 instead of 80 and 120 degrees.

When three gasolines of 80 and 90, 90 and 100 and 100 and 110 degree limits are mixed, there is obtained a fluid containing about 25 per cent of components which do not boil above 100 degrees and with a specific gravity of .740. Its period of evaporation is about 3 hours and its price 1.50 mark per kilogram. Despite its narrow boiling limits it is not an ideal motor gasoline.

In the proposed classification, the boiling limits for class A are to be given as 40 and 125 degrees with not more than 10 per cent distilling above 100 degrees C.

For class B the limits may be 45 and 140, with at most 30 to 50 per cent above the 100-degree boiling point, and for class C 65 degrees lower limit, 150 to 170 degrees upper limit, with not more than 75 to 80 per cent above the 100-degree limit.

13. Refractometer Test

Petroleum is optically active. Oils of resin, fats, turpentine, gasolines and benzols can be distinguished from each other by spectral observation with a refractometer. The use of this means for testing motor fuels has been theoretically considered before, but was never applied in practice.

In the present series of examinations it was found that with the large Zeiss-Pulfriech refractometer could be used successfully for determining the refractometer degree. The lamp employed was one indexed Ia ND 1,62100, and the readings taken of the refractometer degree were recorded after converting them into the corresponding angles of refraction, as the differences in this manner become more prominent.

The refractometer degree at a temperature of 20 degrees is to be determined, in each instance, by leaving the fluid to be tested for several hours in the room where the test is to be made, so that both the instrument and the research material will acquire the temperature mentioned, which is maintained in the room. It is recommendable to cover the container of the test fluid with a glass lid during the process of examination to avoid evaporation which, in the case of light gasolines, causes blurring of the boundary line and leads to inaccurate reading of the refractometer degree.

This degree varies for motor gasolines from 50 to 59 and is highest for the most perfect fuel. Class A should have a refractometer degree not lower than 54, class B not below 53 and class C at least 50.

Benzols have a much lower refractometer degree, varying from 37 to 38. But a crude lighting benzol cannot be distinguished from a pure motor benzol by means of the refraction of light, while different gasolines can be classified by this method, without rendering fractional distillation superfluous, however. The refractometer degrees of toluols are slightly higher than those of benzols, and those of xylols still higher. A benzol with strong aromatic components will therefore register a little higher by this measure than motor benzol.

Motor alcohol shows a refractometer degree of 58 to 59, and the test can therefore be used to advantage for proving an admixture of alcohol to benzol.

As pentane shows the highest (59° 30) and heptane (53° 49) and olefines low refractometer degrees, good and light gasolines contain more pentanes and other grades more hexane and heptane.

Among the fractional components of gasolines those boiling above 100 degrees C. show the lowest refractometer degree and those boiling below 100 degrees the highest, while that of the gasoline as each lies in the middle. With benzols the opposite is the case, the heavier components having the highest refractometer degree. [Dr. Dieterich here furnishes a list of the refractometer degrees for a scale of fuel mixtures produced synthetically by mixing normal gasoline with pure benzol in different proportions; also for the isolated fractional components.]

It is noted that the refractometer degree for a mixture of gasoline and benzol in equal parts drops to 48, and the test can therefore be considered of practical utility, being in itself simple and quickly made.

Test No. 14 relates to prices, which of course should be in harmony with the properties revealed by the other 13 tests and with the classified specifications listed in the previous instalment.

Foster Gear Plant Rushed—J. B. Foster, secretary-treasurer of the Foster Gear Co., Columbus, Ohio, says orders for steering gears are being received so fast that it is a difficult matter to keep up deliveries. The company now has about sixty-five men on its payrolls and plans are being made for an addition to the plant. An order for 18,000 sets of steering gears has been reecived recently and there are orders for about 25,000 more in prospect.

Hess-Pontiac Works Busy—The Hess-Pontiac Spring & Axle Works, Pontiac, Mich., are taking on as many men as they are able to get in anticipation of the busiest year they ever had. This concern's output is largely taken by the Ford Motor Co. For quite a while efforts have been made to get skilled labor and it is said that the factory managers are paying the moving expenses of families coming from far distant localities.

Pierce-Arrow Storehouse—Erection is well under way in Buffalo, N. Y., of a new warehouse for the Pierce-Arrow Motor Car Co. The building will be four stories without basement, and measures 453 by 61½ ft. Construction is reinforced concrete with mushroom floors, the spans being 20½ ft. The lower floor, which is of wooden blocks on concrete base, is located directly on the ground. A covered platform alongside, at the height of the sills of railroad cars, is fitted for the receipt and shipping of motor truck parts, the transfer between the platform and building being by means of three short-lift elevators. The upper floors are finished with granolithic top. The building has steel sash with wire glass. Steam heating will be used—a departure from the blower system in use elsewhere in the plant.

Seek Skilled Labor—The Detroit Pressed Steel Co., Detroit, Mich., last week attempted to fill its urgent requirements for skilled labor by sending a representative to Milwaukee, where the newspapers were liberally patronized for "want ads." So many positions are open in Milwaukee, however, that the company met with little success. The free employment office operated in Milwaukee by the Wisconsin Industrial Commission is unable to fill all the calls for skilled help that are sent in by Milwaukee and southern Wisconsin manufacturers, particularly in the motor car trade. The Mitchell-Lewis Motor Co., Racine, Wis., sent a hurry call to the bureau last week for fifty machine hands, but was able to get only half that number. The Racine company at the same time left a standing order for all the experienced motor car factory help that could be procured, and men are being sent to Racine as rapidly as they present themselves. The situation is considered unprecedented, for not in many months has there been even a semblance of an urgent demand for skilled labor.

New Chevrolet Plant—Ground was broken recently on the new plant of the Chevrolet Motor Co., Detroit, Mich. This plant will be used for the manufacture of motors and will employ 1100 mech ics. The building, 616 by 150 ft., story, with 2⅛ acres of floor space, be ready for operation by Sept. 15.

With a view to being prepared further expansion, the company wi the last three weeks has acquired p erty on both sides of the Flint Rive the Fourth and Fifth wards sufficie care for all future development.

The new property acquired incl about a dozen residence buildings must be removed, some of them w the first new structure will be built west of the Mason Motor Co., one o Durant companies, which was acq by the Chevrolet company recently, while it will continue to be conduct a separate institution with a sep organization, its function will be to all of the motors for the Chevrolet p in Flint, New York City and Tarry With the new building the prod will be increased to 1000 motors a

The Mason plant is working nigh day shifts with a force varying fro to 750. With the completion of th building the day force will probab increased to about 1500.

Gray & Davis Employee's Out Some 2000 employees of Gray & Inc., Boston, Mass., together with families, attended the annual field Wakefield July 31. Field sports game, tug-of-war, water races, etc nished interesting events in the pr It required forty-seven trolley c transport the operatives from Bos the grounds.

The Automobile Calendar

Aug. ..... Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.

Aug. 2-3 ..... San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.

Aug. 7 ..... Des Moines, Ia., Speedway 300-Mile Race.

Aug. 7 ..... Chicago, Ill., 100-Mile Match Race, Chicago Speedway.

Aug. 7 ..... Rockford, Ill., Hillclimb, Rockford Motor Club.

Aug. 20-21 ..... Elgin, Ill., Road Races.

Aug. 30 ..... Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.

Sept. ..... Peoria, Ill., Second Northwestern Road Congress.

Sept. 4 ..... Twin City, Minn., 500-Mile Race; Twin City Motor Speedway Co.

Sept. 6-10 ..... Indianapolis, Ind., Show, Indiana State Fair.

Sept. 6-15 ..... Detroit, Mich., Show, Michigan State Fair.

Sept. 8-11 ..... Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.

Sept. 13-17 ..... Oakland, Cal., Pan-American Road Congress.

Sept. 17-18 ..... Peoria, Ill., Illinois Garage Owners' Assn. Convention.

Sept. 18 ..... Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.

Sept. 18-25 ..... Los Angeles, Cal., Show, Shrine Auditorium.

Sept. 20-25 ..... San Francisco, Cal., International Engineering Congress.

Sept. 24 ..... Indianapolis, Ind., S. A. E. First Section Meeting.

Sept. 27-Oct. 10 ... Denver, Col., Show, International Soil Products Exposition, Automobile Trades Assn. of Colorado.

Oct. ..... Dallas, Tex., Show, Dallas Automobile Dealers' Assn.

Oct. ..... Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.

Oct. 1-2 ..... Trenton, N. J., Track Races; Inter-State Fair.

Oct. 2 ..... New York City, Sheepshead Bay Motor Speedway Track Meet.

Oct. 2-9 ..... Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.

Oct. 3-10 ..... St. Louis, Mo., Show est Park Highla Louis Automobile facturers and Assn.

Oct. 6-16 ..... New York City, Nin trical Exposition tor Show at Gra tral Palace.

Oct. 11-12 ..... Dayton, O., Nation ing Brick Manuf Assn., Annual Me

Oct. 14 ..... Chicago, S. A. E. S Committee Meetir

Oct. 16 ..... Chicago, Ill., 350-M Chicago Speedwa

Oct. 18-19 ..... Cleveland, O., Hotel Sixth Annual Co Electric Vehicle America.

Nov. 1-3 ..... Pasadena, Cal., Hotel Green, Wal pel.

Nov. 18 ..... Arizona 150-mile Prix.

Nov. 29-Dec. 4 .... Electric Prosperity

Dec. 31 ..... New York City, Grand Central P

Jan. 22, 1916 ..... Chicago, Ill., Sho seum.

March 4-11 ..... Boston, Mass., Tru Mechanics Bldg.

The Week in  the Industry

Buckbee with Ahlberg—George A. Buckbee has been made manager of the Boston branch of the Ahlberg Bearing Co., Chicago.

O'Rourke Purchasing Agent—J. S. O'Rourke has been appointed purchasing agent of the Oakland Motor Car Co., Pontiac, Mich., succeeding H. R. Vinot, resigned.

Garage

New Fox Lake Garage—Albert Paulson has established a garage and repair shop at Fox Lake, Wis., occupying the Fox Lake Garage.

A $20,000 Garage—A large garage costing about $20,000 is being erected on Lisbon Avenue, near Thirty-first Street, Milwaukee, Wis., by Graf Bros.

Lakeside Garage Opened—C. H. Wilkenson has opened a garage and repair shop in Lakeside, Mich. His specialty is to take care of repairs on Ford and Overland cars.

$22,000 Garage Fire—Fire caused a $22,000 loss in Anniston, Ala., when the brick garage owned by Joseph Saks was destroyed together with automobiles valued at $10,000.

Fifty-Truck Garage—L. O. Stewart & Bros., coal, wood and ice merchants of Washington, D. C., are planning a garage to accommodate fifty trucks. The structure will have 20,000 sq. ft. floor space and its cost will be $10,000.

Enter Garage Field—W. D. Johnson, Lancaster, Wis., and R. J. Hoover, Sauk Prairie, Wis., have formed a partnership and will engage in the garage and repair business at Lancaster. The firm has plans for a $5,000 garage building 60 by 132 ft.

Recent Wisconsin Garage Happenings—W. W. Osborn has opened a garage and repair shop in the Stroebel warehouse building on Main Street, Neenah, Wis. Hunt & Machia, operating the Sawyer Garage at Sturgeon Bay, are now located in their new fireproof garage, erected on the site of the building destroyed by fire on Sept. 13, 1914. The Western Iron Stores Co., Milwaukee, one of the largest wholesale and retail dealers in mechanics' tools, machinists', mill and shop supplies, has moved to new and larger quarters at 145-147 West Water Street, one block south of Grand Avenue. The Main Auto Co., Appleton, has purchased the stock, equipment and business of the Griffin Auto Co., Appleton.

Motor Men in New Roles

Bertman Succeeds McManus—A. W. Bertman has succeeded E. E. McManus as advertising representative for the St. Louis, Mo., branch of the Firestone Tire & Rubber Co.

Kenney in St. Louis—F. C. Kenney, who has been managing the Memphis, Tenn., Studebaker branch, has returned to St. Louis, resuming his former position of assistant manager at that branch.

Hopkins Goes to Providence—E. C. Hopkins, formerly identified with the Boston branch of the Buick Co., has gone to Providence to become manager of the Buick agency in Rhode Island controlled by Charles F. Thatcher.

Gets National Tire—The Barnthouse-Hemmerly Auto Co. has secured the agency in Marion, Ohio, for the National tire.

Arnold Branches Out—The Arnold Auto Co., Wichita, Kan., will establish a branch house at Hutchinson. The concern handles the Chalmers.

Studebaker in Oklahoma City—A wholesale Studebaker branch has been opened in Oklahoma City under the management of Iver Schmidt.

Bimel Indiana Headquarters—The Bimel Buggy Co., Sidney, Ohio, maker of the Elco "30," has established State headquarters in Indianapolis, Ind. A. C. Nobes, president of the Sidney concern, is in charge.

Move to New Quarters—The salesrooms of the Paige Detroit and the Saxon in Boston, Mass., have been moved into a new building just finished at 595 Newbury Street. Both companies will have ample quarters for salesrooms and service stations.

Installs New Furnace—The Wisconsin Welding & Cutting Co., Milwaukee, Wis., is installing considerable new equipment, including a furnace costing $1,500. The shop is now equipped to weld aluminum, this department being in charge of Gustave Johnson, an expert in this line. C. H. Hansen is general manager.

Welding and Cutting Shop—A welding and cutting shop that makes a specialty of motor car work has been established at Green Bay, Wis., by Walter F. Gerald, formerly associated with the Universal Oxygen Co., Sheboygan, Wis. The new shop is known as the Badger Welding & Cutting Co., and is located at 127 South Barclay Street.

Ogg Detroit Electric Mgr.—Basil Ogg, former president of the Springfield Auto Sales Co., Springfield, Ill., has been appointed manager of the branch house to be established by the Anderson Electric Car Co. of Detroit, and which will open for business at 218-222 South Fourth Street, Springfield. Mr. Ogg will devote his entire time to this firm.

Dealer

Opens in Louisville—The Paige Motor Sales Co., which secured the Paige agency in the Louisville territory Aug. 1, has opened an office and salesroom at 725-729 South Fourth Street, Louisville, Ky., formerly occupied by the Kentucky Motor Car Co. Edward A. Briel is president and manager of the new concern.

Peck in New Quarters—The Peck Auto Sales Co., Studebaker distributor in the Grand Rapids (Mich,) territory, has completed and moved into its new service station repairshop. The building is concrete and brick construction. The present quarters of the company across the street will be devoted to sales and office purposes.

Shop and Service Station—The Hudson-Brace Motor Co., handling the Hudson in Kansas City, Mo., is building a shop and service station 50 by 112½ ft. on Oak Street, in the rear of their present salesrooms. The present quarters where the shop is now located will then be used for salesrooms, second-hand cars and cars in process of delivery.

Judd Takes Over Business—John L. Judd, who has been traveling representative for the E. A. Gilmore Co., Boston, Mass., New England distributor for the Lewis VI and the Allen cars, has taken over the business and he will continue it at the present salesrooms, 92 Massachusetts Avenue. Mr. Gilmore has retired from the business entirely and he may go to Worcester to handle the Dodge.

Opens in Kansas City—The Bush-Morgan Motor Co. opened for business Aug. 2 at 1526 Grand Avenue, Kansas City, Mo., as agents for the Paige car. They have a well-equipped repair shop and service station, handsome offices and commodious salesrooms. Mr. Roy R. Bush was formerly well known in the farm implement field when with the Kingman-Moore Co.; later he was with the Velie Co. at Moline. Mr. W. H. Morgan has been associated with Mr. Bush for many years.

Birmingham Co. Moves—The Turner Electric Supply Co., Birmingham, Ala., has moved to 2104 First Avenue.

Buys Supply Co.—The Austin Tire & Supply Co., with C. L. Pate manager, has purchased the business of the Aber-Schultz Auto Co. at Austin, Tex.

New Dallas Velvet Co.—D. L. Ormsby, distributor of Velvet shock absorbers for the State of Texas, has sold his State rights to the M. & S. Sales Co., Dallas, Tex.

New Los Angeles Garage—R. Starkweather has opened a general repair shop at 726 West Pico Street, Los Angeles, Cal., to be known as the Imperial Garage.

Packard Electric in Detroit—The Packard Electric Co., Warren, Ohio, has opened a branch office in the David Whitney Building, Detroit, Mich. W. L. Marsh is in charge.

Madison Opens in Louisville—The Madison Co., which recently acquired the agency for the Madison, has opened an office and salesroom at 206-210 East Broadway, Louisville, Ky.

New Garage for Shawano—The F. H. Gruetzmacher Automobile Co., Shawano, Wis., organized recently, is erecting a large garage. The building will contain a complete machine shop and welding plant.

Headquarters at Dallas — The Giant Tire & Rubber Co., Omaha, Neb., has obtained a permit from the Secretary of State of Texas to do business in that State. Its Texas headquarters will be at Dallas.

Toledo Co. to Move—The Browne Supply Co., Toledo, Ohio, has taken a lease of the corner at Jefferson and Erie Streets and will occupy it about July 15. The company will have practically double the space it now occupies.

New Tire Store—The Louisville Tire Co. has moved into its new tire and accessory store at 666 South Third Street, Louisville, Ky. The company handles Dayton airless and pneumatic tires. F. W. Weisenberger is the manager.

Noxal Co. Makes Change—The Noxal Co. is giving up its sales office at 1400-1402 Michigan Ave., Chicago, Ill., and is combining its sales office with the executive and manufacturing offices at 29 South Clinton Street, change taking place Aug. 1.

Hartford Dealer Moves.—Kingsley & Wetherell, Inc., Hartford, Conn., representatives of the Moon and King, have leased the store at 11 Main Street for a salesroom and will occupy it in the near future. The service station at 59 Congress Street will be retained.

Open New Oil Station—Austin, Bryant & Carter, distributors of A B C oils, will shortly open a distributing station in San Francisco which will supply the trade of all of northern California, including Stockton and Sacramento.

Auto Supply Opens in Seattle—Barsby & Neep Auto Supply Co. opened in Seattle, Wash., recently, and will act as distributors of Master carbureters in the King County territory, besides which they will handle Marathon tires and the complete Johnsville line of accessories.

New Velie Distributors—A. W. and M. J. La Roche have been appointed eastern distributors of the Velie Motor Vehicle Company of Moline, Ill., under the firm name of La Roche Brothers. Salesrooms have been secured at 506-508 North Broad Street, Philadelphia, Pa.

Oakland Company Organized—The Oakland Motor Co. has been organized at Austin, Tex., and it has been appointed distributor for the Oakland in that territory. H. H. Cullen and F. E. Pryor are managers. The company has opened rooms at 300 East Fifth Street.

Places Big Ball Order—The Los Angeles branch of the Ahlberg Steel Bearing Co. has placed an order for 100,000 steel balls, which is only the beginning for the Los Angeles house. The stock inventory shows 150,000 on hand. The branch will keep stock on hand to supply the service stations of twelve states.

New Midgley Tire Agencies—The following firms have taken on Midgley tires: Peterson-Keyes Automobile Co., 401 North Capital Avenue, Indianapolis; Motor Tire & Repair Co., 1817 Grand Avenue, Kansas City; Athena Tire Co., Chicago, Ill.; Kleyn Automobile Co., Duluth, Minn., and Peters & Sons, Ltd., London.

Milwaukee Garage to Add — The Sanger Automobile Co.. 564-574 Farwell Avenue, Milwaukee, Wis., operating one of the largest garages in Milwaukee, and representing the Franklin, is preparing to double the size of the garage by the addition of a full second floor. 50 by 130 ft. The first floor will be remodeled and equipped with electric freight elevators, steel shutter rolling doors, etc.

Babcock in New Shop—The Babcock Automobile Spring Co., Milwaukee, Wis., has taken occupancy of its new factory and store building at 192-194 Milwaukee Street. The company devotes its attention exclusively to replacement of automobile springs and expert repairing, which includes re-arching and re-tempering. The company is Wisconsin distributor for the Tuthill-Titanic spring.

Recent King Changes—Reason & Ross, King dealers in Cincinnati, have changed firm name to the King Motor Sales Co. The Bowman Sales Co., King dealer, has changed its location from McKean, Pa., to Erie, Pa.. where it was located at 18-24 West Fifth Street. Barnhart & Danner, King distributors at Salt Lake City, Utah, have moved into a new establishment at Fourth South and West Temple Streets, and will operate under the name of Lincoln Garage.

Hyatt Roller's New Bldg.—Excavating is well under way for the new office building of the Hyatt Roller Bearing Co. at Cass Avenue and West Grand Boulevard, Detroit, Mich. The building will be the home of the sales and engineering departments of the automobile division of the Hyatt Company. It is to be three stories high and its exterior will be of rough red brick with fine stone trimmings and cornices.

Recent Braender Tire Changes—The Braender Rubber & Tire Co. advise that Ketcham & Lawrie of Newark are no longer their agents in the State of New Jersey. They have appointed the O. A. R. Motor Car Co., 915 South Avenue, Plainfield, N. J., to represent them in that territory. The Tire Shop, 1926 North Charles Street, is no longer representing the Braender Rubber & Tire Co. in Baltimore, but the McGraw Tire Co., Inc., 10 West Oliver Street, Baltimore, has taken the agency for the Braender products for the entire State of Maryland.

St. Louis Cos. Extend.—The Park Automobile Co., St. Louis, Mo., agent for the Chalmers line, has been given additional territory in three states. The new selling territory of the Park company includes twenty-seven counties in Missouri, thirty in Illinois and seven in Kentucky. The Park company will appoint sub-agents in the larger towns of the new territory in the near future. The Weber Implement Co., distributor of Hupmobile and Mitchell cars, has opened a news salesroom for used cars at the northwest corner of Eighteenth and Pine Streets. The building is two stories high and covers a lot of 100 by 109 ft.

Louisville Trade Happenings—The Empire Auto Sales Co., agent for the Empire, has moved its quarters from 437 South Second Street to 624 South Third Street, Louisville, Ky. The Louisville Automobile Exchange, 544 South Third Street, has secured the agency for the Mitchell. Kentucky Motor Car Co., Cincinnati, Ohio, formerly agent for the Oakland in the Louisville territory, has discontinued its Louisville office, located at 725 South Third Street. The Hyatt Auto Repair Co. has opened a repair shop at 211 York Street. The Hanna Gibson Co., 206 East Broadway, has acquired the agency for the Madison Six. The Quick Tire Service Co., Third Street and Broadway, has been appointed Louisville distributor for the United States Tire Co. The Central Garage has opened an accessory store and automobile repair shop at 437 South Second Street. J. J. Gaffney is president of the concern. The Callahan Motors Co., agent for the Chandler, has acquired the Louisville agency for the Scripps-Booth.

VOL. XXXIII NEW YORK—THURSDAY, AUGUST 12, 1915—CHICAGO No. 7

The AUTOMOBILE

2,070,903 Cars in United States

Registrations for First 6 Months of 1915 Show Gain of 334,809—625,000 Car Output Predicted

By Donald McLeod Lay

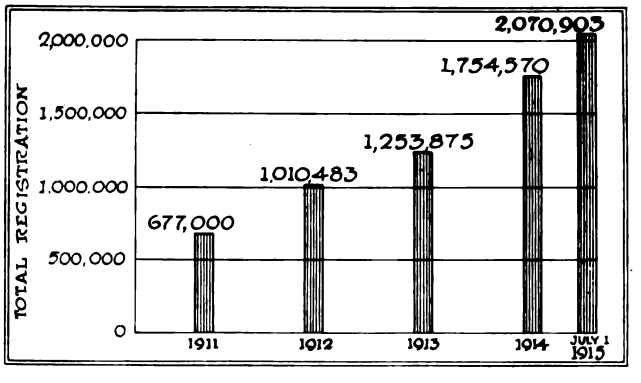
AT last the number of automobiles and motor trucks in the United States has passed the 2,000,000 mark, the total registration throughout the country at the end of the first six months of 1915 showing that 2,070,903 machines are in use between the Atlantic and Pacific and Canada and the Gulf. These statistics represent the most accurate count it is in any way possible to secure, all duplicate registrations being deducted.

334,809 Gain

This stupendous showing at first glance almost overshadows the gain of 334,809 registrations over the 1,747,234 cars and trucks in use at the end of 1914, as reported in THE AUTOMOBILE for March 25. Significant as these statistics are in the registration field, they also serve to indicate the tremendous volume of production which, contrary to many predictions, instead of decreasing, has expanded steadily so that at the present time practically all of our factories are either working night and day or up to capacity. While one concern alone has manufactured over 300,000 gasoline passenger cars, the other makers of this type of vehicle have almost all increased their outputs, while the manufacturers of electric passenger cars and those of trucks of all classes have found their factories taxed to the utmost to keep up with the growing demand.

Predictions as to the total output of these factories during the current year are found to be very conservative when they halt at a total of 625,000 cars and trucks. When one pauses to think that in addition to the 300,000 cars made by one company there are several other concerns building from 50,000 to 100,000 cars yearly, and a larger group of manufacturers who may be credited with turning out from 10,000 to 50,000 cars, it is found that 625,000 is by no means out of the question.

An idea of the remarkable upward sweep of production together with the accompanying increase in car and truck registration since 1910 may be gained from the tabulation at the top of page 273. The detail figures for the individual States together with their totals are to be found in the full page table immediately below. To graphically illustrate the car population of the different States, the map at the top of page 272 shows the distribution throughout the country.

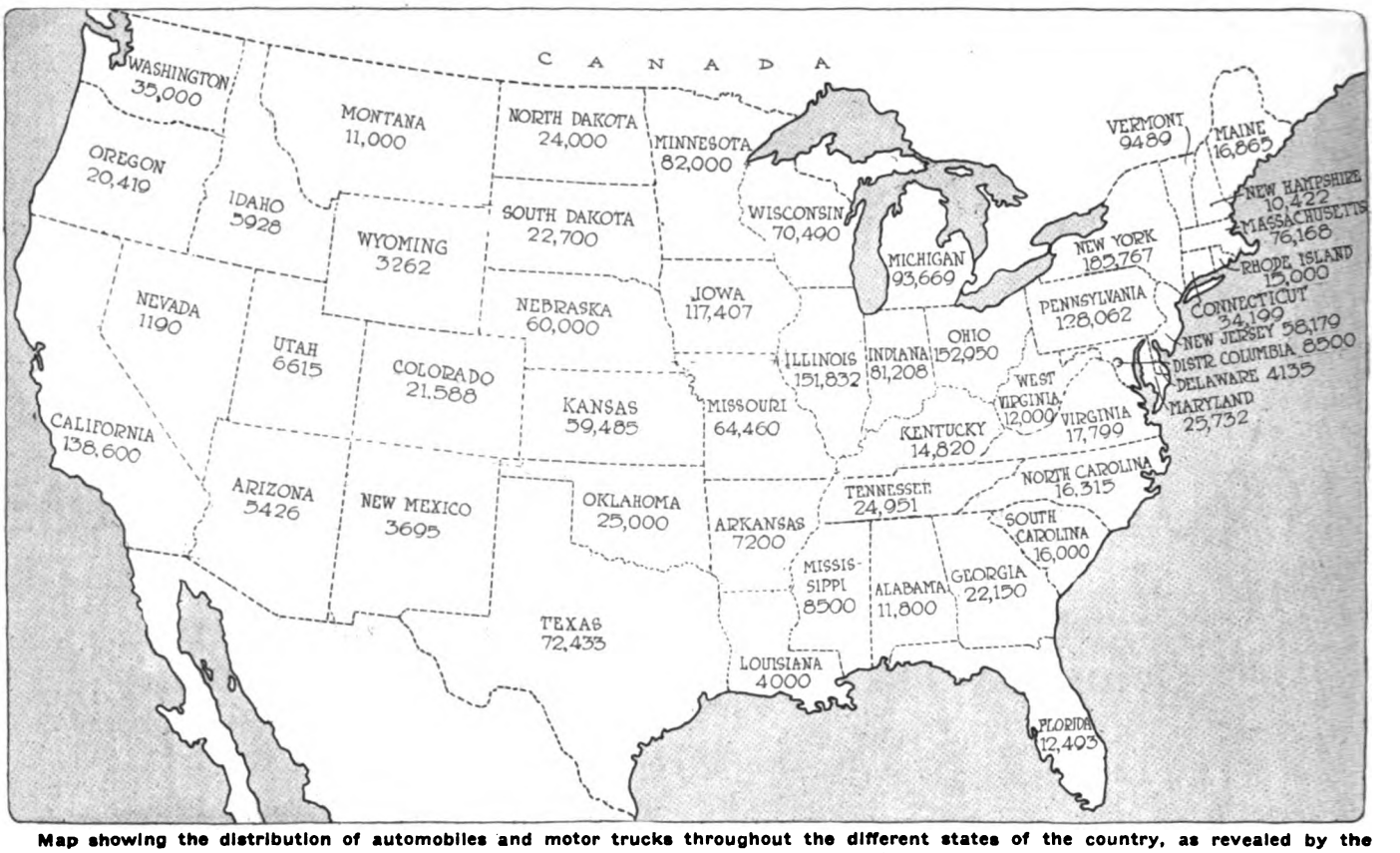


New York	185,767	Virginia	17,799
Ohio	152,950	Maine	16,865
Illinois	151,832	North Carolina	16,315
California	138,600	South Carolina	16,000
Pennsylvania	128,062	Rhode Island	15,000
Iowa	117,407	Kentucky	14,820
Michigan	93,669	Florida	12,493
Minnesota	82,000	West Virginia	12,000
Indiana	81,208	Alabama	11,800
Massachusetts	76,168	Montana	11,000
Texas	72,133	New Hampshire	10,422
Wisconsin	70,490	Vermont	9,489
Missouri	64,460	Dist. of Columbia	8,500
Nebraska	60,000	Mississippi	8,500
Kansas	59,485	Arkansas	7,200
New Jersey	58,179	Utah	6,615
Washington	35,000	Idaho	5,928
Connecticut	34,199	Arizona	5,426
Maryland	25,732	Delaware	4,135
Oklahoma	25,000	Louisiana	4,000
Tennessee	24,951	New Mexico	3,695
North Dakota	24,000	Wyoming	3,262
South Dakota	22,700	Nevada	1,190
Georgia	22,150		
Colorado	21,688	Total	2,070,903
Oregon	20,419		

Automobile and motor truck registrations in the various states up to July 1, allowing for duplicate registrations

Farmers Buying Cars

One of the phenomenal features apparent to anyone analyzing the registration statistics for the past two years is the gain made by the States whose populations are for the most part devoted to agriculture. These growing statistics serve to emphasize the reports to the effect that farmers throughout the country and especially throughout the grain belt of the Middle



Map showing the distribution of automobiles and motor trucks throughout the different states of the country, as revealed by the statistics of the registration officials. All duplicate registrations, such as those of non-residents and those due to transfers of ownership of the same car, have been deducted

Dealers, Garages, Supply, Repair and Charging Stations in the United States, etc.

States	Dealers	Garages	Repair Shops	Supply Dealers	Charging Stations	Total
Alabama	89	75	22	12	12	155
Arizona	64	56	7	7	5	97
Arkansas	80	68	14	3	5	126
California	895	1,027	96	69	101	1,594
Colorado	188	243	20	10	24	335
Connecticut	280	313	54	21	23	506
Delaware	44	50	5	2	3	68
District of Columbia	46	46	20	12	6	111
Florida	151	149	16	2	12	235
Georgia	179	201	25	9	14	227
Idaho	69	61	1	1	5	95
Illinois	1,254	1,166	93	52	144	1,881
Indiana	646	597	68	19	67	1,007
Iowa	1,334	1,077	84	19	84	1,646
Kansas	564	565	40	12	37	934
Kentucky	169	135	7	3	14	217
Louisiana	76	55	7	3	12	104
Maine	184	196	16	4	12	299
Maryland	153	160	23	10	12	251
Massachusetts	597	704	110	62	80	1,175
Michigan	540	582	46	38	53	905
Minnesota	926	625	34	27	24	1,161
Mississippi	66	59	10	3	7	102
Missouri	618	449	100	36	40	925
Montana	157	124	13	4	9	211
Nebraska	548	430	30	11	28	705
Nevada	33	34	6	1	2	59
New Hampshire	127	152	15	3	13	213
New Jersey	432	714	48	34	53	936
New Mexico	57	49	1	1	2	82
New York	1,314	1,661	196	156	138	2,596
North Carolina	151	144	14	3	10	216
North Dakota	313	214	14	1	9	413
Ohio	979	839	92	58	110	1,479
Oklahoma	210	178	14	12	9	314
Oregon	159	165	11	17	14	253
Pennsylvania	1,062	1,138	73	110	105	1,727
Rhode Island	80	114	12	38	8	208
South Carolina	83	89	4	8	3	134
South Dakota	318	213	2	17	10	400
Tennessee	124	95	11	16	8	188
Texas	457	367	33	55	45	713
Utah	49	37	3	9	5	76
Vermont	120	112	3	13	3	181
Virginia	160	119	10	14	10	218
Washington	251	227	21	34	20	289
West Virginia	133	97	3	7	16	168
Wisconsin	683	558	15	52	50	887
Wyoming	41	33	None	6	4	59
West Indies	13	10	None	1	None	15
Canada	524	430	26	29	68	691
Mexico	9	9	None	None	2	12
Hawaii	4	5	None	None	3	5
Total	17,903	17,916	1,787	947	1,553	27,702

West, have been buying cars in constantly growing numbers and are still buying them.

Two features of the automobile and motor truck market which may be mentioned as peculiar to 1915 are the war orders for cars, trucks and tractors for the European belligerents and the continued rainy and stormy weather, which, in some sections, has had a very bad effect on the standing crops, road conditions and numerous other factors which must always be considered as influences on the automobile market.

Ohio Shows Largest Gain

Comparing the gains made in registration by the various States during the first six months of 1915, we find that the ratio of increase has been fairly uniform as compared with the registration increases during the calendar year 1914. Ohio shows the largest gain, having 32,096 additional registrations to its credit since the first of the year as compared with an increase of only 36,348 in the previous twelve months. However, it must be remembered that the bulk of the registrations are made during the first six months of the year so that it can hardly be expected that the tremendous increase will continue at its present rate, although it is practically certain that the 1914 statistics will be far surpassed. New York comes second with 25,302 more registrations than at the beginning of the year and comparing well with its gain of 37,302 in 1914. Michigan is slightly ahead of Pennsylvania with 22,085 new registrations as compared with 22,016. Michigan's gain is already larger than its total increase for the entire year 1914, while Pennsylvania's is two-thirds of its last year's figure. Illinois is credited with 19,494 additional registrations while Iowa has 18,000, Wisconsin has 16,108, Indiana has 15,708, Oklahoma 15,640 and California 15,499. Other States showing gains of 10,000 registrations or over since the first of the year are: Minnesota 14,635, Missouri 14,128 and Nebraska 10,000.

Taking up the individual standing of the States with re-

spect to the total number of cars and trucks in use, New York still leads the van with 185,767, all duplicate registrations, including non-resident registrations and cars re-registered owing to changes of ownership, etc., having been deducted from the gross total. Ohio has usurped second place with 152,950, Illinois, which formerly held it, having fallen back to third position with 151,832. California, which was third at the beginning of the year is now in fourth place with 138,600, while Pennsylvania has moved up to fifth place from sixth position at the end of 1914, having 128,062 cars and trucks. Sixth place goes to Iowa, which was formerly fifth, this State having 117,407 registrations when the duplicates are deducted. Michigan has risen from eighth to seventh place and is nearing the 100,000 mark, having 93,669, while Indiana, which was tenth, is now eighth with 81,208. Massachusetts has dropped back from seventh to ninth place which is significant of the more rapid growth of registration in some of the central and western States. The Bay State's total is imposing, however, being 76,168. Tenth place goes to Texas with 72,433, these figures being based on the count made by the Dallas Chamber of Commerce last December, no later statistics being available. Texas has thus moved up one position in the ranks; Wisconsin, with 70,490, has moved from thirteenth to eleventh position. Missouri has gained two places, rising from fourteenth to twelfth, its total being 64,460. Nebraska with 60,000, Kansas with 59,485 and New Jersey with 58,179 are the only other States with registrations of over 50,000. The standings of the States in this respect may be seen in the tabulation on page 271.

Production and Registration Since 1910

1915 to July 1

Registration		Production
2,070,903		625,000 (Estimate)
	1914	
1,754,570		515,000
	1913	
1,253,875		450,000
	1912	
1,010,483		378,261
	1911	
677,000		209,957

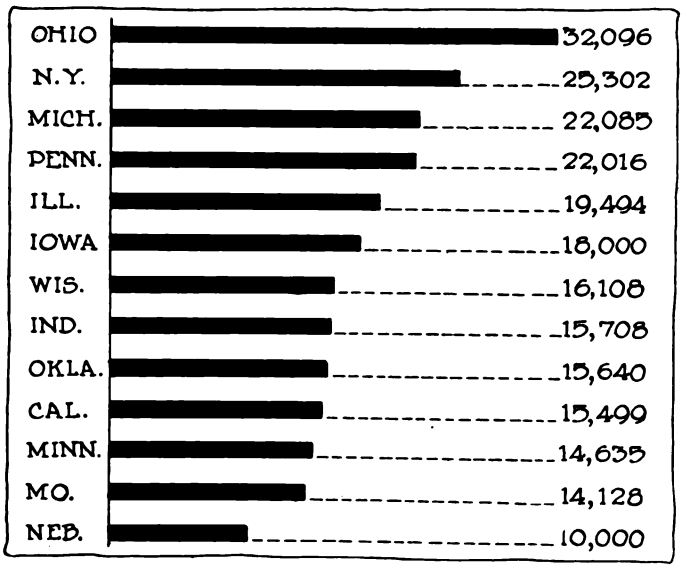
Few Systematic Records Kept

Comparatively few of the State registration officials have systematic record keeping departments which enable them to give detailed registration statistics. In other words, while they are usually able to give the total number of registrations, they have no records to show how many are gasoline passenger cars, how many electric passenger cars, how many gasoline trucks or electric trucks. A perusal of the tabulation at the bottom of this page will serve to illustrate this excellently. It will be noted that the total registration is available in practically every case whereas only a few of the States are able to give the detailed statistics, the result being that the totals are far from complete in all these cases. For example, the total number of chauffeurs in the United States of whom records are available is

Car and Truck Registration in Each State from Jan. 1, 1915, to July 1, 1915.

State or Territory	Total Registration	New Registration	Registration Up to Jan. 1, 1915	Gasoline Passenger Cars in Use	Gasoline Commercial Cars in Use	Electric Passenger Cars in Use	Electric Commercial Cars in Use	Non-Resident Registration*	Re-registered**	Chauffeurs Registered	Total Fees	Remarks
Alabama	11,800	3,300	8,500	***	***	***	***	***	***	***	***	
Arizona	5,851	811	5,040	***	***	***	***	***	425	1,390	$37,862.75	
Arkansas	7,200	1,558	5,642	***	***	***	***	***	***	***	***	
California	138,600	15,499	123,101	***	***	***	***	***	***	15,558	1,862,646.50	New law.
Colorado	21,738	3,305	18,433	***	***	***	***	150	***	***	***	
Connecticut	34,199	4,894	29,305	28,031	6,168	***	***	***	***	***	475,440.41	
Delaware	4,135	1,085	3,050	***	***	***	***	***	***	***	***	
Dist. of Col.††	8,500	500	8,000	***	***	***	***	***	***	***	***	Perennial reg.
Florida	12,493	1,127	11,366	***	***	***	***	***	***	***	***	New law.
Georgia	22,500	1,590	20,910	21,500	475	500	25	50	300	***	112,500.00	
Idaho	5,953	1,681	3,272	***	***	***	***	25	***	400	95,000.00	
Illinois	151,832	19,494	132,338	***	***	***	***	***	***	20,485	775,386.88	
Indiana	81,208	15,708	65,500	***	***	***	***	***	***	***	535,049.00	
Iowa	126,407	18,000	108,407	***	***	***	***	***	9,000	***	1,003,527.72	
Kansas	59,485	9,018	50,467	***	***	***	***	None	None	***	292,812.50	
Kentucky	14,820	3,074	11,746	***	***	***	***	***	***	3,000	98,586.27	
Louisiana	4,000	500	3,500	***	***	***	***	***	***	***	***	Local reg.
Maine	17,315	1,615	15,700	16,444	871	None	None	100	350	21,183	225,438.00	
Maryland	25,732	5,519	20,213	23,472	2,260	***	***	***	***	4,970	311,133.27	
Massachusetts	83,868	.....	87,000	***	9,900	***	***	***	7,700	17,620	999,524.90	
Michigan	98,474	22,085	76,389	***	***	***	***	***	4,805	***	305,032.00	New law.
Minnesota	82,000	14,635	67,365	***	***	***	***	***	***	***	***	Triennial reg.
Mississippi	8,500	4,606	3,894	8,000	500	***	***	***	***	***	***	Law invalid.
Missouri	66,061	14,128	51,933	***	***	***	***	None	1,601	7,762	273,718.00	
Montana	11,000	294	10,706	***	***	***	***	***	***	***	***	
Nebraska	60,000	10,000	50,000	***	***	***	***	***	***	***	***	New law.
Nevada	1,200	.....	1,487	***	***	3	**	10	None	None	3,412.53	
New Hampshire	11,322	796	10,596	10,484	938	***	***	500	400	3,782	220,000.00	
New Jersey	63,412	3,165	60,247	***	***	***	***	***	5,233	76,240	857,154.30	
New Mexico	3,770	578	3,192	3,710	50	10	None	None	75	None	29,500.00	
New York	195,268	25,302	169,966	169,575	25,693	***	***	2,177	7,324	66,921	1,642,357.00	
North Carolina	16,315	1,500	14,815	***	***	***	***	***	***	***	***	
North Dakota	24,000	6,652	17,348	***	***	***	***	***	***	***	***	
Ohio	154,600	32,096	122,504	148,792	1,486	4,322	***	150	1,500	***	874,532.23	
Oklahoma§	25,000	15,640	7,360	***	***	***	***	***	***	***	***	New law.
Oregon	20,419	4,072	16,347	***	***	***	***	***	***	3,032	91,092.00	
Pennsylvania	134,870	22,016	112,854	128,006	6,864	***	***	***	6,808	29,898	1,435,384.00	
Rhode Island	15,000	2,669	12,331	13,500	1,500	***	***	***	***	***	***	
South Carolina††	16,000	1,000	15,000	***	***	***	***	***	***	***	***	Local reg.
South Dakota	22,700	1,280	21,420	***	***	***	***	***	***	***	***	
Tennessee	24,951	5,283	19,668	***	***	***	***	***	***	***	***	
Texas§§	72,433	7,701	64,732	69,710	1,935	610	128	***	***	***	***	Loc. and per. reg.
Utah	6,615	341	6,274	***	***	***	***	***	***	***	***	Perennial reg.
Vermont	9,906	1,650	8,256	9,622	277	4	3	30	387	2,000	179,977.65	
Virginia	17,799	3,647	14,152	***	***	***	***	***	***	1,505	146,162.50	
Washington†	35,000	4,747	30,253	***	***	***	***	***	***	***	***	New law.
West Virginia	12,000	3,776	8,224	***	***	***	***	***	***	***	***	
Wisconsin	70,490	16,108	54,382	***	***	***	***	***	***	***	359,900.00	
Wyoming	3,262	834	2,428	***	***	***	***	None	None	***	16,310.00	
Total	2,120,003	334,809	1,785,613	650,846	58,927	5,449	156	3,192	45,908	275,746	$13,259,440.41	

NOTE.—3,500 steam cars, 350 steam trucks included. * Number of cars belonging to residents of other States. ** Number of cars re-registered owing to change of ownership, etc. *** Not listed separately by registration officials. †Estimated by State registration officials. ††Estimated on basis of population with reference to sectional registration. §Registration law runs from July to June. §§Statistics from Dallas Chamber of Commerce, these being only up to December, 1914. Electric cars and trucks are usually included among the gasoline machines.



Thirteen states show increases of 10,000 or over as compared with their registration statistics at the end of 1914

275,746, which, when compared with the 2,070,903 car total, is manifestly far too low.

Five States Have New Laws

Perennial registration is still the rule in the District of Columbia, Utah and Texas, Florida having left this group by the passing of a new law this summer. In Texas, registration, in addition to being perennial, is of a local character, as is the case in South Carolina. Other States which have new laws are Michigan, Nebraska, Oklahoma and Washington. Triennial registration continues to characterize Minnesota while Mississippi is still in the predicament of having its automobile law invalid.

$13,259,440.41 in Fees

As an indication of the extent to which automobile registration fees go toward supporting the State governments, etc., returns from twenty-seven of the forty-nine States show the tremendous total of $13,259,440.41 which has been paid in fees by the automobile and motor truck owners of these States during the first six months of 1915.

27,702 Dealers, Etc.

Another side of the automobile industry which reflects the rapid increase in the registration and production of cars and trucks is that occupied by the dealers, garages, repair shops, supply dealers and charging stations for electric batteries used in the cars. According to the Automobile Trade Directory, the authority in this field, there is a grand total of 27,702 of these in the United States, Canada, Mexico, Hawaii and the West Indies, all overlapping establishments being counted but once. Counting them individually, there are 17,903 dealers, 17,016 garages, 1787 repair shops, 947 supply dealers and 1553 charging stations. The distribution of these establishments among the various States and countries may be seen in the tabulation appearing on page 272.

Recent Court Decisions—Race Horse Injured

By George F. Kaiser

IN a recent Maryland case the owner of a race horse recovered damages against an automobilist, whose car had run down and injured the horse.

The horse was 5 years old, eligible for the 2.24 class; had won all amateur races in which it had been entered, and had come in second in its first professional race. While in Baltimore, being driven to the driving park, it was injured in a collision with an automobile, and when raced later in the season it was unsuccessful. The owner was allowed to show that while it had formerly been level-headed, fearless, a bold racer, and easy to handle, after the accident it was high-spirited, nervous, easily frightened, timid in racing and valueless as a race horse.

The court also held that a photograph of the horse, taken before the accident, could be used in order that the injuries might be pointed out and decided judgment for the owner against the motorist was proper upon the facts.—*Weiler vs. Weiss*, 92 *Atlantic* (*Maryland*) 1028.

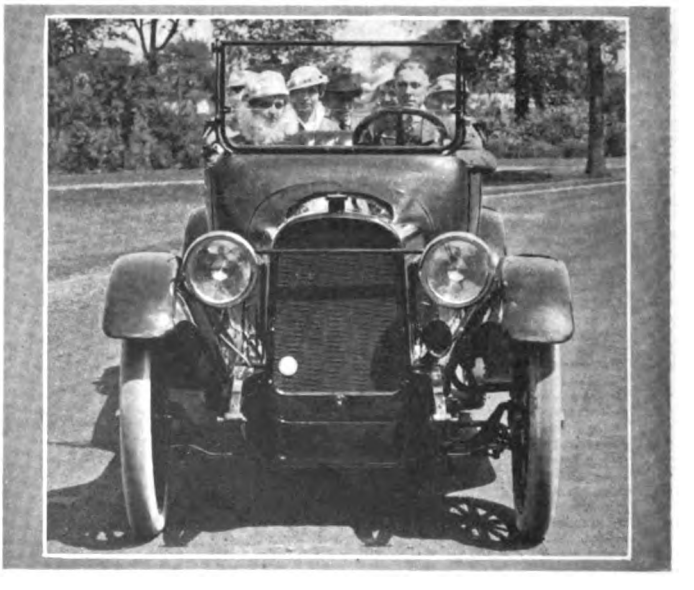
Usual Guarantee

In Kentucky a person suing for breach of warranty on an automobile sold on the "usual guaranty" must show what the usual guaranty was.

In a suit for damages for breach of warranty against a motor car company, the court decided in favor of the company. The other party contended that, the company had guaranteed and warranted the car sold to do good work, to operate well and be capable in every respect; to run over certain territory which he might have occasion to travel; and as the machine was warranted not to be defective, and be suitable to transport him and his passengers safely, but in reality it would not operate or do good work but was worthless as an automobile.

The company claimed that there was a 90-day warranty to replace defective parts, provided the machine was not repaired outside the factory.

The court held that the dealer said a 1-year guaranty on the car was not in absence of evidence of the dealer's authority as an agent, and in the face of proof that he was not an agent competent evidence to show what the usual guaranty was. The proper way to prove the usual guaranty was to call upon the company's officers or some other competent person to testify.—*Johnson vs. Co.*, 169 *S W.* (*Kentucky*) 992.



The 1916 seven-passenger Chalmers six, the chassis of which was described in THE AUTOMOBILE for July 22

Possible Troubles With Aluminum Motor

A Brief Consideration of Some Smaller Details and Their Seriousness

By A. Ludlow Clayden

SINCE writing last week on the subject of the possibilities of aluminum that have been neglected, it has been possible to obtain the opinion of one of the largest of motor manufacturers, who was also one of the first to experiment with aluminum cylinders, and the engineering opinion in this large plant seems to be capable of summation into the idea that the ultimate triumph of aluminum depends upon nothing but its price. That the aluminum motor is a better motor by virtue of its light weight and by virtue of its better conductivity to heat is undeniable, and it appears that the naturally anticipated difficulty of porosity is not a real trouble.

Suits Valve-in-Head Motor

There is no doubt, however, that the aluminum construction lends itself best to the overhead type of valve gear. In an engine with detachable cylinder heads any porosity of the bore is cared for by the cast iron liner, the head can easily be thick enough to remove all risks and both main block and head are simple castings, which again cuts the chances of porosity developing. At the same time it is reasonable to suppose that practice will make perfect in this as in all other things, and the aluminum cylinders of to-morrow ought to be better than those of to-day.

Curiously, the idea of casting the aluminum around the iron liners is not favored by either the founders or the engineer who has done most experimenting with aluminum motors. Broadly the idea is that the absolutely even thickness of the iron liner makes for freedom from distortion and that in making a composite casting it would be impossible to use a liner nearly so thin as can be done by the other method. Also it is not easy to cast the aluminum around so large a mass of iron as would be necessary.

In the machine shop the task of boring out the aluminum to receive the iron liner is a quite light one, as a rapid cut can be taken and the fitting of the liner is not difficult. Liners which have been put in cold while live steam was blown around the aluminum jacket have shown no tendency to loosen up in service and really there is no reason why they should do so as there is very little axial force transferred to the cylinder walls by the well-lubricated piston.

More dubious perhaps, is the durability of the cast iron valve seats that are cast in place as shown last week in the photograph of a block prepared for an L-head motor. It would be permissible to wonder whether the constant hammering of the valve may not loosen the iron in time, but even should it do so there are other ways of tackling the problem. For instance the valve seat and the valve stem guide might easily be a complete part, just as the cylinder liner is a complete part, and such a piece could be secured in a previously bored out seating in the aluminum.

Another point for speculation is the proper material for valve caps where an L-head design is employed. From the expansion viewpoint aluminum should be the best material and it would also have the advantage that it would carry heat away from the spark plug much better than a steel or iron cap, but it seems probable that the durability of the screw thread would be insufficiently good, considering how tightly valve caps have to be screwed in.

This last difficulty remains, whatever the material of the cap, so it looks as though the designer of an L-head job with aluminum cylinders would have to devise some novel way of securing the valve caps without using fine pitch screw threads. Of course the adoption of a detachable head does away with the difficulty, but there are many engineers who dislike to abandon the individual valve accessibility that is given by the use of valve caps.

Another thought suggested by discussing the subject, is that some engineers have kept away from the overhead camshaft type of motor because they think it cannot be made without a considerable increase of weight over the normal type. Whether this is true or not, it follows that this drawback is removed by the possibility of employing a lighter metal.

Yet another question that has arisen is the problem of fastening together the upper and lower portions of an aluminum engine with a detachable cylinder head. Often it is not too easy to find accommodation for more than the minimum essential number of studs and the softness of aluminum would call for an increase in the number so that the stress on each might be lessened. Here again the objection seems to be more imaginary than real, judging by experience as it exists at present, but a more serious possibility is that a stupid person could easily bend an aluminum cylinder head by tightening down too much on one stud before taking up the others. With a cast iron head there is danger of cracking the casting this way, but it is not so likely a happening. There may be nothing in the objection, but if there were it would seem advisable to devise some dodge which would enable the studs to be replaced by bridge pieces or clamps of some kind. Several possible ways suggest themselves but the chances are that they need not be considered unless practice proves the contrary to be the case.

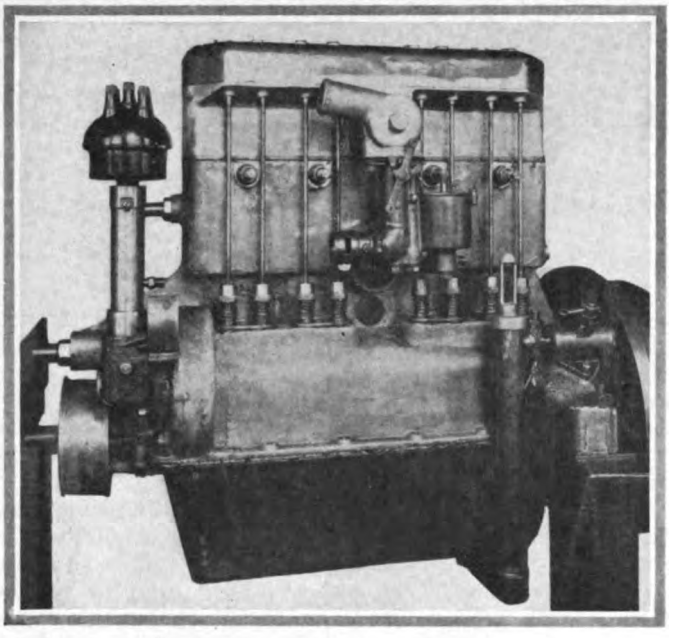
Some Useful Data

A point which will arise naturally in the mind of an engineer when first he thinks of using aluminum cylinders is that the co-efficient of expansion for aluminum is greater than that for cast iron. Examining the actual figures for a moment, the co-efficient of expansion for aluminum is 0.000023. Assuming that the motor operates between the temperatures of 32 and 212 deg. F., which is an over statement, the expansion per foot would be 0.0023 ft. or just under 28 thousandths inch. If the distance between the cylinder bore centers is 6 in. the maximum displacement on a large six-cylinder motor would not exceed 30 thousandths at most, as the range of temperature over which a motor operates is much smaller than from 32 to 212 deg. F. Per cylinder the amount of axial displacement would therefore be about 4 to 5 thousandths which the normal end play on a connecting rod bearing exceeds very greatly.

Another point is the amount which must be allowed for shrinkage in casting, this being 5/32 in. per foot as against ⅛ in. for cast iron, not by any means a serious matter.

Prefers Steel to Aluminum

PORT JEFFERSON, L. I., N. Y.—Editor THE AUTOMOBILE:—The question of aluminum and its uses in the make up of the modern automobile as outlined by A. L.



Another view of the Sterling aluminum motor illustrated and described in THE AUTOMOBILE for Aug. 5

Clayden in THE AUTOMOBILE, Aug. 5 issue, will no doubt open up a discussion which should establish something of value in reference to this material and its general use.

My experience conflicts with his conclusions and recommendations in a great many ways. I am not forgetful, however, of the fact that we may consider the results to be obtained from several different angles which would more or less influence the obtainable results to be had by the use of aluminum. In explanation of this statement in the case of a low-priced automobile with a comparatively low range of efficiency required the generous use of aluminum would without doubt result in a material gain in efficiency both in up keep and roadability, but to produce increased efficiency by reducing weight and increasing the power output disregarding the gains as a result of weight reduction aluminum would be the last metal used.

In the first instance it would mean the easing up of work required and from a predetermined unit with given capacities it would result in a net improvement, but in the latter case the object would be to refine the power plant bringing it up to a higher standard in an endeavor to generate more power with a smaller unit. This would mean increased ability demanding higher stresses and higher thermal efficiency. Carrying this theory to a point within practical limits would result in reducing the power demanded, which together with the increased ability would result in a net gain many times greater than an attempt to lessen the weight through the use of aluminum under the same conditions as mild steel and cast iron are now used.

Difference in Expansion

Assuming that one adopts the second plan I do not believe the use of aluminum would be permissible in any of the vital parts about the motor. The first great handicap is the vast difference in expansion between this metal and any of the stronger steels or even cast iron, which means that the use of liners or inserts is practically prohibited, and still further considering the fact that while aluminum is only about one third lighter than steel its strength is less than one-sixth as great as that of modern steel, the result being that most any part of a motor or car can be made lighter by the use of steel. My impression is that if two engineers of equal ability were given free hand to design an automobile of a given capacity one to be confined to the use of steels and the other to the use of aluminum, cast iron and mild steel, that the former would win out by a large margin so far as ability and lightness are concerned.

Referring to the Sterling motor used in the article as a criterion of the use of aluminum I would doubt very much the ability of this motor to withstand being brought up to a high efficiency for any length of time. The insertion of a cast iron sleeve for the cylinders would to my mind destroy any gain to be derived from the conductivity of aluminum so far as dissipating internal heats is concerned inasmuch as the joint would prove a non-conductor to a far greater extent than the aluminum would improve the conductivity.

There appears only one possible condition that might make this type of construction possible and that is that owing to this joint the inner sleeve would work under a much higher temperature than the outer walls, which might overcome the great difference in the co-efficient of expansion between the two metals, but even should this assumption prove to be a fact we are still up against the tremendous range of temperatures that exist in the operation of a modern automobile, and whether or not these could be compensated for by prolonged experiments is a question.

Redesign to Reduce Weight

Since the total weight of this motor is not given it would be quite hard to give an estimate of what could be saved in design, but it does not follow the best design for lightness, and my impression is that the motor could be re-designed and be made lighter by using iron and steel throughout than it is as shown with the use of aluminum, and there is no doubt but what its power output could be increased per pound weight considerably, and after all this is the unit of measure that must be considered.

The use of aluminum and aluminum alloys for pistons is certainly a mistake so far as my experiments have led me to believe. That they can be made at less cost than a steel piston or cast iron of equal weight is a fact, but when it comes to the question of weight, disregarding cost, the steel is far ahead of aluminum. Besides with the steel piston a much higher thermal efficiency can be had than with the use of aluminum. In the case of the Sterling motor if the aluminum cylinders are lined with cast iron the conductivity of the aluminum piston loses its value to a great extent and my impression is that a very low compression ratio would have to be used in order to keep from melting the pistons.

The use of aluminum to any great extent for important chassis parts has also received a setback in my estimation as a result of my later experiments along this line. I am thoroughly convinced that road shocks run much higher at times than any of us estimate. My conclusions along these lines are brought about by the use of aluminum in chassis parts. Inasmuch as failures appear at long intervals apparently not consistent with fatigue or ordinary use while none of the steel parts as used in my last two years of experiments have shown a sign of failure, so that by using aluminum I believe a factor of safety of twenty to one would have to be adhered to. This would mean that the weight of your parts would be far in excess of steel under the same conditions when you use a factor of safety of ten to one figuring from the elastic limit of steel rather than its ultimate strength. A more convincing argument can be had when confined to some specific case, a result which we hope will be had if the subject can be kept alive in the columns of your paper. —Finley Robertson Porter Co., Inc.

Aluminum Too Porous

DETROIT, Editor THE AUTOMOBILE:—Relative to the use of aluminum castings for cylinders, for motorcars, permit me to call to your attention that in 1906 the Oldsmobile Co. used a water pump on the forward end of the crankcase. This pump was of the key type, the body of the pump being machined

directly out of the aluminum crankcase. In certain sections of this country the water was of such a character that it rapidly ate through the aluminum and permitted leakage of the inside of the crankcase. This was so serious that the Olds company had to make a change in design and incorporate a pump as a unit, bolted to the face of the crankcase.

I would hesitate very much about attempting to repeat this performance, in running water directly through the aluminum. I realize that there are a number of intake manifolds, waterjackets, and there is evidently no trouble in the use of aluminum for this purpose. However, my direct knowledge of the subject is of a very limited nature, and I would hesitate to make any claims that the water used in the various parts of the country would not ultimately eat through the aluminum and destroy the casting. Of course, an owner could be instructed to use distilled or rain water in the cooling system, but this is imposing a hardship that is fully as disagreeable as instructing the owner to use distilled water in the battery once a week. This is one of the hardest problems we have had to combat since the incorporation of the electrical starting and lighting system on the modern automobile.—C. C. Hinkley, engineer Chalmers Motor Co.

History of Aluminum

PHILADELPHIA, PA.—Editor THE AUTOMOBILE:—My recent experiences have not included the pistons that I feel sure ought to be of aluminum. I early foresaw the value of this light metal and knew something of the cycle frames cast in one piece that were stronger than steel ones. I began using aluminum in 1896 and that winter tried cylinder heads and waterjackets of it. Early in 1897 I tried a few pistons as large as 6 in. diameter in a water-cooled job and some small ones in a motorcycle engine. Also used it for rear-axle housings. The results were bad. The metal was found to be very porous. It was clear the founders did not know how to handle it. Gas could be heard bubbling through it.

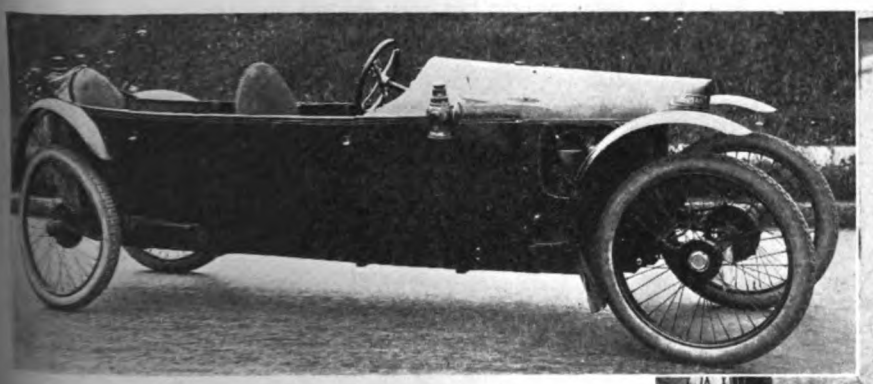
The rear housing did not show much strength at the heavy end where it should have been strongest and was perfection at the light end where it first cooled. The motorcycle pistons did better but fearing to take the chances they were all abandoned. But I still remembered the cycle frames. They were cast in iron molds and before pouring the molds were heated above the melting point of the alloy. After pouring they were cooled by a spray beginning at the bottom. This allowed the molten metal to flow to the cooling portion and fill up the shrinkage which ordinarily tears a casting to pieces. Surprising strength was gained by this process but the molds did not last long. With better steels to-day this should not bother. It certainly has a big future.—Charles E. Duryea.

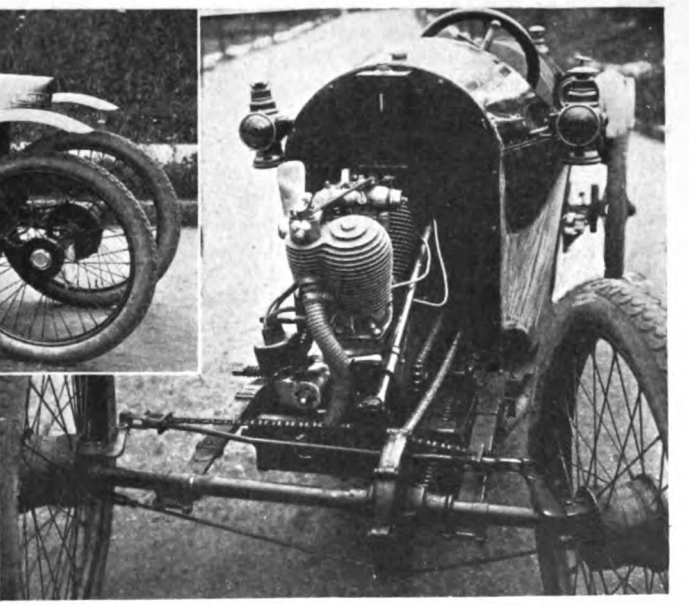
Likes Aluminum Parts

SANDY HOOK, CONN.—Editor THE AUTOMOBILE:—I notice in the current issue an article on the lightening of motor car parts and therein a reference to the adoption of aluminum alloy connecting-rods, I might say that I installed magnalium rods in my car, model O, Knox, over a year ago, these rods have run close to 6000 miles without any attention whatever and in connection with the change to magnalium pistons reduced the weight of the reciprocating parts 27½ lb. I consider this a very pronounced reduction and to get a further idea as to the possibilities of the metal have designed a piston for this motor, 4⅞ in. bore, that figures 11⅝ oz.

I am regularly turning out Ford pistons that weigh 13 oz. and have installed alloy pistons in quite a number of other makes of cars with very satisfactory results. The magnalium pistons in my car were installed three years ago and have run nearly 20,000 miles.—A. C. Griscom.

Morse Cycle Car Has Front Drive

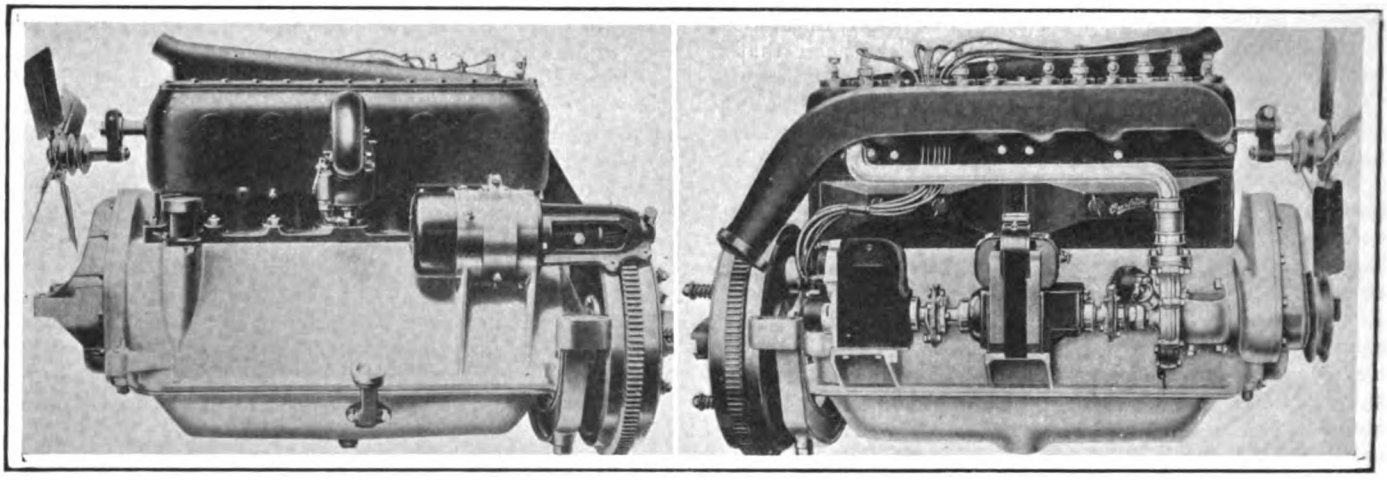




FOR those who believe in the cyclecar, the product of the Morse company, Pittsburgh, Pa., which has just announced a car of this type with tandem seating, narrow tread, and two-cylinder V-type engine, will be of interest. The car is shown in the accompanying illustrations and is said to weigh but 600 lb. It is featured by a front drive, so arranged that the power plant is assembled as a unit in front, the drive being transmitted to the front axle by chain, the efficiency for which is claimed to be 95 per cent.

A claim of 40 to 50 miles per gal. of gasoline is made and it is stated that it is possible to travel from 50 to 60 m.p.h., while owing to the low center of gravity, the tendency to overturn is very slight. The hill-climbing ability of the car is claimed to be very good and according to the showing made at the recent contest at Uniontown, where the little car secured sixth place in the event for cars up to 230 cu. in.

The change-speed mechanism provides two speeds forward and one reverse. The brakes are 8 by 1⅜ in. mounted on the rear wheels and lined with Raybestos and there is also a brake on the transmission communicating to the front wheels. The equipment includes an Atwater Kent system for ignition, Schebler carbureter, a full set of lamps for the side and tail, with a top, gas tank and gas headlamp at $30 extra. The price of the car is $350 with standard equipment, and it is mounted on a 105-in. wheelbase, with 28 by 3-in. tires, and is provided with a two-passenger tandem-seated body.



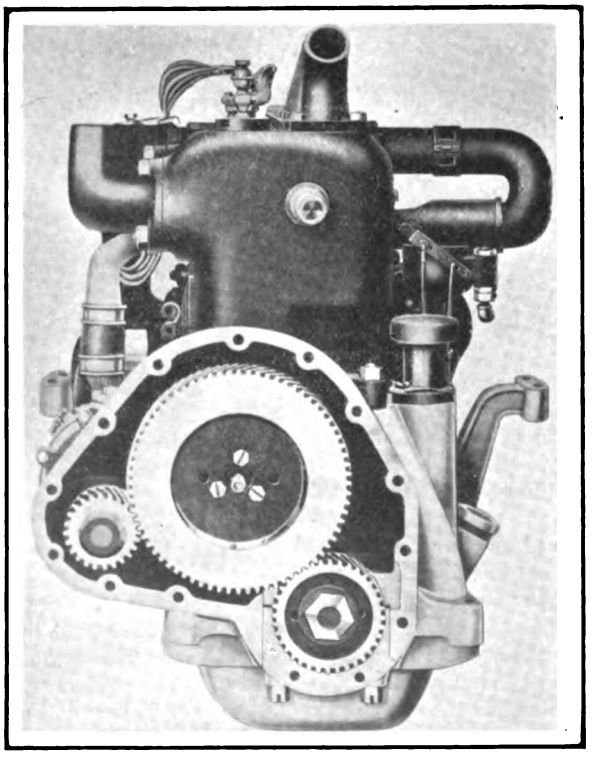
Left—Shows high mounting of starter and carbureter. Right—Gives a good idea of the valve accessibility. The oil pump can be seen just above the coupling between the water pump and generator

Overland Brings Out New Six

Chassis Is Similar to 1915 Model—Motor Improved in Detail—New Design Body Has Straighter Lines

At present the Overland plant at Toledo is producing completely one type of car only, the four-cylinder model with poppet valve motor. The Knight motors for the Willys-Knight come from Elyria and the sixes from Detroit, so the assembling shops and the test shop at Toledo are not interfered with by the necessity for handling more than one model of engine. In the chassis assembly the frame designs are changed a little so as to suit the different motors and the effect is that the assembly operations differ very little indeed whether the chassis has the standard four, the Knight or the six. This system makes for efficiency to a marked degree and means that the three models can be produced with extremely little special organization in the main factory.

Though not made in very large quantities as quantities are reckoned by the Willys-Overland Co., the Overland six is none the less a popular car. This year some 7000 or so are scheduled, and the car would certainly sell readily in larger quantity as the price, $1,145, is quite low as compared with the style and finish. The main characteristics are a smooth acting motor, with ample power and excellent acceleration, a large and very comfortable body, particularly good springs and conspicuous accessibility. In running it is very quiet even after covering a distance equivalent to more than an average year's use, the model car, which has been run over 12,000 miles by the factory testing staff, being altogether devoid of small rattles or squeaks, either from the chassis or from the body. Considering the harsh way in which factory test cars are usually treated, this speaks very well of the body framing in particular, as an old body without a door rattle is far from a common thing to meet.



Front end of motor showing new timing gears, oil filler and horizontal carbureter with hot air supply taken through cylinder block

Several Changes in Motor

The 1916 motor is considerably different from the 1915 six, having helical gears for timing drive instead of the spiral gear arrangement used previously. By this change some weight has been cut out and the engine rendered much neater and more accessible. With an S. A. E. rating of 29.4 the motor dimensions are 3.5 by 5.25 in., giving a piston displacement of 303 cu. in. The maker's rating is 45 hp. and this the motor should be easily capable of developing, as it will run at high crankshaft speeds.

Regarding the valve side of the motor, it will be seen that the generator and magneto are driven in tandem from the water pump shaft, and that all three accessories are placed low enough to clear the valves of obstruction. It should be added that the accessibility is actually better than it appears even, as the generator stands well away from the side of the crankcase, giving room for the manipulation of a tappet adjusting spanner. The use of leather disk couplings between pump and generator and between generator and magneto entirely prevents noise in the drive and also eliminates the possibility of slack arising, which is important in a tandem drive, for any lost motion between the front

end pinion and the magneto would necessarily affect the timing of the ignition.

In the valve side view of the engine the large exhaust pipe is noticeable. This has a vertical division inside, extending from about the middle of the length right back to a point just above where the exhaust pipe is attached. The purpose of this division is to separate the discharge from the three front cylinders so that exhaust strokes take place on alternate sides of the division, the idea being to prevent interference which might create back pressure.

The reverse side of the motor bears the carbureter and the starting motor, the former being a special form of horizontal instrument attached directly to the cylinder block where it is extremely accessible. All the air for the carbureter is drawn right through the cylinder casting, entering at a hole concealed by the exhaust manifold and reaching the carbureter by the curved pipe seen in the reproduction.

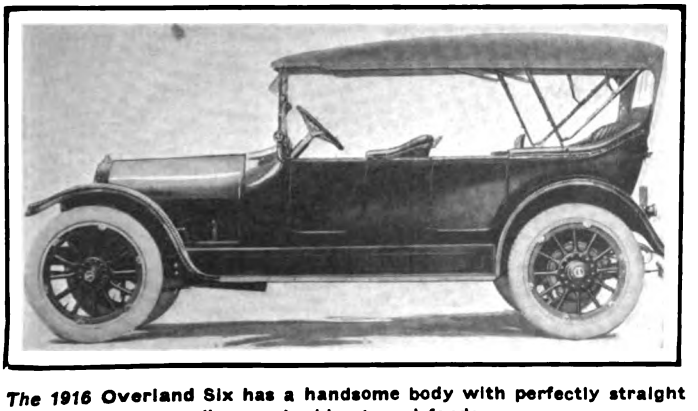
It should be noticed that the starting motor is placed high up, where it is out of the way of dirt and the Bendix drive is accessible for the occasional lubrication which it needs. On this side of the motor also are the oil filling cap and the level indicator, so all the ordinary needs of the motor can be attended to by raising only one side of the hood.

Lubrication is a combination of force and splash, a plunger pump operated from the camshaft sending high pressure to the main crankshaft bearings, the pump shaft bearing and the timing gears. Troughs catch the overflow and dippers on the connecting-rod caps distribute spray to all parts of the motor. A large diameter shaft and very rigidly supported bearings eliminate vibrations with a remarkable degree of success.

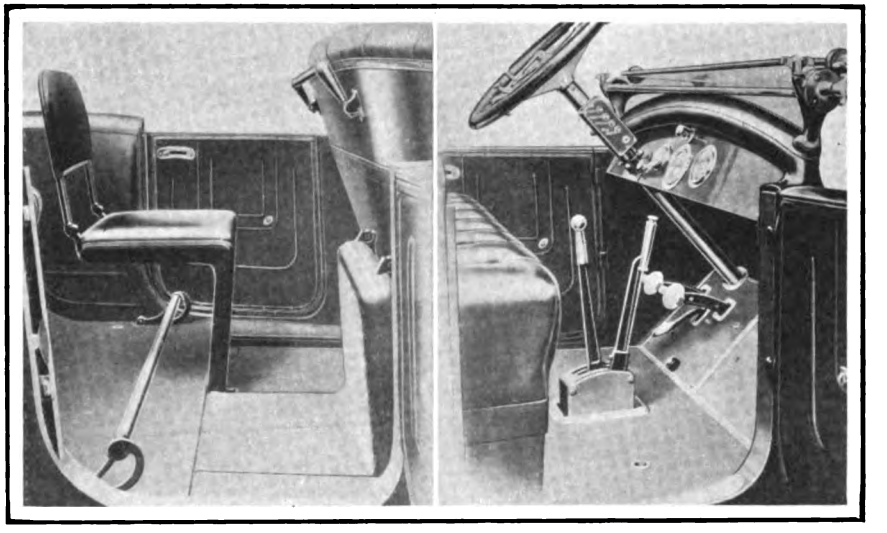
Clutch Has Multiple Springs

An aluminum cone with a leather facing is used for the clutch, but there are three springs instead of the more usual one. Spaced equally around the clutch cone these light springs are ideally accessible for adjustment and there is no need for the exercise of any very special precaution to see that all are at the same tension, since inequalities are compensated for by a floating spider inside the flywheel. Cushion springs beneath the leather are used to ease the engagement, which is very smooth and soft. A special point is made of the light pedal pressure required which is available for drivers of any stature by virtue of the adjustable pedal plates.

Though the after part of the chassis is similar in appearance to the well known Overland four, the rear axle is strengthened in proportion to the heavier stresses it has to bear. It is a floating type with the road wheels mounted upon double rows of Timken taper roller bearings. For the differential the four-pinion bevel pattern is used and there are large Timken bearings to support both it and the crown wheel. The driving shafts can be withdrawn through the hubs, and the axle case is strengthened by the use of truss rods.



The 1916 Overland Six has a handsome body with perfectly straight lines and wide, domed fenders



Left—Type of folding seat used in Overland Six. Right—Every detail of the control grouped for the driver's best convenience

Located on the rear axle is the three-speed ball bearing transmission, and there is a torque tube containing the propeller shaft, in accordance with Overland practice. The single universal is located well forward in the chassis where it is completely protected and easy of access for lubricating purposes. Quite a feature of the car are the large brakes which provide great arresting power with smoothness of action, the service brake in particular having a wonderful grip with quite light pedal pressure. Ample width of drum and plenty of surface for both the external and the expanding bands is the secret, combined with direct pull rods and no lost motion or heavy pull-off springs.

Convenience of Control

A point in the design which has had special study is the location of the controls which the driver requires. Thus the accelerator pedal is situated in the natural resting place for the right foot, the right hand rests easily upon either the gear or emergency brake levers and the lamp and ignition switches are all together in a little control box clipped to the steering column. The speedometer dial is central in the cowl board, flanked by the ammeter and the oil pressure gage, all being illuminated by a dash light which is always burning when the headlights are in use with or without the dimmer. It may be added that all the switches can be locked by a turn of a key at the bottom of the control box, so preventing interference with any circuit. For operating the starter there is a toe button, as the Bendix drive needs only a switch action for its complete operation.

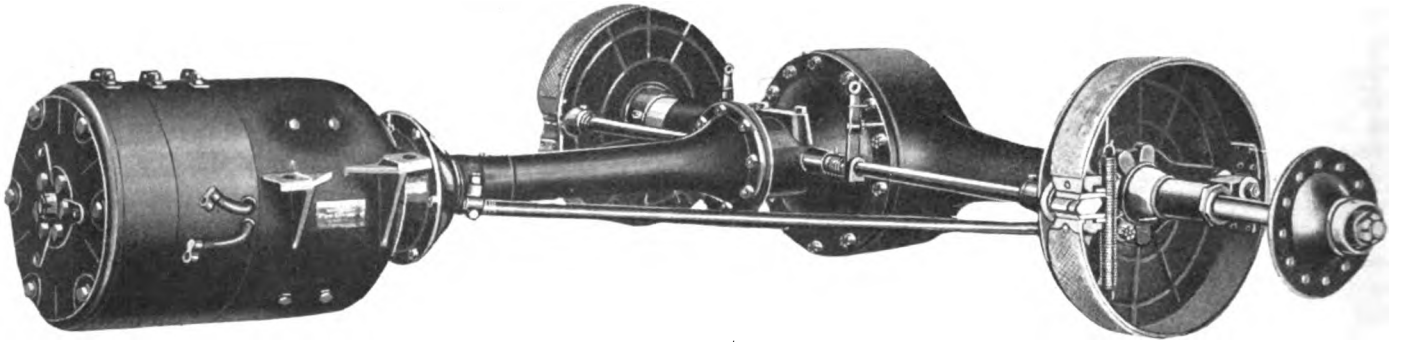
Plenty of Room in Tonneau

It is said that the springs are especially good and their easy action is aided by an ample depth of upholstery, but the long, three-quarter rear springs do not create much roll when rounding a curve at high speed, and it is also noticeable that the rebound is slight. For this reason it is possible to sit back comfortably on a rough road and make use of the leg room.

The standard equipment includes all the usual accessories and a spare demountable rim, tires being 35 by 4½, with nonskid treads on the rear.

Improved Detroit Electrics Lower in Price

Spiral Bevel Drive Optional—High Quality Chassis and Bodies



Power unit showing direct drive connection between motor and worm bevel drive. Note large expanding brakes in hubs

WHAT might be regarded as a new phase in electric car manufacture begins this week with the announcement of sweeping reductions in the prices of all of the models of Detroit electrics, made by the Anderson Electric Car Co., Detroit, Mich., the activities of which in its field are a good indication of the trend of this branch of the industry.

The Detroits are to sell at prices ranging from $1,975 to $2,275, which means reductions running from $600 to $725, depending upon the model. Along with this significant move, Anderson makes the statement that production is to be practically doubled for the coming year, this being the main reason for the large price cuts, as the cars are quite evidently not cheapened in any way. They are, as a matter of fact, more highly refined than ever.

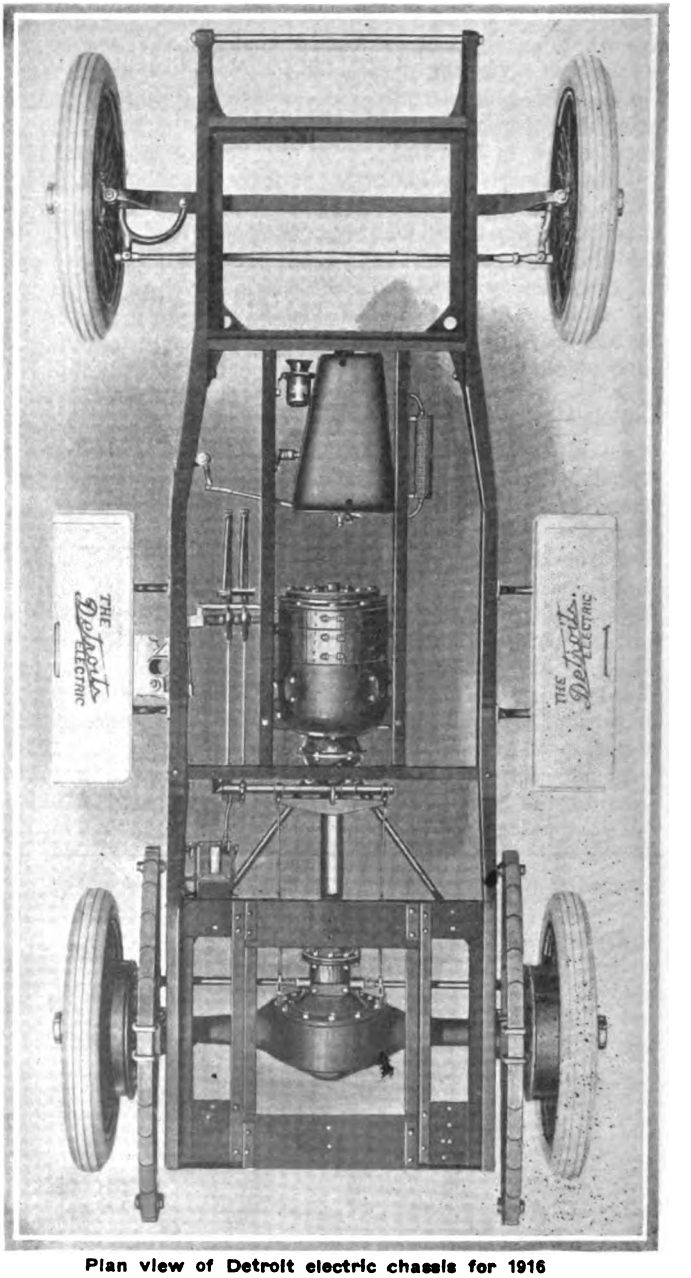
As an indication of the standardization that is going on with the Anderson company, it has adopted a one-chassis basis of production, with five different types of bodies fitted thereto. This is a noteworthy situation from a manufacturing standpoint.

The 1916 Detroits comprise six models. Briefly, these are model 61, which has been reduced from $2,600 to $1,975, and is a four-passenger brougham; model 60, a five-passenger double-drive brougham which formerly sold for $3,000 and is now $2,275; a rear-drive five-passenger brougham, model 59, which has been cut from $2,950 to $2,225; model 58, formerly $2,950 and now listing at $2,250, also a five-passenger brougham, but having front drive; a four-passenger inclosed type, known as model 57, which formerly cost $2,850 and is now $2,175; and model 56, which is a popular cabriolet style for three-passengers and sells at $2,075, as compared with its old price of $2,650. There is nothing changed in the basic construction of these cars, as they continue to use a 4-hp. series wound motor with shaft drive to the rear axle, and 42-cell lead battery equipment.

Optional equipment is given for the rear axle, for beside the standard type of worm drive used in the 1915 models there is being offered a floating spiral-bevel gear rear axle with a reduction of 6 to 1. Ball bearings are used in the construction, and the differential gears are cut from chrome-nickel steel.

Refinements Numerous

There are, however, a number of refinements worthy of notice, all tending towards greater interchangeability of parts throughout the line of bodies, and to even better body work, performance and convenience. For instance, the glass



Plan view of Detroit electric chassis for 1916

in the bodies is mounted on thick rubber, with the channel dovetailed in such a manner that it is said to be impossible for wash water or the most driving kind of rain to find its way within the body. Door locks have been fitted which may be operated from either side of the car, both from the inside or the outside, this having an obvious advantage.

Cut-Out Design Improved

The current cut-out has been entirely redesigned in order to adopt the more efficient knife blade type of switch and this new design has proved itself most reliable after much testing. The top cover of the cut-out box is easily removable for inspection purposes and, as another indication of accessibility, taking out two screws allows the removal of the bottom of the box, to which the contacts are fastened. This makes it simple to inspect or work on the contacts.

The third speed shunt has also been made of greater capacity, by using a larger diameter of wire. This acts principally to increase the rate of travel on third speed and it really makes a better speed range for, with the new wiring, the third speed is exactly half the difference between the second and fourth speeds, measured in miles per hour.

All the bearings in the controller have been made of the self-lubricating type, and another controller change is a new design of cover and the use of a pressing for that member. The resistance for the adjustment of the motor brake, together with the meter shunt, has been mounted on the controller base and underneath the cover. A piece of felt running the length of the controller frame and saturated with sperm oil provides for automatic lubrication of the controller drum so that the drum contacts wipe across the felt which keeps the controller blade constantly clean and lubricated. Leakage of the current is prevented through the oiled felt by now mounting the lubricator in a separate casing insulated from the controller base.

No change in principle has been made in the motor brake. Refinement details however include the use of a Raybestos covered disk mounted upon a screw thread, which allows adjustment for wear. This dispenses with the twelve or fourteen adjusting washers which were used on the previous models of motor brakes. Improvements have also been made by the addition of more brake material, which allows a greater degree of wear without the need for frequent adjustment.

Brakes on rear hubs are of the internal expanding type, size 2½ by 16 inches, and are operated by merely pushing foot brake pedal forward. To the left of foot brake pedal is located a smaller pedal. Pushing this small pedal forward with the foot applies rear hub brakes and simultaneously cuts off the power through a knife blade cut-out switch. It also operates ratchet which sets brakes. When brakes are set in this manner they cannot be again released until controller handle is in neutral driving position.

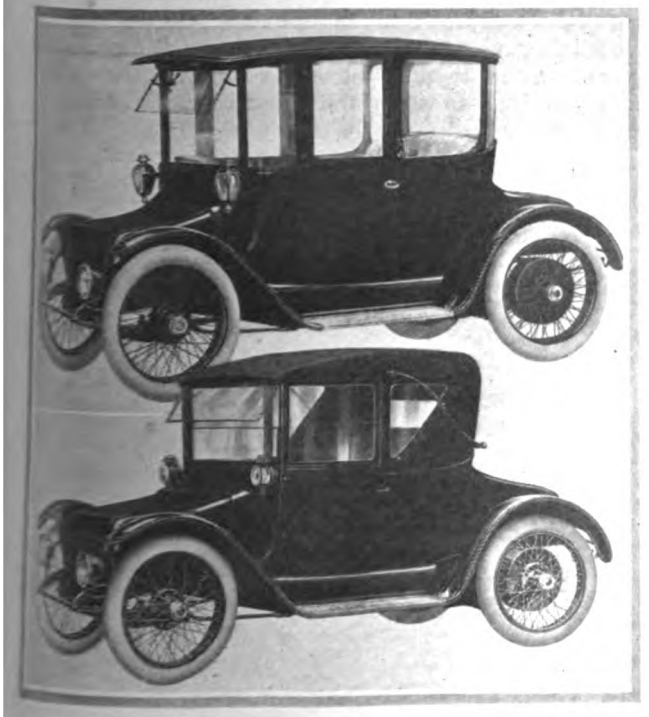
A new design has been worked out for the first speed resistance. The resistance coil of heavy wire is supported on the frame at each end, so that there is a circulation of air all around it. This increases the heat radiation, and affords a considerable saving in weight.

Refinements have also been built into the controller mast and its universal joints, the latter now being of heavier construction than it was, with an adjustment provided for wear. A bar of spring steel is used to connect the joints so that there will be a slight yielding in case an inexperienced driver should apply the motor brake too harshly. The steel, however, is stiff enough to be rigid under all ordinary driving conditions. This construction is to safeguard the bending or disarrangement of any of the other parts of the controller mechanism.

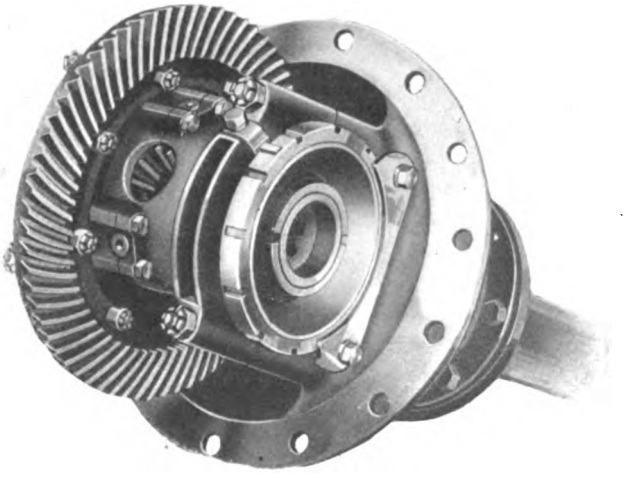
Battery equipment consists of 42 lead plate cells of 15 plates each, and is contained in eight trays arranged lengthwise of the car. This method of arranging them allows for identical trays, and very accessible connections upon raising the battery hoods. Weight reduction of about 50 lb. has been accomplished in the battery construction.

Wide Choice of Body Styles

Enumerating some of the special features of the several body types, the Anderson company calls special attention to the fact that model 61 is especially applicable for city driving, due to its compactness and the ease of handling in traffic. The operating levers are mounted on the left of the rear seat, and steering is accomplished by the driver's right hand, while the shorter lever does the controlling. Theft of the car is prevented by a nice feature whereby the levers can be swung upward into a vertical position and locked against operation. Three persons can be accommodated on the wide rear seat, and a fourth passenger is taken care of by a revolving Pullman-type of chair in the front right corner. Wire wheels or wood type are optional, as are also Goodrich silvertown cord tires of 34 by 4½ size, or Motz cushion tires. Wheelbase of all models is 100 in.



Above—Model 57 four-passenger Detroit electric rear drive brougham which sells for $2,175. Below—Model 56 three-passenger cabriolet which is listed at $2,075



Details of spiral bevel worm floating rear axle which is optional on the new Detroit electrics. This has a reduction of from 6 to 1 and ball bearings are used in its construction

New Commerce Delivery

Strength and Sound Design Features of Chassis—Every Detail Made for the Job

IT is an accepted maxim that the best sort of vehicle to use for the transportation of goods is one built for the purpose and not one adapted to suit it. While many converted pleasure chassis do give good service as delivery cars it stands to reason that a type with twice the strength cannot fail to give more enduring service.

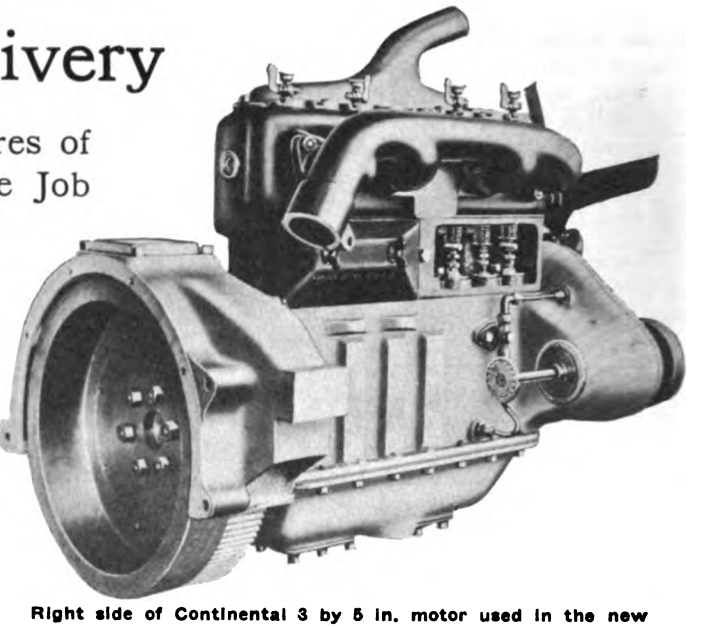
It is with this idea that the Commerce chassis has been built, but with the additional thought that the retail storekeeper or dealer does not want to pay a high price, in fact a high first cost may easily make it impossible for a car to be used where it would be truly valuable.

Good Units in Assembly

The Commerce Motor Car Co., Detroit, Mich., has picked good units such as a Continental 3 by 5 in. motor. Gearing and clutch come from the Detroit Gear & Axle plant, being just as much intended for rough handling as is the truck motor, while the bevel driven rear axle is a special construction calculated to carry a big overload. The rated capacity of the car is 1,500 lb. and plenty of space is allowed, as instance the dimensions of the floor of the panel van which is 88 in. long and 44 in. wide. As to the frame, this is good stout steel and the section 4⅝ in. deep by 3⅛ in. wide, these dimensions being maintained for nearly the full length and the amount of tapering off confined to the front end which has only the engine to carry.

Thoroughness and simplicity are the keynotes of the whole machine the driver having as little as possible to care for. Thus the motor is cooled by thermo-syphon, the special design of radiator and the amply large pipes making this system perfectly satisfactory and eliminating the water pump which always needs some attention. For lubrication a sight feed is introduced in the feed line from the oil pump and all the oil for the rear crankshaft bearing passes before the eyes of the driver.

Brakes, which of course, need adjustment from time to time have settings at three points, so that their efficiency can be maintained at the full till the last scrap of lining is used up. On the bands themselves there is a setting to keep the last lever in the position of best pulling power. Then there is an adjustment on the clevis of each pull rod which cares for the countershaft lever positions, and lastly there is an adjustment at the front end which cares for small degrees of wear and can be got to with the utmost ease.



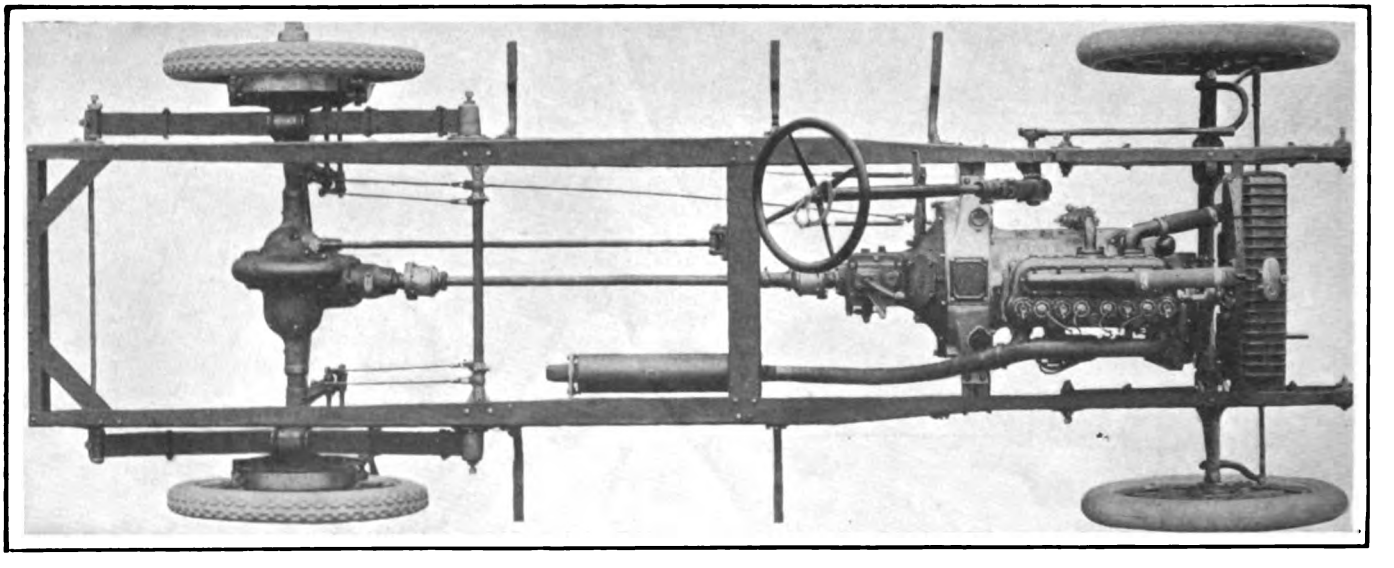
Right side of Continental 3 by 5 in. motor used in the new Commerce delivery car

Motor Is Rugged Job

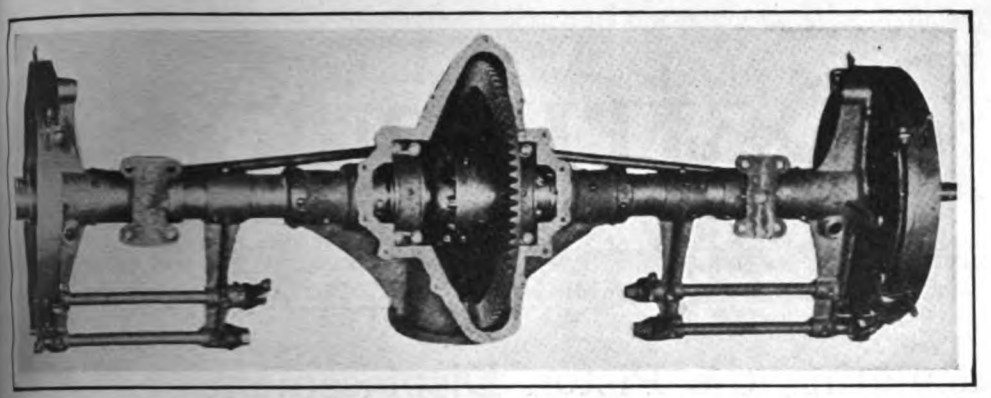
There is no need to say much about the motor save that it embodies all the best Continental practice. The four cylinders are in block and the valves are individually accessible through brass valve cups which makes grinding in a somewhat quicker job than when the whole cylinder head has to come off. On the right side the Eisemann magneto is situated and is low enough not to obscure the valve springs which are inclosed behind pressed steel cover plates. On the left side there is nothing but the Breeze carbureter and the oil filler.

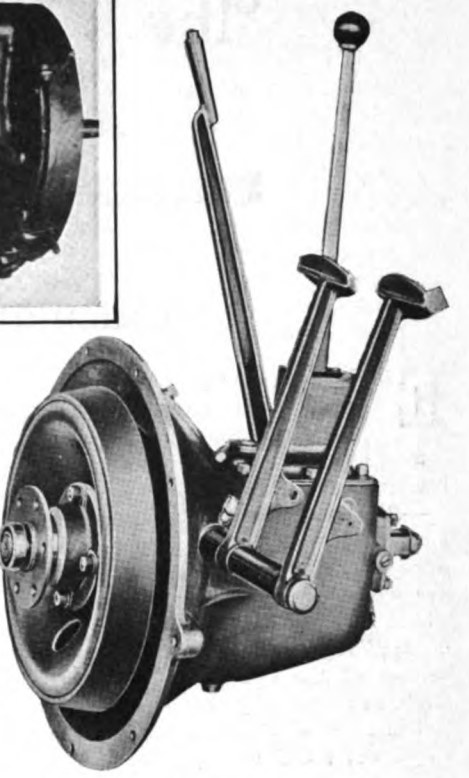
There are three large crankshaft bearings to which oil is fed under pressure from the plunger pump that is operated off the camshaft, dip troughs catching the overflow and caring for the connecting rod lubrication. A separate feed supplies the helical front end gearing. On the left side just alongside the oil filler is a gage with a dial that shows at a glance whether there be the proper supply in the oil pan.

In order to save weight the engine has an aluminum crankcase, but the gearset is housed in cast iron as the case is



Plan view of Commerce delivery car chassis, showing the strong construction of the assembled units and three-point suspension of the power plant





Upper left—Showing the strong construction of the rear axle used in Commerce delivery cars. Note the large braking surface

Right—Clutch and control lever assembly on the new Commerce. Note compactness of the unit

small. The leather cone clutch makes up with the gearbox and has a self-contained thrust as is shown in the drawing. Of course the gears are a very important part of any commercial car since they come into use so much more frequently and this gearset has been constructed to withstand any amount of hard usage. It may be noticed that the bearings are all large, especially the double row New Departure at the rear end of the main shaft.

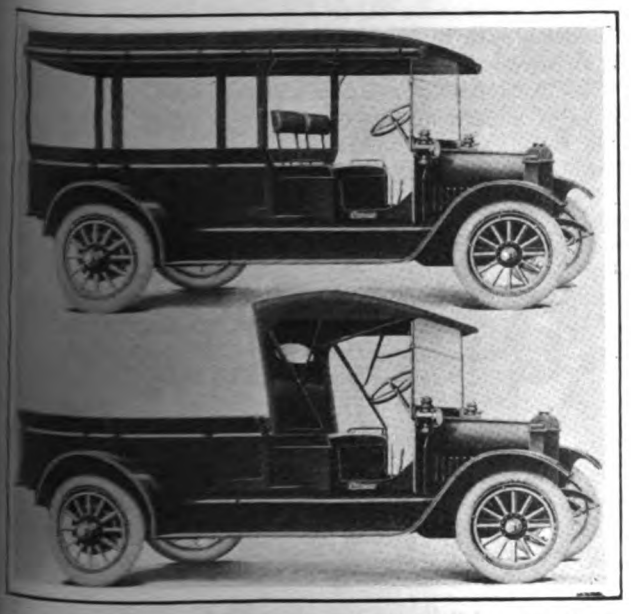
Three-Point Suspension

Three-point suspension is used for the power plant, the front end resting on a dropped cross member of the frame. It should be noticed in the chassis plan that this cross member does not carry the radiator and the reason for this is interesting. It is certain that the frame of any car of this sort will weave, so the radiator has a stiff cross member with nothing to do save support the water carrier. This cross member is not riveted or bolted rigidly to the frame sides, but is secured by only two cap screws that are put through the upper flange of the main frame, one on either side. Any weave that takes place in the main frame cannot by any possibility, twist the radiator support, so the cooler is relieved of all stresses.

For the radiator cast iron top and bottom tanks are employed and the middle part consists of a nest of vertical tubes. The side pieces are plain pressed steel and contain no water. Thus should the radiator happen to be damaged it is easy to take out and replace the middle part without having to buy a complete new radiator. There is a large hinged filler cap through which water can be poured from a bucket without the least difficulty.

Coming now to the axles, the rear is a built-up construction with a stout cast steel center that carries the differential and bevel wheels, there are four differential pinions and large ball bearings to support the whole. As a type the axle is three-quarter floating, with Hyatt heavy duty bearings to carry the wheels. Brakes are 15 in. diameter and 2 in. wide so there is plenty of surface.

A point to be observed is that the Commerce company has abandoned the single universal joint construction in favor of two universals with a torque stay. The front axle is a heavy I beam section with nothing special about it, but the springs are quite a feature. Those at the rear are 50 in. long and no less than 3 in. wide while the front springs are 36 in. by 2¼ in. All shackles are bushed with bronze, and the rear end hanger which has a great deal of work to do has a large grease pocket which cares for the lubrication in the event of the driver neglecting his grease cups for a few days. In laying out the brakes the countershaft has been located on the line between the two front end hangers, so that movement of the axle does not affect the brakes.



Two of the Commerce models for 1916. They have a capacity of 1,500 lb. and are made in various body styles

Three Body Types

There are three standard body styles, a panel car, an express truck without canopy and with a mohair top for the driver, and an express car with wood top. All three complete vehicles cost the same $975. The thoroughness of the chassis work is equally apparent in the bodies. Of course it is not hard to make an open body strong enough, but a panel body that will not rattle or bulge after a year's hard service is a different sort of proposition. For the Commerce panel body plenty of good hardwood framing is used, the doors are solid enough for a 3-ton truck and the hinges and bolts so stout that the roughest sort of treatment could not hurt them.

Further all three bodies are well finished and carry their ruggedness in their appearance.

Standard tire equipment consists of United States pneumatics 34 by 4 in., non-skid on the rear wheels and plain in front, while one spare rim is included in the equipment. The windshield is in keeping with the rest of the fittings and the oil lamps are heavy gage material.

The Rostrum

Calculating the Piston Displacement

EDITOR THE AUTOMOBILE:—Will you please explain exactly how to find the piston displacement of a motor in cubic inches?

2—Has the r. p. m. anything to do with the calculation?

Irving, N. Y. E. C. H.

—Piston displacement of the motor means the volume passed through by the pistons during one stroke. In other words, for each cylinder it is the cubical contents of a cylinder whose diameter is equal to the bore of the motor and whose length is equal to the stroke of the piston. With this in mind it is only necessary to give the rule for finding the volume of the cylinder which is the area of the sectional circle multiplied by the length of the cylinder.

The area of the sectional circle is equal to the diameter (squared) multiplied by .7854 and thus the formula becomes:

$$D = .7854\, d^2\, L$$

In this formula D is the displacement; d is the diameter of the cylinder or the bore of the motor, and L is the length of the stroke. Thus, for a 4 by 5 motor of one cylinder, the displacement would be:

$$.7854 \times 4 \times 4 \times 5$$

and for a four-cylinder motor it would be:

$$.7854 \times 4 \times 4 \times 5 \times 4 = 251.3$$

2—The r.p.m. have nothing to do with calculating the displacement unless you desire to bring in the factor of time. If you wish to know the displacement of a motor per minute, then you would bring in the factor of r.p.m. When speaking of the piston displacement of a motor, the r.p.m. have nothing whatever to do with the matter.

Very often it is desired to estimate the volume of gas entering the cylinder in a given time and when this is done the displacement for a given time is calculated. For instance, if it is desired to know how much gas is drawn into a motor for a period of a minute, it would be necessary to know the number of intake strokes per minute and multiply this by the piston displacement. This would give the theoretical amount of gas drawn into the motor, but as a matter of fact, since the volumetric efficiency of a motor is never 100 per cent, only a portion of this amount of gas would be drawn in. It is only with theoretical calculations of this nature that the displacement for a given length of time is used.

Wants to Increase Speed of Regal N

Editor THE AUTOMOBILE:—I would like to ask you for your advice on a few matters relating to my car, which, being of American manufacture, is difficult to obtain in England. I want to increase the road speed of this car and any help you can give me will be greatly appreciated.

1—I own a 1913 Regal model N, underslung car number 5085, and I am desirous of increasing the speed at the road wheels. How can I best obtain this—by either fitting a new ring gear and bevel pinion of higher gear ratio, lighter reciprocating parts to engine, or larger road wheels? The best speed obtainable at present is 35 m.p.h., but at anything over 30 m.p.h. the vibration is excessive.

2—Regarding the water circulation, the engine is cooled by what is known as thermo-gravity circulation, wrongly called thermo-syphon, but it could not very well be worse, the water does not circulate. Could not a circulating pump be fitted? If so, how and where? Would like the approximate cost of parts recommended.

3—Regarding the underslung frame, is there any real merit in this type of frame? If so, why do not more makers use it? Also, is it a part which the Regal company has discontinued using?

4—I get a slight leak from the bottom of the Model L Schebler carbureter. How can I prevent this? The cork float is good and the valves appear tight.

5—Can the rake of the steering column be altered?

Paignton, England. F. W. G.

—You can probably increase the speed of the car considerably by doing all the things which you suggest. The expense will be considerable, however, and possibly it would be better to rely simply upon a higher gear ratio and a change in the timing so as to put the spark further ahead for high speeds.

2—THE AUTOMOBILE has no record of what it has cost for previous installations of water pumps on cars in which the original cooling system was of the thermo-syphon design. The pump installation will be also a rather complicated matter on a car which has not been built for it, and it is impossible to estimate accurately what the cost will be for arranging the drive, etc. The work in fact, could not be attempted except by a shop where the equipment is complete and where those in charge of the work are mechanics of exceptional ability.

3—The Regal company has abandoned the underslung frame and so have other American manufacturers who at one time used it. The fact that it has fallen into disuse is sufficient to show there has been no real demand for it.

4—The repair of the leak will depend upon whether or not it is of a permanent nature of merely the condensation of the gasoline in the manifold after stopping the motor. If the gasoline leaks from the carbureter for a short time after

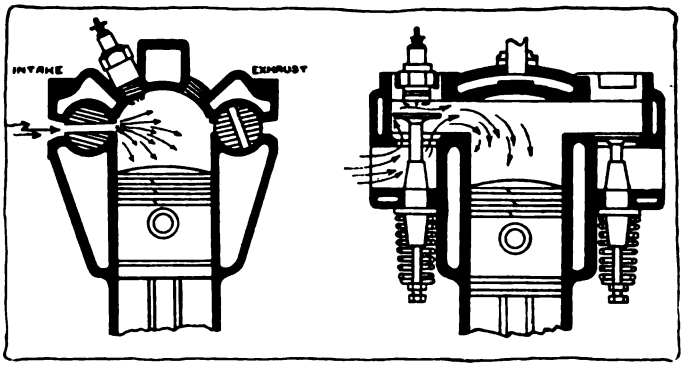


Fig. 1—One of the advantages claimed for the rotary valve motor is the direct flow of the intake gas

the motor is stopped, and then stops leaking, it is the gasoline which has been drawn up in the manifold condensing and then running back into the carbureter, causing it to overflow. The remedy for this is in the fitting of hot air connections which assist in thoroughly vaporizing all the gasoline. If the leak is a steady one it shows that the cork float is slightly water-logged, in which case it will have to be dried out and re-shellacked or the valve to the gasoline inlet does not seat tightly and will have to be ground in.

It would be advisable to make sure that the float valve seat and that the bowl gasket in the bottom of the bowl are in good condition with the float at the proper height, that is 1 1/16 in. from the top of the bowl to the top of the float. If these three points are correct, the carbureter will not leak.

5—The rake of the steering column can be altered by simply loosening the bolts which clamp the steering gear to the sub-frame and pulling the column down to the desired angle and then tightening the bolts again.

Interested in Rotary Valve Motors

Editor THE AUTOMOBILE:—I am interested in rotary valve motors and wish to learn the action and design of the Speedwell, Mead and any other well known design.

Do these motors cool the valve core or shaft by forcing water into them or simply cool by water-jacketing the container? If water is passed into the core, how is the connection made with the water pipe? How large a port area in square inches do these motors use to a certain cylinder size?

Fairfax, Mo. A. L. C.

—The Speedwell and Mead rotary valve are one and the same thing because the Mead rotary valve motor is used in the Speedwell car. The manner in which this motor operates cannot be better described than in the accompanying diagram, which shows the valve in various positions for a four-stroke cycle motor. As seen by the diagram, Fig. 2, the Mead rotary valve motor employs two rotating sleeves, one for intake and the other for exhaust, thus giving a sort of T-head construction, although the advantages of semicircular sections are maintained by the combustion chamber. In practice, the intake and exhaust rotating sleeves are made in halves, this being done so that longitudinal expansion of the rotating sleeve can be taken care of at the joint. For a six-cylinder motor one-half of the intake valve would serve three of the six cylinders and the other half coupled to it would serve the other three cylinders. The intake and exhaust valves are similar in appearance. The path of the gases through these sleeves is shown in Fig. 1. The method of drive for the valve can be anything desired, a common means being a worm mounted on a vertical shaft which drives the two valves which are directly connected to worm gears which mesh with the worm on the vertical shaft. Regarding your question as to the water-jacketing and cooling used in connection with these motors, the illustration of the castings employed in actual manufacture will clearly bring this out. The container of the valve is waterjacketed but the valve itself does not hold any water because to do so would mean a very complicated arrangement, since there would have to be some connection between the moving valve and the stationary part. The port areas in these motors are very close to the areas of the clear openings of large poppet valves, the gain being not so much in valve size as in valve timing.

Has Trouble with Overheating

Editor THE AUTOMOBILE:—I have a 1912 model B Abbott-Detroit. For the past two years this car has been heating, and several people have tried to remedy this fault without success. It is heating worse than ever now, and I would like to know what I can do. The entire system has been flushed throughout, radiator, cylinders, every pipe and water connection has been cleaned, carbon removed from cylinders, valves, pistons, etc. The spark has been advanced to the farthest possible position, the gas mixture cut as lean as possible, and the fan works all right. The oiling system has been thoroughly gone over and every part of the motor seems well lubricated.

Can you explain which way the paddle wheel in the water pump should go? It seems as though this wheel has been changed and I have put it on the way I am almost positive it should go, despite opposition, and I now leave it to you.

2—Will the placing of a heavy gasket between the cylinder blocks and crankcase, to lower compression, have any effect upon the cooling? This I notice has been done at some time.

New Smyrna, Fla. I. A. M.

—It would seem as if you had done about everything possible to overcome the heating in the Abbott motor, unless the water pump paddle which you mention has been placed in the pump casing wrong end to. The casing of the water pump on the model B Abbott consists of two parts, known as the body and the cover. The body is the larger half, while the cover is the smaller half. The body has the inlet connection to the cylinders, while the cover has the connection which draws the water from the radiator.

The body is the half which is closest to the front of the car and the paddle has one side entirely smooth with the exception of the hole for the pump shaft, while the other side has part of its surface cut away around the pump shaft hole to admit the passage of the water. Obviously, the paddle must go into the water pump body smooth end first, as if it is placed the other way around it would shut off the passage of the water, preventing it from reaching the pump, and hence the circulation would cease.

It can be readily determined whether or not the paddle has been placed in properly by merely taking off the radiator cap. When this is done and the motor is running the water can be seen circulating in the radiator when the paddle has been placed in properly and the pump is working.

2—The heavy gasket you mention as having been placed between the cylinder blocks and the crankcase was originally

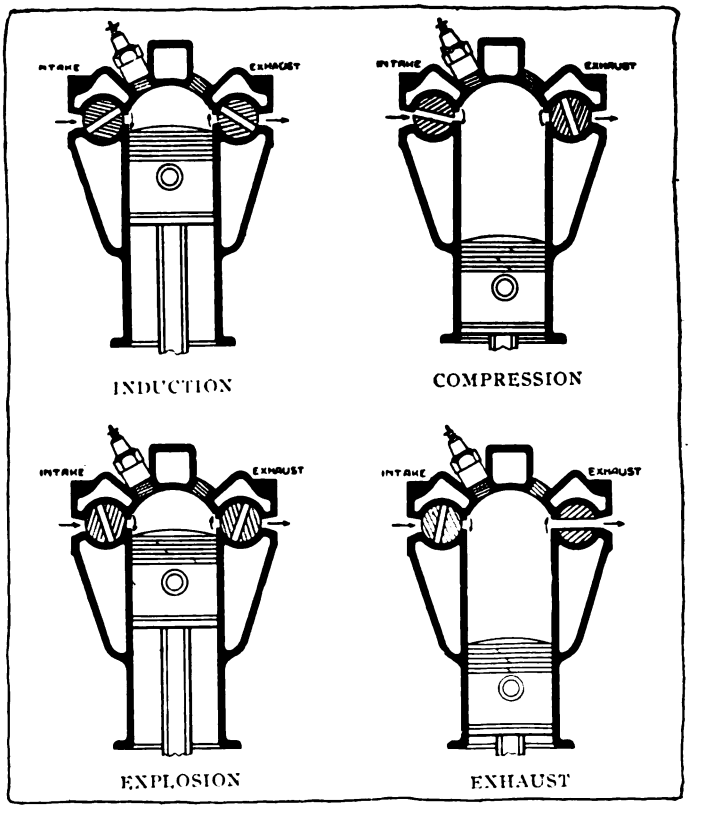


Fig. 2—Mead rotary valve as used on the Speedwell motor in different phases of its four-stroke cycle

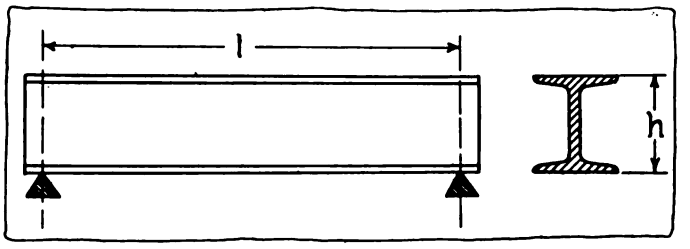


Fig. 3—Diagram of I-beam supported at ends, 1, is the length or span of the beam and h is its depth

put on the car at the factory, and this will not in any way affect the cooling system of the motor. If the trouble is not in the water pump paddle the only suggestions which apply are those which would be true with any gasoline engine having a water cooling system.

Causes for Jumping at 15 m.p.h.

Editor THE AUTOMOBILE:—My Ford 1915 model is inclined to jump or run unevenly when running at from 12 to 15 miles, but works satisfactorily when warmed up and at higher speed. The ignition, gasoline line and valves are in good order.

2—Can you advise me where I can obtain a float for a Holley carbureter?

Dresden, O. J. S. C.

—Without seeing the car it is very difficult to say what may cause a thing of this kind. In fact, the action of the car itself and the "feel" to the driver are largely what determine the points to be looked after in remedying the trouble. If the car goes along well and then suddenly acts as if the brakes have been put on, due to the fact that the motor misses fire or explodes unevenly and has to work against the compression of the dead cylinders, it is an entirely different feeling from that due to first weak and then strong explosion. Sometimes a slipping clutch will cause an uneven sensation.

It is possible that the commutator is dirty or that the valves are in such condition that they seat tightly enough for higher speeds, but at low speed permit a leakage of gas and hence they miss. Some of the units or contact points on the coil vibrators might be badly worn or dirty and need cleaning and adjustment. Sometimes the misadjustment in these coils is just enough to be noticed at certain speeds. At other times, a short circuit in the ignition may give an irregular action and this can be quite often detected by the buzzing of the coil unit continuously instead of intermittently. Some of the reasons generally given for the engine running irregularly at low speeds are the following:

1—Close gap between spark plug points.
2—Too great clearance between valve stem and pushrod.
3—Weak exhaust valve spring.
4—Air leak in intake manifold.
5—Coil vibrator improperly adjusted.
6—Spark plugs dirty.
7—Gas mixture too rich or too lean.
8—Poor compression on account of leaky valves.

Only Experts Drive in Big Races

Editor THE AUTOMOBILE:—Are only expert drivers allowed to race in the big events like Indianapolis, Chicago, Vanderbilt Cup, etc.?

2—What is necessary to become a professional driver?

3—What firms employ amateurs so they can acquire experience?

Newark, N. J. G. H. MESSER.

—Only expert drivers are allowed to race in events of this class.

2—To become a professional driver it is necessary to have the owner of some car designate you as the pilot of his vehicle and permit you to enter it in the contests. Generally before a man employs a driver he must become convinced of his ability, and, therefore, it is generally necessary to have some kind of work or practice which will enable you to prove that you are capable of handling high-speed racing cars.

3—No firms employ amateurs for the purpose of giving them experience in racing.

Kleinart Is Reconstructed King Racing Car

Editor THE AUTOMOBILE:—Is Klein's Kleinart the King racer reconstructed, or is it a new car?

2—What are the racing colors of the Maxwell and Sun beam companies?

3—Has kerosene been used in the Maxwell racers since the 1914, 500-mile race?

Rye, N. Y. G. MCCULLOH.

—Klein's Kleinart is the King racer of last year entirely reconstructed. The wheelbase is now 108 in. whereas it was formerly 113 and the motor is now under the 300-in. displacement limit, having a Duesenberg motor, eight-valve, 3 63/64 by 6 in. bore and stroke.

2—As far as is known to THE AUTOMOBILE these teams have no definite colors. Some of the Maxwell cars have been distinguished by the use of American shields. As far as THE AUTOMOBILE has any record kerosene has not been used in any of the large races this year.

Building Garage Over a Creek

Editor THE AUTOMOBILE:—I am building a new garage which will reach over a creek and concerning the construction would like to ask the following questions:

I will have a span of 22 ft. across the creek and intend to use an I-beam suspension with an I-beam 12 in. deep, 5.21-in. flange and thickness of web 0.56 in. having a sectional area of 11.76 sq. in. How much load will one of these carry in the center supported at the ends only?

2—How many would you recommend for a span 22 by 8 ft., using 2 by 12-in. wooden joists set into channel of the beam on each side to lay the floor and being placed 16 in. center to center?

Crestline, O. O. F. F.

—The formula by which beams supported as you state are calculated is: $M = \frac{SI}{c}$ in which M is the bending moment, S is the unit stress on the part of the beam furthest from the neutral axis which is the center line in the case of an I-beam, c is the distance of the most remote fiber from the neutral axis which in the case of an I-beam is equal to one-half the depth and I is the moment of inertia. The part of the formula $\frac{I}{c}$ is known as the section modulus and for an I-beam this is equal to $\frac{Ah}{3.2}$ where A is the area of the flange section and h is the depth of the beam.

Substituting for the section modulus the dimensions given by you the value 44.1 is secured.

The formula for the bending moment for your beam therefore comes: $M = 44.1\ S$. If the beam is to be loaded at the center the bending moment is equal to half the load on the beam times half the span. As the beam is 22 ft. long the bending moment at the center for a load of P (lb.) would be $\frac{P}{4} \times 11$ and assuming the tensile stress to be equal to 16,000 lb. to allow plenty of factor of safety if the beam is of steel and 14,000 lb. per square inch if the beam is of iron, the equation would become:

$$5.5\ P = 44.1 \times 16{,}000 \text{ or } 44.1 \times 14{,}000,$$

or the safe load would be about 12,800 lb. on a steel beam and 11,200 lb. for an iron beam.

The calculations given above are assuming that the

is all concentrated at the center, but if the beam is uniformly loaded from one end to the other, as it probably would be in the way the building would be constructed, the safe load on this beam would be double that given for the load concentrated at the center. The figures given for safe load on steel and iron beams are those furnished by the Pencoyd Iron Works, Philadelphia, Pa.

2—This would depend on the floor load.

Motor of 2388.8 Piston Displacement

Editor THE AUTOMOBILE:—Kindly give me the S. A. E. rating and piston displacement of an eight-cylinder motor, the bore and stroke being 6½ by 9.

2—Is the magneto on a Reo six a high or low-tension?

3—What is the highest automobile license in Ohio?

Akron, Ohio. G. H.

—The S. A. E. rating of an eight-cylinder motor, 6½ by 9, is 67.6 hp. The piston displacement is 2388.8 cu. in.

2—The magneto on the Reo six is a Remy high tension.

3—According to our latest advices on Aug. 2, Ohio had 161,700 motor cars registered since the first of the year and estimates at that time were made that by the end of the year 175,000 cars would be registered. At that date the chauffeurs' licenses numbered 13,643.

Van Sicklen Uses Air Principle

Editor THE AUTOMOBILE:—Will you please explain what the "air principle" in speedometers is?

2—What is the construction of the Van Sicklen speedometer?

Lowell, Mass. J. C. C.

—The air principle, when referred to in connection with speedometers, generally deals with the method used by the Van Sicklen apparatus made by the Van Sicklen Co., Aurora, Ill. This speedometer differs from others in general use in that its operation is based upon the generator and calibration of a current of air. This air current is generated by a spiral gear pump which is driven in the conventional manner by a flexible shaft from one of the road wheels or from some portion of the transmission mechanism.

The illustrations, Fig. 4, show the construction of the instrument. The current of air generated is directed against a vein on the inside of the floating dial. The floating dial itself is a light inverted cup secured to a shaft that passes vertically through its center as shown in the illustration. The shaft forms an axis about which the cup is free to turn, and when the air current generated by the pump is directed against the vein on the inside of the cup, it tends to turn it on its axis.

Referring to the illustration of the floating dial, it will be noted that the mileage scale and figures are placed on the outer vertical face of the inverted cup and these graduations are visible to the driver. As the speed of the car increases, the speed of the little pump increases proportionately, as does the air pressure against the vein of the floating dial, but in order to regulate and calibrate the effect of the air pressure upon the dial, a channel is provided beneath the vein through which the air is allowed to escape. This channel is graduated in width so that the relation between the amount of air directed against the vein by the pump, and the amount allowed to escape under the vein is so balanced or proportioned as to hold the vein in such a position that the scale showing through the face of the dial indicates the speed.

For example, at 5 m.p.h., the pump is creating a draft of air against the vein, the force of which is so regulated by the width of the channel beneath it, though a certain proportion of the air escapes, that the Fig. 5 on the floating dial registers with the point in the center of the opening on the face of the instrument. In a like manner at 10 m.p.h., a greater draft is being directed against the vein of the floating dial by the pump, having a tendency to force it further around on its axis, and therefore the distance to which the dial or vein is turned is simply limited by the channel beneath the vein which governs the amount of air allowed to escape. A spiral spring is provided as shown at the top of the floating dial which tends to bring the dial back to zero and the air passage is so arranged that the resistance of this spring is compensated for.

2—The construction of the Van Sicklen speedometer is that shown in Fig. 4, and the principle of operation is that above described. This is what is known and referred to by the Van Sicklen company as the air principle.

Timing of Abbott-Detroit Four

Editor THE AUTOMOBILE:—What is the proper timing of the valves in the Abbott-Detroit?

From the sound of the exhaust, which emitted a half burned mixture, I decided that the valves were out of time so I changed the position of the camshaft two teeth, with the following results: More power, less fuel consumption, but with a greater tendency to heat.

2—What is the proper size of nozzle for the model 30, using the Stromberg carbureter?

New Smyrna, Fla. J. A. M.

—The timing of the Abbott four is such that the inlet opens at 11 deg. past top center, and closes 44 deg. past bottom center. The exhaust opens 45 deg. before bottom center and closes 11 deg. after top center. If you will arrange the camshaft so that the inlet on No. 1 cylinder starts to open at 11 deg. past top center, all the other timings will automatically take care of themselves, since with a unit camshaft such as employed in this motor, when one point is fixed, the timing is automatically taken care of.

2—The proper size nozzle to use on this car is No. 63.

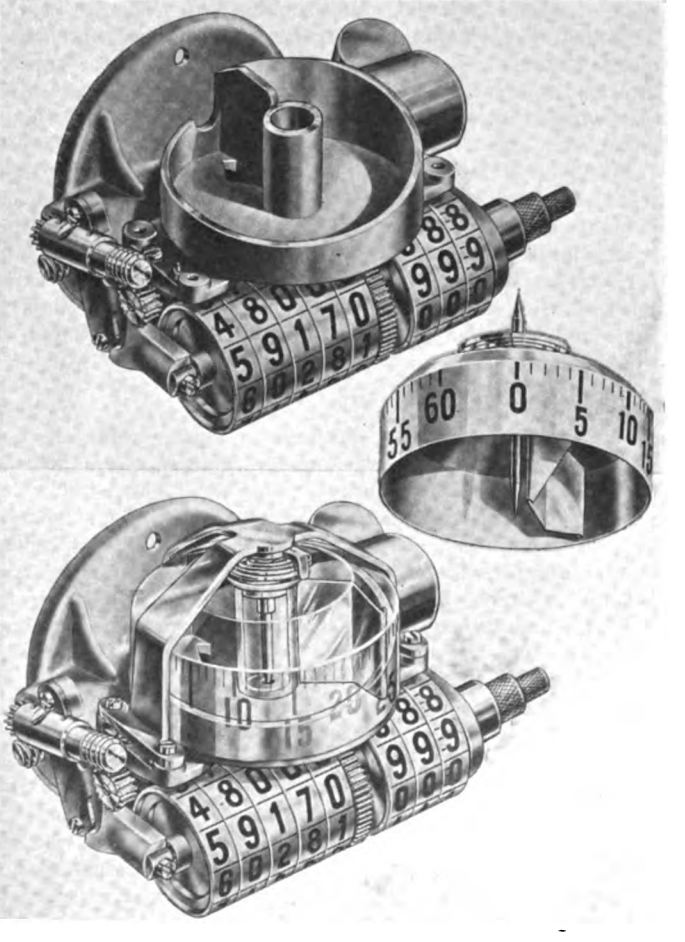


Fig. 4—Assembly views of the Van Sicklen speedometer, showing utilization of the so-called air principle

Car and Carbureter Design Suitable for Driving With Any Fuel

With a Study of Modern Carbureters Functioning with Automatic Brake Action on Fuel Feed at High Speed by Admission of Air in the Jet

WHAT is asked of cars in Germany under the present conditions of war and shortage of gasoline, with regard to their suitability for being operated with any fuel that can be obtained, throws a strong light on the requirements with which all cars may eventually be expected to comply in other countries, including even the United States, with a view to economy in motor operation and the establishment of a wholesome competition in the motor fuel market. A direct and immediate technical and practical interest also crops out, bearing upon the best carbureter construction in general and the use of 30-speed (1800 r.p.m.) and 40-speed (2400 r.p.m.) motors with heavy fuels for stationary and boat work as well as for motor vehicles.

Moreover, American manufacturers building cars and trucks for export are necessarily interested in those developments in the motor fuels which must influence the design of motors and carbureters, making for long stroke, high compression, small sizes and high speed in order to burn benzol and alcohol and even heavier fuels on an equality and optionally with gasoline.

The treatment which Baron von Löw has given this subject in his *Brennstoffmischungen, Anlassbehälter und Moderne Vergaser für den Automobilbetrieb* (Fuel Mixtures, Auxiliary Fuel Tanks and Modern Carbureters for Automobile Traffic), published by Kreidel, Wiesbaden, supplements in many ways the work by Dr. Dieterich rendered in abbreviated form in THE AUTOMOBILE of July 29 and Aug. 5 under the title: Analysis and Valuation of Motor Fuels and 14 Methods of Examining Them. Von Löw presents an extract of his book in *Automobil-Rundschau* for June, and this is rendered in substance in the following. The presentation is throughout based on experiments he has made to arrive at a construction usable without changes with different fuels. His reasoning and conclusions agree, it will be noticed, with some of the recent developments of the fuel feed system in this country.

The Merits of Auxiliary Tanks

We need in reality two different fuels to operate our cars sensibly, one for starting the motor from cold and another to utilize it to best advantage when hot. The fuels which can be used for both conditions are uneconomical, as long ago realized in the case of stationary motors. Naphthalene motors, for example, are operated with benzol until hot and are then switched to their cheaper main fuel.

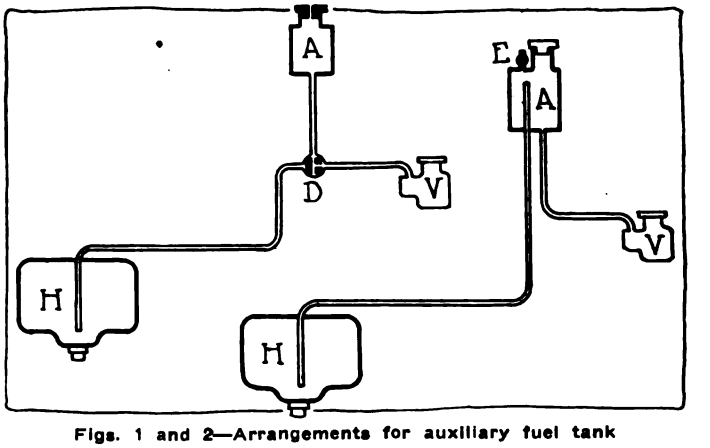
Figs. 1 and 2 illustrate two ways of arranging the auxiliary tank. H is the main fuel tank, A the auxiliary tank and V the carbureter. With the three-way cock D placed as in Fig. 1, the starting fuel flows to the carbureter and the motor can readily be cranked. After running for 1 to 5 minutes the motor is hot enough for the main fuel, and D can be turned on to admit it. An auxiliary tank on this plan facilitates measurements of fuel consumption and has the special merit for war conditions that it permits the car to be run 5 to 20 kilometers farther after the main tank has been put out of action by a shot. It is at least as good in this respect as a bullet-proof shield for the main tank.

Formerly auxiliary tanks were placed as in Fig. 2, with the object to avoid pumping pressure into the main tank after the motor has been stopped for some time. By admitting air through cock E the fuel then flows nevertheless at once to the carbureter and the motor can be started, whereafter the exhaust gases soon produce the necessary pressure in the main tank. For cars with an auxiliary tank a hand air pump is thus unnecessary and it is used only as a reserve for the case of certain troubles. But the older form of auxiliary tank, Fig. 2, is not adapted for present purposes—starting with a special fuel—since the fuel from the main tank flows through it and remains there after the motor has been stopped.

The Heating of the Liquid Fuel

The starting fuels which may be considered are benzol, gasoline and ether, and the main fuels are mixtures of benzol with alcohol, heavy petroleum and tar oils and also unmixed alcohol and the products of the cokeries using coal or lignite for raw materials. In order to use the heavier ones among these fuels it is necessary, besides using an auxiliary tank, to develop the heating of the carbureter more systematically than is usually done in automobile motors. Fig. 3 illustrates several possibilities in this respect.

The simplest means for improving the heating consists in using lead gaskets instead of asbestos at the joints of the induction pipe, P, P and bb. At the same time metal gauze can be laid across these joints, so as to heat the mixture not



Figs. 1 and 2—Arrangements for auxiliary fuel tank

only along the walls of the duct but all the way through it. The same object is served by piercing the suction channel with a hot-water pipe from the water jackets, as indicated at RR. These two provisions—the metal gauze and the pipe through the suction channel—involve a considerable reduction of the cross-section area of the channel and are therefore not usually recommendable, but in other places, such as the three marked *ss*, where they do not reduce the necessary area (the pipes being flared to offset the reduction) gauze screens are desirable for fire security.

Although in general the heating of the liquid fuel is much more advisable than the heating of the mixture, it has not been found a good plan to carry the fuel pipe in two or three coils around the exhaust manifold, as this heats a volatile fuel too much. For the fuels used in the experiments it was

sufficient to heat the carbureter by drawing exhaust gas from a sleeve surrounding the exhaust pipe and wound with asbestos cord. By providing the suction channel with a flop K it was made possible to draw cold air as well, when required. Fig. 3 shows further the two cocks HH with the aid of which an additional dosing with air can be provided for a fuel that requires it.

With a wrapped suction channel and an auxiliary tank as the only additions made to the normal car equipment and a few shims in reserve for loading down the carbureter float, the tests with the heaviest fuels were begun, the nozzles and the air intake areas remaining unchanged as used for operation with gasoline.

That a good carbureter can work with benzol—without extra loading of the float—equally as well as with gasoline—is a fact now widely known, but it was surprising that the car with the arrangements mentioned also ran pretty well with kerosene. To be sure, in previous experiments with an old car and an old spray carbureter, both of 1906 model, it had been shown that this old carbureter could work without any re-adjustment with ordinary alcohol and kerosene, but the motor speed at those tests had to be so high that normal operation of the automobile was impossible. With the new car and the new carbureter, both from 1914, the situation was quite different. Even at low motor speed the heavy fuel was here so well atomized that an explosive mixture was formed and the motor worked. On the other hand, high motor speed became precarious with kerosene for fuel. The throttle had to be partly shut to avoid knocking. It is well known that kerosene motors must have a larger combustion chamber than gasoline motors because a kerosene mixture gas is more easily fired by compression than a gasoline gas mixture, and therefore liable to premature ignition. That the throttle could not be opened interfered of course considerably with the utilization of the car with kerosene; it could only be driven at 40 kilometers per hour on level roads with the high gear in mesh while it should have reached 80 kilometers.

Mixtures of kerosene and benzol in equal parts gave much better results, but for lack of kerosene these tests were not continued. Mixtures of benzol and alcohol were taken up instead. Starting onto a measured stretch of road at 40 kilometers per hour and pushing the motor to its best it was observed what maximum speed was reached at a point further on, B, where a slight downward grade changed into a sharp upgrade, and also to what point the speed had dropped at C, at the top of the rise. Pure benzol gave 82 kilometers per hour at B and 56 at C, while a mixture of 1 part benzol and 2 parts alcohol gave 78 kilometers at B and 48 at C.

On another stretch of road where B lay somewhat higher than the starting point and C at the top of a sharp rise as before, pure benzol gave 65 kilometers at B and 62 at C, while the mixture gave respectively 62 and 56 kilometers and another mixture composed of benzol and alcohol in equal parts gave 64 and 60, or almost as good a result as the benzol alone.

[The author here goes on to show that a given volume and a given money value of the mixed fuels give more mileage than the same volume and value of gasoline and slightly more mileage than the same money value of pure benzol, but the comparisons are mainly of interest for the war conditions under which the price of gasoline has gone up more than that of benzol and the latter more than that of alcohol. He shows finally that, in order to make gasoline, benzol and alcohol equally economical, the prices per liter should be 42 pfennig for benzol, 35 for gasoline and 32.4 for alcohol, these figures holding strictly good only for such a car as was used by the author—with auxiliary tank and wrapped exhaust pipe sleeve and suction channel—while subject to some modifications for other cars originally less well adapted for being operated with benzol and alcohol.]

To illustrate, further, the possibilities for using different

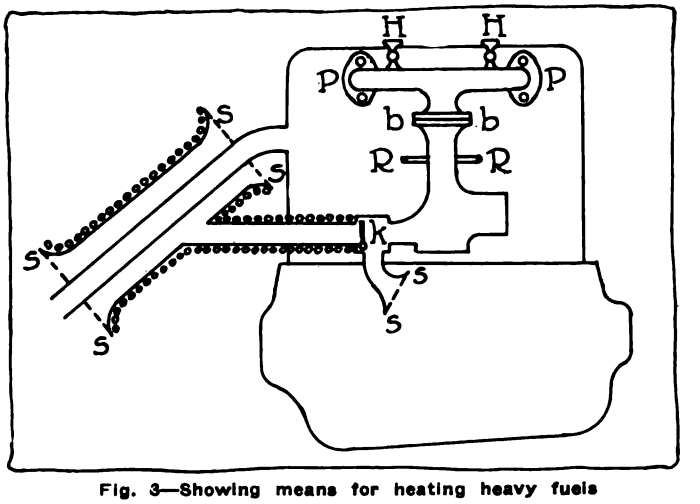


Fig. 3—Showing means for heating heavy fuels

fuels the author's practical experience supplies data of interest. For the past three years he has driven his cars mainly on benzol, and nothing was changed in the cars. Nozzles and jets, float levels and heating arrangements remained as they were, and yet the cars work better with benzol than with gasoline. When occasionally it was impossible to obtain benzol he was compelled to drive for a couple of days on gasoline, and in those cases there was always noticed a lessened ability to pull through on any given gearspeed, and knocking of the motor occurred easily—something which never happens with benzol. Similar observations were made with regard to cars driven by others. On the whole, he found that there were no drawbacks to the use of benzol for cars not of a decidedly antiquated construction; one of his own dating back, as mentioned, to 1906 and being used entirely without changes.

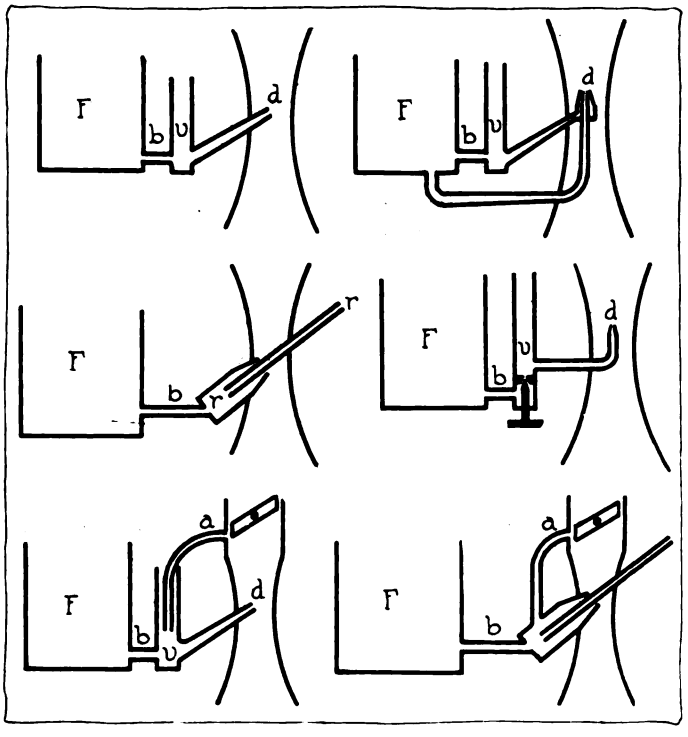
The much feared soot formation so often charged against benzol is in reality quite immaterial, as it occurs only during the first minutes after starting, and later, when the motor gets warm, the soot is gradually burnt out. The film of soot reaches therefore only a certain thickness, and it is rather harmful than useful to clean the spark plugs and piston heads frequently.

More astonishing than the fact that the modern motors work equally well with gasoline and benzol is the observation that they accomplish almost as good results with alcohol as well. This seems singular, since the caloric value of alcohol is so low and the attempt made 12 years ago to run the Berlin taxicabs on alcohol proved a failure. The answer is the following: The low caloric value of the alcohol is in part compensated by the related fact that alcohol requires much less air for its combustion than either gasoline or benzol, so that a cylinderful of explosive alcohol mixture after all contains nearly the same amount of energy as a cylinderful of the other explosive mixtures. And the early failures were due to the design of early automobile motors which had lower compression and shorter stroke than those of the present day.

The efforts made for improving the motors on general principles have incidentally and without intention resulted in meeting the requirements for employing benzol and alcohol as fuels.

The car with which the road test figures were obtained is the same Audi car with which director Horch of the Audi works took part in the 1914 Alpenfahrt (reliability run in the Alps). It has a motor with 90 millimeter bore and 140 millimeter stroke and weighs 1356 kilograms and is in the same condition in which it came back from the Alps, excepting the addition of the auxiliary tank and the stronger heating device.

If the figures obtained with this car are somewhat better than could ordinarily be obtained with vehicles of older date, other tests with two Horch cars of 1906 and 1908 and with



Figs. 4, 5, 6, 7, 8, 9—Diagrams of modern carbureters

two Mercedes cars of 1910 and 1912 have nevertheless shown that older cars with older carbureters can work very well with the new fuels. The mixtures of benzol with alcohol are especially to be recommended those who are nervous about the soot formation with pure benzol. By mixing the two fuels both the soot formation with benzol and the rust formation with alcohol alone are most effectually obviated.

Almost as harmless as the slight soot formation with benzol are the small explosions in the carbureter with alcohol. If the reports occur with a certain adjustment of the throttle, the best plan is to throttle down till they stop and then to open the throttle again by degrees, at each adjustment giving the motor time to get warmer. It will then in most cases work properly after coming back to the first adjustment. But if the driver gets fidgety and tries every two seconds if the explosions will occur when he opens up wide, the motor of course gets colder all the time and the explosions get more frequent. No doubt, the technics of motor construction are already so advanced that motors could be built now for all the fuels which on the whole would work more perfectly than the best automobile motors built for gasoline only.

Compression the Critical Feature

Among motorists catch phrases are very current. One of these has it that "the automobile motor is a gasoline motor," meaning to convey the idea that it is a risky thing to operate it with any other fuel than gasoline. But it is now an established fact—widely known and based on fundamental heat economics—that a good automobile motor works better with benzol and other fuels than with gasoline, and the phrase therefore holds true only for antiquated designs. There is general agreement on this point among motor engineers, and the author claims only the discovery that practical motor building is already much farther advanced than usually supposed and that results are obtained with the good automobile motors of to-day and modern carbureters which nobody had expected.

Another catch phrase says: "The fuel question is a question of carbureters." But this slogan is no more correct than the other. The fuel question is—like all important problems relating to internal combustion motors—a question of the compression. But a good carbureter can contribute to the solution of fuel problems.

[It was well understood as early as 1902 that alcohol motors should have a long stroke and a compression of 140 lb. In the modern European automobile motor the long stroke, the high piston speed made possible by improved balancing and better materials and workmanship, the large valves giving a full charge and the moderately high compression—made actual by the speed and the valve dimensions, while in 1902 it was theoretical only—have produced conditions for operating with mixtures of benzol and alcohol which really agree perfectly with the requirements formulated after the government tests with pure and mixed alcohol fuels conducted in France and Germany in 1901 and 1902. The statements made by von Löw are therefore not so radical or surprising as they may seem at first glance.—M. C. K.]

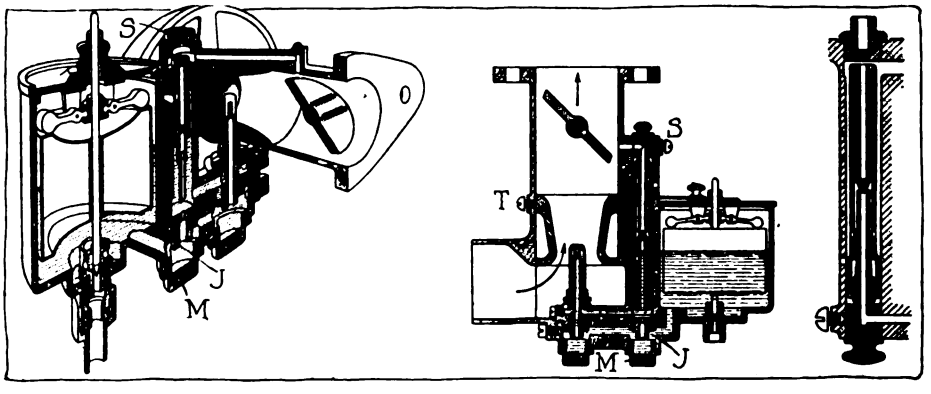
Spray Carbureters With Air Brake

Considering that the adoption of the principle of checking the fuel feed by admitting air to the interior of the jet (*Bremsdüsenprinzip*) stands for an improvement of carbureters which has only been accomplished during the past few years and contributes strongly to our ability to operate with different fuels, a review of the modern carbureters representing this type of design will be found in order to complete the presentation of the subject.

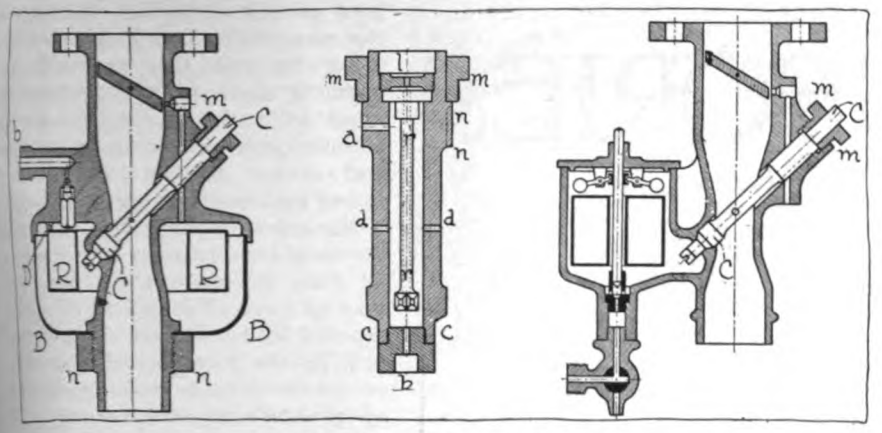
The principle is shown in Fig. 4. F is the float chamber, *b* the brake-jet, *v* a storage compartment and *d* the spray jet. When the opening of the throttle valve suddenly causes a strong suction, the fuel in the storage compartment serves for the acceleration, and when the motor has reached high speed the level of the stored fuel is reduced and air enters with it into the spray jet, while the brake jet *b* supplies fuel relatively slowly (due to the interference of the air). The Zenith carbureter has also another jet, as shown in Fig. 5, and in the Pallas carbureter, Fig. 6, the storage space is differently arranged and the brake air enters through the tube *rr*. A third carbureter, being the German Longuemare, is represented in Fig. 7. Here the brake jet is subject to regulation, while those in the Pallas and Zenith are easily exchanged. That these two carbureters also have a special starting jet *a* opening opposite to the edge of the throttle flop, on the plan indicated in Figs. 8 and 9, is a matter not concerning the main principle; similar starting jets are used in carbureters such as the Favorit, which have no brake jet arrangement.

Among 14 carbureters entered in the competition held in February, 1914, by the Prussian war department three were of the brake jet system, and they took the first three prizes.

Some of the details in the carbureters of this type illus-



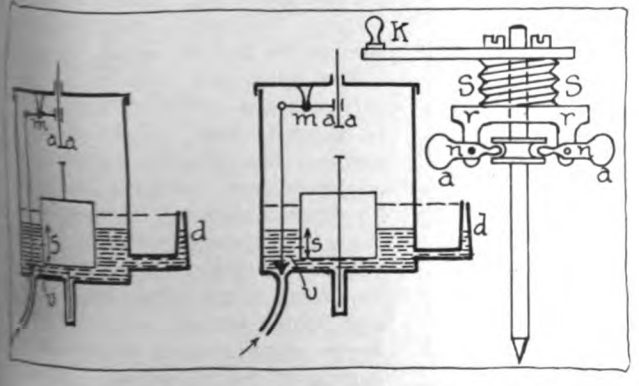
Figs. 10, 11, 12—Details of Zenith construction; horizontal and vertical



Figs. 13, 14, 15—Details of Pallas construction

trate the requirements in which motorists are interested. The Zenith, whose first appearance in the market led all carbureter technics into new paths of progress, is made in a horizontal model, Fig. 10, and a vertical model, Fig. 11. These illustrations show a number of narrow passages which are not readily accessible, and to remove jets and various screws special spanners are required. Both models have a special starting or still-running carbureter which can be taken out by removing or loosening the screws S. It is shown separately in Fig. 12. In the course of the years this auxiliary part has become more and more elaborate, due to the exaggerated demand for very slow still-running. The success accomplished in this respect is interesting, showing how patiently carbureters and motors can be made to behave. But in itself the capacity for slow still-running gives no guarantee of excellence in more important things, as there is a great difference in the carburetion requirements for slow-running without load and slow-running with full load.

The Pallas carbureter, Fig. 13, has the same admirable workmanship as the Zenith and can be taken apart without special tools. The jet mechanism *cc* can readily be taken out after removing the nut *mm*. Its details are shown in Fig. 14. At the upper end there is the air duct *l* from which air is led through the tube *rr*, referred to before in the diagram, to underneath the fuel, which it helps to atomize by forming bubbles. The fuel enters through the brake jet *b*, Fig. 14, and is delivered through spray jet *dd*. The channel *a* leads to the starting jet. The conical surface *cc* forms a tight joint separating the jet mechanism as a whole from the contents of the float chamber. The latter, BB, Fig. 13, is pressed and very light and secured by a large nut *nn*. The float RR is of the annular type, which, however, makes it less accessible, so that it is not so easy to load it down when a heavy fuel is used. The ideal would therefore be a Pallas carbureter with a lateral float chamber on the plan shown in Fig. 15 and also with the method for float adjustment used in the Lyma carbureter.



Figs. 16, 17, 18—Means for adjusting float level

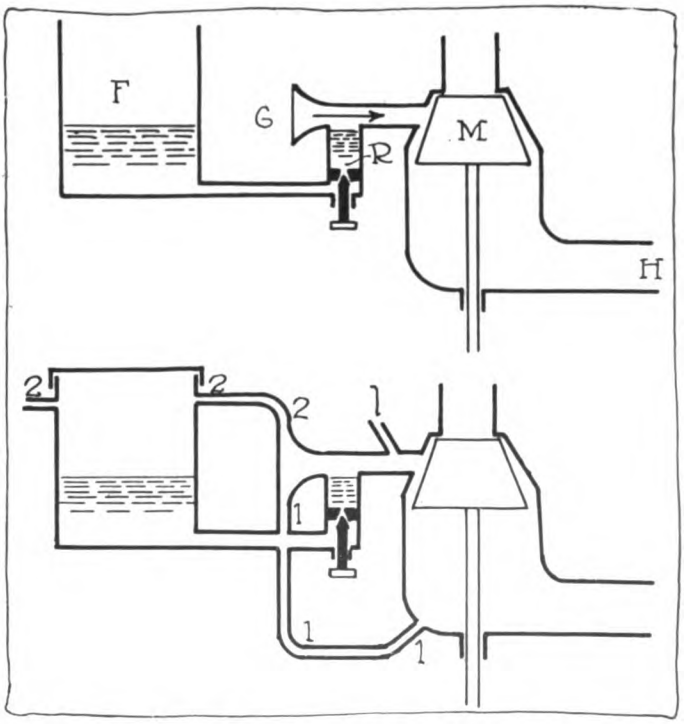
A lateral float can readily be adjusted to the specific gravity of the fuel by placing perforated disks or shims on it. With the Lyma carbureter this adjustment is accomplished as follows: Fig. 16 represents a float dipping into light fuel to the depth S, just clearing the bottom of the chamber. In Fig. 17 the float is in a heavier fluid and begins therefore to float at a smaller depth of immersion *s*. Both the light and the heavy fuel must reach the level of the dotted line, in the chamber and in the jet, for normal work. This can be effected by making the abutment *aa* adjustable. When the float spindle strikes against the abutment the feed valve *v* is closed in both cases and, if the abutment *aa* is placed higher for the heavier fluid, as indicated in the illustrations, the level in the jet can be the same as for the light fuel. The abutments can also be made adjustable by having the fulcrums *m* movable, and this is the expedient used in the Lyma carbureter, the mechanism being shown in Fig. 18. The fulcrums *nn* here correspond to *m* in Figs. 16 and 17, and the lowest points *aa* of the balls to *aa* in these diagrams. The fulcrums *nn* are secured in a red-brass casting *rr* which can be screwed up and down in the cover of the float chamber by means of the high-pitch thread *gg* and the crank *k*.

The crank can be turned 240 deg. and this allows for a change of specific gravity from .65 to .92. A dial on the cover gives the intermediate figures, so that it is easy to place the crank arm in the proper place for each fuel—for benzol at .88, for example, for alcohol at .82 and for ordinary gasoline at .72.

The Lyma can be counted among the brake jet carbureters, because the fuel feed at high motor speed is so much reduced by means of a throttle-jet that the air feed through the other intake is very much increased, on the plan shown in Figs. 19, 20, 21 and 22.

The fuel is not thrown out in a stream from a jet in this

(*Continued on page* 298)

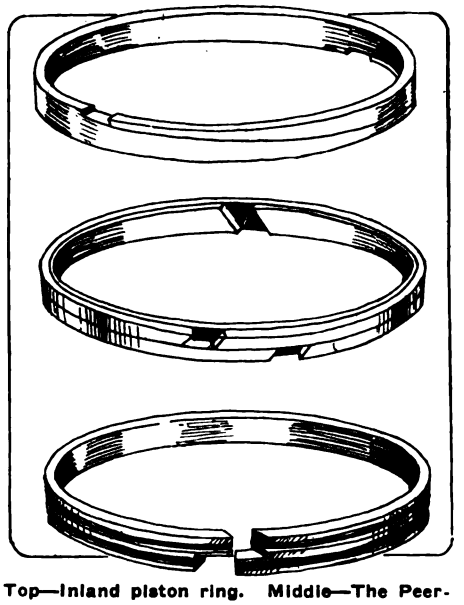


Figs. 19, 20—Diagrams of Lyma fuel feed control

ACCESSORIES

Peerless Piston Rings

THERE are three sections in the Peerless piston ring, there being two outer rings, each half the width of the ring groove in the piston, and these are superimposed on a wide inside ring, the latter being as wide as both the outer rings together. All joints are broken while the proper spacing is maintained by means of small pins. The joints are simply diagonal cuts. Wherever there is a joint there is a seal formed by the solid metal of another ring, so that there is no passage left for gas or oil leakage. Peerless rings are all made eccentric. Stock sizes are from 2⅜ in. in diameter to 6 in. in diameter while the widths vary from 3/16 to ⅜. Prices: All sizes up to and including 3½ in., $1.75; up to and including 6-in. size, $2.—Peerless Piston Ring Co., Newark, N. J.



Top—Inland piston ring. Middle—The Peerless ring. Bottom—No-Leak-O ring

Inland Piston Ring

A novel design of piston ring has been brought out under the name Inland. It is a one-piece concentric type featured by the fact that the end joints of the ring are absolutely staggered and hence there is no possibility of aligning the joints and hence causing leakage.

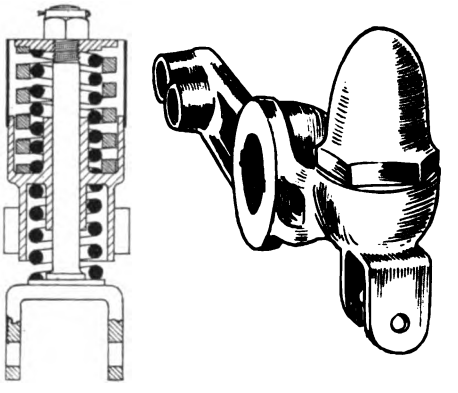
The ring is a concentric design and is cut on a spiral with the free end tapered thus, according to the makers, giving the advantages of the eccentric type. To get the advantages of concentric design the free ends are so supported, as shown in the accompanying illustration, that they give uniform thickness to the entire cross-section. A third advantage which is stated to correspond to that secured in more than one-piece ring, is given by the fact that the rings are slotted to less than one-third their width at opposite points on the circumference of the ring. The object of the construction is to give uniform pressure at all points on the cylinder walls with sufficient elasticity to render them harmless to the cylinder. The distortion of the rings is unlikely as heat-treatment is given before grinding. The price of the ring depends upon the size employed.—Inland Machine Works, St. Louis, Mo.

No-Leak-O Piston Rings

The No-Leak-O piston ring is distinguished by the use of a step-lap joint, a groove between the sliding face forming the step-lap joint on the side of the ring. It is this latter groove which makes this ring different from others on the market which employ the step-lap joint. The joint gives a tight seal at the ends of the ring while the oil fills the groove which forms a seal around the ring giving a tight fit and preventing the escape of gas. At the same time the oil lubricates and forms a packing or seal against the oil being drawn or forced up into the firing chamber.

The grooves control the oil. The cylinder walls are constantly lubricated by the oil from the grooves and the grooves take up fresh oil as fast as the supply is depleted by lubrication. This oil seal is said by the manufacturers to greatly reduce the quantity which works its way up into the combustion chamber.

The rings are made in one piece from seasoned stock and are stated to be resilient and not to clog or lose their efficiency. The price varies, of course, with the size employed.—Automobile Accessories Co., Baltimore, Md.



Left—O.M.C. light car type shock absorber. Right—Hup absorber for model 32 Hupmobiles

Hup Shock Absorber

Shock absorbers for model 32 Hupmobiles use a helical spring for absorption of shocks, the spring being contained in a bracket, as illustrated herewith. Adjustment may be made by removing the cap inclosing the spring and turning a hexagonal nut on the spring bolt. Price is $10 per pair.—Miller & McLean, New York City.

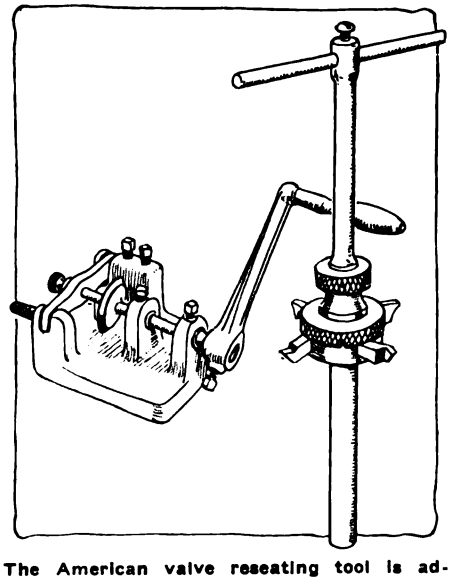
O. M. C. Shock Absorbers

O. M. C. shock absorbers are made in two distinct types, one for heavy and the other for light cars. Though differing considerably in constructional details, they are alike in one respect: they are designed to check excessive spring movement both up and down—in other words, they are double acting.

The heavy car type is made with two cylinders. The plunger rod carries at its lower end a piston which works in a liquid. A valve in the piston opens only when the piston rises; when the piston descends the only passage for the liquid —oil—is through a few small holes. The upward movement of the piston is resisted by a coiled spring.

When the leaf spring of the car is compressed the coiled spring is brought into play; when the rebound occurs the hydraulic brake acts, easing and checking the up-throw. Thus the piston rises without hydraulic resistance, but is checked by the oil on its descent.

The light car type employs springs only and the cylinders are single—that is, there is one cylinder for each car spring. The cylinder is divided into two compartments, as the accompanying illustration shows. In the upper one is the main spring, which is double, the outer and heavier spring, of square section steel, being reinforced by the inner and lighter spring, of round steel. The lower compartment contains a single spring of round section. The cylinder slides on the central rod, the upward



The American valve reseating tool is adjustable to any valve

movement being checked by the two upper springs and the downward movement by the lower single spring. Prices are: Heavy car type, for cars of 1500 to 2000 lb., $35 per pair; to 2600 lb., $35; to 3300 lb., $40; to 3900 lb., $40; to 4500 lb., $45; over 4500 lb., $45.

Light car type, for Fords, $8 per pair; $15 for four.—A. J. Picard & Co., New York City.

American Valve Reseaters

American valve reseating tools can be adjusted to suit the valves of practically any car. The valve facer consists of a cast iron base with bearings for a short shaft mounted directly in line with a bushing for the valve stem, and a holder at one side for the cutting tool. The valve is placed with its stem in the bushing and the shaft turned by means of a crank, driving the valve through a connection provided for the purpose. By adjusting the cutters to the proper distance from the center valves of any size can be faced. Six bushings of different sizes are furnished.

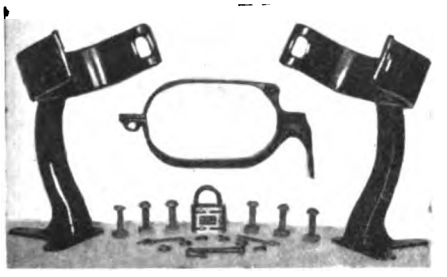
The seating tool consists of a head carrying four cutters, a stem entering the valve stem guide, and an upward extension with a T-handle for turning the tool. On the cutter head are two large knurled nuts; turning one loosens the adjustment and turning the other sets the cutters to any size within the range of the tool. When set, turning back the lock nut holds the adjustment. Two sizes are made, one seating valves up to 1¾ in. and the other from that up to 3 in. Price, either size reseater, $6; facing tool, $6; seater and facing tool together, $10.—American Valve Tool Co., Stamford, Conn.

Sly Overland Tire Lock

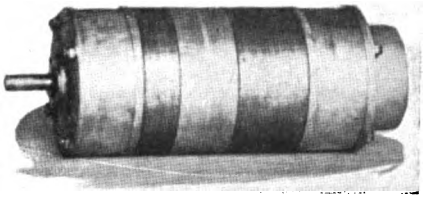
A tire lock designed especially for Overland cars is manufactured to take the place of the upper strap which holds the tires. To attach the lock two cap screws which hold the bracket for the top strap are removed with a socket wrench and the lock put in its place, using the same bolts. When the tire is in place the bolts cannot be removed. The locks are made in two types, single and double. Price, single, $1.50; double, $1.75.—W. W. Sly Mfg. Co., Cleveland, Ohio. Distributed by New Era Spring and Specialty Co., Detroit, Mich.

Apco Ford Tire Holder

A tire holder designed to carry the extra demountable rim or spare wheel on Ford cars is announced by the Auto Parts Co. It resembles in construction the side tire holders which have been brought out for Fords by the same concern and includes an automatic locking clasp which permits of easy and rapid removal or replacement of a spare. The new design is for attachment to the running board and the clasp is provided



Apco tire holder for Fords with fittings



Rae motor-generator for Ford cars

with an easily operated lock. The makers claim that a spare can be removed or replaced in 5 sec. The retaining screws are not accessible when the clasp is closed so that it is impossible for thieves to readily remove the holders. Finished in black enamel the new holder sells for $2.—Auto Parts Co., Providence, R. I.

Autoprotector

The Autoprotectors are instruments to be mounted on the front axle of a car or truck and connected with the throttle, the air supply or the ignition system in such a way that if the car is driven too rapidly over rough roads or under other conditions that subject it to severe shocks, the car will be slowed down or even temporarily stopped. The device is adjustable as to the severity of the conditions under which it will commence to act and can be sealed.

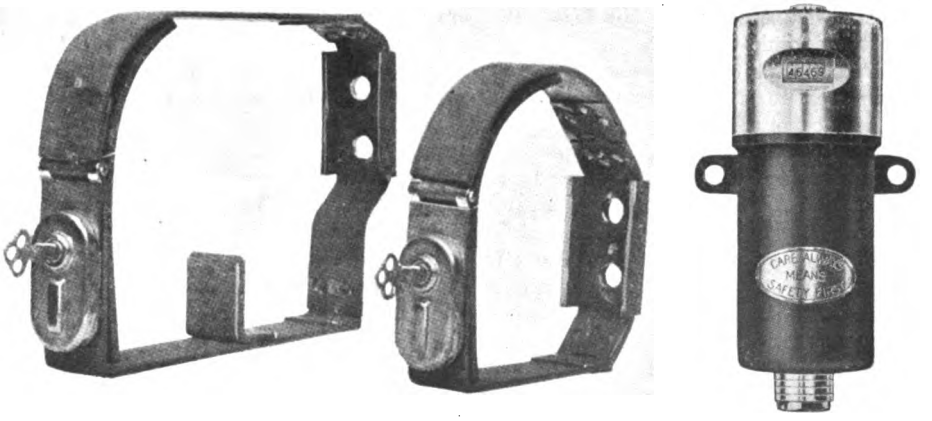
Inclosed in the casing is a weight which is held in normal position by a spring, but which is displaced by sudden shocks and is prevented from returning immediately to its normal position by a dashpot, the piston rod and piston being attached to the bottom of the weight. The weight is connected to the Bowden wire which acts on the throttle, air supply or ignition. A succession of shocks will tend to keep the weight out of its normal position and the speed of the motor will be affected in proportion to the amount of displacement of the weight. A counter attached to the device shows the number of abnormally severe shocks experienced, and this acts as an additional check on the driver. The device commences operating as soon as the first shock is transmitted to it. Price, with counter, $25; without counter, $18.—Autoprotector Co., Dorchester, Mass.

Rae Ford Electric System

The Rae is a small, simple motor-generator for starting and lighting Ford cars. It is used in connection with a 12-volt battery and operates at one and a quarter times crankshaft speed when running as a generator, while as a starter it is claimed to turn over the motor at 400 r.p.m. The starter action is actuated by pressure on a button, the connection being electrical. The Rae unit, which is shown in the accompanying illustration, is furnished with the necessary wiring, cutout, etc., and is installed so that the drive is directly from the crankshaft by silent chain. It is mounted on a saddle secured by three cylinder-head bolts and is supported by a bracket attached to the motor base.—Morgan Electric Co., Detroit, Mich.

Rels Brazing Metal

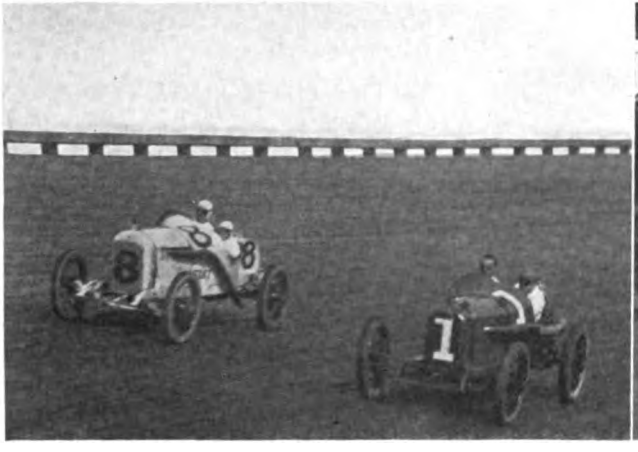
This product is a metal for brazing or soldering aluminum; the metal is too hard for use with a soldering iron, so a gasoline torch or its equivalent must be used. The surfaces to be united are heated to bring all oil to the surface and are thoroughly cleaned, scraped bright and the abutting edges chamfered, much as in ordinary brazing. The surfaces are tinned with the metal, no additional flux being required, and are united by running in more metal to fill up the V formed by the chamfers. The metal sells for 50 cents per bar.—Rels Mfg. Co., Brooklyn, N. Y.

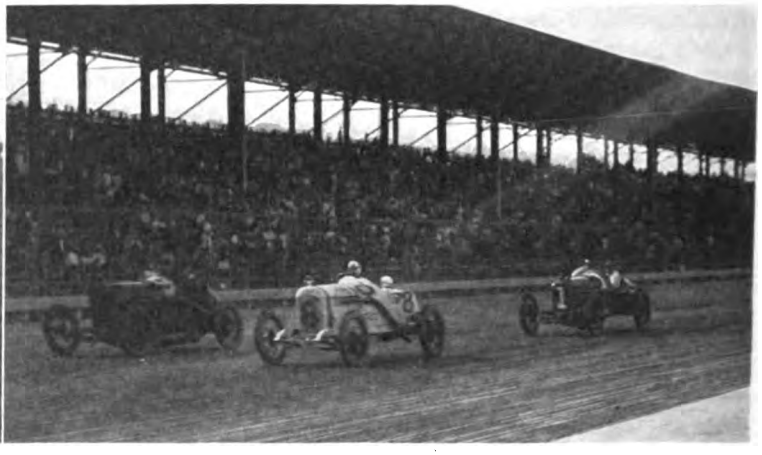


Left—Double Sly tire lock for Overlands. Center—Single type. Right—Autoprotector to prevent overspeeding on rough roads, etc.

Resta Wins Century at 101.86 M.P.H.

Battles with Stutz for Leadership Until Tires Turn Scales —Burman is Third





Left—Cooper passing Resta on a turn and taking the lead only to lose it on the straightaway. These two ran wheel to wheel for 80 miles, averaging 104 m.p.h. Right—Passing the grandstand—left to right—Burman (9), Cooper (8) and Resta (1). Burman drives 104 m.p.h. and passes Cooper running second to Resta on the 28th mile.

CHICAGO, ILL., Aug. 7—The distinction of winning the first automobile race in America at a speed of over 100 m.p.h. was carried off by Dario Resta at the 2-mile board speedway here to-day by winning the 100-mile challenge race at a pace of 101.86 m.p.h. and defeating his three rivals Cooper in a Stutz, Burman in another Peugeot and Oldfield in a Delage. Resta put his Peugeot over the 100 miles in 58 min. 54.2 sec., finishing 52 sec. ahead of Cooper who was the only real rival he had. Burman was nearly 3 min. behind, having had two stops for tire troubles as compared with one stop each by Resta and Cooper; and Barney Oldfield, whose new Delage with four carbureters was not well tuned up, stopped at the end of 96 miles, having been lapped several times by the other drivers. Cooper's average was 100.58 and Burman's 97.78 m.p.h.

Fully 20,000 spectators sprinkled through the huge grandstand, in the bleachers, on the back stretch, and from the parking spaces in the infield, watched the 100-mile challenge duel, the first of the kind ever held on a speedway in this country. The weather was perfect and the track in condition. The four cars were sent away at a flying start, Oldfield having drawn the pole position acting as pacemaker. Resta was second from the pole. Cooper third and Burman on the outside.

From start to finish the race was Resta's. His Peugeot was seen to have the necessary speed, although from the start Cooper disputed the laps with him. Burman had apparently a lot of speed, but when he began to show it he ran into tire troubles and fell behind leaving Resta and Cooper to dispute the lead. Both Resta and Cooper made one tire change each. Resta changed a right rear at 74 miles and momentarily Cooper shot his Stutz into the lead, the crowd cheering to the echo as the Stutz entry was the real hero of the day with the grandstand and bleachers. Resta made the change in 35 sec. but was nearly 56 sec. behind Cooper when he got going again. This put him nearly three-quarters of a lap behind. He started, setting a faster pace to overtake the Stutz, but at 80 miles Cooper was seen to slow up on the back stretch; a right rear had given way and he had to travel at reduced speed for a mile to the grandstand pits. In the meantime Resta had seized the moment and was back in the lead.

Before Cooper could make the change and get out Resta had a lead of 51 sec. on him, or nearly three-quarters of a lap. With only 20 miles to go Resta at once slowed down from a momentary pace of nearly 110 m.p.h. to 102 and held it until the finish. In the meantime Cooper was pushing his Stutz, gaining each lap, but there was not enough time remaining to overcome Resta's lead, and he finished 52 sec. behind.

The average speed of 101.86 m.p.h. for the century does not represent the real speed of the race, the stops made by Resta and Cooper cutting the speed from 104.35 m.p.h. which the leaders had maintained from the start up to over the 75th mile when tire troubles began. Many expected that the pace would be much faster at the start as it had been in the opening 500-mile race in June, but the drivers apparently profited by the experience and decided to hold a rather conservative pace at which the tire troubles would be a minimum. Last June the pace set at the start was 108 m.p.h. and tire troubles started at 17 miles and before 25 miles were covered there were many tire changes. To-day the pace for the first 10 miles was 104 m.p.h. and practically this pace was maintained until the finish. The first five laps are a fair criterion of the speed as follows: Lap one, 101.41; lap two, 104.35; lap three, 105; lap four, 104.65 and lap five, 104.65 m.p.h. From the 10-mile mark the pace was a steady one up to time of the tire troubles. All three cars, Peugeot, Stutz and Peugeot had higher speed possibilities which were apparently held in reserve.

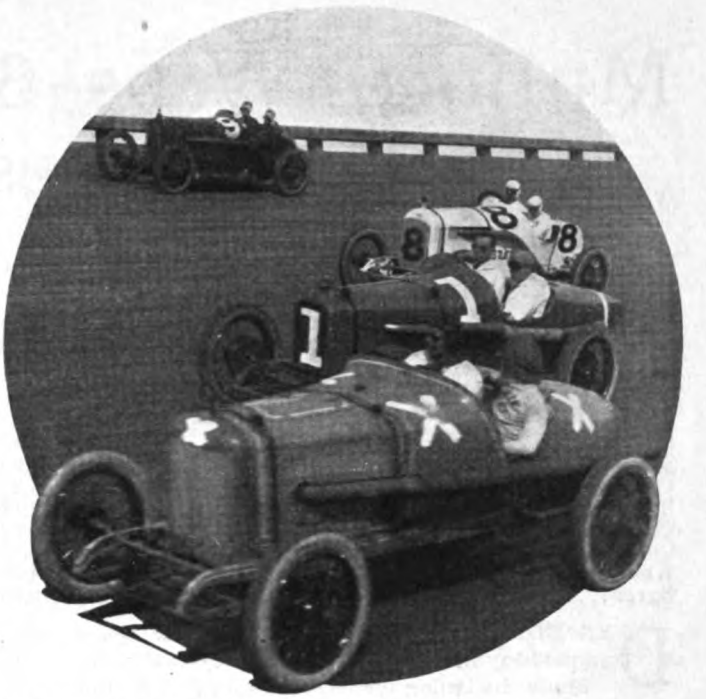
A Perfect Start

From the spectacular viewpoint there were some tense moments in the 58 min. of racing, but the grandstand did not have all the chances to applaud that it wanted. The start was perfect, all four cars were sent on a pace lap with Oldfield at the pole setting the pace. As the tape was approached the pace was easily 90 m.p.h. and all four crossed in a row, the red flag fluttered and they were off.

Lap two brought the first sensation, Cooper putting the Stutz into the lead at three-quarters and leading the Peugeot over the tape by three lengths. It was what the crowd wanted and it cheered. Burman was now 100 yards back, a position he held for nearly 20 miles. Lap three saw another change, Resta passing Cooper on the backstretch and leading over the tape by three lengths. The pace was 105 m.p.h. Lap four brought a thrill when Cooper and Resta were practically side by side, Resta leading by 2 feet. The next lap was Resta's by a length, so were the next three, but lap nine brought Cooper into the lead with a margin of two lengths. So the see-sawing continued. Resta led for three more laps, then Cooper took three in a row; Resta then took three more, Cooper sandwiched in one, then they alternated for three or four more laps, scarcely a length separating them. Resta would pull away on the straights and Cooper would ride fast on the bank and overhaul the Peugeot. This continued until the tire episodes at 74 miles, when the grandstand had its turns in cheering for respective favorites.

Burman's Tire Luck

Burman furnished his sensational burst of speed at the 25-mile point. Up to this time he had been trailing nearly 100 yards behind Resta and Cooper. Suddenly he started picking up a few yards on each lap, almost imperceptibly, when suddenly at the twenty-sixth mile he was on the heels of the leaders and crossed the tape actually a few inches ahead of Resta but a few inches behind Cooper who was leading. It was one of the spectacular parts of the race. The cars could not have been closer together and traveling at over 105 miles per hour. It was the moment the crowd had waited for, they were all on their feet, the air was filled with cheering. But this three-cornered duel, while not so spectacular, continued for the next twenty miles, Burman being mixed in the group at the end of each lap. The pace proved too much for his tires and at 42 miles he dropped back and had to change a right front, leaving Cooper and Resta to battle for the honors. From this time Burman was not up in front or near it again. He ran 20 seconds back, some laps gaining a few seconds only to drop them in others. At 72 miles he stopped again to change a right rear, and any driver who has to make two tire stops in a 100 mile race has little chance of winning.



The first lap on the curve—Burman (9), Cooper (8), Resta (1), Oldfield (X), approaching the starting line at 90 m.p.h.

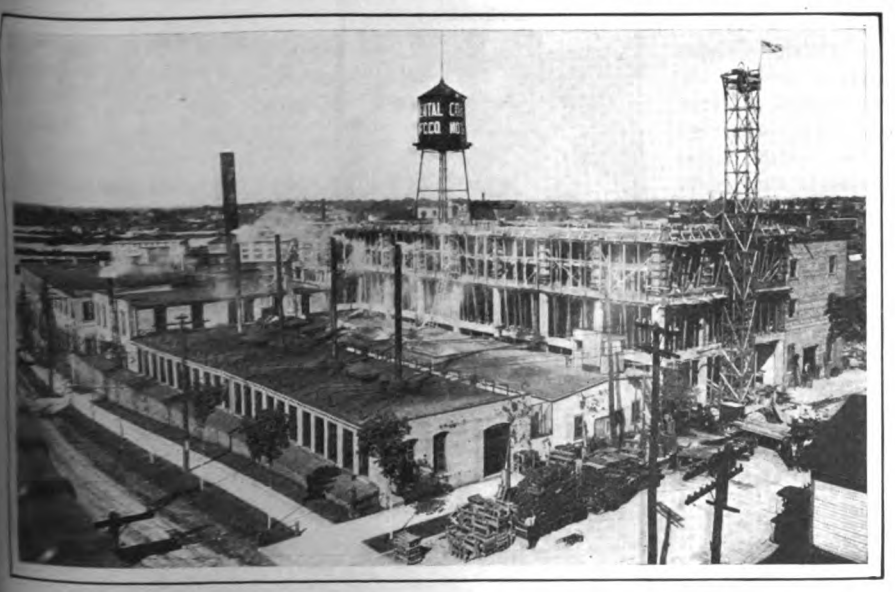
Oldfield's tire troubles started earlier than might be expected for the pace he was setting. It was in the fifty-second mile when coming down the homestretch ahead of Resta and Cooper who were about to lap him the second time, that a right front tire blew, but his car never wavered. He stopped on the next lap and made a rapid change. He made two other stops.

Resta's Peugeot was lubricated by Oilzum. The times of the four drivers at every 10 miles of the race are given in the following tabulation:

Times in Chicago Challenge race at every 10 miles

Driver	10	20	30	40	50	60	70	80	90	100 miles
Resta	5:45	11:31	17:22	23:10	28:58	34:49	40:41	47:19	53:08	58:42.2
Cooper	....	....	17:22	23:10	28:58	34:49	40:41	47:04	53:50	59:34.4
Burman	....	....	17:23	23:10	30:30	36:17	42:59	48:47	54:35	61:22.4
Oldfield	....	....	20:01	26:22	34:06	40:21	47:51	55:26	62:31	out

Continental Motor Adds to Muskegon Plant



MUSKEGON, MICH., Aug. 7—Two additions are being made to the already large Muskegon plant of the Continental Motor Mfg. Co., which is practically entirely devoted to the manufacture of four-cylinder motors. Also the main building, shown in the foreground, will soon need to be reconstructed to give more floor space. One of the new buildings illustrated as under construction is 54 by 150 ft., and the other is 70 by 330, the latter being V-shaped. Both buildings are four stories in height and together they will increase the floor space over 125,000 sq. ft. and will permit the doubling of the present working force of nearly 2000. The added facilities will raise the production of four-cylinder motors from 4000 to 6000 per month, and the cost will be from $300,000 to $400,000.

Mulford Wins 300-Mile Race on Des Moines Speedway

Finishes in Duesenberg 1 Min., 7 Sec. Ahead of De Palma's Stutz—Race Was Duel Between These Two and O'Donnell's Duesenberg—Two Serious Accidents Mar Contest

Order of Finish Des Moines 300-Mile Race

Duesenberg	Mulford	3:27:05.33
Stutz	De Palma	3:28:12.02
Duesenberg	O'Donnell	3:31:45.51
Du Chesneau	Brown	4:26:22.18
Clergy	Barndollar	4:40:35.02
Cooling	Henderson	5:01:43.25
White	Shrunk	5:09:54.13
Ogren	Alley	5:10:13.08

DES MOINES, IOWA, Aug. 8—The new 1-mile board speedway was opened in this city to-day by Ralph Mulford winning the 300-mile race in a field of eleven starters at an average speed of 87 m.p.h. and defeating by 1 min. and 7 sec. Ralph De Palma, who drove a Stutz and who was announced a winner after the race. Owing to the speed, the 1-mile track, and inadequate timing arrangements an error was made in the announcement and after hours of checking the lap records, Mulford was declared the winner and entitled to the $5,000 for first place, De Palma receiving $2,000 for second position.

The opening of this new speedway was unfortunately marred by two accidents, each of which resulted fatally. Joe Cooper, Sebring, Ohio, driving a Sebring, blew a tire in the thirty-ninth mile when running in second place, and close to De Palma's Stutz. The accident happened when traveling at 90 m.p.h. at the end of the turn into the home stretch. Cooper's left rear tire blew, swerving the rear end of the machine toward the inside of the track and putting the car at right angles on the track. Cooper fought to hold it on the track and succeeded in keeping it from running off the inside only to have it skid a distance of 30 feet into the railing at the top. This railing crumbled like tissue paper, and the car with the driver and mechanician fell over sideways to the ground below. Cooper was caught beneath the edge of the machine and died immediately. His mechanician, Peio, was thrown clear out of the car. The accident happened directly opposite the grandstand.

The other accident occurred in the 240th mile when William Chandler, traveling in fourth place, went off the track at the inside, due to the breaking of the left rear wheel. Before going off the track the car skidded half way up the board surface on the back turn, then turned over, and landed through the guard fence 40 ft. from the inside of the track. Chandler and his mechanician Keller were thrown clear, but Keller died a few hours later due to a combination of injuries, and Chandler is now out of danger.

Trio Fight Duel

The race from start to finish was a masterly fought duel among Mulford in a Duesenberg, De Palma in a Stutz, and O'Donnell in another Duesenberg. It was either Mulford or De Palma's race until 297 miles had been covered when the two were running wheel to wheel, and had been for 20 miles, when De Palma blew a tire, and although he made a speedy change it was impossible to catch Mulford. De Palma had tire difficulties all the way through the race, which kept him back at crucial points when he had practically control of leadership.

From the start, which was a flying one, after the co testants making a circuit of the track, De Palma took the le until the thirty-ninth mile, when he stopped for tires, a O'Donnell in his Duesenberg, who was trailing him clo pushed to the front. O'Donnell gradually increased his le and at 60 miles was a lap ahead and at 80 miles was a ahead of Mulford and three laps ahead of De Palma, who h again stopped for tires. O'Donnell's lead came to a sud end at 90 miles, when tire troubles stopped him and p mitted Mulford to take the lead with De Palma only a behind him. At 100 miles Mulford had held the lead carried off the $100 prize for leading at this mark, his ti being 1:07:06, a speed of 88.6 m.p.h. At this point O'Don was two miles back and De Palma four. At 98 miles Palma stopped for his fourth tire change.

Mulford's Tire Luck

Mulford made his first stop at 105 miles for tires, but to his lead and making a quick change he was able to ma tain leadership. He succeeded in holding it until near 200th mile, when O'Donnell took the lead due to tire trou by Mulford. O'Donnell carried off the $100 for leading the second century, the average being 86 m.p.h. At this p De Palma was a lap back and Mulford running in third sition was four laps back. From this point De Palma gra ally forged ahead, followed by Mulford. At 213 miles he only half a lap behind O'Donnell, who was leading.

The Race Crisis

At 320 miles the crucial event happened, O'Donnell and Palma both going to the pits together. This permitted M ford to gain his lost laps so that when the two got back the track, Mulford was on a par with them. From this p

Left—Joe Cooper, w Sebring car went over edge of the Des M speedway

Below—Where the car through the railing

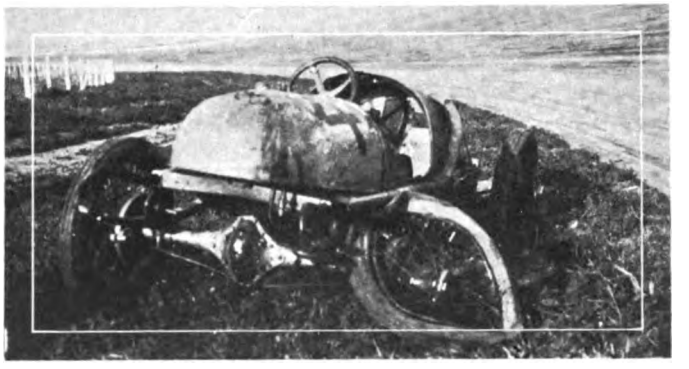
until the finish of the race there was one of the grandest struggles seen in speedway racing. For the next 50 miles O'Donnell, De Palma, and Mulford were all bunched.

Mulford Kept Out of Pits

De Palma was leading when O'Donnell's chances vanished due to his going to the pits for tires at 270 miles. This left Mulford and De Palma masters of track and road driving, to fight to the bitter end, and it was a great race between the two. De Palma held a slight lead until 289 miles, when Mulford lead him by a wheelbase. The two fought mile after mile on even terms until 294 miles, when De Palma took the lead and seemed a certain winner, barring tire troubles. Mulford was close behind and when De Palma's bad luck arrived at 297 miles, and the tire blew, it was Mulford's race.

Keeping out of the pits was what won for Mulford and going into them too often beat De Palma. Mulford made the last 100 miles without a single stop, and went to the pits only three times during the entire race. De Palma's last tire change when only 2 miles from the finish was made at lightning pace, but master effort was useless.

The other starters in the contest were not factors with the exception of Cooper, whose elimination came early. Chandler, who had fought up to fourth place with his Duesenberg at 225 miles, gave promise of being a factor at the finish, but was flagged out by fate at 239 miles. Tom Alley in the Ogren was running fifth but experienced motor difficulties. The O'Connell entry was out at the end of the eighth lap with engine trouble, and the White six entered by Shrunk went first to the pits at the thirty-second mile. Scott withdrew his



Chandler's car, which went off the track in the 240th mile at the Des Moines race

Anderson near the finish because of motor trouble. Brown took fourth place with his Duchesneau, and Barndollar was fifth in the Clergy. Henderson in the Cooling was sixth, Shrunk in the White seventh, and Alley in the Ogren eighth and last.

It was expected that trouble might arise because of the failure to properly check the scoring, but De Palma said he would not protest, although several technicalities could be raised as a basis for protest. He claims that he averaged 33 sec. for his seven tire changes at the pits and his longest stop was for gasoline and tire changes, which was 79 seconds. He says the track is all right and one of the best he had raced upon. His car was lubricated with Oilzum.

Official Time at Various Points in the 300-Mile Race on the Des Moines Speedway Aug. 7

Car	Driver	20 Miles	100 Miles	160 Miles	200 Miles	260 Miles	300 Miles
Stutz	De Palma	13:15:09	1:11:44:21	1:52:25:52	2:18:56:78	3:00:05:51	3:28:12:02
Sebring	Cooper	13:20:57					
Duesenberg	O'Donnell	13:19:68	1:08:02:52	1:49:59:95	2:16:54:22	2:59:24:51	3:31:45:51
Duesenberg	Chandler	13:55:69	1:15:16:40	2:02:30:85	2:33:49:88		
Duesenberg	Mulford	13:30:35	1:07:06:94	1:51:45:78	2:20:25:06	3:00:24:59	3:27:05:33
Ogren	Alley	14:01:39	1:15:06:52	2:00:10:68	2:29:40:77	4:21:33:27	5:10:13:08
White Spl	Shrunk	13:57:01	1:53:54:83	2:51:02:52	3:53:07:22	4:40:33:85	5:09:54:13
Du Chesneau	Brown	15:58:75	1:22:01:55	2:12:42:59	2:49:20:93	3:51:38:91	4:26:38:18
Cooling	Henderson	14:53:36	1:28:07:27	2:24:44:25	3:06:38:75	4:24:10:50	5:01:43:25
Anderson Spl	Scott	16:58:00	1:31:19:62	3:20:04:41	3:58:28:93	4:54:22:41	
Clergy Spl	Barndollar	17:22:15	1:34:10:00	2:28:37:68	3:05:54:75	4:03:45:18	4:40:35:02

Iowa College Automobile Course at Fair

DES MOINES, IOWA, Aug. 7—The department of engineering extension of the Iowa State College at Ames, having conducted forty successful automobile institutes in cities and towns of Iowa, has arranged to offer a course of free lectures instructing the motorist concerning the proper care and operation of his car at the State fair, to be held here the week of Aug. 27.

Mr. Leavell, the lecturer, has had several years' experience in second-hand car, garage, and service station work, and has also been connected with the engineering departments of several prominent firms engaged in the manufacture of cars and accessories.

Much of the exhibit material which has been used in demonstrations throughout the State will be displayed. There will be a number of carbureters of the best known makes and models cut open to show the inside mechanism. Sections cut from damaged casings will be used to illustrate the common forms of tire abuse. There will be battery plates, pieces cut out of different types of radiators, spark plugs, and much other material of interest.

After 9 each morning Mr. Leavell will be in the automobile institute lecture room under the west end of the grandstand to answer questions relative to motor car troubles. The regular lecture will begin at 10. At the close of the lectures there will be opportunity for any one in the audience to ask questions for general discussion. During the afternoon Mr. Leavell will be available by appointment to discuss or explain individual trouble cases, and as far as possible to inspect and give advice concerning cars which are brought to within a reasonable distance of the lecture room. He will offer suggestions and advice concerning such work as the motorist should be able to perform for himself, and will point out what mechanical attention the car needs. He will not do any repair work himself. This will have to be done by those regularly engaged in such work. All of Mr. Leavell's advice and suggestions are given free.

Among the subjects which will be taken up in the lectures or will be touched upon in the general discussions at the close of the lectures are the following:

Care of Running Gear. Causes and Prevention of Spring Breakage. Spring Lubrication. Steering Gears. Alignment of Wheels. Care and Adjustment of Brakes. Types of Rear Axles. Types of Ball and Roller Bearings Used in Different Parts of the Car. Proper Lubrication and the Selection of Proper Lubricants for Different Parts of the Car, as The Engine, The Transmission, The Differential, The Wheels, The Clutch, etc. Methods of Manufacture of Oils and Greases. Radiators, Causes of Boiling, Effects of Impure Water, Anti-freeze Mixtures. Care and Attention of Electrical Starting Systems. Location of Troubles with Magneto and Battery Ignition Systems. Adjustments. Carbureters, Principle of Operation, Construction, Location and Remedy of Trouble. Fuels for Motors. Manufacture of Gasoline. Relative Merits of High and of Low Test Gasoline.

Six S. A. E. Men for Navy Committee

Howard E. Coffin, Hudson Motor Car Co. | William G. Wall, Nat. Motor Vehicle Co. | John G. Perrin, Continental Motor | A. L. Riker, Locomobile Co. of Amer.

NEW YORK CITY, Aug. 10—Of the nine members of the S. A. E. asked to accept nomination for positions on the Navy Department Advisory Committee, six have accepted and voting is now in progress for the final selection of the two representatives. The six members who have accepted nomination and whose names are now before the Society as a whole for selection are Louis S. Clarke, vice-president and consulting engineer, the Autocar Co.; Howard E. Coffin, vice-president, Hudson Motor Car Co.; A. L. Riker, vice-president and chief engineer, Locomobile Co. of America; John G. Perrin, consulting engineer, Continental Motor Mfg. Co.; William G. Wall, vice-president and chief engineer, National Motor Vehicle Co., and Rollin H. White, first vice-president of the White Co.

Car and Carbureter Design for Driving with Any Fuel

(*Continued from page* 291)

device, and it can be classified as a surface carbureter with a throttle-jet. A portion of the air supply passes, as indicated by the arrow in Fig. 19, over the fuel level in the tube *R* which connects with the float chamber. The amount of fuel entering this tube is regulated by an easily adjustable throttle valve, and the level in *R* therefore becomes high when the motor is resting, making starting easy, while the level drops when the speed is increased, so that then more air is drawn in. As said, it is only a portion of the air which passes over *R*, the main intake being at *H*. The charged air strikes the large metal cone *M* which is the organ for closing and regulation of the carbureter. When the motor is shut down this cone comes to rest against a large metallic surface and is thereby kept warm, so as to assist in starting after any brief rest period.

The air channel *G* does not lead to the atmosphere, as Fig. 19 would suggest, but branches into two pipes, 1 and 2 in Fig. 20, the first one leading to the lower portion of the carbureter and the second through the top of the float chamber. The channel *G* also has a fresh air inlet at *l*, though only in the vertical model, the Lyma being manufactured in both vertical and horizontal models, like the Zenith.

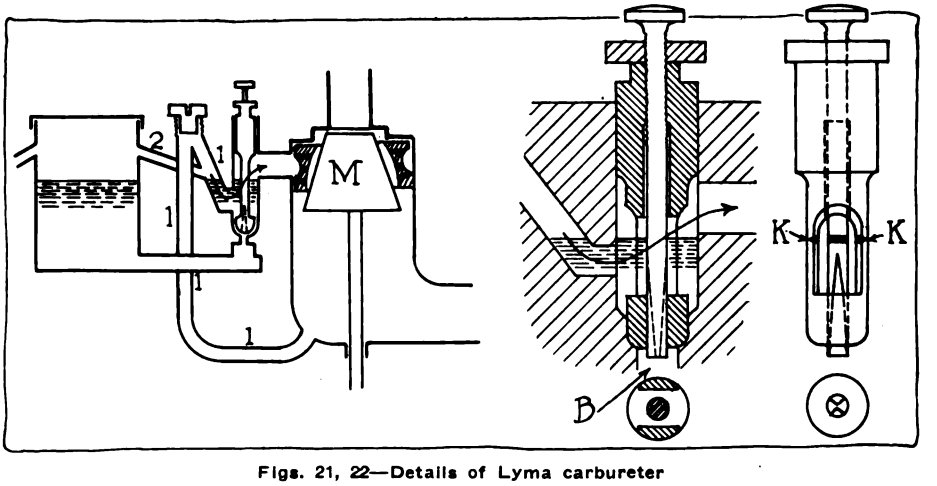
In reality the pipes have not as simple a course as shown in Fig. 20. Channel 1 does not dip downward at once but is first sent upward as in Fig. 21, with the object of forcing the air to bubble through the fuel so long as this stands high—for starting and at low speeds.

In the horizontal Lyma there is an additional organ, consisting in a ring-shaped body (shown hatched in Fig. 21) with a number of narrow passages through which the gas mixture must flow before it strikes the cone *M*.

The organ for throttling the fuel, which is sketched into Fig. 21 and shown in detail in Fig. 22, is easily removable, being held in position only by a spring in the same manner as the float chamber cover is now in many carbureters held down only by a spring and a catch. The double-hatched part is held down by such a spring, so as to make its lower spherical surface form a tight joint against the fuel entering at *B*, Fig. 22. The fuel rises, however, through tapered slits in the spindle of the organ, and if this spindle is raised or lowered—by thread and locknut—the slits give a larger or a more restricted channel for the admission of the fuel. When the adjustment has been found at which the motor works best, a slight notch is filed at one point—such as *KK* in Fig. 22—so as to make it easy to find this most favorable position again after the spindle has been removed for cleaning of a possibly clogged slit.

The Lyma carbureter has also an arrangement for introducing fresh air in the cylinders during coasting, but the channel provided is much too narrow. Another device for automatic adjustment of a slide to proportion heated and cold air is probably also of small value, as it is not found in the horizontal model. The greatest merit in Lyma design is the provision for adjusting the float to the fuel gravity.

[Von Löw concludes with the statement that he will not return to gasoline after the war and the prediction that others who do so, rather than arranging to use all fuels, will be disappointed].



Figs. 21, 22—Details of Lyma carbureter

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, August 12, 1915 No. 7

THE CLASS JOURNAL COMPANY
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Long Distance Telephone ---------- 2046 Bryant, New York

SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Cantilevers Come Slowly

NOW that so many new models are announced it is obvious that European history will repeat itself in America with respect to cantilever springs. In both hemispheres the cantilever spring is an old idea and it has been used for many years. But for no very apparent cause a sudden wave of enthusiasm for it appeared in Europe between two and three years ago and this has been followed by a similar wave in America. At the S. A. E. meeting in New York last January, everyone was talking cantilever springs, and the wildest sorts of claims for them were to be heard, yet we now see that only quite a few of the new cars are being fitted with anything novel in the way of suspension.

Presumably the truth is that the cantilever spring has been tried out extensively and has shown peculiar adaptability to certain chassis while proving a difficult problem on others. As a spring it may be good or bad just as any other sort of spring can be, but there is now a fairly prevalent idea that a good cantilever spring layout is decidedly more costly than a semi-elliptic or three-quarter design.

It is highly satisfactory that there has been no rush to use the type until its good and bad points were discovered, and the present situation suggests that its popularity will now increase in proper proportion to its merits without any spurious advantages being claimed for it.

Industrial News Service

IT is a matter of regret that an ancient and honorable contemporary, in the curtailment of its activities, should belittle the sphere of usefulness of the entire industrial press, to bolster its change of policy. It openly directs the automobile industry to the daily press for the news of the industry. In so doing it ignores the foundation principle of industrial journalism. We appreciate the usefulness of the daily press on general topics, but in an age of specialists no individual or organization can specialize on everything. The business man, therefore, depends on the daily press for the great sensational events of the day, and on the industrial press for an accurate record of the developments of the industry with which he is associated. Whether these facts are needed daily, weekly, monthly or yearly depends on the reader's activity, but in the automobile field we have no confidence in a constituency satisfied with a mortuary news service when every opportunity exists for authentic weekly information.

The automobile industry in exceeding its most sanguine expectations has established new records for industrial development; each week is punctuated with some salient event, and the automobile press owes it to the industry to accurately record such, not in a cursory manner, but with authentic details. The daily press, aware of these facilities, looks to the business press for authentic records of development, knowing as it does its impressions are furnished by those not familiar with the warp and woof of the industry.

We are, however, pleased to see our contemporary waking up to the facts of specialized journalism, and devoting one issue to the engineer and the other to the dealer. This will probably result in two separate and distinct monthly issues, which follows our conception of separate publications for consumer, dealer and manufacturer, instead of the blanket sheet idea.

Just how much will be lacking in this elimination of industrial news service and what influence this will have on the character of the circulation satisfied with this deficiency will be of special interest.

The Return of the Worm

NOT so long ago these was vivid interest in American automobile engineering circles regarding the use of worm drive for pleasure cars, and there were many who thought the worm would come. Then the spiral-type bevel made its appearance and the wave of interest largely died. What, however, it is now being asked, is the probable effect of the low gear ratios now so usual, and there are many who are again looking to the possible coming of the worm.

One of the disadvantages of the worm-driven axle is the fact that it must have a rather large center case and so give clearance trouble either beneath the axle or above, according to whether the under or over position is chosen. But with bevel ratio of 5 to 1, the clearance difficulty is coming up again and the worm is little, if any, worse for the same reduction.

Earl Overland Vice-President

Leaves Hendee Mfg. Co.—To Assume Duties Oct. 1—Is a Director

TOLEDO, OHIO, Aug 9—C. A. Earl, vice-president and general manager of the Hendee Mfg. Co., Springfield, Mass., has resigned to become vice-president and director of the Willys-Overland Co., this city. He will assume his duties Oct. 1. For over twenty years Mr. Earl was with the Corbin Screw Corp., New Britain, Conn., and after it became a unit in the American Hardware Corp. he became first vice-president of the latter. He resigned this position and that of general manager of the Corbin business last year to become vice-president and assistant general manager of the Hendee company.

His experience has been such that he is not only a manufacturing executive, capable of organizing and directing a factory on lines of maximum efficiency, but he is an experienced director of sales policies and organizations, and at the same time enjoys a high place in the esteem of Boston and New York banking houses, who have reason to know his capacity in large financial matters.

—

Overland Declares a 48-Hour Week

TOLEDO, OHIO, Aug. 6—Forty-eight hours will constitute a week's work for the 20,050 Willys-Overland factory employees after Nov. 1.

Though the regular working hours of all employees will be reduced from fifty to forty-eight hours a week, no reductions in daily or weekly pay are to be made. The reduction of working hours without corresponding decrease in pay is equivalent to a raise in pay proportionate with the reduction of hours of labor for all employees.

Under the new time and rate schedules time and one-half will be paid for all overtime and double time will be paid for services on Sundays and holidays.

The move follows an increase of 5 per cent in wages granted about six weeks ago.

It is announced that night and overtime forces will not be reduced so long as the demand for Overland cars keeps so far ahead of the factory's production.

—

Locomobile Adopts 8-Hour Day

BRIDGEPORT, CONN., Aug. 9—Acceding to the demand of the machinists working for the Locomobile Co. of America here, president S. T. Davis today conferred with a delegation of employees and conceded an 8 hr. day, thus avoiding what might have been a serious tie-up of the plant which is now being rushed to capacity on large orders for motor trucks from abroad. The question of wages for this working schedule will be taken up at a board of directors meeting to-morrow. Mr. Davis will report to the committee next Thursday. The men demand the same rates for an 8 hr. day as formerly received for a 10 hr. day. Previously they had rejected a bonus proposition made to them by the Locomobile officials.

—

Lyons Atlas Discontinues Cars

NEW YORK CITY, Aug. 11—The Lyons Atlas Co., Indianapolis, Ind., manufacturer of the Lyons-Knight motor car, it is believed will temporarily discontinue the manufacture of automobiles, and confine its activities to the manufacture of engines and parts for the automobile industry. Some change in manufacturing policy of this nature has been trade rumor in the Hoosier capital for some time. The general impression is that while present plans are to cease manufacture for the time being, there is a possibility that the company may reconsider manufacturing at a later date. The company's new test cars are still undergoing road tests, but some of the automobile experts in connection with the factory have been released from their duties.

The Lyons Atlas Co. for years manufactured poppet valve types of motors for the trade, and over 3 years ago announced the manufacture of the Knight sleeve-valve motor for general use. Soon after this, the company decided to manufacture cars fitted with this motor, which policy has been continued up to the present.

—

Bosch Has 8-Hour Day

PLAINFIELD, N. J., Aug. 7—The Bosch Magneto Co., the largest of the nine Plainfield factories, in which the machinists have threatened to strike, announced to-day that it had granted the demand for an eight-hour day. This is acceptable to the men.

—

Vacuum Oil Raises Wages

BAYONNE, N. J., Aug. 7—Officials of the Vacuum Oil Co. have announced an increase of wages for the 800 employees to take effect at once. Those receiving less than $2.50 a day are to get an increase of 10 per cent and those receiving $2.50 or more are to be given 25 cents a day more.

—

Gasoline Advanced 1 Cent

OKLAHOMA CITY, OKLA., Aug. 10—The Pierce Oil Corp. advanced the price of gasoline 1 cent for its distributing stations throughout the State.

Sun Six Detai Announced

L-Head 3 by 5 Power Plan Touring Car and Roadste —Territory Assigned

BUFFALO, N. Y., Aug. 9—Specifica of the Sun light six which is now b manufactured in this city and three products of which will soon start transcontinental run have just been r public. The motor is an L-head 3 by 5, designed to develop 50 hp the block. It is a unit casting, inclu both intake and hot-air connections, ing a clean exterior. The reciproc parts have been lightened and the n is primarily a high-speed design. clutch is a three-plate dry disk mounted, with the gearset, in unit p plant form with the motor. Gas feed is by the Stewart vacuum syst

The three-speed gearset has its shaft mounted on annular bearings the countershaft on plain bearings. rear axle is three-quarter floating a carried on ball and roller bearings. housing is of pressed steel and c the 3¼ by 52-in. semi-elliptic rear s which is used in connection with H kiss type drive. The spring is des to be approximately flat under load frame is of channel section 4½ in and 42 in. wide in the rear taperi 28 in. in the front width. The whe is 116 in. and the tread 56 in., wi option of 60 in. if desired.

The body designs are two in n a five-passenger streamline type or passenger roadster. The equipme cludes Remy or Westinghouse st lighting and ignition, with single wired on a single system. The c Brewster green, and although th is not yet announced, it is given o it would be less than $1,000.

Sales Managers Appointed

Territorial divisions have been and the sales managers and thei tories so far assigned are: C. H. for Ohio and Pennsylvania; G. A. for Michigan, Iowa and northern I J. E. Newell for Arkansas, Miss Louisiana, southern Illinois, easte souri and parts of Indiana, Kentu Tennessee; G. A. Jones for Kansa homa, Texas and western Misso L. Dixon for New York and V with the exception of New York C

The officers of the company Crawford, who was formerly sa advertising manager of the Hayn pany, is now vice-president of concern; R. C. Hoffman, who h wih Case, General Motors, Am Haynes, is engineer and pr manager.

Automobile Exports $68,107,818

Total for Fiscal Year Doubles 1914—June Increase Is Sixfold

1914 to June 30.		1915 to June 30.	
No.	Value	No.	Value
Cars ...28,506	$25,392,963	23,880	$21,113,953
Trucks . 784	1,181,611	13,996	39,140,682
Parts	6,624,232	....	7,853,183
	$33,198,806		$68,107,818

June, 1914.		June, 1915.	
No.	Value	No.	Value
Cars ... 1,982	$1,870,882	4,418	$4,785,998
Trucks . 90	120,257	2,990	8,578,802
Parts	473,968	....	1,139,182
	$2,465,107		$14,503,982

WASHINGTON, D. C., Aug. 11—Exports of automobiles and motor trucks have reached a total in the year ending June, 1915, far in excess of any previous 12 months. They totalled $60,254,635, made up of motor trucks to the value of $39,-046,892 and automobiles valued at $21,-113,953. This value represented 37,876 vehicles made up of 13,996 motor trucks and 23,880 passenger cars. To this can be added parts to the value of $7,853,183, giving a total of $68,107,818.

Trucks Gain Eighteenfold

When these figures covering the year are compared with the previous year, namely that ending June 30, 1914, the increase becomes apparent. During the year ending June 30, 1914, the total value of automobiles and trucks was $26,574,-574, showing that exports have more than doubled during the past year, the war conditions being entirely responsible for this. In the fiscal year ending June, 1914, only 784 motor trucks were exported as compared with 13,996 during the past year; in other words, the truck exports have increased eighteen fold during the year.

The war has not had such a favorable effect on the export of passenger cars, which has decreased during the past year from 28,506 to 23,880, a net decrease of 4,626 machines. This is explained by the fact that the demand for passenger vehicles during the early part of the war year was not great. The total value of the 784 trucks was $1,181,611; and the value of the 28,306 passenger cars $25,-392,963.

Sixfold Increase for June

The export figures for June, 1915, show 2990 motor trucks valued at $8,-578,802, and the export of passenger cars valued at $4,785,998. During June, 1915, the exports of automobile parts, not including engines and tires, amounted to $1,139,182.

Contrasting the business in June, 1915, with June, 1914, great export gains are registered all along. June, 1914, recorded 90 motor trucks exported at a value of $120,257, in other words the exportation of motor trucks was thirty-three times greater in June, 1915, than June a year ago.

In June, 1914, 1982 passenger automobiles were exported, valued at $1,870,-882; where as in June, 1915, there were 4418 automobiles exported, valued at $4,785,998.

Monitor Eight and Four at $1,075 and $795

COLUMBUS, OHIO, Aug 9—Two cars, an eight and a four, have been put out by the Cummins Auto Sales Co., under the names of the Monitor 8 and the Monitor 4-30. The eight is listed at $1,075 and the four-thirty at $795, both f.o.b. Columbus, Ohio.

The motor of the eight is a Golden, Belknap & Swartz unit with its cylinders cast in two blocks at 90 deg., and having 2¾ by ½ dimensions. The heads are removable from this motor, as is also the bottom of the crankcase. This motor has a single camshaft and is oiled by a combined pressure and splash system. The drive is through a multiple disk clutch to a three-speed selective gearset, then through a driveshaft fitted with two Spicer universal joints to a Timken rear axle. The wheels are artillery type, with 33 by 4 tires, and the springs three-quarter elliptic. The body is a five-passenger design equipped with a mohair top and jitney jiffy curtains. The equipment is complete, including Stewart speedometer, double ventilating windshield, a complete set of tools, robe and foot rails and tire carrier. Gasoline feed is by the Stewart vacuum system.

The Monitor 4-30 has its four-cylinder L-head 3¾ by 4¼ motor cast in a block. It has a unit power plant with three-point suspension, including a multiple-disk clutch, three-speed gearset and center control units. The drive is by shaft, the propulsion being taken through a torsion tube. The rear axle is floating and the wheels 32 by 3½. The gasoline tank is carried in the cowl and has a capacity of 10 gal. The wheelbase of this car is 108 in., being 4 in. shorter than the eight. Electric lighting and starting is included on both these cars.

Church Packard Assistant Chief Engineer

DETROIT, MICH., Aug. 6—H. D. Church has been appointed assistant chief engineer of the Packard Motor Car Co. Mr. Church joined that company six years ago and for the last five years has held the title of truck engineer. H. T. Woolson, who has been chief engineer of the Gas Engine & Power Co., Morris Heights, N. J., succeeds Mr. Church as truck engineer.

Budlong Resigns from Packard

Becomes Vice-President of Gaston, Williams & Wigmore

NEW YORK CITY, Aug. 11—Milton J. Budlong, president of the Packard Motor Car Co. of New York, Chicago and Philadelphia, has resigned to become vice-president of the importing and exporting firm of Gaston, Williams & Wigmore, Inc., of 140 Broadway, this city. He has been with the Packard company 7½ years.

He will be succeeded as president of the Packard Motor Car Co. of New York by E. B. Jackson, manager of the Philadelphia company, who will retain the general supervision of that organization. H. M. Allison, who for years has been manager of the Packard Motor Car Co. of Chicago, will follow Mr. Budlong as its president.

Mr. Budlong entered the automobile industry about 12 years ago, when he became secretary and treasurer of the Siemens & Halsky Electric Co. of Chicago, which was then controlled by the Electric Vehicle Co., Hartford, Conn. He later became president of the Hartford company, where he remained about 3½ years. During the Selden litigation, Mr. Budlong became general manager of the Association of Licensed Automobile Manufacturers, remaining in this capacity for about 8 months. In 1908 he joined the Packard company.

New Mack Models Coming

NEW YORK CITY, Aug. 10—The International Motor Co. is preparing a new line of heavy chain-driven Mack trucks which it is expected will not be ready before Jan. 1. These vehicles have been undergoing very thorough tests in actual service, one of them being in use at the National Guard maneuvers at Plattsburg, N. Y. at the present time.

The International Motor Co. is increasing its export trade through the efforts of its export department, located in a separate office in New York City in charge of W. T. Stevens, who is sending representatives into Africa, South America, India, China, Japan, Australia and other points in Oceania.

It marks the introduction of the Renault type of hood with this concern, the radiator being incorporated in the dash. The radiator is new, being of the French Solex type, a circular type design. A particularly neat designing job has been done with aluminum dash cowl. The cab is steel. The truck uses an improved four-cylinder motor, amidship gearbox and double chain drive.

Scarcity of Parts Serious

Truck Makers Cannot Secure Enough—Foreign Buyers Growing Factor in Trade

NEW YORK CITY, Aug. 11—The unprecedented demand for component parts of automobiles has been the dominant factor in the industry during the past week. Many makers have been held up in deliveries by failure to get some necessary part in sufficient quantities. It is not unusual for automobile passenger car makers to have a corps of road men who constantly are drumming up quicker deliveries from parts makers and who search broadcast for additional supplies in times of exigencies. This condition has invaded the motor truck field and now not a few truck makers have had to resort to the same methods of securing component parts, a most unusual situation in this field.

Big Foreign Demand

The scarcity of parts is undoubtedly due to the increased demand from foreign countries. During the past week, several jobbers from England have been in Detroit, Cleveland, Toledo, and other centers, and inquiries by mail have arrived on every steamer. One representative from France has been making the rounds during the past week. The British trade has never been in a more flourishing state so far as sales are concerned than at present, and automobiles are sold in England much faster than they can be shipped. Owing to the increased domestic demand these foreigners are finding great difficulty in obtaining cars of any kind. There is some talk among them of buying up stocks of used cars so difficult do they find it to get new cars.

A very important stage in the development of the American industry is shown by the anxiety of foreign interests to purchase motors, axles, gearsets, steering gears, etc., for assembly abroad, the feeling being that once this method of manufacture is started abroad it will continue. Parts makers are appreciating this and doing all they can to accept orders for small quantities.

Big Wheat Crop

The home trade, so far as can be learned from the distributing centers, has continued to hold throughout the vast agricultural territory, excepting where there is an immediate lull due to harvesting conditions. Continued rains add a more serious aspect to conditions. The oat crop has suffered very seriously during the past week in several States. Severe storms have injured the corn crop, but the bumper wheat crop, which promises to be the greatest in the history of the country, is looked to to carry the average, in spite of adverse weather conditions.

In engineering circles, the idea is gaining strength that the V-type of motor in eight and twelve-cylinder designs will largely displace the six-cylinder next year, so great is the demand for them and so small the trouble connected with them to date. Several of the expansions and additions to factories are rapidly getting into shape to produce these types.

Conditions in the Southwest, including New Mexico, give promise of increased business, the favorable situation in mining and other industries indicating such. For the first 7 months of this year 4230 automobile licenses were issued by Secretary of State of New Mexico, this representing a gain of 60 per cent over the corresponding period of a year ago. It is believed the percentage of increase this fall will be much larger when farmers and others begin realizing on their season's work. The greatest increase in registration and demand comes from the rural districts.

—

Cars Scarce in West—Harvesting Hay and Rye

MINNEAPOLIS, MINN., Aug. 7—The automobile business of last week in the Twin Cities was exceptionally good, considering several factors which worked against the trade. One was that farmers in Northwestern States have begun to harvest hay and rye. It is more important to the farmer and to the automobile dealer that he turn his attention just now to getting the crops in. Successful crops will pay in the fall.

Another factor was continued inability by many agencies and distributers to get cars enough to fill orders. Farmers and agents sit around the agency offices and the factory branches and refuse to move until they get cars. If three freight car loads come in, they are all gone in a trice, driven off by the waiting line.

Still another trouble was wet weather. After a long summer of cool and rainy weather the resumption by the rain god last week made roads worse, so that prospects could not get in, and somewhat dampened the ardor of other probable buyers, who turned their thoughts to something else for the time being.

The delay caused by waiting for 1916 model announcements has been overcome, according to Minneapolis dealers.

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Signal Co. Changes Name

DETROIT, MICH., Aug. 5—The De Weese Auto Safety Signal Co. has changed its name to that of Auto Safety Signal Co. and has increased its capital stock from $1,500 to $20,000.

N. Y. Sales Ahea of 1914

Dealers Report Continued Go Business—Bad Weather Affected Some

NEW YORK CITY, Aug. 10—The l automobile dealers report large s during the last two weeks. The incl ent weather last week in some c pulled down the sales records, but tal the last week in July and the first in August together, the dealers re larger sales for that period than for same one in 1914.

Reports from Dealers

The Saxon company up to Aug sold between 1500 and 2000. Sales week were fair. Shipments are co in fast from the factory. A large centage of the sales are on the six inder car. The company is doing a business in Long Island, which sho 300 per cent increase.

The Oldsmobile company has so its cars and reports that if it had cars it could sell them. Shipment slow.

Mercer sales in July were two an half times greater than those in th responding month in 1914. Sales Aug. 10 are greater than those f whole month of August in 1914.

There is only one Stutz car o floor. Sales during the past ten have been unusually good. Even second-hand cars are sold.

Hudson sales are 300 per cent Up to May 4, the agency sold 58(During June the sales were 274 241, and up to Aug. 9, fifty-six car been sold.

All Franklin cars are sold. Th is twenty-one cars behind in ret ders. Lozier reports good sales. ments are coming in regularly. state sales are double those of Last week the rain slowed up th but during the last few days they up. Not a car on the Packar Marmon is all sold out, having demonstrator left.

—

Automobile Liability Rates Cut i

NEW YORK CITY, Aug. 10—Th mobile liability rates have been New Jersey by the New Jersey & Plate Glass Insurance Co. Th are $6.50 added to the insurabl power for cars from 16 to 30 hp to $14 under the conference co tariff rates, and all cars above 30 $14 below the conference tari above company has applied to N State for permission to write au liability and property damage.

S. A. E. Suggests Standard Names

Names of Parts Adopted at Recent Meeting—List Open for Criticism

DETROIT, MICH., Aug. 9—The suggested names for parts which have been adopted at the meeting of the nomenclature division of the standards committee of the Society of Automobile Engineers have now been announced and the committee is seeking criticism before final acceptance of the terms included. The nomenclature suggested is as follows:

Fore—toward forward end of car. Rear—toward rear end of car. (Confusion only likely in regard to dash.) Where parts are numbered No. 1 should be toward the front of the car; for instance, No. 1 cylinder is the one nearest the radiator (in conventional construction). (Note—Should valves be numbered 1 I, 1 I, 2 I, 2 E, etc., or should they be numbered 1, 2, 3, regardless of cylinder location?) Right is to the right hand when sitting in one of the seats of the car. Left—opposite. Cylinders of V type engines should be numbered 1 R, 1 L, 2 R, etc. Studs, screws and bolts shall take names from parts which they serve to hold in place, although they may be assembled with other parts, e. g., cylinder stud is permanently screwed into crankcase but holds the cylinder in place.

Engine: The name "engine" should be used rather than "motor" to avoid confusion with electric motors and secure lower freight rates. Cylinder. Cast in block—not cast en bloc. Valve cap. Exhaust valve cap. Valve chamber. Cylinder head. Cylinder head plug. Water jacket cover. Water jacket top cover gasket. Water outlet. Engine water inlet. Water jacket side (or front or rear) cover. Timing cover. Valve spring cover gasket. Valve spring cover stud. Valve stem guide. Spark plug. Priming cup. L-, T-, I-, or F-cylinders—L-head, valves on one side only. T-head, valves on opposite side only. I-head, valves in cylinder head; F-head, one valve in head, other on side.

Crankcase: Crankcase (one word). Barrel crankcase. Split type crankcase (indicating the type which is split horizontally at the center line of crankshaft). Crankcase upper half. Crankcase lower half (only used when the lower half contains bearings). Oil pan (used for lower part of split or barrel type crankcase, whether this acts as an oil reservoir or not). Oil pan baffle. "Bushing" instead of "bearing" for removable and renewable lining used in a bearing. Crankshaft front bearing cap (upper half and lower half). Crankshaft front bearing cap. Crankshaft front bearing support (sometimes used in barrel crankcase). Crankshaft rear bearing cap. Crankshaft rear (etc.) bearing cap. Crankshaft center bearing bushing (if all three bearings or if all except end ones are alike). Crankshaft second bearing, third, etc. (if more than three bearings, e. g. front bearing, second bearing, third bearing, fourth bearing, rear bearing). Inspection cover. Hand hole cover gasket. Timing gear cover. Timing gear cover gasket. Flywheel housing. Generator bracket.

Crankshaft: Crankshaft. Flywheel. Crankshaft timing gear (or sprocket). Crankshaft timing gear key. Flywheel starter gear. Flywheel starter sprocket. Flywheel studs. Starting stud. Crankshaft starting jaw.

Camshaft: Camshaft. Eccentric shaft (V engine). Camshaft timing gear. Camshaft timing gear key. Camshaft idler gear. Camshaft oil pump gear. Camshaft distributor gear.

Connecting-rod: Connecting-rod (hyphen saves confusion). Straight connecting-rod—Connecting-rod (V type engine). Connecting-rod cap. Connecting-rod bushing. Cap half (lower half). Connecting-rod cap bolt). Connecting-rod cap nut. Connecting-rod bearing shims. Connecting-rod Piston pin lock screw (in connecting-rod or piston). Piston pin. Piston boss. Piston. Piston ring. Piston groove.

Valve: Valve lifter. Valve lifter guide. Valve guide clamp. Valve lifter roller. Valve roller pin. Valve adjusting screw. Valve roller pin. Valve rocker (either at cam or at overhead valve—if both, upper and lower). Valve push rod (intermediate between lifter and valve—I-head engine). Valve adjusting screw. Exhaust valve. Inlet valve. Poppet valve. Valve spring. Valve spring retainer. Valve spring retainer lock.

Group 7-8-9: Water pump. Water pump impeller. Water pump impeller key. Water pump body (in case of doubt, body is member mounted on engine). Water pump cover. Water pump shaft. Water pump gland. (The part which contacts with the packing, whether threaded or not). Water pump gland nut (or screw, etc., where these parts are used to compress gland). Water pump shaft gear. Magneto (or generator) coupling, pump end. Magneto coupling, center member. Magneto coupling, magneto end. Tire pump driving gear. Tire pump shaft gear. Tire pump. Tire pump idler gear. Generator gear. Generator shaft. Generator coupling (members as above). Starter-generator. Gasoline pressure pump (power pump). Gasoline hand pump.

Group 10: Oil pump. Oil pump body (any type of pump). Oil pump plunger. Oil pump plunger spring. Oil pump inlet valve. Oil pump outlet valve. Oil pump shaft. Oil pump shaft gear (outside pump). Oil pumping shaft gear (inside pump). Oil pumping follower gear. Oil pump cover.

Group 11: Starting crank jaw. Starting crank shaft. Starting crank. Starting crank handle. Starting crank handle pin.

Group 12: Fan. Stationary fan support. Adjustable fan support. Fan hub. Fan blades. Fan pulley. Fan belt. Fan driving pulley.

Group 13: Inlet manifold (more than one connection to cylinder). Inlet pipe (only one connection to cylinder). Inlet manifold or pipe gaskets (at cylinders). Carburetor gasket.

Group 14: Exhaust manifold. Exhaust manifold gaskets.

$300,000 Addition for Fisk

CHICOPEE FALLS, MASS., Aug. 6—The Fisk Rubber Co. will erect a $300,000 brick and steel mill building on its new property at Oak and Grove streets, in addition to the three buildings now under construction there. The new building will be located on the property recently acquired by the company between the six-story warehouse now in process of erection and the Boston & Maine railroad track. Employment will be furnished for 3000 additional persons. The building will be five stories, with a basement 600 ft. long and 110 ft. wide.

Croxton Plant Sold to Washington Tire & Rubber Co.

WASHINGTON, PA., Aug. 7—The sale of the plant of the Croxton Motor Car Co. in the west end of the town to C. J. Davis of East Palestine, Ohio, who represents the Washington Tire & Rubber Co., tire maker, was completed yesterday. It is stated that the plant will start working before Dec. 1. About 150 men will be employed at the beginning, that number being increased later to 350. Mr. Davis will have charge of the Washington plant.

Pennsylvania Registrations $1,483,201

HARRISBURG, PA., Aug. 7—The receipts of the automobile division of the Pennsylvania State highway department for the first six months in 1915 show that $1,483,201 had been received. These receipts are the more remarkable when it is considered that on the first of July, 1912, the total receipts of the automobile division were $519,000.

Stewart Pump Supplies Cool Air

Tests Made at Armour Institute Show that Air at Tire Is at Atmospheric Temperature

CHICAGO, ILL., Aug. 9—In order to prove its contention that the statements contained in a paper presented by Paul W. Litchfield at the recent meeting of the Society of Automobile Engineers are not accurate as regards the air temperature due to the heat imparted by power pumps, the Stewart Warner Speedometer Corp. has had a series of tests made by Professor Roesch at the Armour Institute of Technology, Chicago.

The tests which were made on the Stewart motor driven pump show that the air enters the tire at virtually the same temperature as that of the outside, and furthermore, the fact is brought out that the air from a hand pump is from 30 to 40 deg. higher in temperature than the outside air. The tests were made with the Stewart pump inflating a 37 by 5 tire.

The temperature of the air was taken at three points simultaneously.

STEWART TIRE PUMP TEST

Room temperature..... 71 deg. Fahr.
Average r.p.m. of pump.....735 deg. Fahr.

Line pressure, lb. per sq. in. gage	Degrees Fahr. Temp. of air in pump	Temp. of air passing cooling coil	Temp. of air entering tire
0.00	71	71	71.0
30.25	110	76	72.0
41.00	129	84	71.5
48.00	152	88	71.0
58.25	168	94	70.5
64.00	188	98	70.0
70.00	202	103	69.5
76.00	214	107	70.0
83.00	225	110	70.0
88.00	232	114	70.0
94.00	240	116	69.5
101.00	248	117	69.0

One of the remarkable findings of this test was that the air entered the tire 2 deg. cooler than the outside air.

FOOT PUMP TEST.

Hose—24 in. of rubber hose regularly supplied with pump to gage.
Room temperature—72 deg. Fahr.

Line pressure, lb. per sq. in. gage	Temperature (degrees Fahr.) of air as it enters pump
0.00	72
25.00	74
28.50	76
36.00	78
47.00	80
55.00	82
60.25	85
66.00	87
74.00	89
79.00	92
88.00	96
93.00	99
101.00	103

The total number of strokes required with the hand pump to reach the pressure of 104 lb. was 598. It will be noted Mr. Litchfield said that, with a hand pump, there would be no particular increase of temperature, because a hand pump works so slowly. This test showed a rise of 31 deg. hotter than the outside air, due, of course, to the short length of hose connection that is furnished with hand pumps.

English Ford Sells 12,500 Cars

War Has Not Affected English Business, Which Shows 50 Per Cent Increase

NEW YORK CITY, Aug. 8—That the war has not affected the Ford company's business in England and that its 1915 output was almost 50 per cent better than in 1914, were a few interesting points brought out in an interview with P. L. D. Perry, managing director of the Ford Motor Co., Ltd., of England, who arrived in this city to-day on the St. Paul. He will make his annual business trip to Detroit. Henry Ford, together with his son, Edsil B. Ford, Frank Klingersmith, the director of the plant, and Frank Mayo, chief engineer, met Perry at the pier.

Mr. Perry denied the report that the company had received large war contracts. The company, however, is making about 15,000 cars for the British Government for use as motor ambulances.

As stated above the war has not affected the English company's business and the concern does not expect a boom after peace is declared because its factories are running at full pressure all the year round.

Mr. Perry said that the Ford factory at Manchester, England, employed 1600 hands and paid 50 per cent higher wages, grade for grade, than any other automobile concern over there.

Up to Aug. 1 this year, the company sold 12,500 cars and had 8500 on order, which included 600 ambulances that were sold to the government. The output was almost a 50 per cent increase over 1914. The engines and axles are made at Detroit and the other parts including the bodies, are made at Manchester.

The British Government sends 100 soldiers from the Army Transport Service to the Ford works for two weeks at a time to learn how to repair machines in the field and how to put them together.

The $440 car sold in the United States costs $575 in England, the extra charge being made to cover the cost of packing, insurance and transportation.

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Britons Would Protect Motor Trade

LONDON, ENGLAND, Aug. 6—Protection against the American invasion of British motor vehicle markets is being sought by British motor vehicle manufacturers. Appeals have been made to members of parliament for either the prohibition of imports of motor vehicles or the imposition of a high import duty. They point out that owing to the absorption of the greater part of the motor output of England by the government they are unable to meet American competition; on the other hand, it is pointed out by the importers of American vehicles that British makers are now earning more than ever through war contracts and that while they are losing domestic trade to American builders their plants are running at forced draft and they are selling to a market which costs very little to secure.

British merchants who have had both motor vehicles and horses taken from them by the government are forced to adopt American vehicles to carry on commerce. The real status of the matter seems to be that British makers fear that having once used American trucks English merchants and tradesmen may continue to buy them thereafter, even though home supplies are again made available.

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Ford Inventory Complete—18,500 Men Resume Work

DETROIT, MICH., Aug. 9—After having been laid off several weeks pending the taking of the annual inventory, the Ford Motor Co. resumed normal activities today when between 18,500 and 19,000 men returned to work. This return to activities of the Ford company has a far-reaching effect upon many other plants or factories which are largely working for the Ford company only. At the C. R. Wilson Body Co. it was stated that the number of men which make up the Ford department is 300 to 350 from a total force of 1300 to 1400. At the Herbert plant the force to be taken back to-day is estimated at 700 out of a normal force of 800 to 850. At both of these concerns the Ford departments will turn out touring car bodies exclusively, and both are to turn out a much larger quantity than during the past fiscal year.

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Gramm-Bernstein Has 1,250 Foreign Truck Orders

LIMA, OHIO, Aug. 9—S. A. Gramm, vice-president and general manager of the Gramm-Bernstein Co., Lima, is authority for the statement that orders for 1,250 motor trucks are on the books of the company at this time and that considerable additonal business had to be turned down because of lack of capacity. That is being remedied, however, and additions and extensions are under way which will be completed in October of this year which will largely increase the capacity.

The company has already shipped 300 motor trucks to foreign countries, such as France, Roumania, India and Russia. A large proportion of the orders now on the books are from foreign nations.

The company is now shipping trucks at the rate of 150 per month, and when the machinery is installed in the new additions the number will be increased to 250.

Harvard Roadst for $750

Pioneer Motor Car Co. of T Brings Out 2¾ by 4½ L-Head Four

TROY, N. Y., Aug 7—The Pio Motor Car Co. of this city is puttin the market a car known as the Har which is in roadster form and equipped for $750. This car is desi to fit in with the present tendency to small luxuriously fitted cars which be economical as regards upkeep ar the same time furnish the comfort f in larger cars. The power plant is by 4½ Model motor with the four L- cylinders cast in a block and havin intake and exhaust manifold int Some of the specifications of the ca clude 1⅛-in. valve, Carter carbu Bosch ignition, left or right driv tional, electric lighting and starting power plant type, three-speed ge semi-floating rear axle, quarter-el springs, 28 by 3-in. wire or wood w wheelbase 100 in. The body is of steel, aluminum and wood, with lin running boards bound with alum Storage space is provided under th and also under the rear deck. The ard color is maroon, with black ru gear.

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Parts Export Demand Con

LONDON, ENGLAND, Aug. 5— American parts makers and manu ers of complete vehicles should p now for the demand for motor parts which will follow the larg of American vehicles abroad is the of a European army officer r given. Besides the demand on th of owners of American Motor abroad there is every indication t increased demand for motor which is expected to follow the w to reconstruction work to be do to the construction of former tr means that European manufactur undertake the production of as vehicles and the demands for A standard parts will be very large

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Minneapolis Has Clearing Ho Speed Complaints

MINNEAPOLIS, MINN., Aug. 7— ing a long series of accidents an in July a clearing house for co against violation of traffic ordin automobile drivers was formed Minneapolis Civic and Commer Some of the drivers who cause were indicted by the grand jury drivers were sentenced to the w for reckless speed and nine jitne were fined or imprisoned.

Five complaints were received by the bureau in the first hour. Twenty complaints were received the second day. Passing open street car gates within less than 10 ft., overtaking and passing street cars on the left side of the street, speeding, driving without lights, stopping on left side of street, were chief complaints. At the end of the second week none had been killed and the average of four accidents a day in July had been cut to less than one a day. One reason is better observance of rules for pedestrians issued by the committee of safety.

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Louisville Bans Headlight Glare

LOUISVILLE, KY., Aug. 5—According to an announcement made yesterday by Mayor Buschmeyer to a committee from the Louisville Commercial Club, glaring headlights on motor vehicles must go. There is a city ordinance regulating headlights but, it is said, it has not been strictly enforced. It is expected owners will be given until Sept. 1 to eliminate objectionable features by means of ground glass shades over the upper portion of the light, or full shade with small "peep eye" in the center. After that date active steps will be taken to enforce the ordinance. Members of the Louisville Automobile Club, which has a membership of nearly 1000, have been asked to co-operate in the movement to eliminate the headlight glare danger.

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Dim Headlights in Indianapolis?

INDIANAPOLIS, IND., Aug. 7—Mayor Bell is credited with the statement that his administration will take steps immediately to bring about the passage by the City Council of a new automobile headlight dimmer ordinance, the present ordinance having been declared invalid by Judge Deery in a recent Police Court decision. Harry E. Raitano, city prosecutor, announces that he will enter an appeal in the Marion Circuit Court from Judge Deery's decision declaring the automobile headlight dimmer ordinance invalid. Judge Deery's decision freed more than fifty automobile drivers who had been arrested in the crusade conducted by the police.

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Committee Protests Sprinkling

NEW YORK CITY, Aug. 7—The Citizens' Traffic Committee at its meeting to-day adopted a resolution pointing out the inefficiency and danger of street sprinkling and calling on street officials to abolish it. The substitution of street washing is recommended. Street Commissioner Fetherston stated that his department was opposed to street sprinkling and only practised it in conjunction with street washing. The sprinkling complained of, he said, was done by private contractors.

Test Headlights in Bay State

Highway Commission Engineers Measure Rays, Etc., for Report on Glare

BOSTON, MASS., Aug. 9—Under the direction of the Massachusetts Highway Commission there was a series of tests of motor headlights at the Country Club, Brookline, to-night. The last Legislature directed the commission to make a report of what should be done to regulate the lights so that there would not be a blinding glare in the eyes of people and operators of other cars.

Col. W. D. Sohier and James D. Synan were present for the commission, and they had members of the engineering staff on hand to measure the rays and otherwise compile data. All the motor organizations and a number of the accessory people were present with their devices.

Colonel Sohier, who is chairman of the commission, stated that he planned to have some regulation made and then ask Governor Walsh and members of the Council to approve of it. That would make it a law, and it could be changed from time to time by the same method when it needed improvements instead of having the Legislature do it.

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Fined $50 for Reckless Driving

HARTFORD, CONN., Aug. 9—Fifty dollars fine and thirty days in jail was the sentence imposed on two New Britain young men this week on a charge of reckless driving and attempt to evade responsibility.

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Boys Over 16 May Work in Michigan Plants

DETROIT, MICH., Aug. 5—J. V. Cunningham, Labor Commissioner of the State of Michigan, has taken some important decisions regarding the employment of young boys in factories. This was done in reply to inquiries from manufacturers who desire to know what kind of work the commissioner considers as too dangerous or hazardous for boys. The Michigan Legislature this year amended the labor laws and now boys under 18 but over 16 may be employed for certain work in factories.

The commissioner ruled that time checking, assembling, operating a machine lathe properly guarded, ordinary bench work, sheet metal work in automobile plants are not considered dangerous.

Power punch presses automatically operated and properly guarded, not requiring the operator to come in contact with the die, are considered safe, but power punch presses operated by foot or hand are considered dangerous. Boys may not adjust a die. Gang drill presses, wood working or wood turning lathes on account of speed and edged tools are considered dangerous and not to be handled by boys.

Automatic screw machines having belt shifter with belts, pulleys and gears properly guarded are considered safe.

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Cal. License Fees Reduced One-Half

LOS ANGELES, CAL., Aug. 6—Commencing Aug. 1 automobile license fees in the State of California were reduced 50 per cent, under the law which wisely holds that the remaining five months of 1915 should not be paid for at the full yearly rate.

The Southern California branch of the State motor department is now located in the new Union League Building at Second and Hill Streets, Los Angeles, in charge of Superintendent W. S. Goble.

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N. Y. Sightseeing Ordinance Vetoed

NEW YORK CITY, Aug. 9—Mayor Mitchel has vetoed the proposed ordinance that sightseeing cars might stand in front of a building where the owners have an office, if the consent of the police commissioner and the owner of the building has been secured. The Mayor stated that this would permit cars to sand at all times in front of the building. This is, in effect, the maintenance of a private stand where others may be excluded.

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To Fight Baltimore Ruling

BALTIMORE, MD., Aug. 7—Members of the Automobile Club of Maryland are preparing to fight the ruling which places automobiles under the same ordinance as wagons in that they cannot remain standing on the street more than 2 hr. at a time. This will mean that all the parking places about the city will have to be abolished. The police department has announced that it will begin to enforce the law on Sept. 15.

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Garage Men Planning State Organization

COLUMBUS, OHIO, Aug. 9—The Columbus Garage Owners, Asso. has arranged for a State convention of garage owners, to be held at Columbus, Ohio, Oct. 4, 5 and 6. The plan is to organize a strong State association for the benefit of garage men and tire repairers. A convention committee to arrange for the meeting consists of F. E. Avery, chairman, Robert T. McClure, secretary, and George McDonald, treasurer.

Notices have been sent out to 2000 garage men of the State inviting them to attend the meeting and to give their views of the question of forming a State organization.

Zenith Far Ahead of 1914

Last Year's Total Business Already Surpassed—10,000 Carbureters Monthly Output

DETROIT, MICH., Aug. 9—With two months still to go before the end of its fiscal year, the Zenith Carbureter Co. has already passed its total production of 1914. Business has been steadily increasing since January, and at the present time the monthly output averages 10,000 carbureters. Prospects are the best the company ever experienced and the outlook for 1916 is that it will be another record-breaking year.

The business increase has not been confined to any special type of carbureter, neither has it been exclusively in the passenger car field, but it has also increased considerably in the motor truck field. A reinforced concrete addition is being erected which will give the company much needed additional floor space.

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To Make Bullet-Proof Tires

SOUTH BEND, IND., Aug. 9—The Zeglen Tire & Fabric Co. has been organized in this city to manufacture automobile tires from the Zeglen bullet-proof fabric invented some years ago by Casmir Zeglen. Headquarters of the company will be established in this city. The elimination of all the tire troubles which the average motorist experiences is promised by the backers of the concern. The cost of tires manufactured from the Zeglen fabric will be only 10 per cent greater than that of the average tire, it is said. It is planned to manufacture tire casings here and dispose of them to tire manufacturers. Some of the advantages claimed for the new tires are: freedom from cuts, punctures and stone bruises, elimination of blow-outs and prevention of bulging and rim cutting. In addition to the tire fabric the concern plans the manufacture of protectors for ordinary pneumatic tires; these will serve as guards for inner tubes.

Mr. Zeglen won considerable prominence some time ago by the invention of a bullet-proof coat.

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Oakes Capital Now $75,000

INDIANAPOLIS, IND., Aug. 11—The Oakes Co., this city, has increased its capital $50,000 to $75,000. The officers of the company remain the same.

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To Push Ampco Bronze for Bearings—Capital Increased

MILWAUKEE, WIS., Aug. 7—The American Metal Products Co., Thirtieth Street and Lisbon Avenue, Milwaukee, Wis., which recently announced the perfection of a new metal alloy known as Ampco bronze, the invention of A. Littmann, is now making a campaign in the automobile and garage industry for the use of the alloy for high-speed bearings. Twenty Milwaukee garages, repair shops and machinery and supply companies have been appointed agents and in addition to marketing the bronze for initial use, emphasis is laid upon its use for replacement of bearings. The company has increased its capital stock from $25,000 to $100,000 to accommodate the increased production and trade.

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Few Market Changes

NEW YORK CITY, Aug. 10—The markets for the past week made very few changes, there were but a few gains and very heavy losses. The heaviest loss occurred on Wednesday when open-hearth steel dropped from $25 to $22.50, a total drop of $2.50. The rest of the steel markets made no changes.

The lead was also a bit unsteady when during the first part of the week it rose from $4.75 to $5.00 and then made a considerable drop on Monday of 37½ cents. Copper declined when leading interests quoted 18 cents but round lots were at 17¾ cents, the cause being another severe break in London. While this reduction was noted in some quarters on Saturday, the cut to 18 cents became general yesterday. In the open market the metal was offered at 17⅞ cents with no buyers. The cotton oil market was dormant yesterday with trading being so light that there was scarcely any market at all. There were no changes in the oil and lubricant markets.

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Elmira Truck Projected

ELMIRA, N. Y., Aug. 7—Organization of the Elmira Commercial Motor Car Co. has been completed. The concern has been incorporated in New York with a $500,000 capital. The plan is to produce a vehicle of 500-lb. capacity to sell at $300, after the designs of W. H. Ives of the defunct Ives Motorcycle Corp., Owego, N. Y.

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Detroit Forging Business a Third Larger

DETROIT, MICH., Aug. 9—During the fiscal year of the Detroit Forging Co. which ended Aug. 1, this company did one-third more business than during its previous business year. Manufacturers have been ordering much earlier than last year and all have greatly increased their orders. One of the largest orders ever received by the company was taken a few days ago being for 2,000,000 forgings, valued at over $75,000.

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Guelph Tire & Rubber Elects

GUELPH, ONT., Aug. 7—Several citizens of Berlin were present at a large and enthusiastic meeting of the shareholders of the Independent Tire Co., now known as the Guelph Tire & Rubber Co. This was the first meeting since the liquidation and the reorganization of the company. The provisional directors retired and the first board of directors was elected, which consisted of Messrs. J. E. Carter, Guelph; D. McIntosh, Guelph; L. Kaufman, Ohio; H. L. Davidson, Southampton; R. Dunn Wellesley and Dr. Winning, London, Ont.

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Safety-First Convention Oct. 19-20

NEW YORK CITY, Aug. 7—The date for the first annual convention of the Safety-First Federation of America to be held in Detroit, has been set for Tuesday and Wednesday, Oct. 19 and 20. The program has not as yet been prepared.

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Lindoerfer Leaves Atterbury Co.

BUFFALO, N. Y., Aug. 7—Frank C. Lindoerfer has resigned as general sales manager for the Atterbury Motor Car Co. to take charge of the distributing branch of the Bessemer Truck Co. in this city. With Mr. Lindoerfer is associated Norman B. Harrington, who has been connected with the Atterbury company for the past four years. All of the Eastern territory will be handled through the Buffalo office. Mr. Lindoerfer started

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.33	.33	.33	.33	.33	.33	.....
Antimony	.35	.35	.35	.35	.35	.35	.....
Beams & Channels, 100 lbs.	1.25	1.30	1.47	1.47	1.47	1.47	+.22
Bessemer Steel, ton	22.00	22.00	22.00	22.00	22.00	22.00	.....
Copper, Elec., lb.	.18¼	.18¼	.18¼	.18¼	.18	.17⅞	—.00⅛
Copper, Lake, lb.	.19	.19	.19	.19	.18½	.18¼	—.00¾
Cottonseed Oil, bbl.	5.88	5.83	5.84	5.90	5.95	5.86	—.02
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.87	.87	.87	.87	.87	.87	.....
Lead, 100 lb.	5.00	4.75	4.50	5.00	5.00	4.62½	—.37½
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	25.00	25.00	22.50	22.50	22.50	22.50	—2.50
Petroleum, bbl., Kan., crude	.50	.55	.55	.55	.55	.55	+.05
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.35	1.35	1.35	.....
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	.....
Rubber, Fine Up-River, Para	.59	.59	.58	.58	.58	.57	—.02
Silk, raw, Ital.	..	..	3.80	..	..	3.80	.....
Silk, raw, Japan	..	..	3.42½	..	..	3.45	+.02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	35.50	35.37½	34.75	34.50	34.50	34.25	—1.25
Tire Scrap	.04¼	.04¼	.04¼	.04¼	.04¼	.04¼	.....

with the Haynes-Apperson Automobile Co. sixteen years ago and has been connected with the automobile industry ever since.

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Takes Over Mason Stock

FLINT, MICH., Aug. 6—Complete linking of the Mason Motor Co. with the Chevrolet Motor Co., Flint, Mich., has been accomplished by the taking over of the remainder of the Mason stock by the Chevrolet company.

At the same time that the stock transfer was completed ground was broken for an addition to the Mason factories and twenty more acres of ground were secured on three sides of the Chevrolet plant.

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Daly Resigns from King Co.

DETROIT, MICH., Aug. 6—W. L. Daly, sales manager of the King Motor Car Co., has resigned and after a short rest will enter into an individual venture of his own. R. P. Bishop, assistant to Mr. Daly, succeeds him. I. B. Meers enters the position formerly held by Bishop.

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Dividends Declared

Maxwell Motor Co., quarterly of 1¾ per cent on first preferred together with an additional dividend of ¾ of 1 per cent on the stock, payable Oct. 1.

Studebaker Corp., quarterly of 1¾ per cent on preferred and 1¼ per cent on the outstanding common, payable Sept. 1.

B. F. Goodrich Co., 1¾ per cent on preferred, payable Oct. 1.

Standard Oil Co. of California dividend payable Sept. 15 to stockholders of record Aug. 20.

Security Prices Higher

Sturdy Demand in All Stocks —General Motors Makes High Record

NEW YORK CITY, Aug. 9—Except for a few fractional declines, most of the stocks that changed made substantial gains in this week's security quotations. Resistance to all disquieting influences with a consequent active market, strong tone and higher prices, were the dominant feature. At the beginning of the week there was an upward rush. After this a selling movement of considerable moment set in. Some of the issues again displayed advances similar to those which were so frequent in April and May.

Changes this week ranged from gains of one-quarter to twenty-four points and loses from one-quarter to three points. General Motors common featured the market with a twenty-four-point rise, closing at 203, at an absolute high record. The strength of this issue was attributed to expectation of early dividend action. It is stated that the company will have a net profit for the fiscal period of $20,000,000 meaning a balance for the common of nearly 60 per cent. Willys-Overland common also reached a high price level with a gain of ten and one-half points.

Tire issues showed gains, though not as high as usual. B. F. Goodrich common went up one-quarter point, while that of the preferred rose a half-point. Kelly-Springfield first preferred rose three-fourths of a point, while that of Swinehart and U. S. Rubber rose two points. The rest of the tire issues remained unchanged. The Detroit issues showed very large substantial gains, ranging from one to seventy-five points, with losses slight from one-fourth to ten points.

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Paine President Detroit Commercial Co.

DETROIT, MICH., Aug. 7—W. D. Paine, who was supervisor of sales of zone 4 of the Maxwell Motor Co., has resigned to become president and sales manager of the Detroit Commercial Co. Mr. Paine was with the Maxwell company since its organization. He also was formerly with the Studebaker Corp. and the E-M-F company.

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Cooper Maxwell Supervisor

DETROIT, MICH., Aug. 7—L. K. Cooper has been appointed supervisor of sales in zone 4, by the Maxwell Motor Co., taking the place of W. D. Paine, who resigned. Mr. Cooper has been with the Maxwell organization since its inception and was on special duty in Chicago during the past season. Now his headquarters will be Detroit and his territory stretches from the Great Lakes to the Gulf of Mexico and includes auxiliary offices in Indianapolis, Ind., and Memphis, Tenn. It was Mr. Cooper who won the first prize, $500, in the Maxwell sales competition of the past season.

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Ollier Studebaker Director

DETROIT, MICH., Aug 7—L. J. Ollier, sales manager of the Studebaker Corp., has been named a director of that organization.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Rubber Co. com			300	..	..
Rubber Co. pfd			101	..	..
Castings pfd			98	100	..
pfd			70	78	..
Motor Co. com			90	93	..
Motor Co. pfd			96	97	..
Storage Battery Co.			52	53	..
Tire & Rubber Co. com			506	510	..
Tire & Rubber Co. pfd			109	111	..
Motors Co. com			203	205	+24
Motors Co. pfd			105	107	+2
Goodrich Co. com			50¾	51¾	— ¼
Goodrich Co. pfd			104	105	+ ½
Tire & Rubber Co. com			268	270	..
Tire & Rubber Co. pfd			105	106½	..
Parts, Inc., pfd			..	..	..
Motor Co. com			19	20	+4
Motor Co. pfd			43	45	+5
Springfield Tire Co. com			170	175	..
Springfield Tire Co. 1st pfd			85¼	86½	+ ¾
Springfield Tire Co. 2d pfd			160	170	..
Motor Co. com			35	36	+2
Motor Co. 1st pfd			84	85	+2
Motor Co. 2d pfd			32¾	33¾	+3¾
Motor Co. com			196	199	..
Motor Co. pfd			104	106	..
Finance Mfg. Co. com			..	..	..
Finance Mfg. Co. pfd			..	..	..
Motor Car Co. com			..	120	..
Motor Car Co. pfd			..	101	..
Motor Car Co. com			67	70	—3
Motor Car Co. pfd			94	96	+8½
Motors Co. com			36	38½	+2½
Motor Co. pfd			92	95	..
Truck Co.			17¼	19	+ ¼
Car Co.			33¾	34½	+2½
Electric Co. pfd			..	..	..
Speed Corp. com			61½	63	+1½
Speed Corp. pfd			105	107	..

No quotations available.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Studebaker Corporation com			83¾	84¼	+1¼
Studebaker Corporation pfd			103	104½	+2
Swinehart Tire & Rubber Co.			85	90	—3
Texas Co.			139	141	+7½
U. S. Rubber Co. com			47	48	+2
U. S. Rubber Co. 1st pfd			104	105	+1¼
Vacuum Oil Co			220	225	+16
White Co. pfd			103	108	..
Willys-Overland Co. com			146	147	+10½
Willys-Overland Co. pfd			103	105	..
ACTIVE STOCKS					
Chalmers Motor Co. com	..	99½	..	..	..
Chalmers Motor Co. pfd	..	..	85	88	—10
Continental Motor Co. com	155	180	..	300	+75
Continental Motor Co. pfd	..	75	83	86	—1
General Motors Co. com	63	75	195	200	+19
General Motors Co. pfd	..	85	105	107	+1
Maxwell Motor Co. com	..	..	35	37	+2½
Maxwell Motor Co. 1st pfd	..	..	83½	85½	+2
Maxwell Motor Co. 2d pfd	..	..	32	34	+3
Packard Motor Car Co. com	..	..	..	120	+4½
Packard Motor Car Co. pfd	..	98	..	101	+ ¾
*Reo Motor Car Co	19¾	20¾	33¼	34½	+1
*Reo Motor Truck Co	11	12	17¼	17¾	— ¼
Studebaker Corporation com	..	..	82½	84	—1¾
Studebaker Corporation pfd	..	..	101	103	+1
INACTIVE STOCKS					
*Atlas Drop Forge Co	19	..	25½	..	..
Ford Motor Co. of Canada	..	560	1475	1525	..
Kelsey Wheel Co	185	..	205	..	..
*W. K. Pruden Co	..	20½	20¼	..	..
Regal Motor Car Co. pfd	23	..	..	21	..
BONDS					
General Motors, notes, 6s, 1915	100	..	..	..	..
Packard Motor Co., 5s, 1916	..	..	98¼	..	..

*Par value $10; all others $100 par value.

10,000 Farmers at Tractor Test

May Make Illinois Demonstration a Yearly Affair—Many Sales—Lectures Given

CHAMPAIGN, ILL., Aug. 7—Ten thousand farmers and others interested attended the first Illinois tractor demonstration upon a spacious tract 5 miles south of this city last week. Four days were selected for the exhibition, but the opening days were marked by rain which limited the show to the two closing days, Thursday and Friday. Despite the weather handicap, the demonstration was voted a great success. Due to the proximity of the University of Illinois here, and its well-known attraction for all followers of agriculture, Champaign was the choice of the visitors as the permanent location of the annual exhibit, and it is believed that definite arrangements will be made later for the second demonstration some time in August of 1916. It was suggested that all farm implements be exhibited in conjunction in order to increase the interest and attract the farmers, but the tractor representatives and editors of the farm journals in attendance were opposed to this, and it is likely that in all future events the attractions will be limited to tractors. The demonstration given last week was not a contest and no prizes were awarded.

Conditions of Tests Uniform

To this end all fuel used was of the same grade, the depth of plowing and engine speed regulated, and every effort made to make the demonstration a real showing of what the machines can do in farm work. The mornings were devoted to private demonstrations at which the manufacturers were given considerable latitude in the kinds of work performed. The formal demonstration took place in the afternoon. Each machine was allotted a strip of ground for plowing in accordance with the rules of the field manager. The following is the list of exhibitors: Avery Co., Peoria, Ill.; Bates Tractor Co., Lansing, Mich.; Bull Tractor Co., Minneapolis, Minn.; Bullock Tractor Co., Chicago, Ill.; J. I. Case Co. (Wallis tractor), Racine, Wis.; Corn Belt Tractor Co., Minneapolis, Minn.; Dayton Dick Co. (Leader tractor), Quincy, Ill.; Dauch Mfg. Co., Sandusky, Ohio; Denning Motor Implement Co., Cedar Rapids, Iowa; Electric Wheel Co., Quincy, Ill.; Emerson, Brantingham Co., Rockford, Ill.; Ford Tractor Co., Minneapolis, Minn.; Harrt-Parr Co., Charles City, Iowa; Heider Mfg. Co., Carroll, Iowa; Hoke Mfg. Co., South Bend, Ind.; Holt Mfg. Co., Peoria, Ill.; Huber Mfg. Co., Marion, Ohio; Hume Tractor Co., Hume, Ill.; International Harvester Co., Chicago, Ill.; Joliet Oil Tractor Co., Joliet, Ill.; Kinnard-Haines Co., Minneapolis, Minn.; Lawter Tractor Co., St. Marys, Ohio; Lion Tractor Co., Minneapolis, Minn.; Parrett Mfg. Co., Chicago, Ill.; Peoria Tractor Co., Peoria, Ill.; Sweeney Tractor Co., Kansas City, Mo.; Steel King Tractor Co., Detroit, Mich.; Universal Tractor Co., Columbus, Ohio; Waite Tractor Co., Chicago, Ill., and Waterloo Gasoline Engine Co., Waterloo, Iowa.

The climax to the demonstration came on Friday when thirty-two engines, pulling from two to six plows, went along side by side in a stubble field 110 acres in extent. The larger type of machine, built to pull eight plows of 14-in. bottoms, and the smaller type, with but two plows connected, worked side by side and the farmers were able to note the advantages of each. Turning under 3-ft. rag weeds in ground that had not been touched by a plow for many years was a severe test for the tractors, and some had all that they could do. A 40-acre field of sod was plowed up in quick time. It was observed by many of the farmers that tractors which had been prime favorites on the exhibition lot were not so popular after the plowing tests started, while others that had been regarded as freaks were able to give a better account of themselves than their more pretentious neighbors. Some small outfits that had been regarded as toys were able to demonstrate that they were real tractors in plowing, while some of the huge machines found considerable trouble in handling the weed problem. Many farmers who came doubters returned home purchasers. "I like your tractor but I cannot afford it," remarked one farmer to a tractor salesman. "How many horses will it take to do the work of this machine upon your farm," asked the salesman. "Seven," was the reply. "At $150 each, they are worth $1,050, while my machine sells for less than $1,000," was the agent's observation. The farmer saw the point and placed his order. Several hundred sales were reported as a result of the exhibition, and all companies represented were well pleased over the results. Incidental to the demonstration there were evening programs of lectures. C. O. Reed of the University of Illinois spoke upon the subject of adjusting and operating plows. F. I. Mann of Gilman told of plowing and tillage from the farmers' standpoint. Prof. I. W. Dickerson of the University of Illinois answered in the affirmative the question, Shall I buy a Tractor? Raymond Olney gave a lecture on tractor operation with moving pictures in conjunction. Prof. F. M. White of the University of Wisconsin gave a talk upon traction economies.

P. O. Truck Bi Open Sept. 8

Five or More Each of ½-T to 3-Ton Vehicles to Be Purchased

WASHINGTON, D. C., Aug. 10—*Sp Telegram*—On Sept. 8 the post office partment will open bids for furnis and delivering from time to time as may be required during the next f year for use in the postal service, following gasoline motor trucks: Fi more of ½-ton capacity; five or mo ¾-ton capacity; five or more of 1½ capacity; five or more of 3-ton capa Proposal blanks, specifications and prints will be furnished upon ap tion to the purchasing agent of the office department.

Chemicals High-Batteries Hi

NEW YORK CITY, Aug. 11—Bat are selling at 35 cents, compared 25 cents a short time ago. The mat used in the construction of the coil advanced enormously, due to the w

Manganese, the shortage of whic affected the steel trade, is one of th ingredients of the dry cell, the being ammonium chloride, the c rod and the zinc case. The mang dioxide used in the cells is now for $120 a ton, compared with $25 a ton before the war closed the I nelles and cut off supplies from the Sea, which formerly furnished th of the ore used here.

The advance in zinc, or spelte also boosted the price of dry cell high as 32 cents has been paid grades of spelter used in makir batteries.

Ammonium chloride was forme ported, largely from England an many, in considerable quanties and 6 cents a pound. Domestic facturers are now turning out thi ical at about 7½ cents a pound, ar is apparently no danger of a sho

Velie Sells 600 War Tru

MOLINE, ILL., Aug. 7—The V gineering Co. of this city has a contract from the French Go for 600 light trucks. The st is that 275 vehicles on the order deivered at New York by Jan.

Truck Ousts Mail Car

BOSTON, MASS., Aug. 7—Mot have been substituted for tr in the handling of mail betwee eral post office and sub-statio Boston postal district. A c known as the Boston Mail De

has been organized with a capital of $50,000 to carry out a two-year contract with the government, beginning Aug. 15.

There are fifteen 3000-lb. trucks, all of General Vehicle Co., manufacture, being of a pattern similar to the sixty-eight electric trucks which handle the mails in New York City.

The runs into the Boston suburbs vary from 15 to 24 miles in length, with numerous stops at the various sub-stations. Cars will be garaged and cared for at the Boston Edison Co.'s electric garage on Atlantic Avenue.

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Allis-Chalmers Tractors for Russia

MILWAUKEE, WIS., Aug. 7—An order for a number of new tractor trucks produced by the Allis-Chalmers Mfg. Co. has been received from Russia. These trucks are different from the ordinary commercial vehicle in that they are fitted with creeping or track laying traction devices in place of the rear wheels and the front axles are pivoted at the center to allow them to negotiate rough roads. They have steel tires in front and have steel track in the rear.

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French Contract Rumor Denied

NEW YORK CITY, Aug. 9—A report published in a New York daily purporting to be a cable dispatch from Paris stating that J. P. Morgan & Co. had negotiated a contract with the French Government for the entire motor truck output of the Packard, White and Pierce-Arrow companies for an indefinite period. Charles Clifton, treasurer of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., C. R. Norton, truck sales manager of the Packard Motor Car Co., Detroit, and J. A. Harris, Jr., advertising manager of the White Co., Cleveland, have denied that any such contract has been made or that they have any knowledge of negotiations for same. This strongly brings out the fact that the country is not contemplating any purchase of the very desirable and perishable domestic trade.

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May Register Tractors in Kansas

TOPEKA, KAN., Aug. 5—The tremendous publicity given the tractors in Kansas during the past few weeks has aroused for the interest of Mr. Curt Myers in having an automobile registration department in the office of J. T. Botkin, Secretary of State. Mr. Myers expressed himself as of the opinion that tractors should pay a license registration fee the same as automobiles, since they are harder on the paving of roads than the rubber-tired cars. It is likely that legislation providing for the registration of tractors may be introduced at the next session.

75,000 Cars for Wisconsin

20,000 More Cars Registered on August 1 Than in Whole Year 1914

MILWAUKEE, WIS., Aug. 9—Wisconsin's motor car registration on Aug. 1 reached approximately 20,000 more than the entire registry for the year 1914. There is no question now that the total registration for 1915 will exceed 75,000, the estimate made in these columns at the beginning of the year. The comparative figures on Aug. 1 were:

	Aug. 1, 1914	Aug. 1, 1915
Motor cars	48,000	73,100
Motorcycles	7,100	8,045
Dealers	1,150	1,520

It will be seen that not only have private registrations increased enormously, but the number of dealers is much larger. The registration of dealers for 1914 showed a loss of about 350 compared with the 1913 total.

A. J. Cobban, motor registry clerk in the Secretary of State's office at Madison, says that applications continue at the rate of about 200 a day and figures that the 75,000 mark will be reached before Aug. 31. Instead of being spotty as in former years, this year's registrations are uniformly maintained from month to month, indicating a greater stability and soundness in motor car buying by the people of Wisconsin.

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Kansas Registrations Amount to $48,959

TOPEKA, KAN., Aug. 6—The reports of W. E. Davis, State Auditor, show that for the year ending June 30 the State received as its share of the motor car and motor cycle license fees $48,959.25; last year the sum was $30,702; the State receives 75 cents of each $5 paid for a motor car license and 50 cents of each $2 paid for a motor cycle license. The bulk of the money goes into the road fund of the county issuing the license. During July of 1915 the State received $23,733.25; July receipts, 1914, were $8,267. Sedgwick county paid the largest sum during the year, $2,736.50; Reno county, $1,760.50; Shawnee county (in which is Topeka), $1,566.25.

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One Car to Every 15 Persons in Pomona

POMONA, CAL., Aug. 3—Deputy Assessor C. W. Talbott of this city allows one motor car to every fifteen citizens and estimates that one-fourth of the families living in Pomona own automobiles. His report shows that there are 825 machines here and that they represent an original expenditure of more than $500,000, although the 1915 assessed valuation is $165,000. The total amount of tax collected on automobiles in Pomona this year will be $2,700 or about 2 per cent of the entire tax collections of the city. The deputy assessor estimates that $10,000 is the sum that was paid this year for State licenses. The State and county taxes amount to $3,300 and the city taxes $2,700 bringing the total expense of owning cars up to $16,000 for the year. Fifty cars have been purchased since the assessor closed his books.

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Maryland Business Lines Must Maintain Reserve Equipment

WASHINGTON, D. C., Aug. 7—The Maryland Public Service Commission has issued a set of rules governing the operation of various motorbus lines in the State. An important regulation is that requiring all owners of such services to maintain sufficient reserve equipment in good operating condition. In the opinion of some this rule is construed as an intention on the part of the commission to require the acquirement of additional cars which at all times must be held in reserve in case of a breakdown of the regular cars.

The new rules require that all motor vehicles used in the transportation of passengers or freight within the State for service charge shall be under the jurisdiction of the commission, the same as other common carriers. All such vehicles must be registered with the commission and upon registration the owners will be furnished with identification cards for each vehicle, whether held in reserve or otherwise. The commission reserves the right to arrange or rearrange the routes and schedules so as to prevent congestion on the highways.

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Oklahoma Registration, $50,000

OKLAHOMA CITY, OKLA., Aug. 7—Approximately $50,000 was received by the State highway fund up to Aug. 1 from licenses issued to automobiles by the State Highway Commissioner, from the time the new law went into effect. This sum was derived from approximately 7500 automobiles. The money derived from the taxation of automobiles by the State is to be returned to the counties.

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Van Speedometer Contracts

ELGIN, ILL., Aug. 7—The Van Sicklen Co., which has new general offices in this city, has closed contracts with the manufacturers of the Marmon, Monarch and the new Detroiter for the Van speedometer as standard equipment for the coming year.

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$1,000,000 Tire Co. Formed

DOVER, DEL., Aug. 10—The Perfection Tire Sales Co., to deal in all kinds of tires, has been incorporated, its capital being $1,000,000. F. J. Handel, L. B. Bautz, and M. M. Bennett of Buffalo, are the incorporators.

Astor Cup to Open Sheepshead

Vincent Astor Offers Perpetual Trophy—American Cup Later—Rush Work

NEW YORK CITY, Aug. 9—When the Sheepshead Bay Speedway opens on Oct. 2 the 350-mile inaugural race will be for a perpetual automobile trophy which was offered yesterday by Vincent Astor, the event to be known as the Vincent Astor Cup race. Originally it was intended to have the first race known as the American Cup Race, but with the offering of the Astor Cup it was decided to make this the first race over the Speedway, and the American Cup race will be contested at a later date.

Good progress is being made on the Sheepshead 2-mile board speedway and it is expected that the board surface on which the cars will run will be finished Aug. 20, and the grandstand Sept. 10. The protective walls on the outside of the track and on the inside of the safety apron are more than half completed. Tunnels for six lines of automobiles are being excavated and the concreting of these has begun. One of the small passenger tunnels has been completed. The main grandstand, which is a two-story steel affair, will be 1300 ft. long, and 600 ft. of the double deck structure has already been completed. About 1000 ft. of the open wood bleachers on the back stretch are completed.

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850-Mile Reliability Run through Rockies Sept. 6

DENVER, COL., Aug. 7—An 850-mile sanctioned reliability and economy run of six days through the Rockies in Colorado is scheduled to start from Denver on Sept. 6.

The run will follow the Midland trail directly west from Denver by way of Golden, Lookout mountain, Idaho Springs, Barthoud pass, Hot Sulphur Springs and Kremmling, where the route will swing over the new Rabbit Ear pass road now being completed by the United States Forest Service into Steamboat Springs. The second day will be from Steamboat Springs to Craig over the northern branch of the Midland trail, and thence south through the wild fishing and big game country to Meeker, from where it will follow a link of the Pike's Peak Ocean to Ocean highway to Rifle and Glenwood Springs. The third day's run will be over the main line of the Midland trail to Grand Junction, near the Utah line. The fourth will start the return eastward over the Rainbow route through Delta, Montrose, Gunnison and over Monarch pass to Salida. The fifth will continue on the same road through the Royal Gorge to Canon City and Florence, and the sixth return to Denver by way of Pueblo and Colorado Springs over the Gulf-National Parks highway.

The trip will take in some of the grandest scenery to be found anywhere, and is counted upon to make a widely-felt demonstration of the feasibility of motoring over Colorado's picturesque roads through the mountains.

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$500,000 Speedway for St. Louis

ST. LOUIS, MO., Aug. 7—Initial steps toward raising a $500,000 fund for the building of an automobile speedway and grandstand at Maxwellton, St. Louis County, were taken here this week. Part of the half million dollar fund has been raised and it is not improbable that construction will be begun soon. The details of the project will be made public following another meeting next week.

Maxwellton at present has an excellent mile dirt track and a large wooden grandstand.

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Show Announcements

MILWAUKEE, WIS., Aug. 9—An automobile show will be held in this city, Sept. 13 to 17, when the Milwaukee Automobile Dealers, Inc., will conduct the exposition at the State fair grounds during the State fair week. Machinery Hall will be used exclusively for the show.

VENTURA, CAL., Aug. 9—An automobile show is to be a feature of the annual county fair which is scheduled to open here Aug. 26. There are to be more than seventy-five automobiles on exhibition. The automobile exhibits are to be located in a large tent, 100 by 210, placed on the half-mile race track.

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Denver's Show Plans Progressing

DENVEP, COL., Aug. 9—Entries for the automobile and accessory display planned by the Automobile Trades Asso. of Colorado for the two weeks of the International Soil Products Congress in Denver, Sept. 27 to Oct. 9, are now being solicited by a special committee from the association, and the outlook is favorable for a large representation. Five dealers have already contracted for space, and twice that many more have practically pledged themselves to sign up at an early date. Trade conditions in Colorado and neighboring States in the Rocky Mountain territory are exceptionally good this year, and the show is counted upon to draw attendance from a wide district, especially on account of being held in conjunction with the farming congress, an annual feature.

Rush Twin City Speedway

Working Force Tripled—To Finish by Aug. 15—10,000 Seats Sold in Block

MINNEAPOLIS, MINN., Aug. 9—With the cessation of rain the working force at the Twin City Speedway has been tripled and work is to be finished by Aug. 15. One entire grandstand, nearly 10,000 seats, was sold entire to St. Paul, Aug. 7. Every drug store keeper in Minnesota, the Dakotas, Montana and parts of Iowa have been enlisted in selling seats. Placards and newspaper advertising in every county in Minnesota refer ticket buyers to the druggists. Five hundred militia men have been reserved to police the speedway on Sept. 4.

W. W. Brown, dirt track driver in a Du Chesneau, filed entry Aug. 6.

A cup has been offered by the Speedway for touring clubs. Number of miles traveled, multiplied by cars taking part, gives the score.

The War Department has approved the plan to extend the street railway through the reservation at Fort Snelling to the Speedway. This will give transportation for thousands of persons.

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100-Mile Invitation Race for Indianapolis Oct. 9

INDIANAPOLIS, IND., Aug. 10—The Indianapolis Motor Speedway has to-day been granted a sanction for a 100-mile invitation race to be held on the speedway here Oct. 9. Six cars will start, the piston displacement maximum being 300 cu. in. It is understood that $10,000 in cash prizes will be awarded.

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Ricker Indiana A. A. A. Representative

INDIANAPOLIS, IND., Aug. 7—Charles W. Sedwick, who has been the Indiana representative of the American Automobile Association since 1908, has resigned and Chester Ricker has been appointed to fill the vacancy.

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May Stage Corona Road Race Oct. 1

CORONA, CAL., Aug. 5—There is to be a Corona road race this coming fall, according to prominent business men of the city. A committee has already been appointed to place the stock to guarantee the $15,000 purse and in lots of from one to five shares, more than half of the race stock has been sold within four days. The stock is selling at $50 per share, with one-half down and personal notes for the balance. No stock is being sold outside of Corona and no one person is allowed to purchase more

than five shares. It is certain that the race will not be held on Thanksgiving Day. It is proposed to hold the race about Oct. 1 and the Corona classic will be the only road race held in Southern California this season, if the "Desert Classic" is not revived, which is hardly probable.

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150-Mile Race for Fresno

FRESNO, CAL., Aug. 5—Plans are rapidly being completed for the staging of a 150-mile race for a $5,000 purse on the 1-mile dirt track of the Fresno County Agricultural Assn., Oct. 2. This will close the district fair here which is an annual five-day event. The grandstand has a seating capacity of 30,000 and the drivers will be in full view of the spectators at all times.

L. A. Nares will referee and the judging will be done by W. E. Drury, Bakersfield; W. L. Hughson, San Francisco; L. S. Upson, Sacramento; John R. Graham, Merced; H. C. Carr, Porterville; S. C. Walker, Visalia. Mr. Grimes, from Hanford, will act as timer. The event is sanctioned by the contest board of the A. A. A.

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Maxwell Dealers Attend Announcement Banquet

LOS ANGELES, CAL., Aug. 4—The annual announcement banquet, given by the Laird Motor Car Co., southern California and Arizona distributors for the Maxwell line to their dealers from all over the territory, was held in the big banquet room of the Los Angeles Athletic Club, last Thursday night. The new 1916 Maxwell was displayed in Los Angeles for the first time on that day. C. J. Toner of the Maxwell Motor Co. outlined the policy and plans for the 1916 season after the dinner. There were fifty-three Maxwell dealers and officials present, representing practically every city in Arizona and southern California.

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I. V. A. Convention Oct. 18-19

NEW YORK CITY, Aug. 7—The sixth annual convention of the Electric Vehicle Assn. of America has been scheduled for Monday and Tuesday, Oct. 18 and 19 at the Hotel Statler, Cleveland, Ohio. The decision to limit the convention to two days was arrived at on the occasion of the organization meeting of the convention held in Cleveland, July 19. The short period of the convention was determined upon owing to the other conventions which will occur in the fall and to the fact that it was deemed advisable to have a concentrated program consisting of real business rather than a longer and more social one, as busy men will be more likely to attend such a convention. Others have not as yet been announced.

Thomas and Bablot Are Free

Two Famous Drivers Not in Army Service—Six French Cars Are Available

PARIS, FRANCE, July 28—France is still able to lend some assistance to America in the way of furnishing racing drivers and racing cars. At present two drivers of international reputation are free from army service, these being Thomas, winner of the 1914 Indianapolis race, and Bablot, who has had international reputation. Cars available are three Delages, and one each of Schneider, Alda and Nagant. The following drivers are not available as they are doing army duty: Goux, Boillot, Guyot, Chassagne, Duray, Hemery, Rigal and Wagner.

If America expects to secure any of these cars for its speedway meets it will be necessary to buy them outright.

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New Co. in Cleveland

CLEVELAND, OHIO, July 31—Negotiations are about to be completed here for purchase of a site on the East Side for the erection of a plant for the manufacture of a new car to be built on the lines of a motor boat. The names of the new

An acre and a half with long-time options on additional ground for plant enlargement comprise the site where building is to begin as soon as the details have been worked out. Plans for the factory have been prepared, it is reported, by the National Engineering Co., this city, and the structure will contain about 25,000 sq. ft. of floor space. Equipment will cost $25,000 and the factory site $10,000.

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Baltimore's Jitney Fight in Court Starts

BALTIMORE, MD., Aug. 7.—The legal test of the new ordinance governing the jitney bus in Baltimore has started. Those fighting to have the new law declared unconstitutional claim that the tax of $25 a seat per year is burdensome. The case is being heard by Judge Elliott. As it stands at present, the city has been restrained from putting the new law into operation.

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Philadelphia Jitneys Receive Death Blow

PHILADELPHIA, PA., Aug. 7—The deathknell of the jitneys in this city was sounded to-day when, on the application of City Solicitor Ryan, Judge Sulzberger, of Common Pleas Court No. 2, vacated the temporary injunction which he had granted the Jitney Auto Service Co. on July 15 restraining the municipal authorities from enforcing the City Councils' drastic regulation of operation of jitneys over the city streets.

The failure of several jitney associations to sink personal animosities and petty jealousies was the cause of their undoing. The men failed to file the $2,500 bond designated in the Court's restraining order.

As the ordinance which will now go into effect requires the filing of individual bonds of $2,500 by each driver, officers of the associations admitted tonight that as the car owners in their aggregate capacity were unable to do so it was highly improbable that as individuals they would be able to do it.

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Baltimore Trolley Co. Enters Jitney-Bus Field

BALTIMORE, MD., July 24—The United Railways & Electric Co., of Baltimore, which has been hard hit by the jitney business in this city, has entered the field and is running a number of buses. The new company is the Baltimore Transit Co., and has been incorporated with a capital stock of $100,000. President William A. House, of the United, admits that the company is backed by the railway. William H. McKee of Philadelphia, is manager of the transit company.

President House says the railway's interest in this service is due to its desire to see a bona fide effort made to ascertain whether or not the jitney means of transportation is a desirable supplement to the present methods and the United's future action will depend upon this demonstration.

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Indiana Service Managers Organize

RICHMOND, IND., Aug. 7—A movement has been started to organize the service managers of the automobile manufacturing concerns in Indiana into an association to be known as the Organization of Service Managers in the State of Indiana. Twenty companies will be represented at the monthly meetings according to C. J. Elston, service manager of the Westcott Motor Car Co. of this city. The first meeting will be held to-day.

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Mercer Uses Houdaille Absorber

NEW YORK CITY, Aug. 9—Clodio & Engs, Inc., United States representatives of the Houdaille shock absorber, have received an order from the Mercer Automobile Co., Trenton, N. J., for Houdaille equipment on its 1916 production. The firm has started the manufacture of this article here, and it will now be standard in the American market.

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Safety Isles in Duluth Successful

DULUTH, MINN., Aug. 9—Aisles of safety for pedestrians, "no parking" zones, whistle signals for traffic policemen, and near stops for street cars have been inaugurated this week

Packard Has New Machinery

Entire Factory Equipment Revised for Making Twin Six —Express Shipments

DETROIT, MICH., Aug. 5—Although new machinery and special tools are coming almost daily to the plant of the Packard Motor Car Co. to provide for the practically entire new equipment necessary in making the Twin-Six, the officials of the company have on several occasions lately gone to extra big expense in order to get, with the least possible delay, some machines which were needed more than others. Not long ago, because the railroad company could not guarantee fast delivery of a special milling machine to be shipped from Worcester, Mass., vice-president of manufacturing F. F. Beall, chartered a locomotive for the purpose of thus bringing the machine at once to Detroit. A double-end drilling machine was shipped in the same way from Springfield, Mass., a special transmission boring machine, weighing nearly one ton, was shipped by express from Worcester, and shipments of bar steel were made the same way at express rates.

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Kline Co. Acquires Property

RICHMOND, VA., Aug. 9—The Kline Car Corp. has acquired the property of the old Kline Motor Car Corp. for $15,000. The property is situated just outside the city limits and contains 14,167 acres.

All buildings, machinery, franchise rights and the right to use the name "Kline Car" are included in the property transferred.

—

Rands Mfg. Co. Adds

DETROIT, MICH., Aug. 9—A two-story addition 153 by 65 is now under construction at the plant of the Rands Mfg. Co. and will nearly double the windshield department. The building will cost about $26,000. An increase in business of at least 50 per cent since the first of the year is reported by this concern, which makes tops and windshields on contract work only. Day and night shifts are at work, the total number of men now on the pay roll being about 650.

—

Takes Over Keeton Plant

DETROIT, MICH., Aug. 9.—The Detroit Metal Refining Co., a new corporation, has taken over the old Keeton factory in Detroit and converted it into a modern and up-to-date smelting plant.

Sol Sadek, for years general manager of the Progressive Metal & Refining Co. of Milwaukee, will direct the business of the new company and make his future residence in Detroit. He will, however, retain his interests in the Progressive company.

The Keeton plant has been entirely renovated to accommodate the demands of the new tenant, its two and one-half acres of buildings being fitted with the most modern equipment. This includes forty-eight furnaces, giving an idea of the extent to which the company proposes to operate.

Besides Mr. Sadek, who is widely and favorably known in the metal trades, the officers of the new company are: I. Gerson of Toledo, president; L. R. Grosslight of Detroit, treasurer, and S. Gerson of Toledo, secretary.

—

Detroit Battery to Double Plant and Production

DETROIT, MICH., Aug. 9—Indianapolis men and capital are now principally interested in the Detroit Battery Co., which recently increased its capital stock from $10,000 to $60,000. The business of this concern has been growing steadily and now it is planned to double the size of the plant as well as its production. S. W. Elston, who was secretary-treasurer of the Pumpelly Battery Co., Indianapolis, is president and general manager of the company; W. A. Petzold, secretary-treasurer of the J. L. Hudson Co., Detroit, is vice-president; Sol Meyer, banker, Indianapolis, is treasurer, and M. G. Pierson, formerly of the Kelsey Wheel Co., Detroit, is secretary. W. H. Ducharme, treasurer of the Kelsey Wheel Co., is also interested in the concern.

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Rowe Co. Expanding

EAST DOWNINGTOWN, PA., Aug. 7—Samuel J. Rowe, president of the Rowe Motor Mfg. Co. of this city, stated today that his company expected to break ground soon for an addition to its plant. This addition will be necessary to increase the capacity of the plant as the concern has recently received a contract for some foreign business. The extension will be 200 ft. long and 70 ft. wide built of brick.

—

Ford-Clark to Furnish Parts

CLEVELAND, OHIO, Aug. 9—The Ford-Clark Co. has equipped a plant at 6536 Carnegie Avenue for supplying jobbers, dealers, garage and repair men with parts formerly difficult to obtain in small quantities for repair and replacement purposes.

The line will consist in part of robe rails, springbolts, foot rails, windshields, inlet and exhaust valves, hood fasteners, spring oilers, drag links and bumpers.

The equipment of the machine shop is especially designed to take care of repair orders for motor valves and gr cup spring bolts, and is in charge man who has had extended experi with these parts.

A full line of blanks will be car and it is the intention to finish the any size on short notice.

The officers of the company are: Ford, formerly with the Steel Proc Co., Cleveland, president; A. C. C formerly with the Detroit Seamless Tubes Co., Detroit, vice-president; I Bracken, secretary and treasurer.

—

Firestone Employees on Annual O

AKRON, OHIO, Aug. 9—Employe the Firestone Tire & Rubber Co the number of 15,000, enjoyed annual outing at Silver Lake Par Saturday.

Two of the big thrills of the day produced by Barney Oldfield raci his 100 hp. Fiat Cyclone, and De Thompson, the aerialist, who exh his hair-raising feats of "loopin loop" and flying upside down. A ball game in the morning betwee factory and general office depart resulted in a scrappy contest fo coveted prize of $50 to the wi team.

At noon everybody sat down t ner, corralled by the time-honore tom of the "family basket" idea. afternoon was replete with sports kinds. There were foot races, r races and water sports.

—

Cunningham Employees on Out

ROCHESTER, N. Y., Aug. 7—Th ployees of the James Cunningham Co., this city, took a holiday to-da 400 of them picknicked at Islan tage.

—

Sterling Not to Move

DETROIT, MICH., Aug. 9—The that the Sterling Motor Co. wi into another plant is denied by of that company. The company 225 men.

—

Buick's July Payroll $530,9

FLINT, BICH., Aug. 7—The Motor Co. paid $530,934 wage employees in July, thus setting record in its history. Of th $293,123 was the pay-roll for th half of the month.

—

J. M. Co. to Represent Nationa

NEW YORK CITY, Aug. 7—T Shock Absorber Co. has secure clusive sales agency for Nati and tubes in Philadelphia and N The J. M. company proposes to repairs on National tires free without this added service aff list price of the tire or the guarantee.

Factory Miscellany

Sewell Wheel Expands—The Sewell Cushion Wheel Co. is enlarging its plant and it is possible that within the next 12 months an entirely new plant will be started. The company is located at Detroit.

Benford's New Plant—The Benford Mfg. Co., Mount Vernon, N. Y., manufacturer of spark plugs, will build a two-story plant on Pearl Street, west of Fourteenth Avenue, at an estimated cost of $15,000.

Borgess Rubber Plant Starts—The Borgess Automobile Co. plant has resumed operation following a directors' meeting held recently at which Grant Ashcroft of Jersey City was secured as superintendent of the plant.

Giant Tire Business Grows—The plant of the Giant Tire Co., Akron, Ohio, is working at full capacity 24 hr. a day in spite of the recent improvements in equipment. Shipments to its branch stores throughout the country are being forwarded as rapidly as its facilities will permit.

Hesse Co. Adds—The Hesse Carriage Co., Kansas City, Mo., in the past few months becoming large manufacturers of automobile bodies, is erecting a two-story building on 50 by 133 adjoining their present quarters, the steel being designed to carry five stories. The addition will cost $25,000.

Millbury Mills Busy—A 190,000-yd. order of mohair automobile cover material has made it necessary for the Millbury Mills, West Millbury, Mass., to start night work. The factory cloth will be shipped to New York City, where it will be put through a waterproofing process. The mill has fifty-eight looms.

Dreadnaught Tire Looking for Site—The Dreadnaught Inner Tube Armor Co., Toledo, Ohio, recently incorporated with a capital of $25,000, has been organized and is looking for a factory site for the manufacture of inner tubes and tires. They claim to have a puncture-proof inner tube, which is protected by patents.

Apperson Makes Addition—Apperson Brothers Automobile Co., Kokomo, Ind., has started an addition to one of its plants. This will give the company an additional 150,000 sq. ft. of floor space, which will be utilized for general manufacturing. The Apperson company completed in July the greatest business for a single month it has ever enjoyed.

Colorado Tire Makes Addition—The Colorado Tire & Leather Co., Denver, Col., is building a two-story addition to its plant that will double the present capacity, making a total of 95,608 sq. ft. of floor space. The 250 employees were given an outing recently at the expense of the company. $100 is offered as a prize for a name for the new tire protectors made by the concern.

Vulcanized Products Expands—The Vulcanized Products Co., which started in business in Muskegon, Mich., several years ago, confining itself to the manufacturing of automobile tire accessories, mechanical molded goods and electrical insulation, will begin manufacturing automobile tires and tubes by Sept. 15, provided its new building is completed on time. About fifty men will then be employed and it is expected that an output of 200 tires and tubes daily will be possible.

Gordon Expands—A Columbus (Ohio) real estate brokerage firm has started the erection of a large addition for the J. P. Gordon Co., located immediately north of the present building on Fourth Street. The general contract for the structure has been awarded and it is to be completed by Nov. 1. The addition will be three stories high with basement, 40 by 90 ft. It is to be occupied as a stock room and office. The J. P. Gordon Co. manufactures a varied line of automobile clothing and accessories.

Canadian Ford Expands—Work on another new addition to the Ford Motor Co.'s plant at Ford, Ont., at an estimated cost of $60,000 has been started. It will extend for 705 ft. along the Detroit River frontage. Hardly had the concrete work on the recently completed $300,000 factory become dry when it was decided to start the present work. The newest building will be one story, of concrete, with a steel saw-tooth roof. It will be devoted entirely to machine-shop work. Although over 150 Ford cars per day are being turned out by this plant—running at capacity—production has not kept pace with orders, and the new machine shop will allow a faster output. To insure solid foundations on the river bank 450 piles are being driven deep, and concrete sunk on top of these.

The Automobile Calendar

Aug. 21-22.....Elgin, Ill., Road Races.
Aug. 22.....Ventura, Cal., Show.
Aug. 24-28.....Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Aug.....Peoria, Ill., Second Northwestern Road Congress.
Aug. 4.....Twin City, Minn., 500-Mile Race; Twin City Motor Speedway Co.
Aug. 9-13.....Indianapolis, Ind., Show, Indiana State Fair.
Aug. 6-13.....Detroit, Mich., Show, Michigan State Fair.
Aug. 6-7.....Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Aug. 13-21.....Milwaukee, Wis., Show, Automobile Dealers' Assn.
Aug. 13-17.....Oakland, Cal., Pan-American Road Congress.
Aug. 15-19.....Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Aug. 19.....Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Aug. 19-25.....Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Sept. 24.....Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 27-Oct. 10...Denver, Col., Show, International Soil Products Exposition, Automobile Trades Assn. of Colorado.
Oct.....Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2.....Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 2.....Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9.....Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 3-10.....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6.....Columbus, O., Garage Owners Convention.
Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9.....Indianapolis, Ind, 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14.....Chicago, S. A. E. Standards Committee Meeting.
Oct. 16.....Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 18-19.....Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 31.....New York City, Show; Grand Central Palace.
Jan. 22, 1916.....Chicago, Ill., Show; Coliseum.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Warnsholdt Wichita Ford Manager—H. G. Warnsholdt has been appointed branch manager of the Ford plant in Wichita, Kan.

Hobson King's Pacific Coast Representative.—C. W. Hobson has been appointed Pacific Coast representative for the King Motor Car Co.

Fisher in Terre Haute—Walter Fisher, formerly of the Cadillac agency in Chicago, has become agent for the same car at Terre Haute, Ind.

Tullis Representing English Co.—N. L. Tullis of Vancouver, B. C., has been appointed to look after the interests of the Leyland Motors, Ltd., of Leyland, England.

Dowse Resigns—E. P. Dowse, who has been manager of the Toledo branch of the Goodyear company, has resigned his position to accept a position with another tire company.

Miller Heads Detroit Victor Rubber—Offices have been opened in the Whitney Building, Detroit, by the Victor Rubber Co., Springfield, Ohio. E. H. Miller is local manager.

Hart White's Edmonton Mgr.—M. L. Hart, until recently manager of the White Motor Car Co.'s branch in Edmonton, Alta., has been placed in charge of the Montreal branch.

Glenn Heads Louisville Tire Co.—The Glenn Tire Co. has opened an office at 331 East Broadway, Louisville, Ky. J. P. Glenn is the manager. The concern handles Goodyear truck tires.

Hirsch Chalmers California Representative.—The post of factory representative for the Chalmers Motor Co. in California has been given to J. Hirsch, with headquarters in San Francisco.

Spencer Is Promoted—E. W. Spencer, manager of the sales promotion department of the Studebaker Corp. factory, has been promoted to assistant manager of the Kansas City, Mo., branch.

Cuthbert Chalmers Wholesale Manager—Russ Cuthbert will hereafter have charge of the wholesale end of the L. H. Rose-Chalmers Co. in California, and distribute the Chalmers throughout the State.

Bruske in Maxwell Publicity Department—Paul Hale Bruske, who was manager of the racing team of the Maxwell Motor Co., Detroit, Mich., until this company decided to withdraw from racing, is now a member of the publicity department.

Motor Men in New Roles

Bement Succeeds Pardington—A. F. Bement, who was director of publicity of the Lincoln Highway Association, has been chosen to succeed the late A. R. Pardington, who was vice-president and secretary.

Reed with Donovan—M. N. Reed, formerly associated with Frank B. Donovan in Boston, has taken charge of the sales for Frank B. Donovan (Incorporated), the new Studebaker distributor in Baltimore, Md.

Stubbs Joins Northwest Motors—P. D. Stubbs, formerly western manager for the Hudson Motor Car Co., has become permanently connected with the Northwest Motors Co., Seattle, Hudson and Packard distributor.

Spalding Milburn Electric District Manager—Will Spalding, the Milburn & Walker electric representative with headquarters in Portland, Ore., has been appointed district manager for the Milburn interests for Oregon, Washington, Idaho and British Columbia.

Price Coming East—Frank Price of the Swan Carbureter Co. is on his way from San Francisco to Detroit. He will follow the route of the Lincoln Highway, placing agencies and service stations along the way. The company has a service station in Santa Barbara, Cal.

Branstetter Heads Kissel Retail—H. P. Branstetter, Wabash Avenue and Twenty-sixth Street, Chicago, who has handled the wholesale business for the Kissel Motor Car Co., covering Illinois and Indiana territory, has been given charge of the retail Kissel business in Chicago in addition.

Reeser Willard Assistant Manager—E. B. Reeser has been appointed assistant district manager of the Detroit, Mich., offices of the Willard Storage Battery Co. Mr. Reeser was at one time manager of the Chicago branch of the Kellog Mfg. Co., and more recently was traveling for the Willard company.

Earl C. Anthony Makes Changes—Earl C. Anthony, Inc., announces the following changes in Reo distributing force in California: F. A. Norberg has been placed in charge of the Reo truck department in San Francisco. W. M. Broodie will hereafter act as traveling representative for the Reo in California. L. F. Reed has been appointed resident manager of the company in Fresno, Cal.

Foster Makes Change—Newton Foster, formerly of Boston, has purch
an interest in the NePage, McK
Automobile Co., with headquarters i
attle, and hereafter this company w
known as the Newton Foster Co.,
will act as distributor in Western V
ington for the Paige and National
The salesrooms and mechanical
are located at 1512-1522 Eighth Av

Pennell Heads Fort Wayne F
The new Ford agency has been e
lished in Fort Wayne, Ind. The b
is now in charge of J. C. Pennel
five years connected with the D
branch. J. C. Smith, in charge o
Indianapolis branch, is assisting in
lishing the new agency. Brosi
Brosius, who for several years ha
Ford branch in Fort Wayne, will
tinue in the automobile business at
place on East Main Street.

La Casse Maxwell Branch Mana
W. J. La Casse, prominent figure
automobile industry in Portland,
will hereafter act as branch manag
the Maxwell interests for the Nort
The headquarters will house $1
worth of parts and the Portland
will carry cars for both Orego
Washington agencies and possibly
La Casse came to Portland direc
Fresno, Cal., where he was distric
ager for the Maxwell last year.

Change in Stutz Agency—Sale
ager H. W. Anderson of the Stu
tory, went to Boston, Mass., las
and shifted the Stutz agency t
a new company headed by
Becker, who was a partner of
Freeman and Chace, who have
it for some years. He has lease
quarters at 911 Boylston Street
doors west of the old salesroom
new company has a wholesale
tion for Maine, New Hampshi
mont and Massachusetts.

Vogt Interested in Pullman A
H. F. Vogt, treasurer of the A
Automobile Co., 187 Wisconsin
Milwaukee, state agent for the
Arrow, is a principal in the in
tion of the Pullman Automobil
Milwaukee, which will handle t
man in southern and eastern W
and the counties of Stephen
Winnebago in Illinois. Offices a
rooms are being established at
Oneida Street. The Pullman
been represented in Milwaukee
eral years. R. C. Wrege and A
nickel are associated with Mr.
the new agency.

VOL. XXXIII NEW YORK—THURSDAY, AUGUST 19, 1915—CHICAGO No. 8

The AUTOMOBILE

Brass and Bronze—Offsprings of Copper

Copper the Trunk of the Non-Ferrous Family Tree, with Zinc Forming the Brass Branch and with Tin, the Bronze

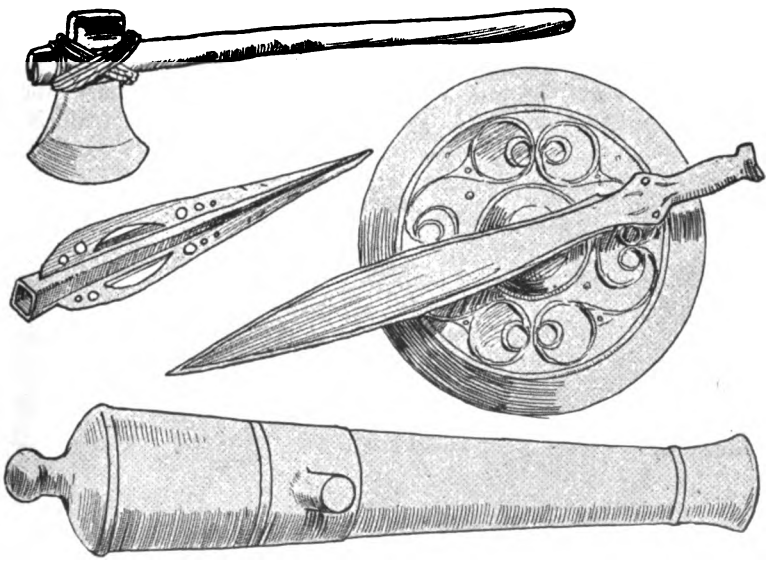
Part 1

By J. Edward Schipper

IN the bowels of the earth below mighty Mount Aetna was the workshop of the one-eyed giants called the Cyclops. Here, according to the mythology of the ancient Greeks, Polyphemos, chief of the giant band fashioned the thunderbolts for Jupiter and also in his roaring furnaces produced huge implements of bronze. With a thunderbolt forged from this metal Jupiter killed Aesculapius, the son of Apollo. Such is the mythical beginning of the great industry of the manufacture of bronze.

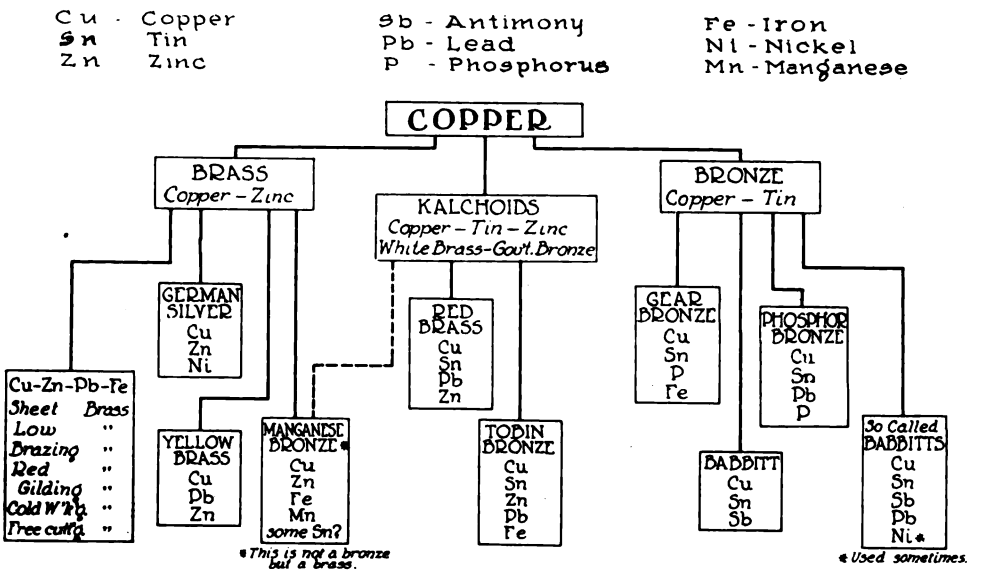
Leaving the realm of the gods and coming down to the kingdom of man, archaeologists assert that between the periods of human culture known as the stone age and the iron age, there was a period called the bronze age. These three great periods of human development overlapped, they say, as is proved by the fact that implements have been found composed of stone and bronze, of bronze and iron and even in a few cases of stone and iron, showing that the bronze age bridged quite incompletely the lapse in time between the periods of stone and iron. The bronze age is thought to have existed 2000 B. C. in several scattered parts of the world.

A Greek manuscript of the eleventh century, one of the prized possessions of the library of St. Marks, Venice, gives the composition of bronze as 1 lb. of copper combined with 2 oz. of tin. From that time on records are plentiful mentioning bronze and its uses. The bronze of classical antiquity consists of copper alloyed with one or more of the metals zinc, tin, lead and even silver depending on the time and the use for which the alloy was intended. From the analyses of old coins it is learned that the Greeks used an alloy of copper and tin until about 400 B. C. when they began to substitute lead for tin with increasing frequency. In the oldest bronze relics the copper content varies between 67 and 96 per cent.



Bronze weapons from the bronze age to the nineteenth century

The ancient history of metals which have copper as their base is not confined to the old world. The American Indians had ornaments which were made from copper and from natural alloys of that metal. The mound builders whose relics are found over vast areas of North America were familiar with copper in many



The non-ferrous family tree, showing a few of the metals in common use and how they are connected to the mother-metal copper

localities although the races which are so classified are said to have belonged to the stone age. Copper and tin were mixed and tempered by the Aztecs and made into useful ornaments and tools. The same metal which has been excavated from the site of ancient Troy has been found in the haunts of old American civilization. Arrowheads, chisels, knives, beads and numerous other articles are found buried beneath the sites of old Indian villages and in the tribal graveyards as well as in the localities where 4000 years ago the Chaldeans practised the infant art of metallurgy.

Brass a Later Development

Brass, the twin sister of bronze, is a later development. The metal brass is mentioned in the Bible but it is debatable if the metal were not bronze. The distinction between the two is rendered difficult because although bronze is a mixture of copper and tin; and brass a mixture of copper and zinc, it was not until the time of Queen Elizabeth (1533-1603 A. D.) that a clear distinction between zinc and tin was realized. At that time however, Queen Elizabeth granted to William Humphrey a patent allowing him the exclusive privilege of making brass by a certain definite process. This establishes the earliest positive date of non-ferrous commercial venture.

Since the Elizabethan era a definite distinction has existed between the two metals, bronze and brass. These two metals, which according to students of antiquity were the bronze of the old Phoenicians and Greeks, are now the framework which supports the structure of our modern house of non-ferrous alloys. The formulae which were used for the ancient coinage are still employed for entirely different purposes although the actual processes of manufacture have undergone such changes that even Polyphemos with his superhuman knowledge of metallurgy would pause in wonderment.

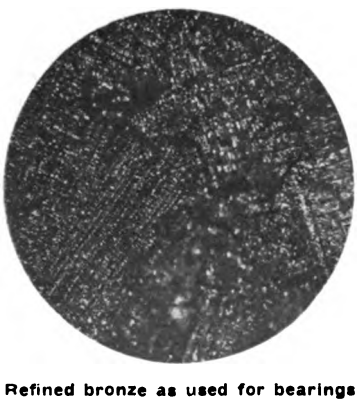
The Non-Ferrous Family

The bronzes and brasses are a family.

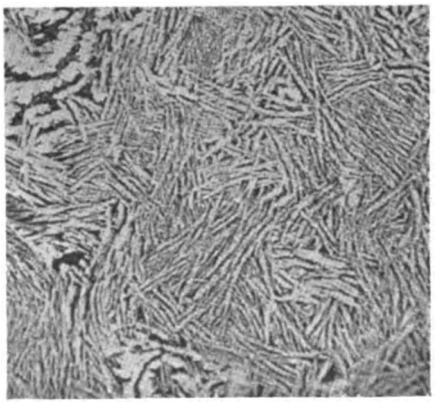
They spring from a common ancestor, which is copper. Like a family divided into two broad divisions by the descendants of brother and sister, so the brass and bronze family is divided into two broad divisions. The trunk of the family tree is copper but on one side grows the tin branch and on the other the zinc. On the tin side are the bronzes, on the zinc sides the brasses. Copper and tin make bronze. Copper and zinc make brass.

If two branches of a great family are to be distinguished from each other they must have certain characteristics of temperament, appearance, character or some other mark of distinction. The non-ferrous family with its two broad divisions of brass and bronze does exhibit such main distinctive features but there are so many other metals which have entered into the combinations of non-ferrous alloys that these main distinctions are often so subdued, or even nullified, that to the casual observer it would be bewildering to trace the primary differences. Brass, however, must of necessity partake of the nature of zinc and must show its effects, hence it is softer than bronze which contains tin, a hardener of other metals. The qualities of ductility and malleability would hence follow through the brass branch of the family were not the qualities of other alloying substances to interfere; and hardness and tenacity would be the main qualifications of bronze were it left unaffected by the introduction of other elements.

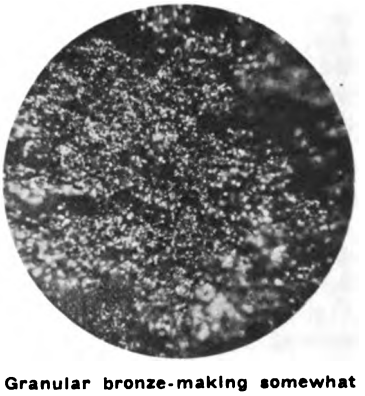
One branch of a family might in itself have the qualities of even temperament and quiet mentality, where another may have fiery tempers and be filled with restless energy, but the introduction of new members into that family may alter the entire characteristics. So it is with the great non-ferrous family, which though it springs from the common mother-metal copper, yet possesses such a world of characters that it can be adapted to widely varying uses. On one side there may be a giant forging, and on the other hand a soft bearing liner. Certainly there could not be two sets of requirements so widely different and yet these



Refined bronze as used for bearings in automobiles



Chilled bronze casting quenched in mould



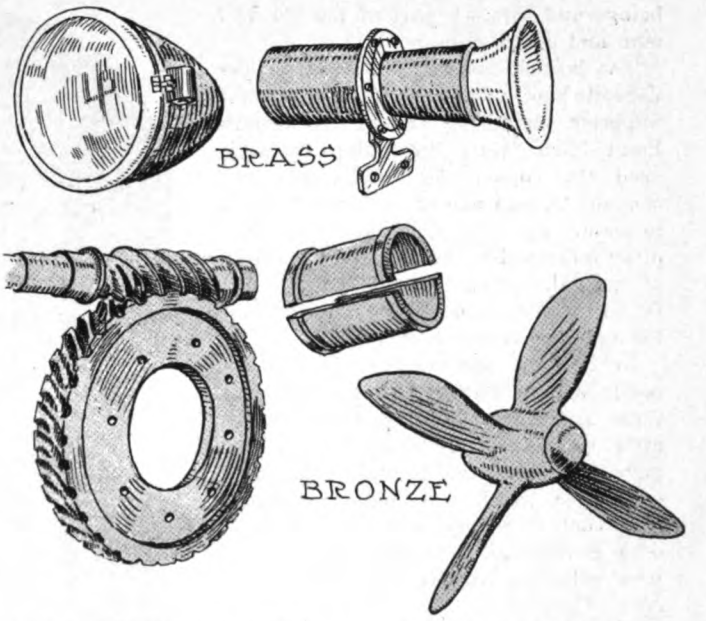
Granular bronze-making somewhat inferior wristpin bearing metal

metals are both offsprings of the same parent metal. It is far from true to suppose that the whole mass of non-ferrous alloys springing from the common base copper can be classified under the heads brass and bronze. Clear as the original compositions of these two metals are, the brasses and bronzes of to-day can not be dismissed by this simple classification because many of the alloys contain both zinc and tin. This would make them both, brass and bronze, or neither. Manganese bronze in common use, is an example of this. This often contains both tin and zinc and as a result falls under both heads and to-day committees appointed by the engineering societies are wrestling with the problem of a definite classification of them. It has been suggested that the entire brass and bronze classification be cast aside and the metals divided into forging and non-forging.

Qualities of Copper Imparted

Copper, as the mother-metal, must impart some of its qualities to its offspring regardless of the number and quality of the alloying substances added. In studying the characteristics of a certain family, we would look for them first in the root of that family. Therefore to know something about the family of non-ferrous metals, we must first study copper. If the ancestor of a family is unyielding and war-like in character, we would scarcely look for the descendants to be agriculturists. If copper were hard, brittle and heavy, or on the other hand soft and light, it is of interest to know how these qualities have been utilized in the products developed from it, what alloying substances have been added to subdue one quality and to accentuate another and so on throughout the gamut of reasons for alloying metals.

Ductility, malleability and tenacity are the three great qualities of copper. It is the possession of all three that endows it with its peculiar importance in machine and structural work. In addition it has a high melting temperature, fusing at about 1930 deg. Fahr. as compared with lead at 625 deg. Fahr. It is high in electrical conductivity and in heat conductivity is second only to silver, the highest, having a capacity in this respect of 73.6 per cent of that of silver.



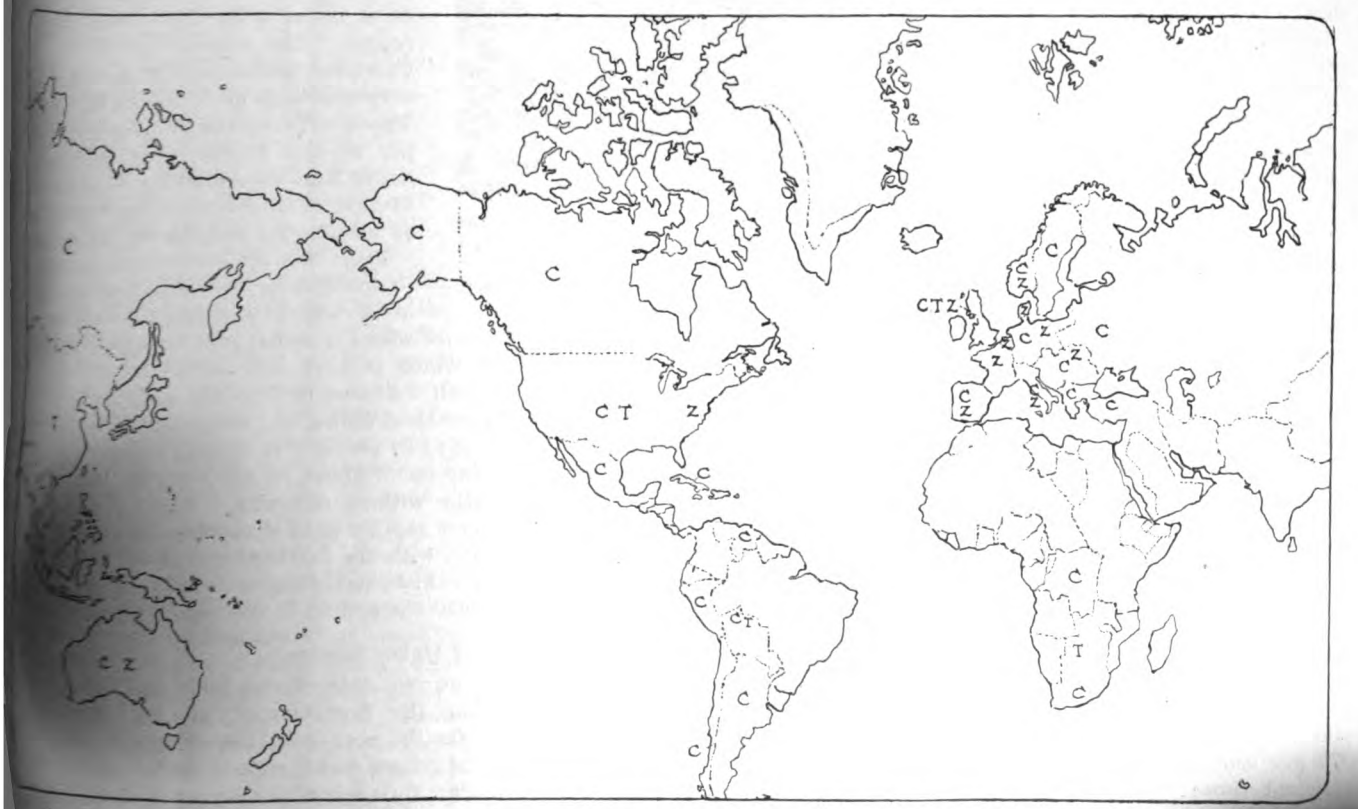
Brass and bronze articles of highly important commercial use

The tensile strength of copper is 20,000 to 30,000 lb. per square inch or about a third of crankshaft steel and in weight it is about nine times as heavy as water having a specific gravity of 8.95.

Heredity of Non-Ferrous Family

These are the family characteristics of the mother-metal copper. These are the family traits which can be traced though, at times very faintly, throughout the great family of non-ferrous metals springing from this common ancestor.

In nature copper is most widely distributed. It exists in sea weed and the blood of certain mollusks. It is part of the composition of straw, hay, eggs, cheese, meat and other articles of food. It is in the liver and kidneys of human



Map showing the parts of the world which produce most copper, tin and zinc, which are indicated by the initials C, T and Z

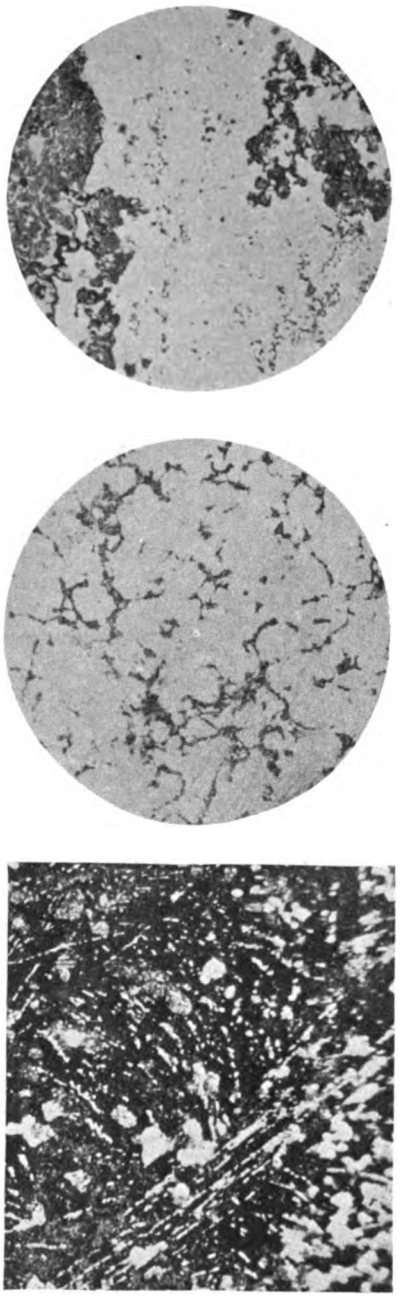
beings and forms a part of the blood of man and other animals.

The largest masses of natural copper deposits known are those found near Lake Superior centering about Keweenaw Point, Mich. Here, the Indians formerly used the copper for implements and ornaments, and one of the metals found in connection with it is silver, which is often imbedded in the copper in the form of crystal. Other copper deposits are found in Tennessee, New Jersey, and through the Mississippi Valley.

In foreign countries the largest deposits are in South Australia, Siberia, Chile and Peru. The ores are moderately rich, generally above 50 per cent pure. Some of the sulphur compounds of copper which are found as copper ores, contain 80 per cent, whereas other ores containing a large proportion of iron sulphide, contain less than 5 per cent of copper.

Three principal methods are used for reducing copper from its ores: They are known as the pyro-metallurgical or dry method; the hydro-metallurgical or wet method; and the electro-metallurgical or electrical method.

The process used depends upon the ore, and the locality in which the refining is done. The impurities contained in coarse copper are mainly iron, lead, zinc, cobalt, nickel, bismuth, arsenic, antimony, sulphur, selenium and tellurium. These are generally eliminated by oxidizing, transforming the products into slag, or gases or by electrolysis. When the Bessemer method of decarburizing pig iron was discovered, it was immediately utilized for copper but it was found that in the converters used for iron, the tuyeres were not arranged to suit the action of the copper. The converters were improved and in 1911, more than 400,000,000 lb. of copper were made. By the electrolytic method the gold and silver content of copper ores are saved, whereas they were formerly lost.



While heat has its influence on the micro structure, its influence is not utilized as in steel. The above photomicrographs show some of its effects

Tin Has Ancient History

Tin which is combined with copper to form bronze is of an entirely different nature. Being one of the metals which enter into the composition of bronze, it was known thousands of years before the existence of authentic history. This is the other of the two metals which started the bronze division of the non-ferrous family. The ancients did not know the difference between tin, lead, zinc and other metals of somewhat similar characteristics, and it was in the fourth century that tin began to assume the characteristics of a definite product. The early Greeks named the metal Hermes after the god who corresponds with the Roman Mercury, the messenger of the gods. This was one of the metals used and fabricated in the firey furnaces of the Cyclops and from the accounts of mythologists, traces its ancestry back to the time of the Greeks and Phoenicians.

Tin is mined in England, Saxony, Bohemia and the Straits Settlements. The ores after preliminary washing carry 65 to 75 per cent of metallic tin. Thus, this metal which in the ancient times was found in close proximity to the copper deposits, as is shown by the fact that the two were combined in fashioning the crude implements of pre-historic times, is now drawn from an entirely different quarter of the earth.

Two processes are used in smelting the ores, both being by furnace: The first, crude implements of pre-historic times, tical circular, or sometimes rectangular hollow shaft in which are placed alternate layers of coke and ore. An air blast introduced near the bottom of the furnace carries the flames throughout the shaft.

The second, is a reverberatory furnace in which the process consists of mixing the purified ore with about one-fifth of its weight of anthracite coal, which is moistened and then fused on the sole of the furnace for 5 or 6 hr. The slag and metal produced are then run off, the latter being cast into bars which are refined and freed from impurities, chiefly iron, arsenic and copper. It is one of the traditions that in refining tin, an inclined hearth is used in which the pure tin runs off and is further purified by stirring with the branch of an apple tree. In testing for purity, the workman heats the tin bar until quite near the melting point and then drops it to the stone floor. If the tin is pure it will splash into a series of granular strings.

Tin a Great Hardener

The physical qualities of tin give little clue to what its action would be when combined with other metals. Studying its qualities alone, it would not be thought that this necessary element in bronze would have such a marked effect on a metal with the characteristics of copper. The specific gravity of tin is 7.293, the metal is white, lustrous, soft, very malleable and has but little tenacity. The tensile strength is about 3500 lb. per sq. in. It fuses at 442 deg. Fahr. has a heat conductivity of 14.5 per cent of that of silver and finds its chief use as an alloying substance.

From the specifications of the metal, it would never be suspected that it is one of the best known hardeners in existence. This is an instance where a metal soft in itself, unites with another metal which is also soft with the result that it hardens it to such a degree that it can only be turned in a lathe with the greatest difficulty. When tin is added to copper to the extent of 30 per cent it attains its maximum hardness. Containing up to about 24 per cent tin bronze can be turned in a lathe without difficulty. After that point, the hardness increases rapidly until it reaches its maximum from 30 to 40 per cent, with the further increase of tin, the hardness decreases. The maximum strength of the alloy is reached with 17.30 tin and 82.70 copper.

Zinc with Copper Makes Bronze

While tin is on one side of the scale and together with copper makes up the fundamental mixture of the bronze division of the family, zinc is on the other side and in combination with the parent metal copper, makes up the body of the brass division. Zinc resembles copper in that it is ductile

and malleable, although to a much less extent. Its tenacity, however, is far less than that of copper, being about 1/10 that of iron, as is shown by its tensile strength of 6000 lb. per sq. in. One of the remarkable features of zinc is its non-corrosive quality due to the fact that upon the surface there forms a thin film of carbonate of zinc which protects the metal from corrosion.

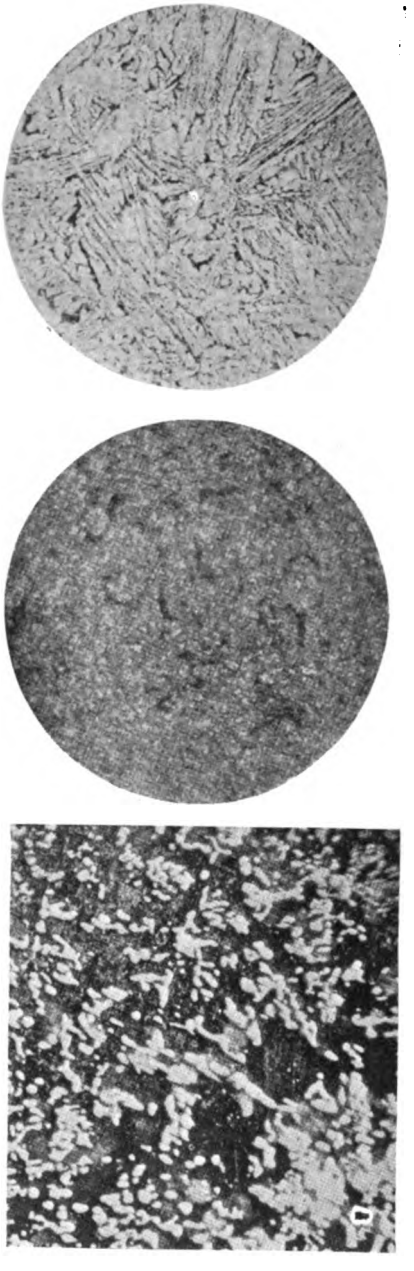
In the tales of antiquity zinc plays as important a part as the other metals which have been spoken of. Aristotle refers to brass as the metal of the Mosynoeci. It is also referred to frequently in the writings of Pliny, who mentions a metal cadmia which served for the conversion of copper into another metal which he called aurichalcum. As late as 1702 the metallurgists stated that the formation of brass was the union of a metal with an earth. Subsequently these authorities adopted the view that cadmia, which was referred to by Pliny, was a metallic calx having the property of dying copper yellow.

The word zinc was first used in the form zinken, and it was not regarded as a pure metal.

Zinc and bismuth were also often confused, and both were called indiscriminately spelter, a name which still exists, although in its modern usage it refers only to zinc and is used merely commercially.

The working of zinc was part of the old Indian civilization, being described in 1597 by travelers as a peculiar kind of tin. History is not quite clear on the date when zinc was first isolated, although it is known that the art of zinc smelting was in existence in Great Britain about 1725.

The world's supply of zinc has increased remarkably during the last century. Germany was practically the only producer of this metal up to 1833. Immediately after, Russia became one of the important producing countries, and in 1837 Belgium joined the ranks followed by England and the United States, which commenced to produce at the rate of 6000 tons per year in 1873. At the present time, the biggest producers are the United States, Germany, England, France, Spain, Austria and Belgium. The world's supply of zinc in 1910 was 450,000 tons. According to a report from Washington, the State of New Jersey is an important factor in the world's supply, the zinc mines of that State having increased their output from 144,312,560 lb. of recoverable zinc in 1913 to 148,506,500 lb. in 1914.



Microphotographs showing the varied nature which can be possessed by practically similar compositions of bronze

Zinc Is Ductile

Zinc being ductile and malleable and of low tensile strength, it would be at once imagined that the alloys of copper and zinc would have great ductility and malleability although the tenacity might perhaps be low. Yet the effects of zinc are of such a varying nature, that different alloys instead of following a definite scale of increase and decrease in strength and other physical qualities, vary quite quickly with different percentages of zinc. As zinc is added, the tensile strength gradually increases from about 27000 lb. per sq. in. for 98 per cent copper and 2 per cent zinc up to 50,000 lb. for 60 per cent copper and 40 per cent zinc. The strength again decreases quite rapidly after passing 48 per cent copper to 52 per cent zinc where the tensile strength is about 24,000 lb. until it becomes as low as 1800 lb. per sq. in. with a composition of 33 per cent copper to 66 per cent zinc. Strange to say the strength again rises, becoming 18,000 lb. per sq. in. for a composition of 5 per cent copper to 95 per cent zinc.

Thus, zinc plays the rôle of a strengthener until it forms about two-fifths of the alloy; from then on down to the point where it forms two-thirds of the alloy it acts as a weakener as far as tensile strength is concerned, the strength curve again taking an upward trend until with zinc 94 per cent of the entire mixture, the tensile strength becomes 18,000 lb. or three times that of zinc alone. In other words, it is the effect of the parent metal copper upon the zinc which increases the tensile strength at this point.

One of the strange features of the brass end of the non-ferrous family is that the zinc has a marked effect upon the color of the resulting alloy. The red copper becomes a reddish yellow between 2 per cent zinc and 15 per cent, where it gradually blends into a yellow red until at 25 per cent zinc the color of the alloy becomes a pale yellow which gradually deepens as 60 per cent zinc is approached. Here the color again takes a turn, passing over into a silvery white, becoming light gray at about 61 per cent and carrying this color until it gradually becomes a dark gray at about 83 per cent zinc.

Structure Also Changes

Another strange and interesting fact about these changes of color is that the interior structure of the metal also changes, the red-yellow shade having a coarse structure at the lower percentages of zinc and then changing to a structure which becomes finer as the yellows are approached, then becoming coarse again as the darker yellows are blended into the mixture until the grays are reached when the coarse structure begins again to give way to a fine content which it holds until the mixture is pure zinc without copper.

This change of color, strength and ductility which occurs coincidentally is one of the features of the brass family which renders it distinctive. The uses to which one of these metals can be put can largely be judged by the color. The white metals which have most copper are generally too brittle for any practical use, but the yellowish metals which range between 40 and 50 per cent zinc are of great value. In fact, by proper manipulation a member of the brass family can be made for practically any purpose, and if there were no other metals in existence, the work done by most of our other metals could in many cases be quite satisfactorily accomplished by specially designed combinations of copper and zinc. Brass may be made brittle and hard and it can be made soft and weak or soft and tough. It can be smooth or rough of surface and can take a polish which is almost mirror-like.

(To be continued)

Factors in Valve-in-Head Design

Numerous Refinements and Developments—Valve Cages Eliminated—Better Combustion Chambers

By W. A. Brush*

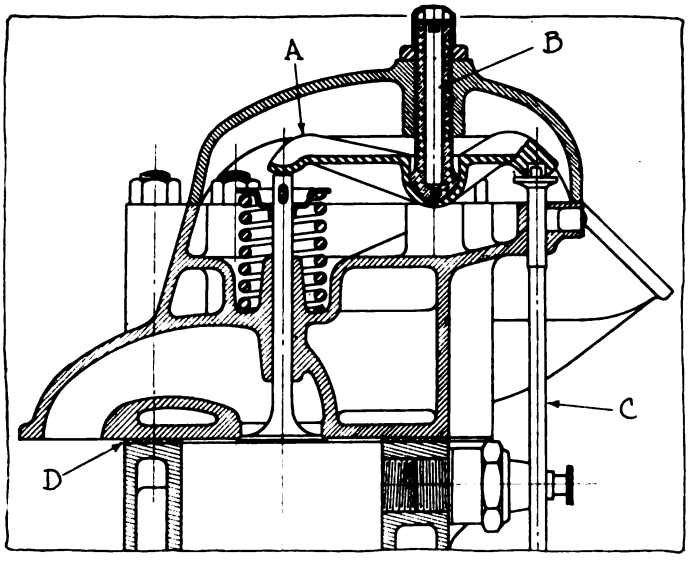


Fig. 1—Valve mechanism of Brush-developed valve-in-head motor. A—Rocker arm. B—Rocker arm stud. C—Push rod. D—Armored asbestos gasket between cylinder and head

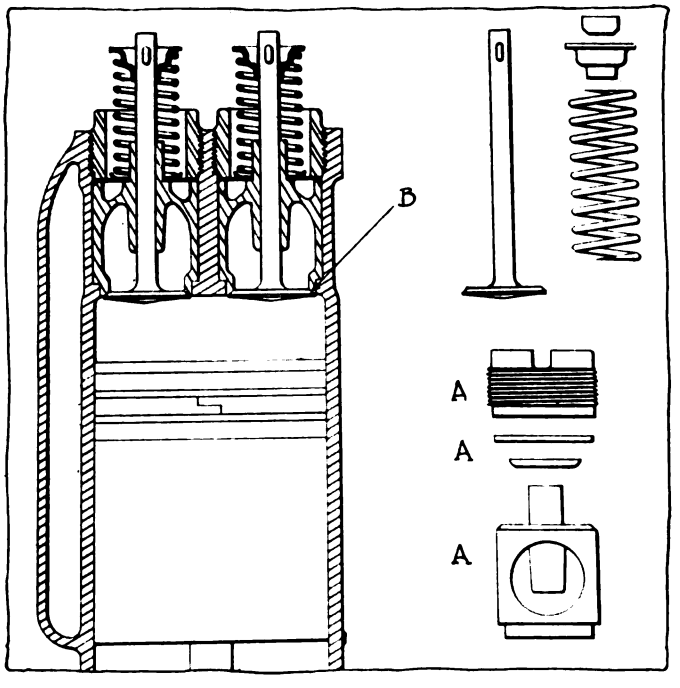


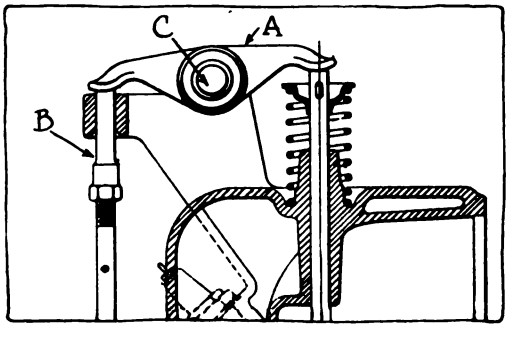
Fig. 2—Typical valve cage valve-in-head motor. A—Parts per cylinder eliminated by use of detachable head. B—Valve seat showing double wall between seat and cooling water

DETROIT, MICH.—Editor THE AUTOMOBILE:—Poppet-valve motors may be divided into two very general classes: one of these classes is the side-pocket class, that is, valves are located in valve pockets arranged at the sides of the cylinders. This class includes those motors commonly known as L- and T-head designs. The other class includes those motors which have valves located in the head of the cylinder. A great deal of skill and time have been expended by automobile motor manufacturers in refining and developing the side-pocket type of motor. Very little effort has been spent in the refinement of the valve-in-the-head motor.

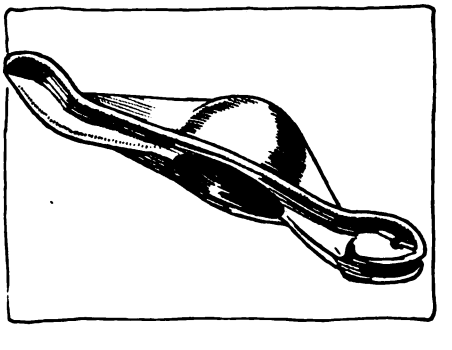
The reason for this condition is not far to seek. The greater efficiency of the valve-in-the-head type has made it a popular motor, in spite of its comparatively crude design. Automobile buyers have set the seal of their approval on the overhead valve because of its efficiency, and in spite of the fact that no effort was made to improve its mechanism until within a comparatively recent period. The Brush Engineering Association, Detroit, has for the last 2 years been refining and developing this type of motor. The features which will be described are now embodied in motors made for the trade by several well known motor manufacturers.

Reference to Figs. 1 and 2 show the difference between the undeveloped and the refined type of valve-in-the-head mechanism. Fig. 2 is a typical section of the old type, valve-in-the-head mechanism, and the first thing that strikes the observer is the possibility of eliminating the valve cage and the parts necessary to hold it in place. *A* in Fig. 2 indicates the number of parts per cylinder which are not necessary in the developed type. Beyond the elimination of these useless parts, there is an added efficiency in the motor and a material decrease in the trouble possibilities, since it is evident that with valve cages, the valve and valve seat must be operated at a higher temperature than is necessary. Note that at point *B* in Fig. 2 between the valve seat and the cooling water, there are two thicknesses of metal; that is the wall of the valve cage and the wall of the cylinder proper. This means that the valve and valve seat must operate at a higher temperature than when the valve is seated directly in a detachable head as shown in Fig. 1. Operating at this higher temper-

*Editor's Note—W. A. Brush is business manager of the Brush Engineering Assn., consulting engineers, Detroit, Mich.



Left—Fig. 3—Typical journal type rocker. A—Rocker arm. B—Push rod. C—Rocker journal.



Right—Fig. 4—Light strong forged rocker of Brush type valve-in-head motor.

ature, both valve and seat are susceptible to undue carbon deposit and pitting. The valve itself, operating at the higher temperature, is more apt to warp and lose its shape.

Fig. 1 shows a valve seated directly in a detachable head. The water jacketing under these conditions is fully as thorough and intimate as is possible to be secured with any type of poppet-valve motor. It therefore operates at as low a temperature as possible and must therefore be correspondingly as little affected by carbon deposit. Any valve-in-the-head motor possesses the advantage over the side-pocket type of having its valves located where they are least easily reached by oil which may work up around the piston, therefore the valve-in-the-head with the valve seated directly in the head casting must, other elements being equal, require the least attention to keep it operating satisfactorily. In other words, it is the least susceptible to the valve troubles, carbonizing, pitting and warping.

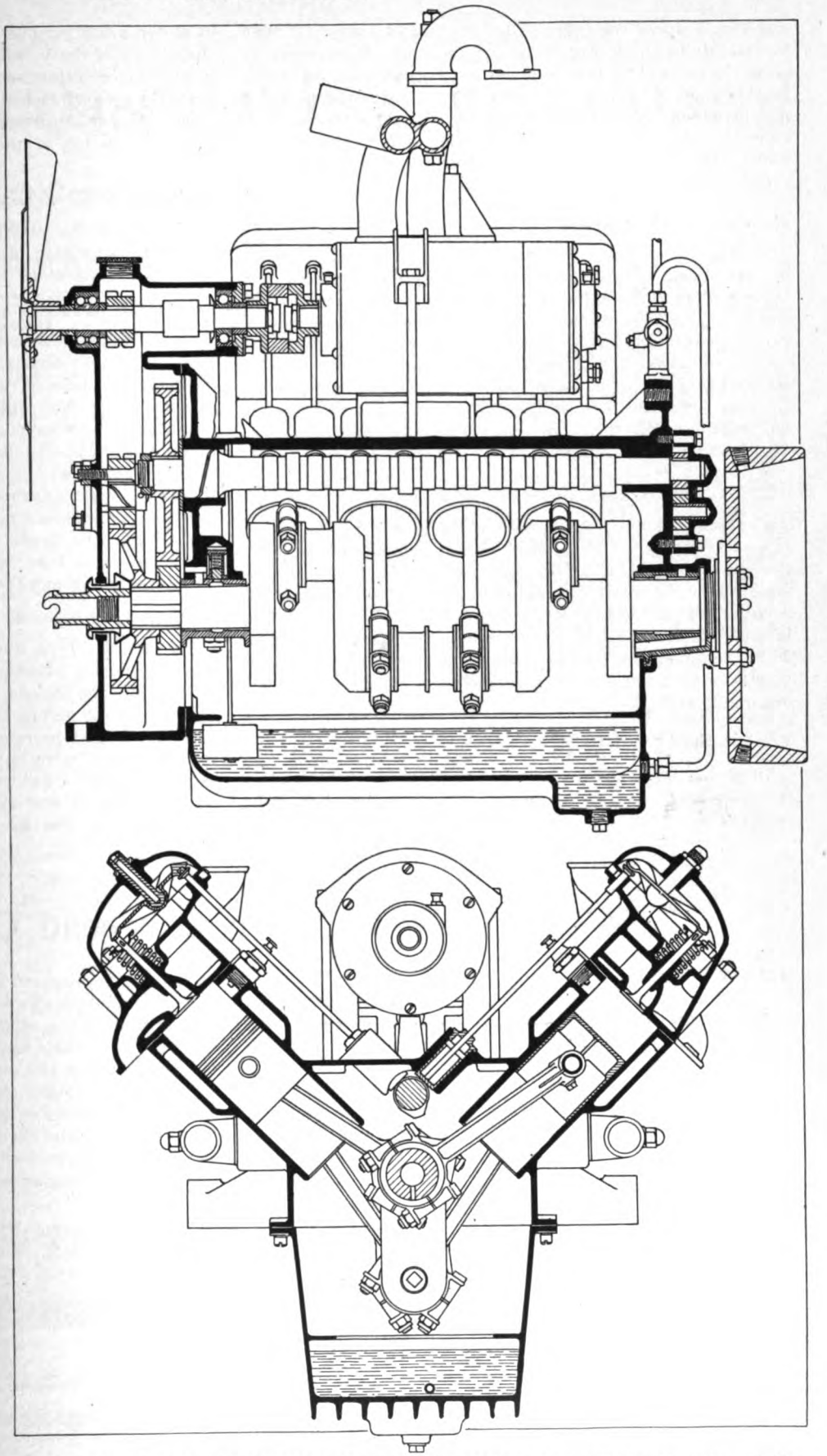
As I write this, I have on my desk a valve just taken out of a motor of this type which has gone through a 300-hr. endurance run. The motor was operated at about 1500 r.p.m. and developed at that speed about 35 b.h.p. Not only is the valve not carbonized and not pitted, but as far as may be determined by inspection, it is ready to go back into the motor for just such a run. The original marks made by grinding-in are still evident to the eye.

The detachable head secures an additional advantage: it permits a perfectly symmetrical combustion chamber with completely machined walls, and these smooth walls naturally present less opportunity for carbon deposit than do the comparatively rough walls of a casting. Practically all of the foundry problems are those which come up in connection with the comparatively small head casting.

Between the detachable head casting and the cylinder blocks there may be used the flat armored asbestos gasket, or if it is desired, the soft copper circular gasket. With properly located studs, either of these gasket arrangements may be made satisfactory.

T-Type Possibilities

Comparison of Figs. 1 and 3 shows the possibilities of refinement in overhead-valve operating mechanism. Fig. 3 is a typical section of the older journal-type of rocker



Upper—Fig. 6—Longitudinal section through two-bearing, eight-cylinder V motor of the valve-in-the-head Brush-developed type

Lower—Fig 7—Transverse section through the motor mentioned in Fig. 6. From the repairman's standpoint the fact that the valves are seated in an easily detachable head is of great advantage. For example, when the heads of the two blocks are removed, the valves may be ground in on a work bench where, by inspection, the workman may know whether or not he is doing a first class job. While the heads are off, if it is necessary to take out a piston and connecting rod for any purpose this may be done through the top of the cylinder bore

and Fig. 1 shows the refined fulcrum-type of rocker. I wish to call attention in Fig. 3 to the fact that there must be either in the end of the rocker or in the push rod, as shown in this case, provision for valve tappet adjustment, which naturally adds to the weight of the operating parts. Furthermore, when wear occurs in the journal in the center of the rocker, there is no means of compensation for this wear except by re-bushing the rocker arm.

The Fulcrum-Type Rocker

In Fig. 1, with the fulcrum-type rocker shown in detail in Figs. 4 and 5, tappet adjustment is secured by raising or lowering the hollow stud which forms the fulcrum for the rocker. This means that whenever tappet adjustment is made, there is automatic compensation for any wear that may have occurred in these operating parts. Furthermore, the well shaped seat in the rocker and the hollow stud provide capacity for a considerable amount of lubricant. The amount of oil contained in these parts is sufficient to provide lubrication for a very considerable period.

Adjusting the Tappets

Tappet adjustment on a motor of the type shown in Fig. 1 is a very simple process. The lock nut outside the cover for the valve mechanism is loosened; the stud is screwed downward while the motor is running until the push rod can just be freely revolved with the fingers. The stud is then locked in position and a satisfactory adjustment has been secured. This developed valve-in-the-head mechanism is lighter, quieter, and more easily assembled than the cruder type originally used.

Valve-in-Head Advantages

In connection with the recent popularity of the V motors it is decidedly worthy of notice that the valve-in-the-head presents some very material advantages. It is the only type of motor which permits the exhaust manifold to be placed the outside of the V, where it is entirely out of the way wh inspection or adjustment of accessories is necessary. It the only type of motor which in V construction makes p sible a tappet adjustment that is accessible, the adjustme being in the top of the head cover instead of down insi the V.

Interior of V for Accessories

This leaves the interior of the V free for intake manifo carbureter, ignition distributer, and, if desired, starti motor and generator.

From the Repairman's Viewpoint

Figs. 6 and 7 are two sections through an eight-cylind V motor of the valve-in-the-head developed type. The val in-the-head naturally retains in V construction the efficie inherent with this type of motor. Furthermore, from repairman's standpoint the fact that the valves are sea in an easily detachable head is of remarkable advanta for example, when the heads of the two blocks are remo the valves may be ground in on a workbench, where by spection the workman may know that he is doing a first c job. While the heads are removed, if it is necessary any purpose to take out a piston and connecting-rod, may be done through the top of the cylinder bore.

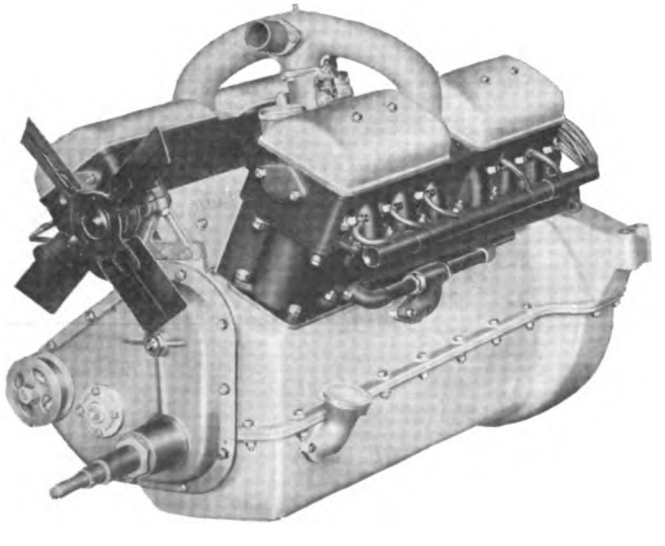
Simplicity and Economy

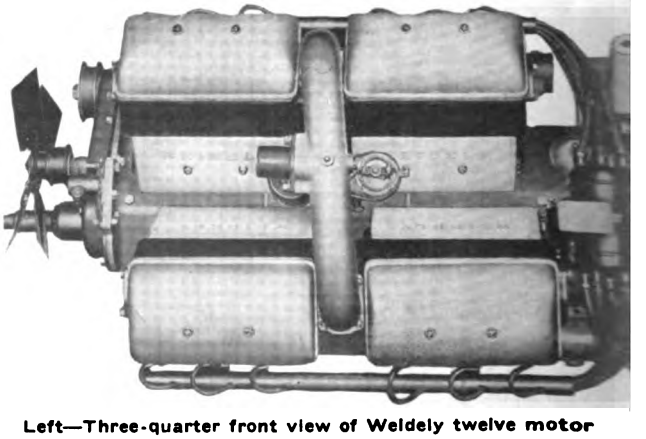
To sum it all up, this type of motor may be comple and thoroughly overhauled without removing the cyli blocks from the chassis, and there are no parts or accesso so placed that before they can be inspected other part accessories must be removed. These advantages are sec in this type of valve-in-the-head motor, not only without ing complications, but with in reality an increase in simpl and reduction in cost over other types.—W. A. BRUSH, I ness Manager, The Brush Engineering Association.

Weidely Twelve with Overhead Camshafts

INDIANAPOLIS, IND., Aug. 16—The Weidely Motor Co. of this city has brought out a twelve-cylinder motor which operates under the Weidely principle of overhead camshaft. The new power plant has 2⅞ by 5 in. cylinders and is stated to give a speed from 2 to 75 m.p.h. when fitted to a passenger car chassis. The cylinders are cast in two blocks of six each with the motor heads cast in a single block for each set of three cylinders. A liberal use of aluminum has been made throughout the motor, the crankcase being vided aluminum design and the pistons also of aluminum

Lightness is one of the main features connected wit new motor, and this has been carried through particular the reciprocating and oscillating parts. In addition to a num pistons seamless steel tubular connecting rods aid i reduction of vibration at high speed. The crankshaft i in. in diameter and the flywheel is a steel forging. Lul tion is by pressure feed. It is intended to put these m through on a regular production schedule.





Left—Three-quarter front view of Weidely twelve motor
Right—Plan, showing carbureter mounting and ignition w

British Give Cars for Ambulance Work

Donated Passenger Cars Converted Into Field Trim and Turned Over to French Military Drivers—Formed In Convoys of 20 to 40—50,000 Wounded Carried in Vosges Mountains

PARIS, Aug. 1—In the brief interval between a trip to the front, from which his automobile returned with a bullet hole through the front fender, and a visit to an artillery factory where experiments were made with new explosives, President Poincaré formally inspected a fleet of ninety automobile ambulances presented by the Automobile Association and Motor Union of Great Britain to the French army.

The ceremony took place in the courtyard of the Invalides with the golden dome of Napoleon's tomb as a background and captured aeroplanes and cannons as decorations. The audience was capable of being produced by war alone: French soldiers and officers in a variety of uniforms; English staff officers in khaki; American ambulance men in the same colored cloth; burly Russian officers; Belgians in the new khaki uniforms which appeared to have been borrowed for them; and English civilian officials in immaculate top hat and frock coat.

All Private Touring Cars

For several months the Automobile Association and Motor Union has been making appeals to its members for automobiles or subscriptions to buy automobiles to be presented to the medical service of the French army. The number of persons who must have parted with their cars is considerable, for the ninety machines inspected at the Invalides represented only a portion of those put into service under these conditions, and they had all been private touring cars. Every European make was represented—English, French, Italian and German, with English predominating. The passenger car bodies had been stripped off and replaced by a uniform type of ambulance body carrying four men lying or eight sitting.

French Drivers Take Charge

The English effort comes to an end with the delivery of the ambulances to the French army authorities. Each car is put in charge of a French military driver and convoys of twenty to forty are formed with the necessary officers taking their orders from the chief doctor. The ambulances are sent out to different points just to the rear of the battle line, where they are made use of in carrying wounded from the dressing stations to the clearing hospital. Except in very rare cases, these automobiles are not used for long trips. They are employed as auxiliaries to the railroads: bringing men from the dressing stations to the military hospital; carrying them from the hospital to the hospital train; taking men from the train to the base hospital. Wherever they are placed the work is apt to be spasmodic. For a week or more there may be nothing to do, then, following fierce fighting, men and machines may run backwards and forwards without a stop for 48 hr. or more.

One of the features of the English automobiles is a very successful type of traveling kitchen mounted on a 30-hp. Fiat chassis. It is designed to handle big quantities of light refreshments, such as coffee, tea, cocoa, bread and butter, etc., to the men who have just come out of the firing line, are temporarily cut off from their food supply, or have come off a long railroad journey. Across the front end of the body is the cook stove, with kerosene as fuel, and the washing sink to which water is pumped from a tank; down each side is a table with food cupboards beneath and plate and mug racks above; across the rear is a folding counter over which the food is passed to men outside.

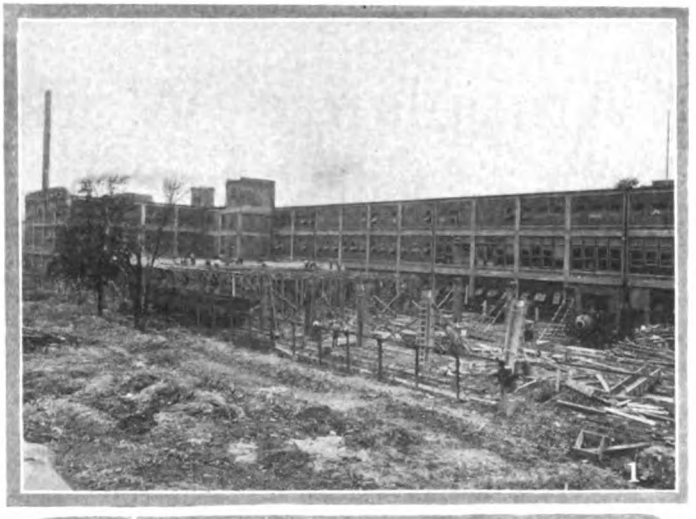
English automobile ambulances in courtyard of Invalides, Paris. In the background are captured aeroplanes and cannon. Here President Poincaré of France formally inspected the ambulances

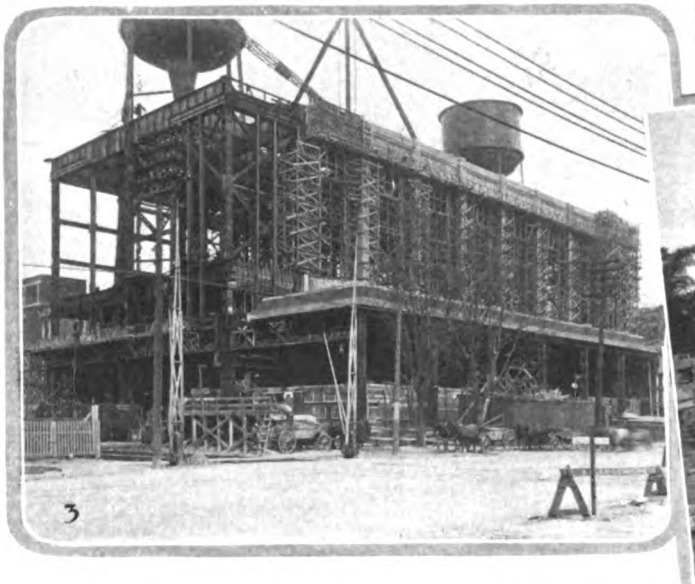
In the Vosges mountains, where railroads are scarce and the automobile is the only reliable means of locomotion, there are twenty-four sections of British ambulances with the French troops. In this district all the work is done over high mountain passes. Since these automobiles went into service towards the end of last year they have carried more than 50,000 wounded.

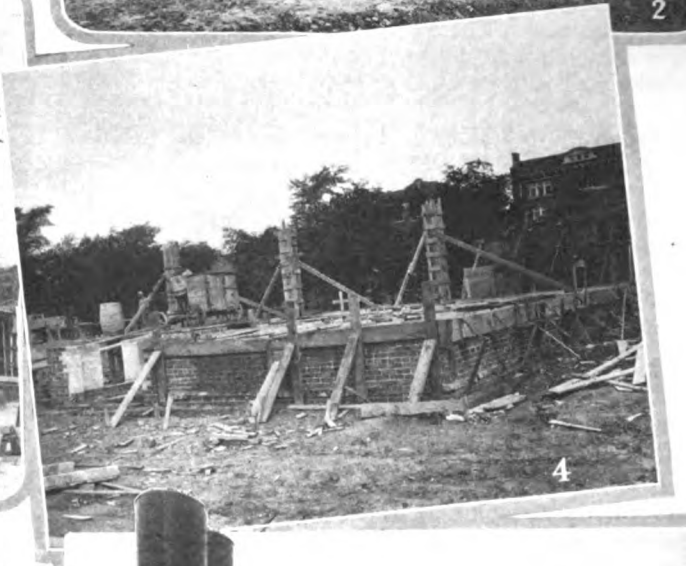
Regularly Inspects Cars Sold

LOUISVILLE, KY., Aug. 14—The Southern Motors Co., this city, agent for the Packard, Hudson, Dodge and Detroit electric employs an inspector who makes periodical inspection of all machines sold by the concern. During the first year that the car is in the hands of its new owner, this inspection is made free of cost. Repairs which in the wisdom of the company appear to be owing to the owner also are made without charge. A nominal sum of $3 is charged for inspection after the first year.

Detroit Plants Mak







1—$200,000 addition to assembling plant of Paige-Detroit Motor Car Co.

2—Dodge Bros. test shed, storage and final car inspection. One of many additions to this company's factory

3—Ford Motor Co.'s new power house, which with equipment represents an expenditure of between $2,000,000 and $2,500,000

4—Hyatt Roller Bearing Co. new office building for automobile division only. It will cost $60,000

5—Beginnings of Timken-Detroit Axle Co.'s new drop forge plant, which will cost $240,000

DETROIT, MICH., Aug. 16—The prosperity of the concerns centering about Detroit engaged in the manufacture of automobiles, trucks and accessories is such that twelve concerns have either finished or are about to complete additional buildings which will provide more than 850,000 sq. ft. additional floorspace. The cost of these additions is well up toward the $5,000,000 mark, according to the estimates given by the twelve concerns, eleven of which total to $4,546,000.

The concerns included in this total are the Packard Motor Car Co., Paige-Detroit Co., Timken Axle, Chalmers Motor, Rands Mfg. Co., Federal Motor Truck, Hyatt Roller Bearing Co., Ford Motor Co., Hudson Motor Car Co., Dodge Bros., Kelsey Wheel Co. and Continental Motor Mfg. Co. The additions in detail are:

Paige-Detroit Motor Car Co.—Addition to assembling plant and also warehouse for materials in the same building. Will be 4 stories high, 312 by 64, or 74,880 sq. ft. Was started in July, to be completed in November. Expenditures about $200,000.

Total floorspace of plant will be 464,880 sq. ft.

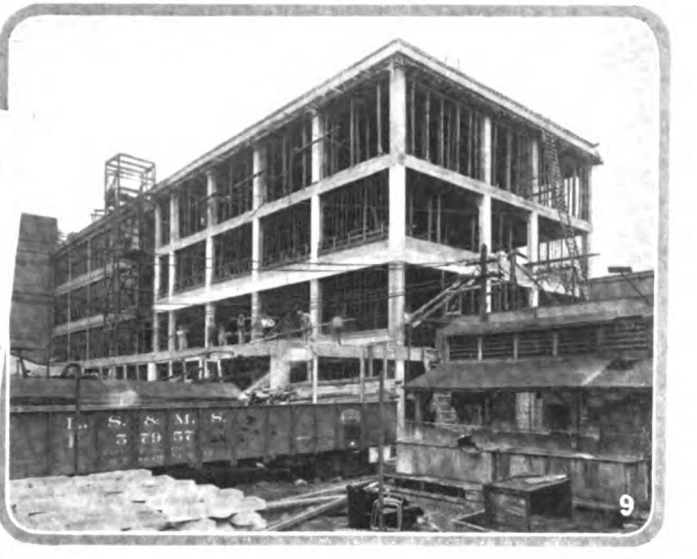
Dodge Bros.—Test shed—storage and final inspection of cars. One story, 380 by 60, 22,800 sq. ft. Started in April, completed in August, to cost $25,000. Additions to Dodge plant have been under way since last year and represent an expenditure on buildings alone of several hundred thousand dollars.

Ford Motor Co.—Power house, 250 by 150. Started in April, 1914, will be at least 6 months before completed. Building to cost about $1,000,000. With full equipment power plant represents an investment of between $2,000,000 and $2,500,000.

Hyatt Roller Bearing Co.—General office building for the automobile division only. Three stories high, 100 by 60, or 18,000 sq. ft., to cost $60,000. Started in July, to be completed in November.

Timken-Detroit Axle Co.—Where new drop forge plant will be located. One-story building, having 16,100 sq. ft. floor-

$5,000,000 Additions



6—Top, body and finished car building and employment department structure which form part of the Hudson Motor Car Co. $1,000,000 additions

7—Truck assembling and machine additions to the Packard Motor Car Co. factory

8—Service and stock department addition to Federal Motor Truck Co. plant

9—Addition to Chalmers Motor Co. machine and manufacturing building, one of several instances of expansion at this factory

10—Windshield plant of Rands Mfg. Co. is adding 20,000 sq. ft.

space. Will cost when completely equipped $245,000. Started in May, to be completed in September.

Other additions to plant being erected. Expenditures on buildings alone $225,000.

Hudson Motor Car Co.—Large building in rear, three stories, 500 by 60, 90,000 sq. ft. To be top and body and finished car building.

Building in front, three stories, 400 by 60, 72,000 sq. ft., to be employment department on first floor, addition to machine shop second floor, and third floor undecided. Work started in May, to be ready in October.

Present other additions to Hudson plant include an additional floor to all two-story buildings and also the lengthening of these buildings. There is also to be a new six-story building. Total expenditure on buildings and equipment is to be between $1,000,000 and $1,500,000.

Packard Motor Car Co.—In the foreground is a steel frame shed addition to the assembling truck department, 240 by 240, or 57,600 sq. ft. Building in rear, addition of one floor 240 by 60, or 14,400 sq. ft., to truck machine building.

Total additions to the Packard plant will give 377,000 sq. ft., and bring the total of the plant to 48.1 acres of floorspace. Additions were started in June and are to be completed in November, and the cost will be about $550,000.

Federal Motor Truck Co.—One-story addition, 168 by 60, or 10,080 sq. ft., to be used as service and stock room.

Chalmers Motor Co.—Four-story addition to the machine and manufacturing building. Will total 24,300 sq. ft. of floorspace. Started in July, to be ready in September. Cost about $40,000. Other additions to plant will make total cost $125,000 and increased floorspace all told 50 000 sq. ft.

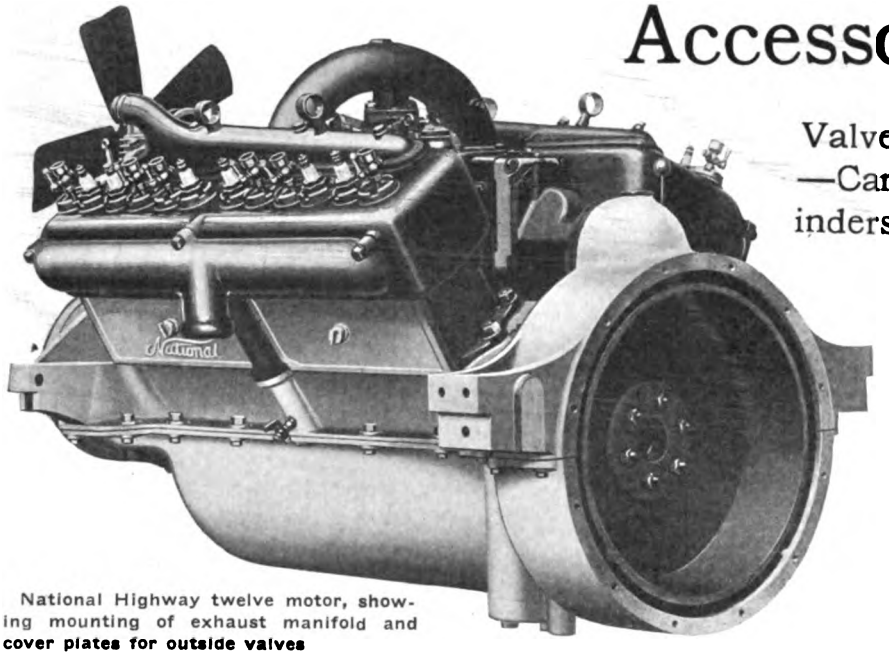
Rands Mfg. Co.—Two-story addition, 153 by 65, 20,000 sq. ft. floorspace to windshield department. Started in July, to be completed in September. Expenditure $26,000.

Kelsey Wheel Co.—Adding a new press and stamping building, 325 by 80, and two floors on another building, all told 78,000 sq. ft., to cost about $250,000.

Continental Motor Mfg. Co.—Additions are being made to the assembling room, block test department and heat treating department. With other additions, these represent 55,000 sq. ft., the cost of the buildings being $150,000.

National Twelve Valves Outside—Accessories in V

Valves Thus Rendered Accessible —Cantilever Rear Springs—Cylinders Have Separate Oil Feed



National Highway twelve motor, showing mounting of exhaust manifold and cover plates for outside valves

A NATIONAL Highway twelve has been on the road for many months and a few privileged persons were taken out in it, by the National Motor Vehicle Co., Indianapolis, Ind. Like other V-type multi-cylinder motors it has a great high-gear ability and combines smoothness with rapid acceleration in a marked degree. The car has all the character that has made the National six what it is to-day after 10 years of development, only it has a good deal more power in proportion to its weight.

The motor is not so very large from a volumetric viewpoint, being 2.75 and 4.75 bore and stroke, giving a piston diplacement of 338.5 cu. in. and an S. A. E. rating of 36.26 hp. The wheelbase measures 128 in. and the body, of standard touring type, is seated for four, with folding seats for two more. The manufacturers describe it as providing ample room for six passengers and close room for seven.

Accessibility Conspicuously Good

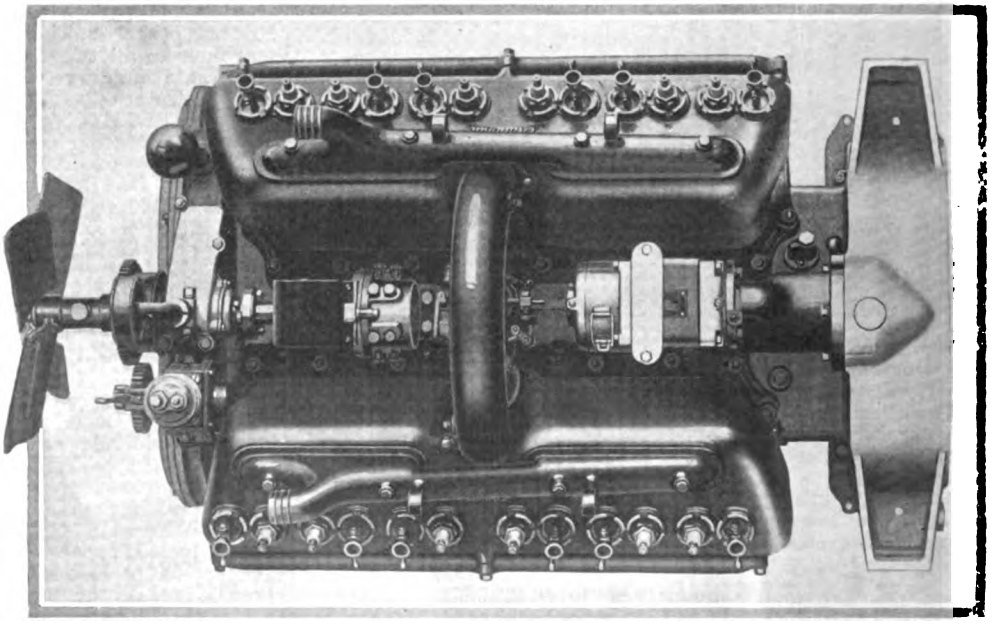
The motor embodies all the best features of modern high-speed design and the use of outside valves; the first example in V designs was suggested by the much better accessibility given by this position, and by the convenience of having the electrical gear and other motor accessories in the V, where their individual accessibility is maximum.

The cylinders are cast in blocks of six and are of conventional L-head design with small combustion chambers. Two camshafts are necessary, but there is no need for rockers or other devices to synchronize the valve action, as the valve operation for either set of cylinders is totally unaffected by the other set. At the front helically-cut timing gears drive the camshafts as in a T-head motor with vertical cylinders, and for the drive to the Splitdorf magneto a silent chain runs from the right camshaft to the fan pulley spindle. This magneto is a special Splitdorf.

In the rear of the V is the Westinghouse starting motor, and the generator is located alongside the crankcase, being the only attachment not within the V. For the connecting-rods the side-by-side design has been chosen, the cylinder blocks being staggered 1 in. to permit of this.

The lubrication system is unusually complete as there is practically no moving part that does not receive a direct supply from the pump. The latter, a gear type, is located in the oil base, having a large screen on the suction side and also a gauze strainer in the form of a tray covering the whole top of the oil pan, but there are no dip troughs as the crankshaft is fully drilled and the oil from the main bearings finds its way to the connecting-rod lower ends.

Separate pipes lead to the timing gears and to each of the camshaft bearings while the piston pins are oiled by an inversion of the usual method of fully forced lubrication systems. As a rule the connecting-rod serves to carry the oil to the wristpins and then to the cylinders, but here the oil feeds to each cylinder at a point about 1½ in. from the

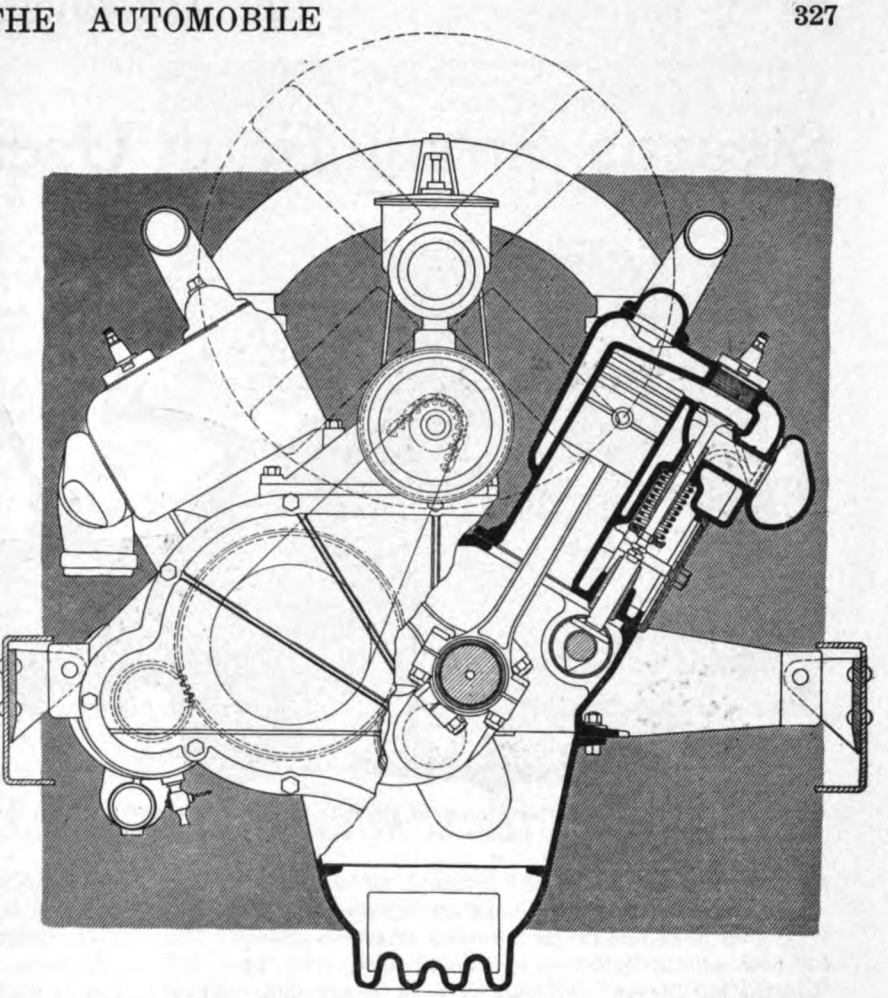


Plan of National twelve showing mounting of the carbureter and electric units in the V with transverse intake manifold. Note water outlet manifold mountings

bottom and reaches the wristpins through tiny holes drilled in the aluminum pistons. The latter have a V groove cut near the bottom, which is used to lift oil into the cylinder, as the absence of splash troughs in the body of the crankcase cuts down the amount of spray present. As to the oil pressure, this is not very high, the relief valve blows off at 25 lb. per sq. in. When the engine is idling the pressure is about 10 lb., and it rises gradually with the speed till the limit is reached.

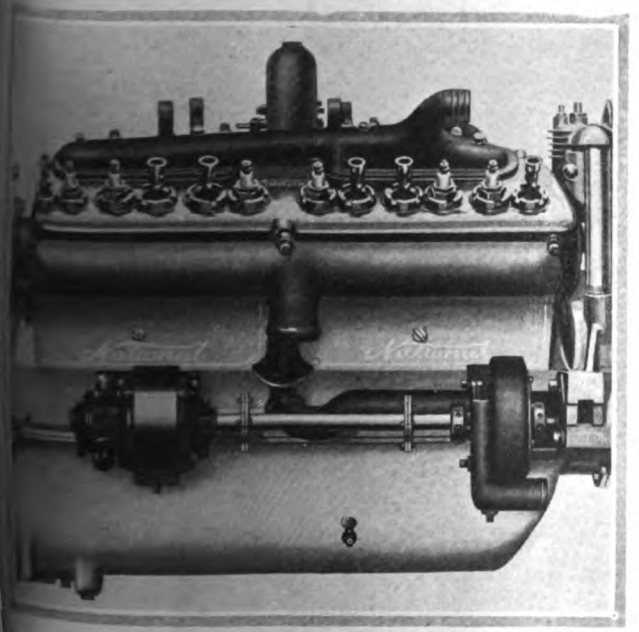
There is only one water pump, but this is duplex internally, the rotating member carrying two sets of vanes. One set feeds directly upward into the block of cylinders on the right and the other half of the pump delivers through a passage cast in the aluminum of the crankcase to the left block. This cuts down the piping materially and makes for efficiency and simplicity.

A few other facts about the engine that are interesting may be given, as for instance the weight of the pistons, which is 8 oz. without rings. The valves are 1 5/16 in. diameter and the lift is ⅜, giving a quite large opening, while the mushroom tappet provides a quick lift and descent, giving a slightly better valve diagram than the roller type. It is probable that the fan has some effect as a damper to the crankshaft, though it is doubtful whether any such aid to elimination of vibration is needed, but the short fan drive, when kept tight, provides a flywheel just as the Lanchester device, with a slipping possibility. Of course reaction from the fan would be cushioned a good deal by the belt and not the chain, but it is an undoubted fact that the presence of a fairly high speed fan does often have a steadying effect on a motor.



Section through National twelve, showing how the outside valves are actuated and also giving an idea of the water jacketing space and exhaust manifold mounting

Aft of the motor there is little in the chassis, if anything, that differs from the Highway six described in THE AUTOMOBILE for May 27. The clutch is an aluminum cone with leather face and the unit gearset provides three forward speeds, all shafts therein running on annular ball bearings. The propeller shaft is tubular and bears two universals, and the rear axle is floating. On both the six and the twelve a flat cantilever rear suspension is employed and it may be noticed that the center bracket has the swivel pin located beneath the spring, instead of above it as is more usual. The springs are 51 in. long and 2½ in. wide with eight leaves each and their action is extremely satisfactory. The front springs have no noteworthy peculiarity, being 38 in. long by 2 in. wide, but special precautions have been taken in laying out the steering and the use of large ball thrust bearings for the front axle swivels makes the steering control very facile.



Right side of National twelve, showing mounting of pump and generator, the only motor accessories not located in the V

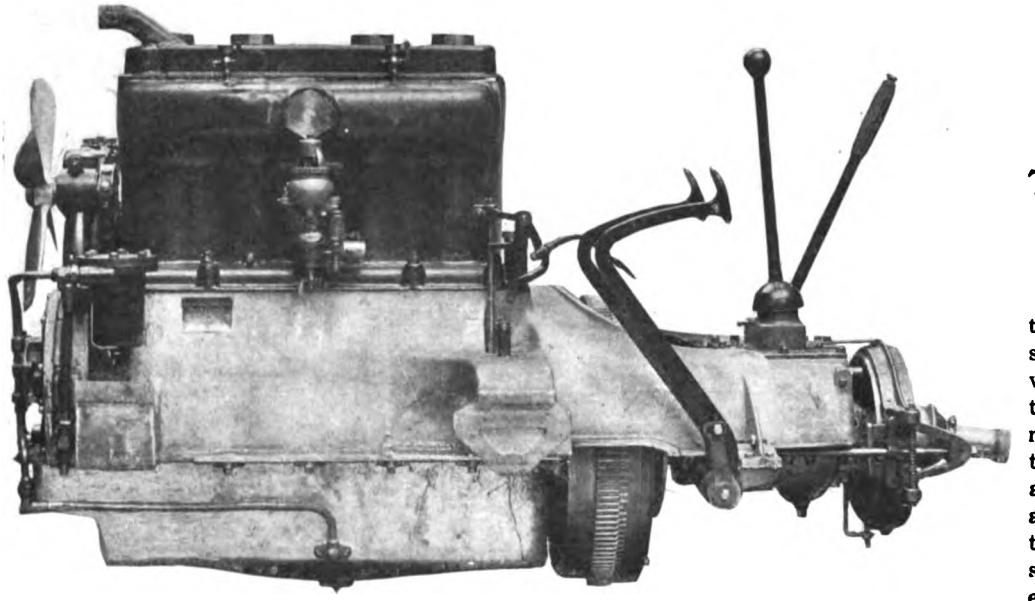
Throughout the rear axle taper roller bearings are used, and the type is floating, very strong steels being used so as to cut the weight as much as possible. This statement applies to the whole chassis which has few redundant parts and very little dead weight in any portion. Drive is by spiral bevel and the top gear ratio is 4.4 to 1. It should be added that the twelve-cylinder engine is made throughout in the National plant at Indianapolis as the shops are well equipped for the production of a moderate number of high class motors.

Brakes 15 by 2 In.

In general the body is like that which drew so much comment at the national shows this year, having the divided front seats and the smooth lines which the National company was among the first to introduce to America. Without the least hesitation it is safe to say there is no car in Europe that is better appearing than the touring National, either six or twelve, and for comfort it can vie with the best. In equipment the car is well provided, having speedometer, one-person top and all the usual accessories, while the four tires are each 36 by 4½ in., which should be large enough for the high power, when the light weight is remembered.

Stearns Small Four Uses Westinghouse

Battery Ignition Adopted— Torque Rod Stronger —Price Now $1,395



Stearns small four power plant, showing oil filler beside fan bracket. Also contracting service brake operating mechanism. The brake is mounted behind the gearbox

THE F. B. Stearns Co., Cleveland, Ohio, created a good deal of interest a year ago by introducing a new small four at $1,750, the design being extremely modern. This car now sells at $1,395 as announced some weeks ago. For 1916 the big Stearns development is to be the eight-cylinder with Knight engine which will be ready shortly, but meanwhile the small four has been put into regular production and the factory is ready to deal with it in quantities. Building extensions which were commenced in the early spring have been completed for some time and the much needed additional space is now fully occupied.

It is the getting into stride with the new four that has enabled the drop in price to be made as quality has not been cut in either chassis or body. There are three changes, the most important being the employment of a Westinghouse two-unit system of electrical equipment and the adoption of battery ignition and the other a small change in the design of the torque rod which increases its strength by giving a larger bearing at the front end where the forward extremity is secured to the frame by a spring hanger.

Complete Lubrication

The motor, 3¾ by 5⅝, has a displacement of 248 cu. in. and an S. A. E. rating of 22.5 hp. This figure does not represent the true power as the long stroke produces a much higher piston speed than the 1000 ft. per min. on which the formula is based. A neat block casting is used for all four cylinders, and the engine has the fully forced system of lubrication introduced last year. Oil is pumped to the three main crankshaft bearings and thence passes to the crankpins. From here it is led up the hollow connecting-rods to the wristpin bushings, while spray of escaping oil from the various bearings cares for the sleeves and the other motor parts. It is proved by the records of the company that bearing troubles are very uncommon with Stearns cars as the number of replacement bushings asked for is extremely small, and, of course, this is a direct measure of the efficiency of the lubrication.

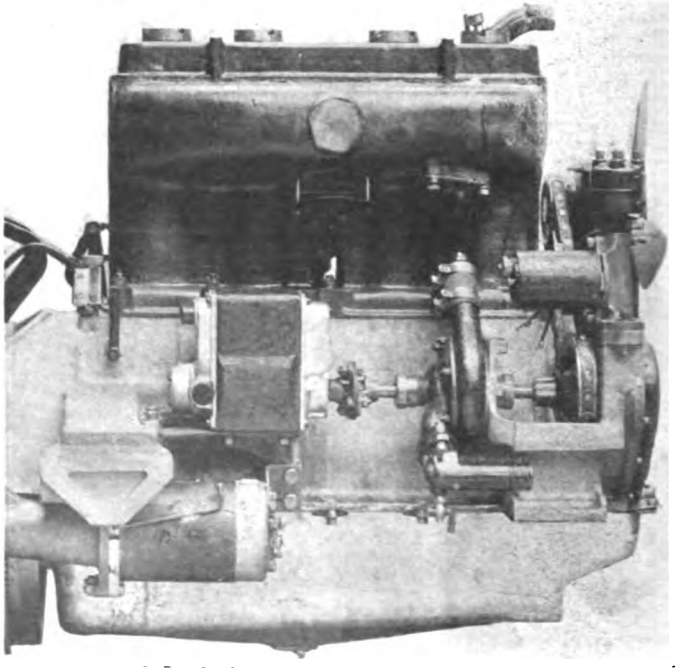
Another change is the substitution of timer ignition for the magneto originally used, the distributer being situated at the front of the engine beside the fan bracket.

Mention of the fan draws attention to a very ingenious small feature of Stearns design which is that the lubrication of the fan spindle is automatic. It may be seen in the illustrations that the oil filler is located alongside the fan bracket and all oil for the motor is put in through this cap. Inside the strainer is a wick having one end in connection with the fan bushing, and this wick becomes saturated with oil each time the crankcase is filled, so attending to the fan lubrication with sufficient frequency.

The location of the generator and the starting motor are also shown in the illustrations, and it needs only to be added that the latter has a Bendix flywheel engagement. The oil pump is located at the front end of the eccentric shaft, and a silent chain is employed for the generator and water pump drive.

Transmission Brake a Feature

The clutch is a leather-faced cone with powerful cushion springs to make the engagement gentle, and a really adequate clutch brake is fitted to make gear shifting as easy as possible. Actually the gears are extremely easy to handle



New Westinghouse electrical equipment of the Stearns light four

though the low-speed ability which is characteristic of the Knight motor makes the high gear available for nearly everything.

One of the most successful features of the Stearns light four has been the contracting brake behind the three-speed gearbox, this having extremely smooth action combined with great power. In the left side view of the power plant the action of this brake operation is shown clearly. The two shoes hinge on the opposite sides of the drum and their free ends bear small rollers. Inclosing these rollers is a triangular, hollow cam which depression of the pedal pulls forward, so closing together the ends of the brake shoes. The separating spring spreads the shoes and also puts a light release load upon the rollers, the cam, and so to the pedal, the effect being that there is no point in the whole of the brake layout where slack can develop and the creation of a rattle is thus impossible. The emergency brakes are of expanding type.

Spiral bevel drive is employed and the axle is a floating construction containing a very full equipment of radial and thrust ball bearings, while a torque stay of pressed steel takes the driving and braking torsional stresses. Propulsion is through the springs which are 50 in. long by 2½ in. wide and of cantilever type: the wheelbase is 119 in.

There are five body styles to choose from, a five-passenger touring car, roadster, three-passenger cabriolet, sedan and seven-passenger limousine. Roadster and touring car both cost $1,395, the cabriolet $1,900, and limousine $2,500. As to equipment this is complete and of the best quality. The upholstery is hand buffed leather and all the body fittings are the highest class.

Stearns-Knight small four which lists at $1,395

Lighting is cared for by double-bulb headlights, tail light and a cowl board bulb. Four 34 by 4 tires are used with a spare demountable rim. The carbureter is made specially for the Stearns motor and fed by gravity from a cowl tank.

Cameron Six Touring or Roadster $1,000

THE Cameron Mfg. Co., New Haven, Conn., will produce for 1916 a six-cylinder chassis of 122-in. wheelbase and 33 by 4 wheels with two styles of body, a five-passenger touring and a runabout with an inclosed seat in the rear which makes it in reality a four-passenger car when opened.

The motor is 3 by 5 block design of conservative construction. At a speed of 2000 r.p.m. it is stated that 40 hp. is delivered on the block and the weight of the motor is said to be less than 9 lb. per horsepower. The crankshaft is carried on three bearings and is 1¾ in. in diameter. The bearings are all bronze backed with nickel babbitt lining. The connecting-rods are 9 in. long with their lower bearings 1¾ in. in diameter by 2 in. length. The upper bearings are ⅞ in. diameter with 1¾ in. length on the wristpin.

Lubrication is taken care of by a plunger pump operated from the camshaft which takes the oil from the compartment in the lower part of the crankcase to an oiltight compartment surrounding the camshaft. The pressure is sufficient to hold the valve lifter against the valve, thus even with clearance the clicking of the tappets is avoided.

The one-piece camshaft is driven from the crankshaft by helical gears of eight-pitch with 1-in. face. The camshaft gear is bolted to a flange forged on the end of the camshaft. The water pump is gear-driven and the shaft extends through to drive the Atwater Kent timer distributer for ignition.

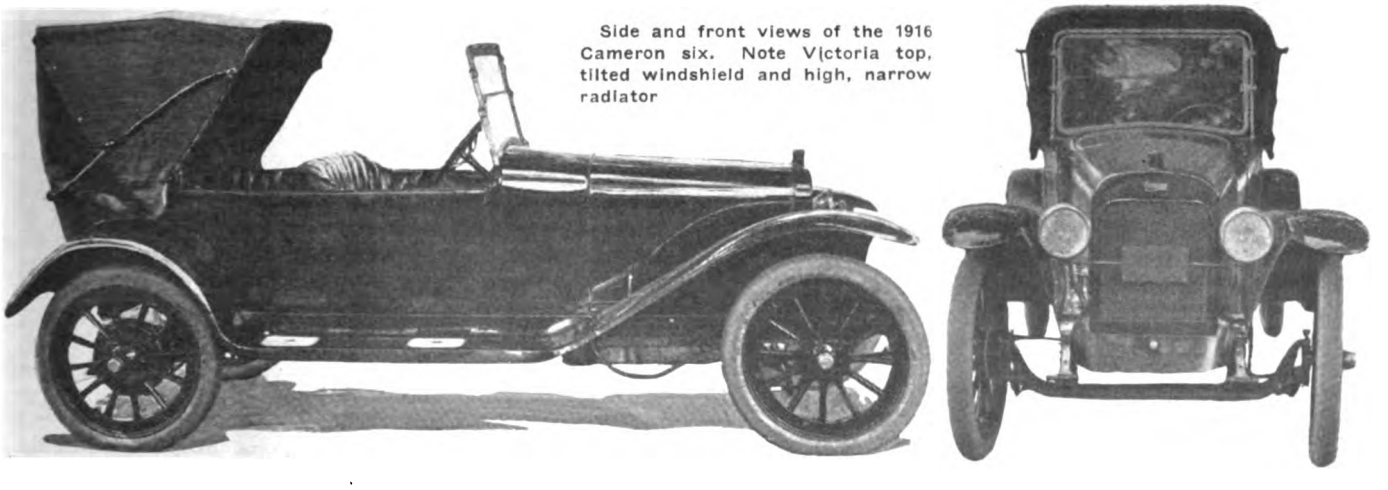
A Splitdorf-Apple starting and lighting system is provided in which a single unit motor generator mounted at the front of the crankcase is driven by silent chain inclosed in the gearcase. The starting switch is the flywheel housing.

Fuel is carried in the tank contained in the cowl, giving a direct gravity feed to the carbureter. This instrument is a 1¼-in. Zephyr and can be primed or adjusted from the seat.

The clutch is an aluminum cone faced with special tanned leather and inclosed in a housing which carries the pedals and receives the radius tube from the rear axle upon which the three-speed gearset is mounted.

The rear axle is floating and the bevel drive and differential are mounted on annular ball bearings and the drive at this point provides a reduction of 3.75 to 1. The two foot-operated brakes are 12 in. in diameter.

The windshield is tipped back on an angle of 15 deg., and the car is provided with a Victoria top over the rear seat which can be thrown back if desired or fitted with curtains which fasten to the windshield in rainy weather. Both touring and roadster are fully equipped and sell for $1,000.



Side and front views of the 1916 Cameron six. Note Victoria top, tilted windshield and high, narrow radiator

Aluminum in Automobile Chassis

Saves Weight Cheaply—Steel Prohibitive on Price

By A. Ludlow Clayden

DETROIT, MICH.—Editor, THE AUTOMOBILE—There were some remarks in the letter from Finley R. Porter published last week which I, as author of the article on the uses of aluminum, would like to reply to directly. Mr. Porter's main contention is that it is possible to make the lightest automobile by the use of the strongest material only; that is by using steel for everything. As a broad statement this is undeniable simply because if a given *strength* is required high tensile steel of a modern sort will give us the machine with least weight, because steel is stronger than aluminum in a greater ratio than aluminum is lighter than steel.

Efficiency at High Expense

From the efficiency standpoint also, he is probably correct in saying that the most highly efficient motor is obtainable by a generous use of steel. The racing Mercedes which has an all steel engine will probably stand long continued high speed better than any other motor ever built. This motor is practically identical with the Mercedes aeroplane engine that is accepted as being the best in the world to-day. But such an engine is extravagantly costly.

I do not wish to go too greatly into detail, but to mention the cylinders as perhaps the most debatable part, it is thought by many engineers that the success of the Mercedes motor is the even thickness of all its parts and the even cooling that must result therefrom. The steel cylinders of this engine are machined all over, both inside and outside, and cost more apiece than a whole motor of simpler construction. With the aluminum motor the cylinder liner can be steel just as well as cast iron, and there is no necessity to back it with aluminum, the outside of the liner might be in direct contact with the water, so avoiding the junction which, as Mr. Porter rightly points out, is a poor conductor. But it is not the cylinder that gives trouble through getting hot; rather it is the valves and the valve seats. Again, in the Mercedes motor the even cooling of these parts is obtained by the method of machining the cylinder all over and then attaching a sheet steel jacket by welding, a perfect way of doing it but prohibitive for ordinary manufacture. If the valves are contained in the head of the cylinder and this head is aluminum we have better cooling than cast iron would give, and much less weight, for but a tithe of the expense demanded by the all steel construction.

Then, turning to more general matters, in many automobile parts the strength of steel cannot be utilized because we require *rigidity*. Take a crankcase as an example, this could be made very light from steel in the form of sheet and wire or tube. By putting in a tubular member to care for each stress and welding up perhaps a hundred pieces the result would be wonderful, but using a much less strong metal like aluminum enables almost the same weight to be attained with an infinitely greater simplicity.

On the subject of aluminum pistons Mr. Porter makes a very definite statement which is not in agreement with the experience of several other engineers. The only possible explanation, to my mind, is that Mr. Porter has not had the opportunity of trying the best sort of aluminum piston or that the design of those he has used has been faulty in some way. The outstanding fault of the steel piston is that when made thin enough to be light it has so narrow a section that it cannot keep cool, and consequently the head reaches a destructively high temperature. With aluminum the thicker section and the better conductivity enable the same reciprocating weight to be attained with much smaller likelihood of trouble, at least such is the experience of many engineers.

It must be realized, however, that sand cast aluminum and die cast aluminum are two very different things. Pistons which fail when sand cast can often be made lighter still in permanent mold form and stand up under treatment much more severe. Similarly with such chassis parts as axle cases. Steel will give the *strength* but not the *rigidity* unless it is thicker than the strength requirement demands, and here too there is a vast difference between sand and die cast aluminum.

With respect to the porosity question raised by Mr. C. C. Hinkley, I would call attention to the fact that Mr. Hinkley bases his criticism on experiments made in 1906, Aluminum to-day is not the same substance as it was then. There are two ways of overcoming the porosity and the best is by die casting. The other is to do as is now done with the experimental aluminum cylinder castings, treat the interior surfaces with a sort of enamel, but once a pattern is selected and got into proper repetition shape there should be no trouble on this score.

In conclusion, I hold no special brief for aluminum and where money is no object whatever the extensive use of steel is undoubtedly desirable, but money is always an object in motor car construction so if we are to make the *average* automobile lighter and keep its price within bounds the use of light material wherever possible seems a better proposition. We can substitute aluminum for cast iron almost everywhere throughout an automobile chassis, without increasing the section, and still have strength and to spare. Design is unaffected, machining is simplified, up-keep cost is reduced, and the extra cost is almost nothing when everything is considered and balanced up.

Expansion Not a Trouble—All 1917 Cars Will Have Aluminum Pistons

By James E. Diamond

Editor, THE AUTOMOBILE—I have read, finding most interesting, Finley R. Porter's contribution to the current issue of THE AUTOMOBILE in which he takes exception to certain premises and conclusions drawn by A. Ludlow Clayden in his recent story Cutting the Weight, in which the more generous use of aluminum is advocated. In a great many ways my views are quite at variance with those held by Mr. Porter, and with exactly the same purpose influencing that gentleman to enter the discussion, I would like to point out wherein I differ with him and endeavor to show why.

Weights of Aluminum and Steel

In the first place, aluminum is not one-third lighter than steel or cast iron, but rather is only one-third its weight, that is, the ratio is not two to three, but one to three. In the second place, I think your contributor has underestimated

the strength of properly manipulated, properly alloyed aluminum. Its strength is greater than that of ordinary cast iron by 3000 or 4000 lb. For purposes of comparison let us assume its strength 20,000 lb., a low figure I am inclined to think that the steel that would be used in most places in an automobile, especially about the motor, would not have a strength of 120,000 lb., which figure is arrived at by assuming the correctness of your contributor's statement that the strength of aluminum is but one-sixth that of modern steel. While alloy steels are much stronger than this, I should judge that the strength of the steel that would be used in most places about a motor would be nearer 60,000 lb. If this is true it immediately follows that a section in aluminum may be three times as heavy, and yet not weigh more than a steel section of equal strength. The question of rigidity here enters. It is undeniable that in many locations about an automobile rigidity is of as much importance as strength. I do not believe there can be any question that in the hypothetical case just mentioned that the aluminum piece would have the greater rigidity.

The Price Question

Mr. Porter grants that "In the case of a low-priced automobile with a comparatively low range of efficiency required, the generous use of aluminum would, without doubt, result in a material gain in efficiency, both in upkeep and roadability." It would seem to me that if this is true in the case of the low priced car, it certainly must be true in the case of the higher priced one.

While the discussion can only remain an academic one, my impression is quite the reverse of Mr. Porter's, relative to the result were two designers of equal ability given free rein to design an automobile of given capacity—it being understood, of course, that each car was to be a commercial proposition, from the standpoint both of price, and of production possibilities—the one to confine himself to the use of steels, and the other free to use aluminum, cast iron, and the milder steels. I am absolutely of the opinion that the latter would produce as light, if not a lighter job, and certainly one better commercially. Further I believe the designer could go over the all steel job and improve it by the use of aluminum in certain places.

Concerning the motor proper, it is stated that the first great handicap is the vast difference in the rates of expansion between aluminum and iron, this prohibiting the employment of sleeves. Incidentally the difference is not so great, after all, being not quite two to one. However, at first glance, it might seem that the point was well taken, but careful analysis I think will show that the part that this really plays is not very significant. As having a bearing on this, let us consider the methods of inserting the sleeves. One method is to machine the sleeve, and bore out the cylinder to exactly the same size, using an arbor press to force the sleeve into place. The other method is to heat the cylinder block to as high a temperature as practicable (higher than the block would ever get in service) then pushing the sleeve into place. It would seem to me that there must be initial tension in both cases between sleeve and cylinder, and that for all practical considerations space between is non-existent, hence a perfect thermal connection between sleeve and block. Since the conductivity of iron is so much less than that of aluminum, much of the heat due to the explosion is going to be retained in the sleeve, with the inevitable result that the sleeve is going to expand. On the other hand, the cylinder wall receiving the overflow of heat from the sleeve is dissipating this heat into the surrounding water, consequently at all times remaining a great many degrees cooler than the sleeve, enough so in fact, not only to equalize the difference in expansion but even to increase the tension existing between sleeve and cylinder. The greater the range of temperatures in the motor the more favorable the conditions for this type of construction. However, after all, theory for and theory against, may be put aside since there is concrete evidence that this sleeve construction is entirely feasible. Experience has shown that the sleeves become loose at no time, remaining securely in place after long continued service.

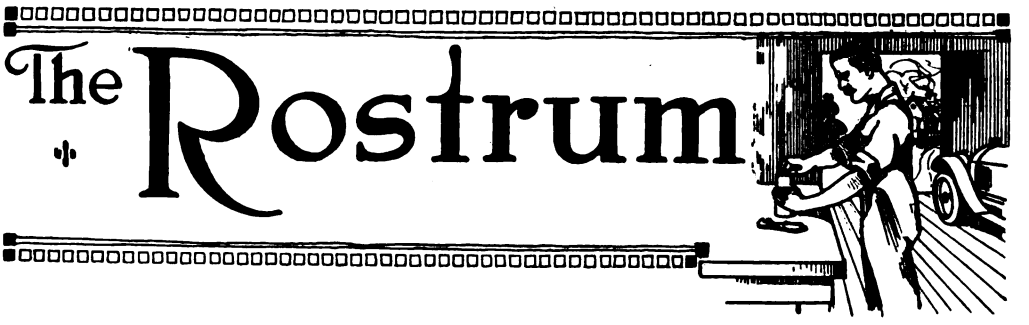
The appreciation is general that light weight is at a premium in the aeronautical motor field, and that expense is a decidedly minor consideration. In the light of this, it may perhaps be interesting to know that aeronautical motor manufacturers have taken a lively interest in the aluminum motor, and I believe that an announcement relative to an all-aluminum aviation motor will shortly be made by one of the manufacturers of the highest grade motors in this country.

Little may be added about aluminum alloy pistons. Mr. Porter has apparently not had the success with these that most others have had recently. There have been problems in connection with the aluminum piston, but these have been gradually worked out, until it looks as though aluminum alloy pistons would be standard equipment on practically all cars by 1917. The steel piston I do not believe will ever become a commercial proposition; its cost must necessarily always be high, and I have heard of disastrous experiences with this type. As a measure of the success of Lynite pistons, I may say that my company has in hand orders for approximately half a million pistons to be made by the Kotheas process.

I hope that I may be permitted a little more space to consider briefly also the case that Mr. Hinkley makes against the use of aluminum as a material for motors due to the fact that the alkaline waters prevalent in certain sections of the country caused rapid deterioration of this metal. At the time Mr. Hinkley noted this unfavorable condition, back in 1906, aluminum foundries did not know very much about aluminum, and handled it the same as brass was handled. It is doubtful whether the foundry with the, at the time, most advanced methods and practices, could have made a success of the job in question—a crankcase with the gear pump housing integral with the casting—with the alloys and methods then in use, and it is almost if not a certainty that any other foundry would have made a failure of the attempt. I believe that every engineer appreciates the wonderful strides made in the art of casting aluminum, for science it is. The job in question would not offer any particular difficulty to-day. In fact, castings are being made to-day that a year since we should not have undertaken. This question of alkaline waters was considered when the first aluminum motors were built, and to answer which several of these first motors were put in cars and shipped to the alkali regions for test. The first of these have been running for 2 years, and are apparently as good as the day the motors were built. I have yet to see the first aluminum intake manifold returned on account of porosity due to the action of alkaline waters.—JAMES E. DIAMOND, Engineer, Aluminum Castings Co.

Automobiles Raise Texas Land Values

AUSTIN, TEX., Aug. 13—Bankers and business men generally who have been taking an inventory of land values in different parts of Texas recently claim that the automobile is more largely responsible than any other one factor for the increase in the prices of farm and ranch properties during the last few years. The improved mode of transportation has brought the towns and the country into close touch with each other and has made living in the rural districts much more worth while than formerly. In some localities, it is estimated that the increase of land values, due to the automobile, averages more than $15 per acre. The general average increase of values, taking the State as a whole and embracing about 168,000,000 acres is placed at $5 per acre, or a total increase approximately of $840,000,000. This increase is exclusive of that which is credited to ordinary growth.



Must Not Stretch Perfection Piston Rings

EDITOR THE AUTOMOBILE:—I have recently put a 4-in. Perfection piston ring in my Buick 31, 1913 model. The car had been run about 800 miles. I used five of these small rings to each cylinder, using the old ones for the other two grooves. The compression seems to be greater than it was before I put these new rings in. The mechanician that put these rings in for me said that they would not damage my cylinders, but I have had several mechanicians since then to tell me that they would, and that after a little while I would have to buy new cylinders. These are soft steel rings. Would you advise me to have these rings removed and new ones put in or let them stay in the car?

Pine Bluff, Ark. E. W. H.

—It has been the experience of many patent ring manufacturers that their rings are apt to cut the cylinders. This is not necessarily true, as in most cases where these rings are applied, they do not cut the cylinders. As a matter of course, any article such as a piston ring is subject to the usage which it is put through by the mechanicians of the garages and in some cases these piston rings are put on without a careful reading of the instructions and contrary to the method in which they are supposed to be applied. The Perfection piston ring as manufactured by the Automobile Construction & Engineering Co., is supposed to be threaded over the piston instead of stretched over it, and if they are put on in this way, they will give good results. Of course if the ring grooves are too wide, and three or four of the patented sections are put in each groove, they will not give the best results and it may be said that neither will any other iron ring or patented device. If the piston rings are stretched in putting them on, they are bent out of shape and will practically never wear in. In that case, there will be more friction and hence more wear than is necessary, but even then, they should not cut the cylinder, and in fact it is stated by piston ring manufacturers that when a cylinder is run dry, it is the piston which will cut the cylinder and not the ring.

The rings can be kept in the cylinders, provided they have never been stretched. If they have not it can readily be noted when the cylinders are off as the rings will be worn evenly all around and where the openings occur at the split, the distance between the ends will be no greater than 3/16 in. If the opening is as much as 5/16-in., ⅜ or more, it is an indication that they have been stretched and should be renewed.

Stalled Motor Hard to Start

Editor THE AUTOMOBILE:—When I stop my engine with the switch I have no trouble in starting it, but when I stall the engine or kill it I have to crank and spin it around a great deal before I can get it started again. What can be the trouble and how can I remedy it?

Westlake, La. P. W. M.

—The fact that your motor acts in the way you describe should not disturb you, but, on the other hand, is an indication that the carbureter is adjusted excellently for the purpose of securing maximum efficiency. You could e change the situation and make the motor easy to start stalling by giving the carbureter an adjustment to pr a richer mixture.

The reason that the motor acts as it does is because you stop the motor on the switch it has chance to r one or two times and thus draw in a fresh charge of gas into the combustion chambers. When the motor is stall killed it is stopped instantly with the result that the remaining in the cylinders is dead and does not posses power to explode. Should the carbureter be so adjusted a much richer mixture would be supplied, the influen the inert gases in the cylinder would be overcome an motor would fire immediately whether it had been st from stalling or for any other reason.

This condition being true shows that the carbureter be adjusted for as fine a mixture as is possible for good ning. It is assumed that the motor acts well while ru since you do not state that any other condition exist however, you notice that the motor is apt to sputter and back when the throttle is opened quickly, it would b to give a slightly richer adjustment on the carbureter. less there is some such indication that the adjustment correct it would be better for you to leave the motor is and exercise care in driving so that you will neve the motor. A driver who is accustomed to his car rar ever, stalls the engine as he knows exactly the amo throttle opening required for each condition and stall the result of not giving sufficient throttle opening f conditions under which the car is being operated.

Alcohol Removes Carbon Deposit

Editor THE AUTOMOBILE:—Is alcohol a good carb mover. If so, how would you use it and how much one use?

Lorain, Ohio. V

—Alcohol is a good carbon remover and for the p can be used in its denatured state which is more eco and just as good. The quantity to use for a cylinder time would be equivalent to five or six tablespoonfuls. the best way of applying it is in a sort of squirt gu posed of a rubber bulb in which there is a long, thin which can be directed against the walls of the com chamber and down on the piston head through a spa opening. This can be readily made by yourself and have such a bend in it that it will be easy to insert opening for the spark plug and at the same time wi shaped that the stream of liquid can be directed agai of the likely spots for carbon.

Carbon deposits are apt to accumulate in pock recesses of the cylinders and also on the piston heads times on motors which have been allowed to go for time without having the carbon removed, it is deposi conical shaped mass on the head of the piston and ve the tip of the cone becomes incandescent and serves

ignite the incoming charge, thus giving rise to the so-called carbon knock. Other places for carbon cones to form are in the top of the combustion chamber and in the recesses above the valve ports. The ports themselves which are swept by the incoming and outgoing gases are most often quite free from any but a soft deposit.

Some people in using denatured alcohol mix it half-and-half with kerosene. The two together form a solvent of the resinous material which acts as a binder for the particles of carbon which in themselves are incapable of cohesion. When this binding material is dissolved, the carbon forms into its natural flakes or scales and can be readily removed. Very often after the carbon has been thoroughly loosened it is necessary to blow out the cylinders so as to remove the carbon flakes and prevent them from again solidifying and becoming a hard carbon deposit. It has been the practice of many to clean one cylinder at a time and then run the motor afterwards with the petcock of the clean cylinder open. This blows out the flakes of carbon which have accumulated, due to the action of the solvent upon the resinous binding material and leaves the cylinder clean.

Another method which has been used successfully in introducing either denatured alcohol or kerosene into the cylinders of a motor for removing the carbon is to feed it into the air intake of the carbureter while the motor is running. The motor will have to be running at quite high speed when this is done, as it will stall as soon as it starts to sputter when the rich kerosene mixture begins to be drawn in.

The time when cleaning a cylinder with alcohol has its best effects is immediately after the motor has come in from a trip and is still warm. At this time a portion of the liquid injected into the cylinders, is vaporized and the vapor of kerosene or denatured alcohol is an effective solvent of the carbon binding material. The best way of carrying through the work would be to lift the hood as soon as the motor comes in from a run and then turn the crank until two of the cylinders are on top center with all valves closed. When this is done these two cylinders should be treated with the liquid which is squirted in through the improvised gun previously described. The motor is then let stand for the night with the alcohol in the combustion chambers of the two cylinders treated. The two remaining cylinders if it is a four, are treated in the same way at the next opportunity.

Some people make a practice of injecting about a teaspoonful of kerosene or denatured alcohol into the priming cup after each trip. When this is done, the necessity for having the carbon removed from the cylinders is postponed for a considerable time as the soft deposit is dissolved each day.

Noise in Gearbox Due to Wear

Editor THE AUTOMOBILE:—Where can I get photographs of all the parts of the Jackson 35 transmission, such as gearbox and shafts? We have a Jackson car which is very noisy in the transmission. Is there any way to get rid of it?

Clyde, Mo. J. E. B.

—You can secure from the Jackson Automobile Co., Jackson, Mich., an instruction book of model 35 Jackson which contains on page 32 a plate showing the complete layout of the gearset assembly. Opposite this on page 33 there is a complete list of parts together with their prices. As THE AUTOMOBILE has no record of any other place to secure a complete layout of photographs of all these parts it would probably be most desirable for you to secure this in the manner described as at the same time the price list will give you the cost of duplicating any parts necessary.

The fact that the gearset is noisy shows that some parts must be worn, probably the gears, as they are the parts of the gearset which are continuously in service and would consequently stand the most chance of becoming worn and noisy. The way possible to proceed is to take the gearbox down and examine all the parts. In ordering the repair parts it is necessary that you give the serial number of the car, which you will find on the small nameplate on the dash.

Inverse Ratio Raises Tooth Pressure

Editor THE AUTOMOBILE:—Will you kindly explain in detail, why and how harm will come by using the motor as a brake on hills? From conversations I have heard held by old engineers and mechanics, they fail to see why harm can come to the gear through inverse ratio as you answered H. H. M.'s inquiry of Johnstown, Pa., in the Rostrum Department of THE AUTOMOBILE for May 13.

Kindly explain this fully and if possible, give problems with illustrations.

Ft. Barry, Cal. A. W. P.

—The practice of using the motor for a brake puts more tooth pressure between the gears than occurs when ordinarily driving the car. If you were to turn by hand a train of gears which instead of having a reduction of 4 to 1 had on the contrary a stepped-up ratio of 1 to 4, you would note the difference in pressure required to turn the gears. It takes exactly the same amount of power applied over the same length of time to bring a car to rest as it does to bring it up to a given speed. That is, the amount of work done is the same. So, it is true to state that if the stop is made in the same distance, the gear wheels are transmitting the same amount of power. Where the factor of increased tooth pressure enters, is, that instead of having a reduction to work

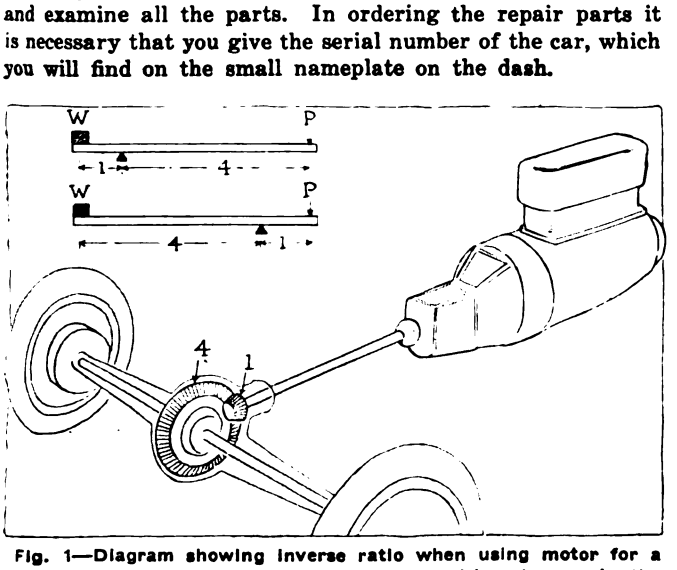


Fig. 1—Diagram showing inverse ratio when using motor for a brake. The small chart shows an analogy with a lever. In the upper example, the pressure on the fulcrum is only 1¼ W, whereas in the lower case where the reduction is 1 to 4, the pressure on the fulcrum is 5 W

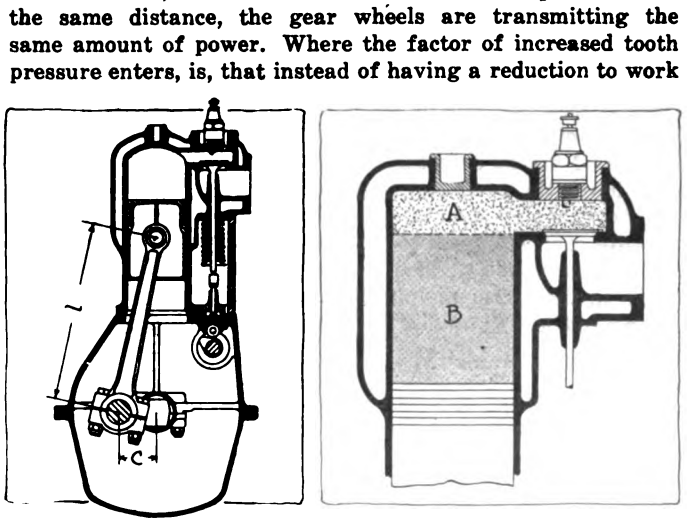


Fig. 2—Diagram showing the determination of the connecting-rod crank ratio and the compression ratio. The left diagram shows the connecting-rod length, 1; and the crank length C. The connecting-rod crank ratio is 1 over C and the diagram to the right A is the compression volume and B the displacement. The compression ratio is A — B ÷ A

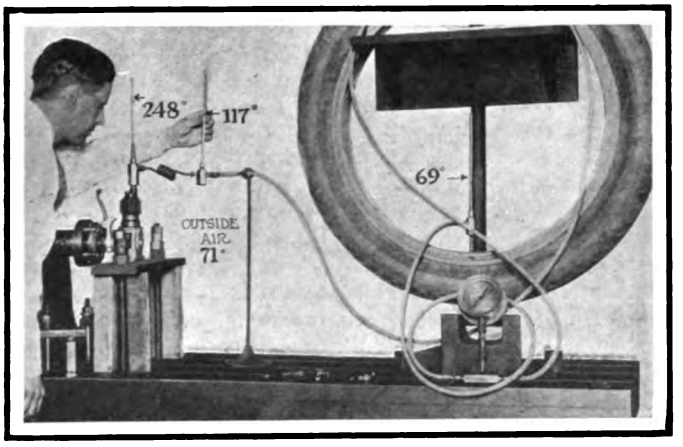


Fig. 3—Illustration showing the arrangement of thermometer used in connection with the test on Stewart tire pump for temperature rise

with of 4 to 1, as in driving a car the ratio becomes 1 to 4 in stopping it. Thus, the proposition becomes similar in many respects to two inclined planes, as shown in the diagram, Fig. 1. If you had to drive a plane which had a slope of 1 to 4 by pressing vertically downwards upon it, it would not move nearly as readily as one which had a slope of from 4 to 1, and, while this analogy is not accurate, it expresses the condition which occurs when the teeth of the small bevel gear sustain the pressure that they do when the drive comes through them in an inverse direction. With a worm and gear this analogy is quite accurate.

Determining Angle of V-Motors

Editor THE AUTOMOBILE—1—Why do they make eight-cylinder engines of the V type 90 deg. apart and twelve-cylinders 60 deg.?

2—How does the Delco motor generator operate?

3—What is meant by connecting-rod to crank ratio?

4—How do you figure compression ratio?

H. W. C.

Albany, N. Y.

—In the eight-cylinder motor there are four explosions to each revolution; dividing 360 deg., or a complete revolution, by four gives 90 deg., the necessary angle between the cylinder blocks. With a twelve-cylinder motor, there are six explosions to a revolution, and dividing 360 by six, gives 60 deg. as the necessary angle.

2—The motor generator is so wound that when being driven by the motor it acts as a generator and when receiving current from the battery, it acts as a motor. With the battery charged and the switch closed, current flows through the windings of the motor generator, causing the armature to rotate and act as an electric motor. When the gasoline engine drives the generator it gives out current which is utilized for charging the storage battery.

3—By connecting-rod to crank-ratio is meant the length of the connecting-rod divided by the length of the crank. As shown in the accompanying diagram, Fig. 2, if L is the connecting-rod length, and C the length of the crank, the connecting-rod to crank ratio R equals $\frac{L}{C}$.

4—Compression ratio is the ration between the entire volume of the cylinder and the volume of the compression chamber. In other words, it is the piston displacement plus the compression volume, divided by the compression volume.

Three Thermometers on Stewart Test

Editor THE AUTOMOBILE:—I notice in your issue of Aug. 12, on page 303, that you mention a test on a Stewart tire pump which brings out the fact that the air entering the tire at a line pressure of 101 lb. is 69 deg. or 2 deg. cooler than that of the atmosphere. Will you kindly tell me how th thermometers were mounted to secure the tabulated result in both the power tire pump and the foot pump?

New York City. S. E. J.

—The tests you mention were made by inflating a 37 by in. tire. In place of the regular air pressure gage on th hose connection, a large dial Bourdon gage was inserted, s as to give the most accurate reading of the pressure. Th temperature of the air was taken at three points simultane ously, as shown in Fig. 3. One thermometer was placed i the air passage where the air left the tire pump *A*. Anothe thermometer was placed between the cooling coil in th Stewart tire pump and the beginning of the hose connectio at *B* and the third thermometer was placed at the tire valv where the air enters the tire at *C*.

The arrangements made for holding the tire and measu ing the pressure with the foot pump are shown in Fig. 5.

Waterjackets on Speedwell-Mead Motors

Editor THE AUTOMOBILE:—I note in your issue of Aug. on page 285 questions regarding the jacketing of the Mea rotary valve motor in the Speedwell cars. Would you kind inform me if the jacket spaces as shown by the illustratio on page 285 are in proportion?

New York City. B. H. S.

—The waterjacket spaces as shown in the diagram a about proportional. The diagram having been made fro actual sections of the cylinders. For your benefit, howev Fig. 4 shows engravings made from photographs of cu away cylinder blocks.

Probable Break in Fine Winding

Editor THE AUTOMOBILE:—I have a 1913 Cadillac, a cannot start the car or run the engine on the battery ignitio I have checked over all connections and tested the wiring, of which seems to be O. K. I have also changed the batte connections on the induction coil to the coil of the generat but without success.

The battery button on the switch has the same effect the relay as the starting button, but a much weaker vibrat is had. As I am starting and running on the generator present, I have no trouble, but would appreciate what s gestions you may have to offer in this regard.

Minneapolis, Minn. G. P. C

—From what you say it would seem that the difficulty only on the battery side and the nature of the trouble is s that although you are unable to run on the battery ignit the shower spark is still obtained by pressing the but marked B.

It would seem that this difficulty is in the ignition re which is equipped with two windings—one a course winc and the other a fine winding. The fine winding is so nected around the contact points of the ignition relay, whenever the circuit through it is closed, the current flow through it is sufficient to magnetize the core of the relay to enable the little armature at the top of the relay to be down against the pole piece of the magnet until the cir is opened by the breaker and distributer. The coarse wind above mentioned on this relay are connected in series with dry cells and the contact point of the relay and the spar obtained by breaking the circuit through the coarse winc

When, therefore, the circuit through the fine windin closed, only a single spark is obtained at the spark plug the reason that when this circuit is closed at the bre points in this distributer, the armature on the little rel drawn down, opening the points on the relay which ar series with the coarse winding, thus breaking the ci through the coarse winding and giving a single spark a plugs.

Inasmuch, however, as the fine winding is also closed little armature is unable to go back to its original po

and close the contact points. It is therefore compelled to remain down until the circuit is opened through the distributer. When, however, the starting button on the switch is depressed, the circuit through the fine winding on this little relay is opened. Under these conditions, therefore, when the corcuit through the coarse winding is closed through the breaker points in the distributer, the little armature at the top of the relay is drawn down in the usual way, breaking the circuit through the coarse winding at the relay contacts. The minute these contacts at the relay are broken the magnetisim in the coil dies away; the relay returns to its original position, the contacts are again closed; the pole piece again magnetized and the relay again drawn down, breaking the circuit again through the coarse winding at the relay point. As the fine winding is open there is no means of holding the little armature down firmly against the pole piece. Hence it vibrates very rapidly, making and breaking the circuit through the coarse winding at a very high rate, thus giving a shower of sparks at the spark plug.

From the information you give, it would seem that there is either an opening in the fine winding or that the relay is improperly adjusted. There are two windings upon the magnet, one being comparatively coarse and the other fine, as described. To quote from the Cadillac instruction book covering this point, these wires are so connected that the current ceases to flow through the coarse wire when the contact is broken. The fine wire connected around the contact is so arranged as to hold the armature after the current is broken through the coarse wire coil. If this second coil were not affected the contacts would vibrate giving a shower of sparks at the plug instead of a single spark. This is what is done in starting and it is done at this time only because it would be wasteful of current to continue it under running conditions.

If the armature vibrates rapidly when the *B* button on the ignition switch is depressed, the holding coil circuit is open. Test the circuit and in emergency connect the two terminals closest together on the relay with a wire. This will stop trouble if the break is outside the relay. If the armature vibrates freely, it indicates either weak batteries or dirt between either the relay or timer contact.

Again quoting from the instruction book covering this point, the following suggestions are made:

"Loose connections, grounded wire and weak batteries may cause improper working of the relay through no fault of the device itself. The only point of adjustment in the relay is at the pole piece. This regulates the distance between the armature and the magnet pole and a gap between the contacts. Adjustment is made by turning the notched head clockwise as one looks down upon it to increase the gap between contacts and vice versa. Normally this adjustment should be such that the distance between contacts when armature is pressed down is about equal to the thickness of a sheet of paper. A simple way in which this adjustment may be made is to turn the notched head of the adjusting screw in a counterclockwise direction until the motor stops firing. Then turn it four or five notches in the opposite direction. Under no condition should the adjusting screw be turned very far in either direction. If particles of dirt get between the armature and pole piece at the point they may be removed by slipping a piece of smooth paper between the parts mentioned, pressing down slightly upon the armature and pulling out the paper."

It is therefore suggested that you make sure that this fine winding in the relay is not open; that the relay itself is correctly adjusted; that all the dirt is removed; that the contact points are in good condition, that all connections are tight and that the dry cells themselves have not become too weak and need replacing. The wiring diagrams of this car are given fully in the Cadillac 1913 instruction book which was provided with the car.

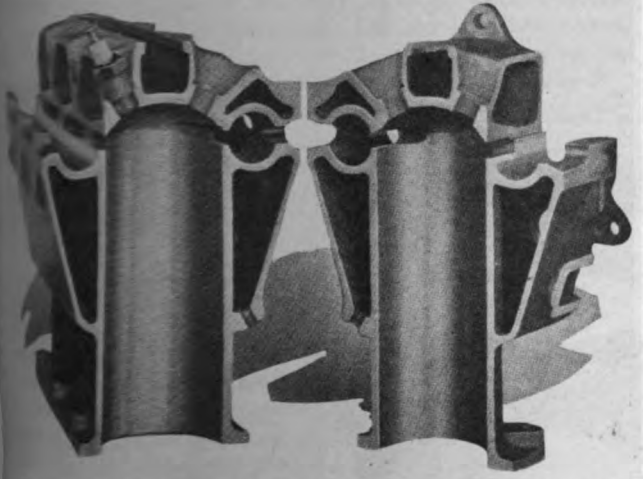


Fig. 4—Arrangement of cored passages on the Speedwell Meade motors which were described in the Rostrum issue of THE AUTOMOBILE for Aug. 12.

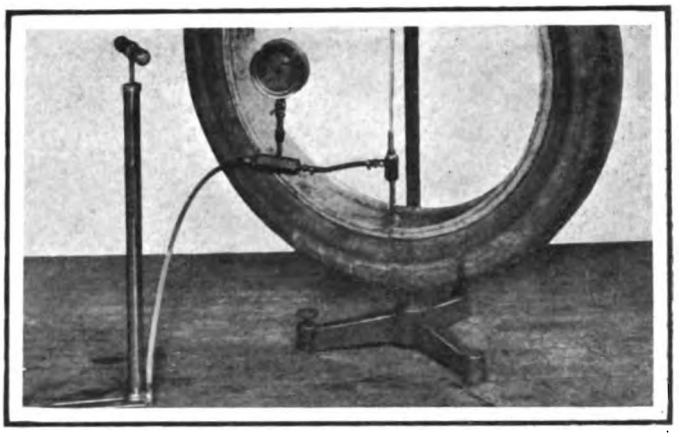


Fig. 5.—Position of thermometer and pressure gage used in connection with tests showing temperature rise with ordinary foot tire pump

Simplex Won Three Successive Races

Editor THE AUTOMOBILE:—Did the Simplex win three 24-hr. road races in succession?

Why is the Simplex not being entered in the 500-mile races now prevailing?

Did the Simplex ever make 100 m.p.h. according to record?

R. L. R.

New Haven, Conn.

—The Simplex 50-hp. stock chassis won the 24-hr. races at Brighton Beach in 1909, 1910 and 1911. These were three races in succession.

2—The Simplex is not being entered in 500-mile races because the Simplex company is not a manufacturer of special racing cars and the 50-hp. motor made by this concern has a cubic inch displacement of 597. As the limit for cubic inch displacement in these races is now 300 it is impossible to enter the cars in the races.

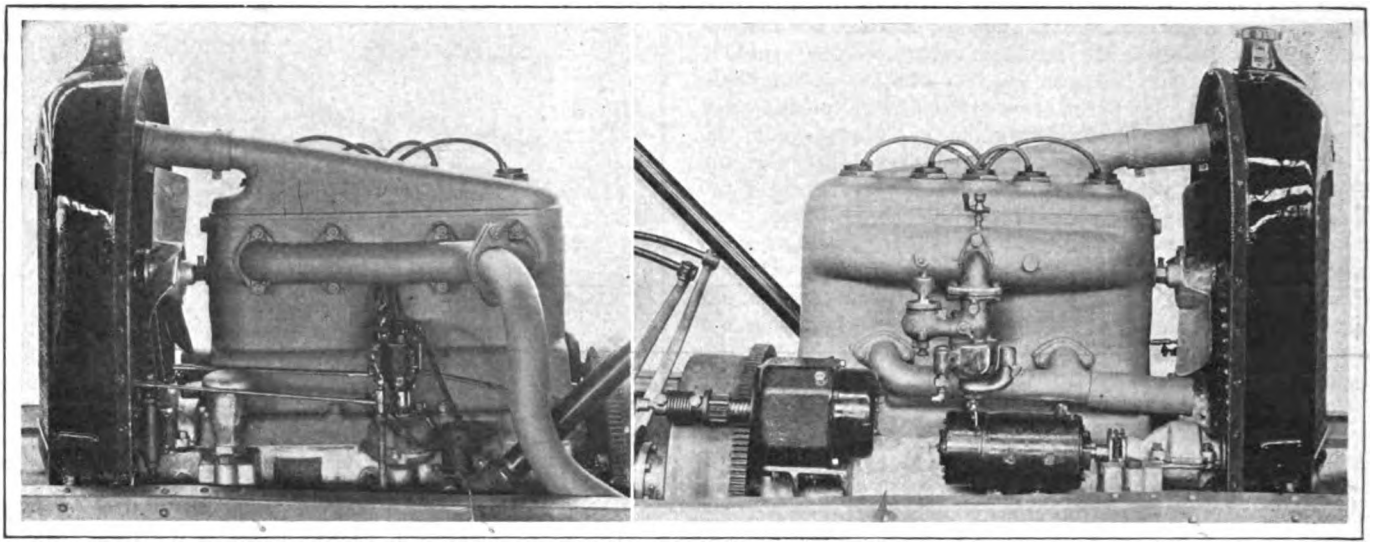
3—The Simplex car has made 100 m.p.h. according to several records.

Compression Pressure Is 70 Pounds

Editor THE AUTOMOBILE:—I have a 1912 four-cylinder, Isotta-Fraschini, the bore being 3⅞-in. and the stroke 5½-in. It is the O. M. type of car No. 1616. What compression should the motor have? Who has the agency for this car?

Wilmerding, Pa. D. G.

—The compression pressure of this motor should be about 70 lb. per sq. in. The agency for this car is the Isotta-Fraschini Motor Co., New York City.



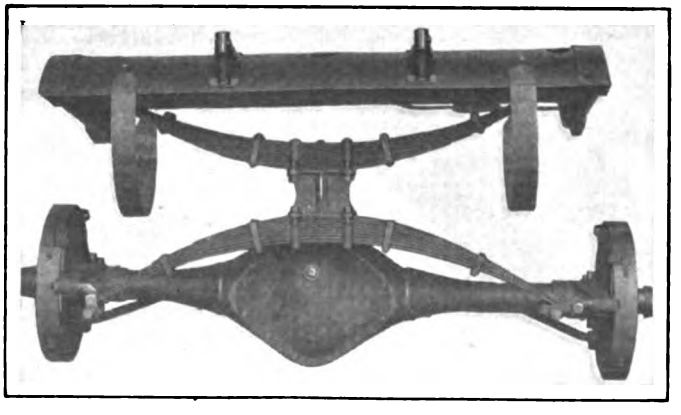
Both sides of the Moline-Knight 40 motor showing how block casting and cored passages have resulted in clean exterior

Moline-Knight Featured By Simplicity

Model 40 at $1,475 Has Cored Manifolds, Block Casting, Central Spark Plugs and Many New Chassis Features Including Novel Type of Rear Suspension

PRACTICALLY all the features which were successfully used in the Moline-Knight 50 motor have been retained in the new one, which is listed under the name of model 40, at $1,475, but in addition a number of unusual features which have all tended toward simplified design have been introduced. The intake manifold is integral with the cylinder block, the object being to have it surrounded by a complete waterjacket space to insure the vaporization of the heavy gasoline now on the market. The cylinder heads are covered by a removable plate over the cylinders providing a greater amount of waterjacketing space over the top of the cylinders than is generally employed. The motor has aluminum alloy pistons, the electric wiring is brought up through the block casting from the distributer to the spark plugs and in addition incorporates a valuable detail improvement in the drive of the fan and the manner in which it is adjusted.

The results obtained by the new motor are shown in the brake horsepower curve herewith. It will be noted that the peak of the curve is at approximately 2200 r.p.m. and the curve is practically a straight line from 700 to 1350 r.p.m., at which point 34 hp. is developed. The port areas of the motor which have helped toward securing the power curve shown are 1.42 sq. in. for the intake and 1.62 in. for the exhaust. The valve timing shows the characteristics of a high-speed motor, the exhaust opening 50 deg. before lower center and closing 11 deg. past upper center. The intake opens at 18 deg. past upper center and closes at 50 deg. past lower center. The throw of the eccentric for the sleeve is 1 in.



New rear suspension adopted by the Moline company

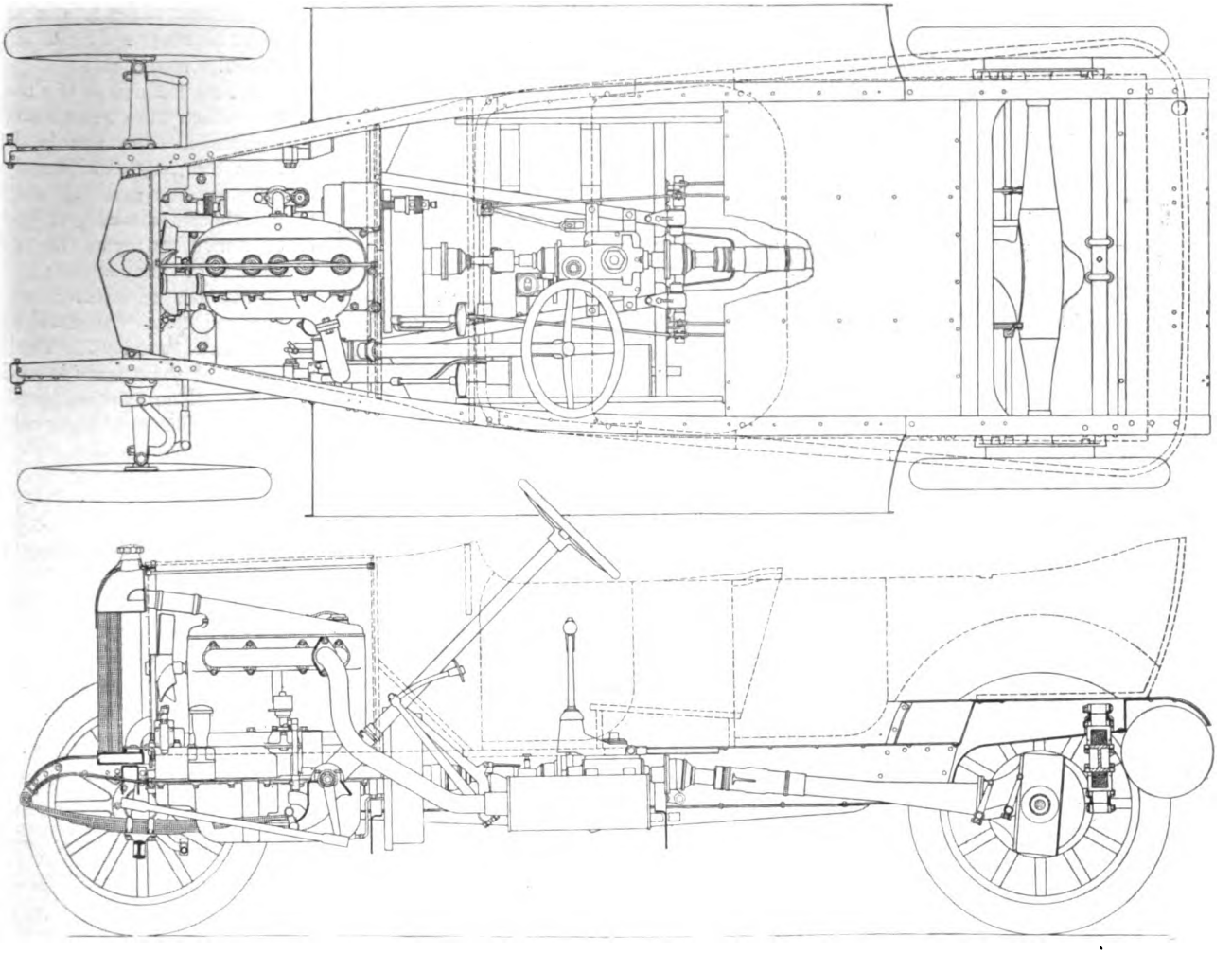
Referring to the sectional view of the motor, it will be noted that the head of the cylinder is a cone-shaped cap carrying the spark plug in its center. This sets into the cylinder to a depth of several inches. An example of the care with which the water system has been designed on this car is shown here, the space between the center and sides of the cap being in the water circuit so that the upper ends of the two reciprocating sleeves have water circulation on both sides of them at A and B. The cylinder cover plate forms the upper water manifold through which the water passes to the radiator. The lower connection from the radiator to the motor has two branches, one leading to the forward and the other to the rear end of the cylinder block, thus insuring uniform distribution.

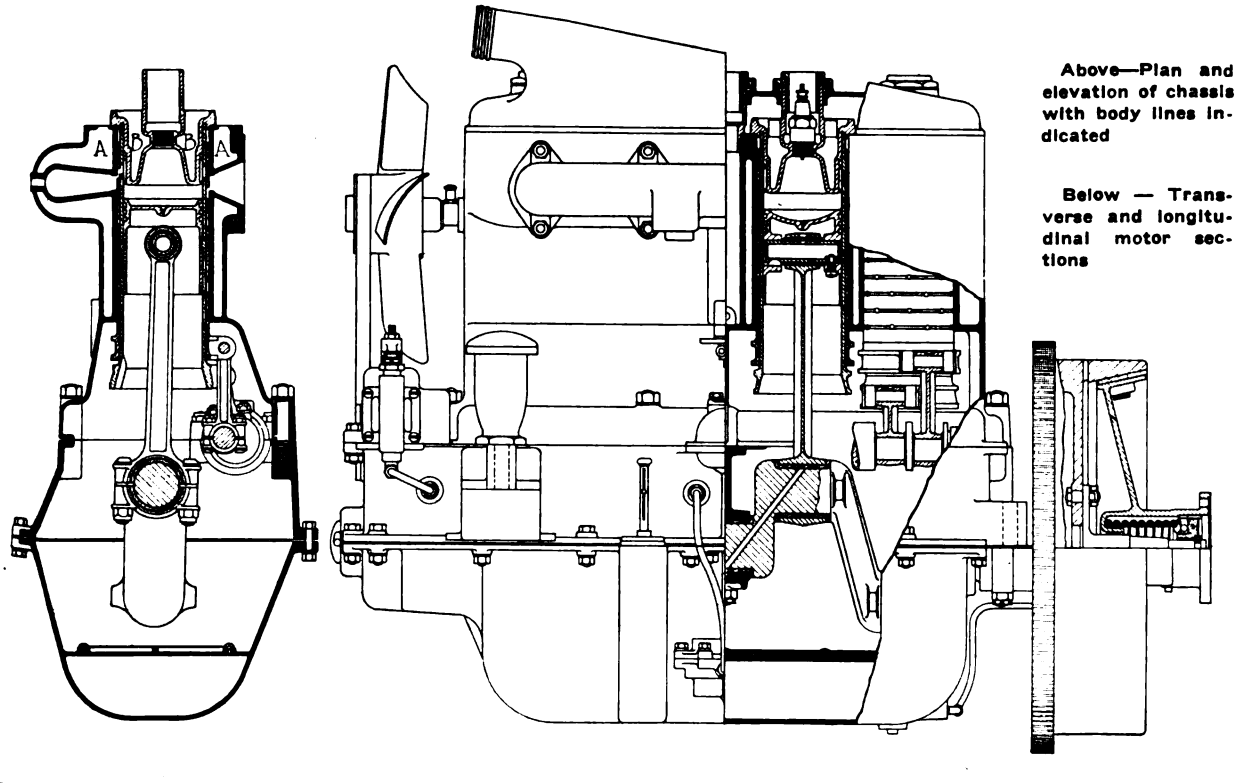
Briefly, the new car has a 3½ by 5 four-cylinder block Knight motor, two-unit electric lighting and start system, thermo-syphon cooling, 118-inch wheelbase, cone clutch, three-speed gearbox with center control, spiral bevel drive and 34 by 4-inch tires.

A change is in the use of an I-beam connecting-rod in place of the tubular section used on the 50. The oiling system has been redesigned in some details and in connection with this the vertical shaft which drives the oil pump carries, at its upper extremity, the distributer for the Connecticut ignition system.

Other than in the use of aluminum pistons which were used in the 50, nothing radical has been done in the way of material. The cylinders are a dense gray casting iron and the cylinder heads also

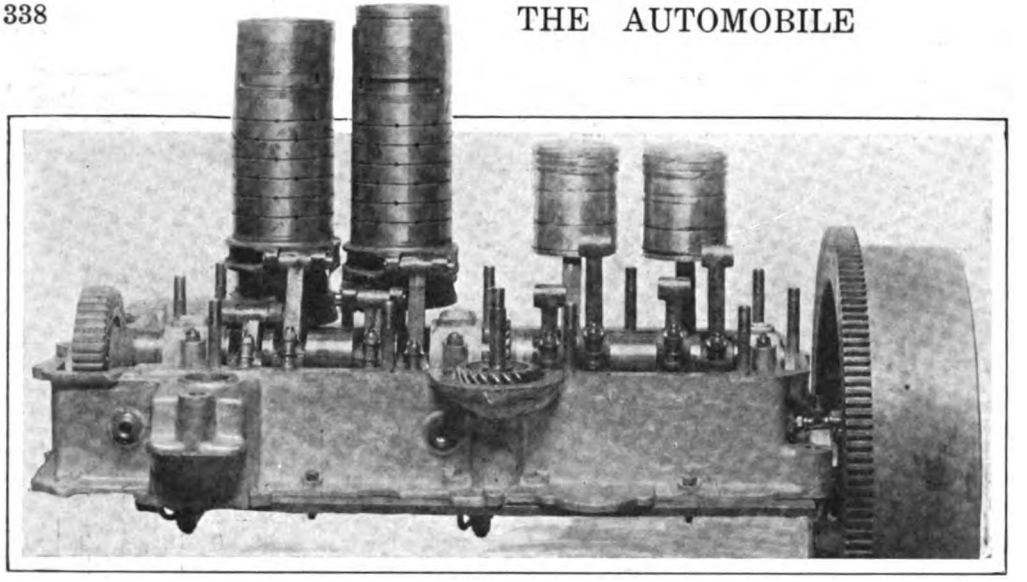
Constructional Views of the Moline-Knight 40





Above—Plan and elevation of chassis with body lines indicated

Below — Transverse and longitudinal motor sections



Motor cylinder block removed showing sleeves and crankshaft units

a gray iron mixture. The sleeves are also cast iron and machined within limits to render the sleeves interchangeable. The wristpins are tubular and case-hardened, transmitting the drive to the drop-forged double-heat-treated connecting rods. The crankshafts are also drop-forged of 0.50 carbon steel and go through two heat treatments.

Eccentric Shaft Drive by Silent Chain

The eccentric shaft is driven from the crankshaft by a silent chain, the centers on this drive being kept very short. In order to keep a proper tension on the chain and proper valve timing the sprocket on the eccentric shaft is provided with a Vernier adjustment. The material used in the eccentric shaft is open-hearth 0.50 carbon steel. The running compression of the motor is 75 lb. per sq. in.

In dimensions the motor shows no departures from ordinary practice, the connecting-rods being 10¾ in. in length with 2½-in. bearings at the big end. The diameter of the crankshaft is 2 in. and the piston length is 1.21 times the bore or 4¼ in. The bearings are bronze-backed nickel-babbitt. The clearance allowed between the sleeves and between the sleeves and cylinder varies between 0.001 and 0.0015 in. There are three piston rings 3/16 in. in width and they are all of the eccentric type.

Pressure Lubrication System

The pressure system of lubrication is used. A gear pump driven from the eccentric by means of a spiral gear takes oil from the oil sump in the lower half of the crankcase and pumps it into a supply pipe running the entire length of the case. From this point leads are taken to each of the three main bearings. Oil is carried to the crankpin bearings through leads drilled in the crankshaft arms. These holes are drilled from the crankpins to the main bearings and register at each revolution with the oil leads to the main bearings. The oil pressure is controlled by means of an oil by-pass valve connected directly to the throttle thus opening or closing the throttle which automatically increases or decreases the oil pressure to the bearings. The oil pressure varies from idling to full open throttle from 5 to 40 lb. The sleeves and pistons are oiled from the spray of oil from the connecting-rod and the oil by-pass is so placed that the surplus oil not needed for the lubrication of the motor flows to the eccentric shaft and generator chains. The oil draining from all parts is filtered through a fine gauze over the oil sump, removing all particles of carbon and residue coming from the motor, or any foreign substances that might be in the oil before it is returned to the oil sump.

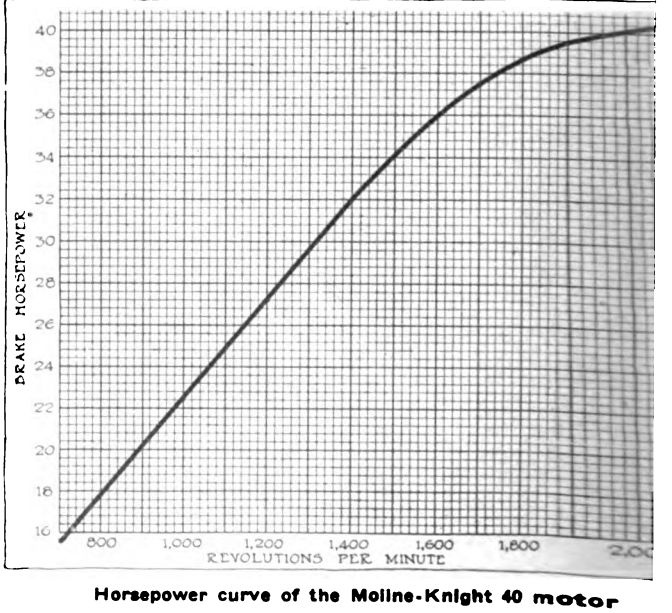
The electric system of the car consists of a Connecticut ignition outfit with a Wagner generator and an Auto-Lite starting motor. The gasolin feed is by the vacuum systen with the gasoline tank on th rear of the chassis where it i accessible behind the body The carbureter used is th Schebler model R.

A new feature is the metho by which the fan belt i tightened. The fan is drive from the generator shaft by split sheave and if the fa belt becomes loose, it can b tightened by tightening a nu ahead of the sheave. Th brings the two halves of th sheave closer together ar tightens the belt. The nu ahead of the sheave is secur in any given position by a st lock washer and when the a justment is made can be secured by attaching this.

The clutch used in connection with the new car is a co ventional leather-faced cone design with cork inserts. T clutch is aluminum and is connected with the gearbox two universal joints. The gearbox is located amidships. T gearset is a compact design mounted on annular ball bea ings and plain bearings with the shifter lever centered rectly on the cover plate. The gears are 3.5 per cent nic steel and the distance between the bearings on the ma shaft of the gearset is 5½ in. The face width of the ge is 0.625 in.

Inclosed Propeller Shaft

The drive is taken through a high-carbon steel shaft 1.3 in. in diameter to the spiral-bevel rear axle which is hou within a pressed steel cover. A seamless tube is used house the propeller shaft and is bolted to the differential c rier. The propeller housing is kept in alignment by st rods and the axle housing is practically relieved of stra as with the new spring suspension the support is brou closer to the wheels than is generally the case. The driv spiral bevel gears are of nickel steel and the axle shafts also nickel steel 1¼ in. in diameter. The driving pinion is ried by a double row bearing behind the pinion and a si row bearing ahead of the pinion, thus assuring perfect m ing of the spiral bevel gears. All the other bearings in axle have Hyatt rollers. The assembly of this part of

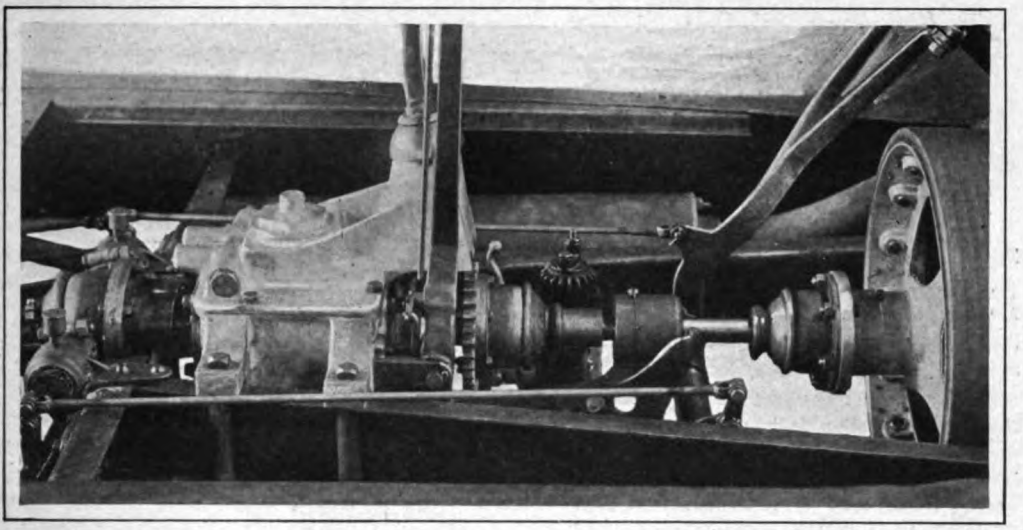


Horsepower curve of the Moline-Knight 40 motor

car is very simple as the axle shaft can be removed on removing a collar and then the pinion and differential assembly can be disassembled.

Double Cross Spring

Perhaps the most radical change about the entire car is in the spring suspension. As shown by the accompanying illustration, the spring is comprised of two independent cross members, which is entirely unconventional. The assembly is made up of two semi-elliptic springs, 42 in. in length, bolted together in the center by means of a special fitting and clips. This makes a double semi-elliptic cross-member running parallel with the rear axle. One end of the upper spring shackles to the frame while the other is attached to the frame but is stationary. The lower spring is fastened in the same manner except that the shackles are on the brake drum. It is stated that one of the results of this spring suspension is to avoid side sway. It is also claimed to be lighter than the conventional method of suspension.



Clutch, gearset and universal driving members in the Moline-Knight model 40

Another development is in the frame construction which has side members 7 in. in depth. The rear part of the frame is stiffened by a pressed steel brace which is formed to go over the gasoline tank and besides being a stiffening member is also a protection to the tank. Another member which absorbs wracking strains is the tonneau floor which is composed of a sheet of pressed steel. Additional strength is gained by the subframe on which the gearset is suspended. The running board suspension is not riveted to the frame in the usual manner by brackets, but instead, the running board itself is hot-riveted directly to the frame. The two ends of the running board curve upward and bolt firmly to the fenders giving a complete frame assembly of great strength, due to its unit construction.

Wire Wheels $80 Extra

Two sets of brakes are on the rear wheels. They have 14-in. drums with face widths of 2½ in. The wheel equipment consists of four wood wheels and an extra rim with wire wheels optional for $80 per set. The fenders are crowned and the finish consists of twenty coats of paint and varnish. The body is a sectional design made in three units, consisting of the cowl, front seats and tonneau. This is done to guard against squeaking and also if desired, the tonneau can be removed and an open body substituted for transporting merchandise.

French Car Owners Must Pay Taxes

PARIS, Aug. 7—French automobile owners are eligible for the payment of all motor taxes, notwithstanding the war. In the whole of France there are restrictions on motoring; in many districts it is forbidden to use a car; in the parts of France farthest removed from the battle zone it is necessary to have a pass renewable fortnightly. Hundreds of cars are lying idle owing to the absence of their owners at the war. In all these cases taxes have to be paid. The claim has been put forward that where permission to use a car cannot be granted, or where the absence of the owner has made the use of the car impossible, taxes should not be exacted. This claim, however, is not admitted. Ownership of the car entails taxation. As the average automobile tax in France is $30 to $35, the matter is of some importance to car owners.

Same Situation in Switzerland

The same situation has arisen in Switzerland, where for the last 5 months of 1914 private automobile traffic was forbidden. In the canton of Geneva five-twelfths of the taxes have been remitted, thus owners do not pay for the period during which they were not allowed to use their cars. In other cantons the taxes are maintained for various reasons. In several cases the tax is so low, being about $4 a year, that the authorities consider it is not necessary to make a reduction. In other cases it is stated that the circumstances are exceptional and automobile owners must take their share of supporting the State. When automobiles are requisitioned temporarily for military service they are not taxed during that period. In France, if automobiles are taken into the army for a limited period and then returned to their original owners, they are taxed as usual. Thus, no matter what his military status, the car owner must pay for the privilege.

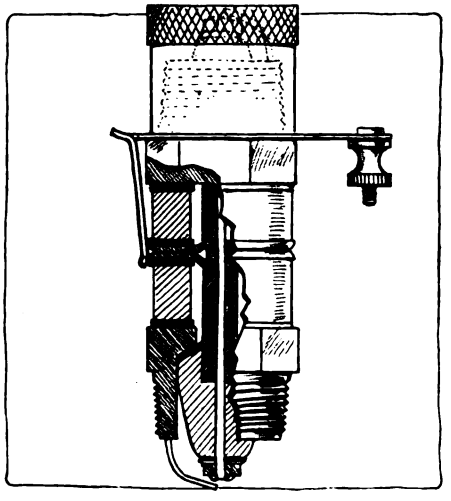
A Three-Passenger Lexington-Howard

Novel body recently brought out by the Lexington-Howard Co., Connorsville, Ind.

ACCESSORIES

Double-End Spark Plug

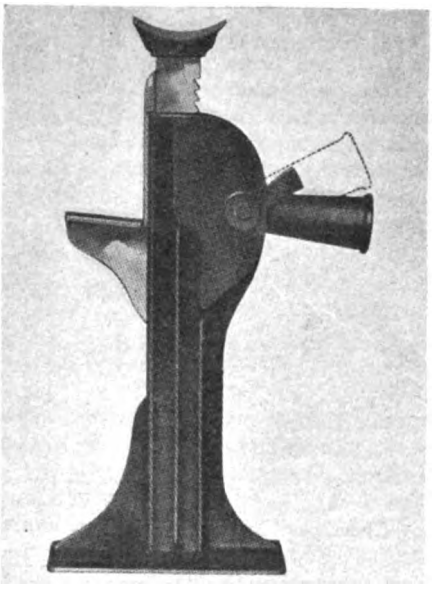
BOTH ends of the Double End spark plug are alike in construction so that either may be inserted in the cylinder. When in use, the upper end fires as well as that in the cylinder so that it acts as an indicator of the condition of the spark for the cylinder. It is practically two plugs assembled into one, as illustrated. The insulator is sheet mica, and when the points at one end are worn out, the plug may be reversed after the worn part is cut out of the circuit. The plugs are listed at $1.50 each.—Twin-Spark Sales Co., New York City.



Either end of the Double-End spark plug may be used

Limousine Jiffy Jack

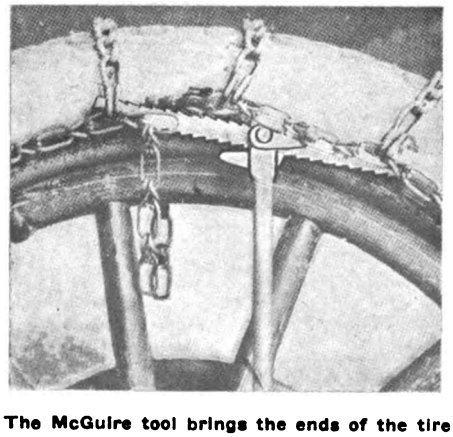
The latest model Jiffy jack is the limousine type illustrated herewith which is claimed to have a lifting capacity of 5000 lb. It is of the rack type, the rack being made of laminated steel, the pawls are forged with machined tips, heat-treated; pawl controlling parts are of case-hardened machine steel, and the pawl spring is of rust-proofed steel. When the load is removed the rack automatically drops. The jack weighs 9 lb. Furnished with wood handle it sells for $3.50—The Jiffy Jack Co., Cleveland, Ohio.



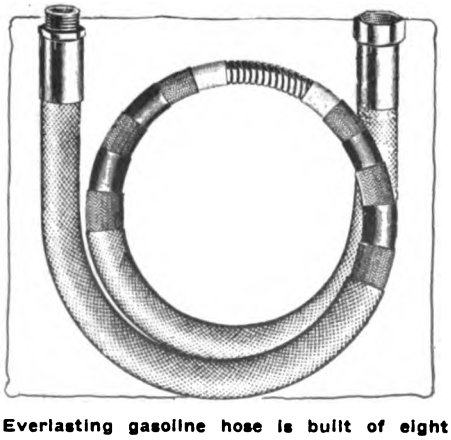
Limousine model Jiffy jack with safety drop

McGuire Tire Chain Tool

To assist in applying tire chains easily and securely, the McGuire tool has been brought out, allowing the chain ends to be brought together easily. The tool uses a dog and a ratchet, the dog holding the ratchet in any desired position. Hooks on the ratchet grip the chain ends and by pushing down the handle the ends are brought together as far as desired, the ratchet automatically locking itself in position, holding the chain ready for closing of the clamps. The tool is 9 in. long, weighs 14 oz. and can be disassembled and put in the chain bag. Price, $1.—E. P. McGuire, Van Houten, N. M.



The McGuire tool brings the ends of the tire chain together easily



Everlasting gasoline hose is built of eight layers, no rubber is used

Chicago Flexible Tubing

The Everlasting gasoline hose is built up of eight layers, the inner lining being of flexible steel under a layer of fiber, one of braid, one of special gasoline-resisting composition, these two layers then being repeated and then the waterproof outer jacket which is woven on. No rubber is used. Other products of the maker of Everlasting hose are hot air hose for carbureter connections, oil, air and steam tubing and acetylene tubing and connectors.—Chicago Tubing & Braiding Co., Chicago, Ill.

Apco Anti-Rattlers

A combination hood anti-rattler and holder is one of the many Auto Parts products. This is a helical spring which has several special clamps attached. The spring is placed transversely under the hood and the clamps are slipped over the lower edges of the hood. The sides of the hood may then be raised to any extent desired without rattling. This arrangement is of assistance in keeping the motor cool in very hot weather as a circulation of air may be obtained without the disagreeable clatter of the hood rattle. The anti-rattler is finished in black enamel and sells for 10 cents.

Another Auto Parts product is the new door anti-rattler for Fords which is a simple construction of spring steel, which is attached to the body part of the hinge by one of the original wood screws. It is made for the 1913, 1914 and 1915 Ford models. It is finished in black enamel and sells for 20 cents. It is supplied to the trade on a display stand, there being twenty anti-rattlers to the stand.

The new Apco valve grinding tool has a universal joint which compensates for any variation from vertical when in use. The weight of the device is sufficient to provide the necessary pressure. It sells for 20 cents.

An improved cutout pedal is also offered which is attached by locking nuts and washers instead of screws.—Auto Parts Co., Providence, R. I.

Strickler Grease Gun

A grease gun designed to force grease through obstructed places with heavy pressure is the Strickler, which is of heavy construction throughout, the hexagonal steel barrel being threaded for a plunger, also of steel, with an air chamber, as the accompanying illustration shows. The outer end of the plunger has a hexagon head to which a wrench can be applied and a hole for a bar. The lower

end of the barrel is threaded for nozzles which, in turn, are threaded to go into grease cup tapped holes; nozzles are made in all standard sizes, with both internal and external threads.

In using the gun the nozzle is screwed into the place of the grease cup and the plunger screwed down by hand until the grease is forced through the bearing. If grease cannot be forced through in this way pressure is applied with a bar or wrench and the bearing moved at the same time to facilitate the passage of grease. The maker states that a pressure of 900 lb. can be attained. Price, $3.50.—Powers Sales Co., Chicago, Ill.

Lawall Vulcanizer

The Lawall vulcanizer is of the tool-box type and can be used for both tube and casing work. An important feature of the device, which is of the type in which gasoline in a reservoir is ignited and allowed to burn out, is that the fuel container has a deep and a shallow section; the fuel in the shallow section burns for about 5 min., this being the time required to bring the vulcanizer to the proper heat; by that time the fuel has run dry in the shallow part and the deeper section, nearer the mouth, burns out, being just sufficient to maintain the proper temperature for 15 min. Part of the outfit is a swivel clamp by means of which the vulcanizer can be held against the tire for casing work or on a tube for patching. The complete outfit consists of the vulcanizer proper, made of aluminum, a swivel clamp with small patch clamp, tube plate, repair material and scissors. Everything goes into a neat canvas roll. Price, $3.50.—L. C. Lawall, Richmond, Ind.

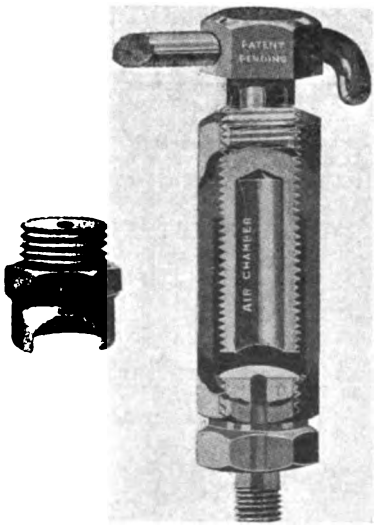
Foxy Gasoline Gage

The Foxy gasoline gage for Ford cars has been designed to meet the requirements for a device which can be easily installed. It consists of a cylindrical float chamber on top of which is mounted a glass gage tube, the pointer of which is a little ball mounted on the vertical rod extending upward from the float. Figures form the indicator on the gage tube.

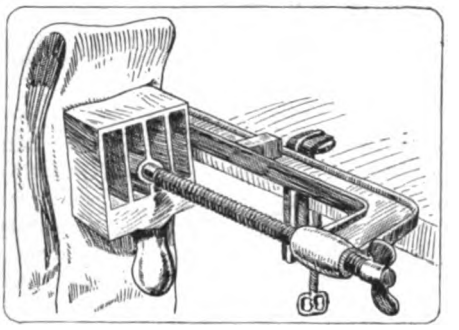
To install the device, the gage is secured to the dashboard and then connected in the gasoline feed pipe by means of a T fitting, a notch being cut in the dashboard for the gage to fit. The device sells for $3.50.—Fox Gauge & Specialty Co., Brooklyn, N. Y.

Paco Racing Bodies

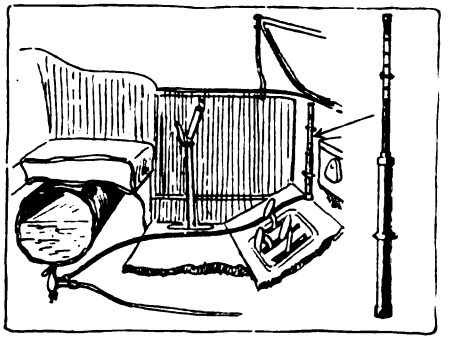
For owners of Ford and other small cars who wish to make their cars into speed creations the Paco racing type bodies have been designed. These are in two streamline styles, one for track work and the other for ordinary use, the former having its seats staggered and



The Strickler grease gun forces the lubricant through obstructed places with heavy pressure



The Lawall tool-box-type vulcanizer can be used for both tube and casing work



The Foxy gasoline gage is mounted on the Ford dash and connected directly to the tank

the cowl brought up close to the steering wheel with the exhaust pipes coming through the hood to meet in a single large manifold. The rear is streamlined and the steering column raked while the pedals are bent to conform with the low driving seat. Equipment includes a new dash, hood air pump and pressure feed system with complete directions for installing. The material is 20-gage iron, with all seams riveted.

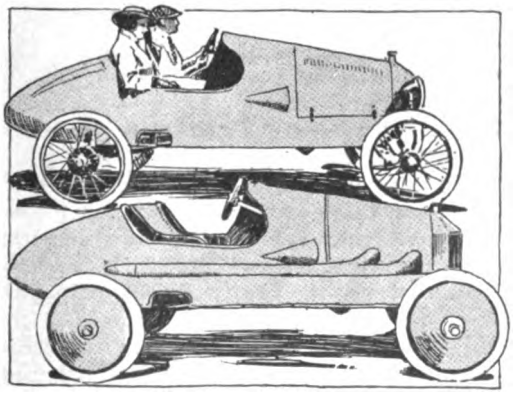
The other body is similar in general appearance but the exhaust pipes are not brought through the hood. Equipment is the same. The bullet-shaped rear contains a 15-gal. gasoline tank and sufficient space to carry luggage. Crated for shipment, either body weighs about 350 lb. Price of either style is $165 complete.—Peoria Accessory Co., Peoria, Ill.

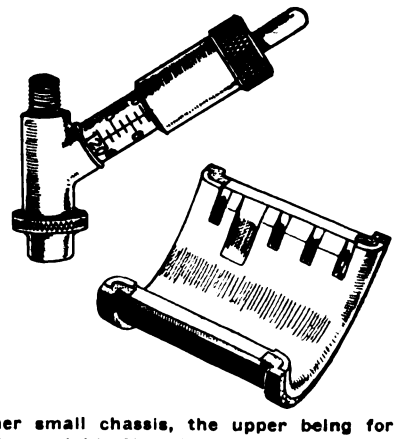
Nurinkle Tire Gage

Under the name of the Nurinkle, an automatic tire gage has been put on the market. With this gage in the air line and adjusted to a certain pressure, the moment this pressure is attained the excess air is expelled through a check valve. At the same time the gage registers the pressure on a graduated cylinder which is part of the device, as illustrated herewith. The small knurled nut on the top of the device serves to regulate the pressure. Price $1.25.—Nurinkle Co., Indianapolis, Ind.

Victor Bronze-Back Bearing

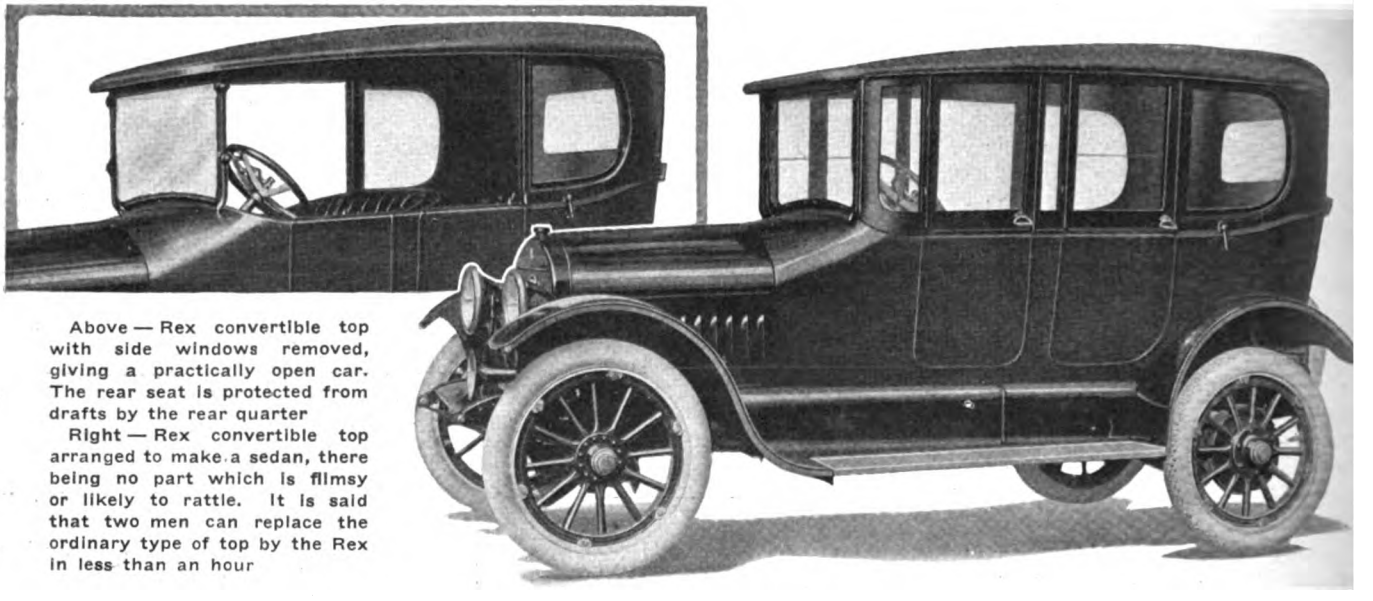
Victor is the name of a bronze-back die-cast bearing in which the soft metal is made almost integral with the bronze by an ingenious locking arrangement. The bronze shell is machined to size, after which the bearing metal is die cast in the shell under pressure and is soldered and locked as indicated in the accompanying illustration by the dovetail joints formed between the bronze and bearing metal. These joints are said to hold the bearing metal to the bronze at the four sides so strongly that separation is practically impossible.—Modern Die & Tool Co., Indianapolis, Ind.





Left—Paco racing type bodies for Fords and other small chassis, the upper being for ordinary work while the lower is for track racing. Upper right—Nurinkle tire gage. Lower right—Victor bronze-back bearing

Rex Convertible Top—Sedan or Open Car



Above — Rex convertible top with side windows removed, giving a practically open car. The rear seat is protected from drafts by the rear quarter

Right — Rex convertible top arranged to make a sedan, there being no part which is flimsy or likely to rattle. It is said that two men can replace the ordinary type of top by the Rex in less than an hour

THE large number of convertible bodies which have been introduced during the past 12 months shows that there is a strong tendency to replace the ordinary top by something which gives a better combination of the advantages of closed or open bodywork. One of the latest attempts to solve the problem is the Rex sedan top made by the Rex Buggy Co., Connersville, Ind., and this has been taken up by the King Motor Car Co., Detroit, Mich.

To accommodate this top the body is made to an ordinary open design, and top irons are attached at the usual places, but instead of using the ordinary iron a socket is fixed securely to the main body frame, showing a threaded hole starting flush with the face of the panel when the body is completed. There are four of these sockets and the irons for carrying the ordinary folding top simply screw into the sockets.

To fix the Rex top the ordinary irons are unscrewed and four others put in their place; these providing four vertical studs on which the Rex top is set and held down by nuts. This gives a rigid attachment for the rear part, and the front end is secured to the upper extremities of the windshield irons.

The main frame of the Rex is hard wood, well strengthened at the joints and comprises the leather and Pantasote roof with the back piece and a post located just aft of the tonneau doors on each side. In this condition the body is just as much an open one as with an ordinary top and no side curtains.

The rearmost windows are held in frames which can easily be put in place and fixed by screws, this protecting the tonneau seat from side drafts. To attach the door windows a few screws are run vertically into sockets on the top edges of the doors and into the body side piece between the doors, the parts to which the windows hinge being also attached to the roof frame. An ingenious idea is the use of thin pressed metal troughs which connect the bottom edge of each window piece with the top edge of each door. As the windows and doors swing on different hinges a gap opens between the two as the door is opened and there is risk of pinching a finger between the two when closing the door again. The metal trough closes this crack and removes the danger while also assisting to keep out driving rain.

All around the top is a narrow leather flap which covers the junction and closes any crack, while the weight rests on felt pads which prevent injury to the paint. Inside the finish is in cloth or Bedford cord so the appearance is handso To give ventilation the tonneau windows are divided and top half can be lowered instantly. There is no part whicl flimsy or rattlesome.

The King company has arranged with the makers of the to supply King dealers at a special price, and it is underst that the top is attachable to any model D touring car. weight is stated to be about 175 lb., or about 100 lb. n than a folding top.

—

261,860 Cars Have Electric Systems Other Statistics

EAST PITTSBURGH, PA., Aug. 14—Some interesting tistics have been compiled by G. Brewer Griffin, ı ager of the automobile equipment department of the Wes house Electric & Mfg. Co. in regard to the car and ligl and starting equipment production.

Mr. Griffin states that 261,860 cars have been equi with electric lighting and starting, while the total produ in this country during the last calendar year was 611 valued at $380,000,000, at an average dealers' valu $621.50 per car. Of this production 350,000 are count Fords, worth $136,500,000. The total value of elec equipment is given at $10,354,570.

Other statistics cited by Mr. Griffin are estimates o terials used in 1915 cars. These are: 670,000 tons of cated steel; 4020 tons aluminum and alloy; 2141 tons r factured brass; 1068 tons curled hair; 2050 tons moss; hides, or one-third hide per car; 3,280,000 sq. yd. imi leather, or 8 yd. per car; upholstery fittings such as tape, etc., worth $917,542; 6,560,000 yd. burlap, etc.; 1 250 yd. top materials and linings worth about $2,44 7950 tons manufactured cotton used in tires on new 300,000 lb. sheet celluloid; 9338 tons rubber and comp 2,446,780 pairs of hinges; and the same number of door fittings; 489,356 sq. yd. carpet for tonneau; 642,908 linoleum for running and toe boards; 8,450,850 boa manufactured hickory and other woods for floors, bodies, etc.

In the starting, lighting and ignition industry alo Griffin states there are between 9000 and 10,000 peop ployed.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, August 19, 1915 No. 8

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Export Opportunity

IT is to be questioned whether manufacturers who refuse preferred orders from abroad for the sole reason that their output is already booked up to American dealers are not short sighted. At the present moment there is a large unsatisfied market just across the Atlantic and a manufacturer with a suitable car has a chance to make a foreign reputation that never will be repeated. When the automobile is suitable to the needs of the British or French market and a good foreign dealer comes along with his money in a bag it would surely be worth while to disappoint a few home dealers by reducing the number of cars they can secure by half a dozen or so, in order to get a footing over seas.

When hard times strike the home trade as one day they must do, the manufacturer with a substantial foreign connection will be in a much better position than a man who depends solely upon home trade.

This applies to parts makers as well as to manufacturers of complete cars, for it is obvious beyond all question that the British automobile trade are ready and anxious to buy in America what formerly they obtained from France and Belgium, and to buy more extensively, too. Had the home trade slumped this year the foreign demand would have still made 1915 a wonderful year, and, however insistent the American demand for cars and parts, the foreign market must not be neglected.

Light Weight Unanimity

THE consensus of engineering opinion that light weight chassis will be the next big development in automobile construction is remarkable. Lately the subject has been much under discussion and there is scarcely a man to be found now who sticks to the old argument of the heavy car. There used to be many who maintained for divers reasons, that high power and great weight produced a better car, where upkeep was not considered, than lesser weight and correspondingly lesser power. This notion is breaking down altogether and some engineers go so far as to predict the speedy demise of the 4000-lb. automobile.

The immense general interest in the subject among all branches of the trade and also in automobile clubs and places where users of car mostly congregate suggests that development along this line will be even more rapid than was at first anticipated. It suggests that the large, light car will soon be here in quantities and that every sale room will have to be equipped with a weighing machine before very many months have passed.

To multiplicity of cylinders, to automatic gearshifts and similar developments objections can be and are raised, but it seems the common sense of light weight is to have no antagonists.

Why Black?

WITH the time of the year when new models are settling down into regular production it is to be noticed that a few manufacturers are breaking away from the black finish that lately threatened to become universal. Of course, the reason for using black in the first place was that it was cheaper than a color and a little black enamel has a great covering power, but black is the very worst paint that could possibly have been chosen for automobile finishing.

Firstly, black shows the tiniest speck of mud or dust long before any other color and two cars starting out in the morning, one black and the other gray, will look totally different at the end of the same run. In a day's use in a town, even in good weather, a black car loses its freshly washed appearance almost at once, and by the afternoon it is dingy. On the other hand, a gray or blue, or brown, even a dark green or a maroon tint, will look fresh for days together.

Then again black is dependent absolutely upon its varnish, for without the gloss it rapidly takes on a rusty tinge like a hobo's coat, which no washing will ever remove. A colored car looks its best, of course, when the varnish is new, but when it has eventually gone dull it still lacks the seedy appearance of old black; it still looks fresh after a wash and the owner's pride in his car is generally more lasting. What's the use in washing a car that looks none the better for it?

The days of bright colors are gone perhaps; some yearn for brilliant reds and yellows, but good neutral tint browns and grays that both look well and wear well ought to be considered by manufacturers much more than they have been.

White to Increase Stock $3,000,000

New Issue to Pay 7% War Truck Orders Render Extension of Plant Necessary

CLEVELAND, OHIO, Aug. 16—The White Co., this city, will issue $3,000,000 new stock, according to an announcement made to shareholders. The greatest percentage of this new money, it was said, will be used for plant extensions, made necessary by war truck orders.

Although its operations are veiled with great secrecy, the White Co. is known to have been one of the heaviest makers of automobiles for war purposes.

To Retire Preferred

The present capitalization is $500,000 preferred and $2,440,000 common. The preferred will be retired immediately at $115 a share plus accumulated dividends until Nov. 1 next, or 3½ per cent.

The new issue of the $3,000,000 preferred will pay 7 per cent and will be sold to present stockholders.

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Enger 12 at $1,085

CINCINNATI, OHIO, Aug. 16—The Enger Motor Car Co. of this city has brought out a twelve-cylinder motor which is manufactured in the conventional twin-six V-type design. The dimensions of the power plant are 2⅝ bore by 3½ stroke. The valves are in the head and the cylinder heads are removable. Other specifications of the car include 115 in. wheelbase, cantilever springs, streamline type bodies and 32 by 4 tires. The list price of the car is $1,085.

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Waverley Electric Price Reductions

NEW YORK CITY, Aug. 13—The Waverley Co., Indianapolis, Ind., will increase its 1916 production to 2000 cars, or approximately 100 per cent. A result of this proposed production is a general lowering of prices ranging from $1,000 to $500, effective Aug. 1, last. The following list gives the former and new prices:

Model	Old Price	New Price
108-5-Pas. Limousine	$3,500	$2,500
Roadster Coupé	2,000	1,750
109-Four-Chair Brougham	2,750	2,500
104-Front-Drive Four-Pas. Brougham	2,400	2,000
105-Rear-Drive Four-Pas. Brougham	2,350	1,900

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New Empire Four at $895

INDIANAPOLIS, IND., Aug. 16—The Empire Automobile Co., which recently announced a six-cylinder model at $1,095 has in addition a new four-cylinder car which displaces the previous four. The new model lists at $895 and has a new power plant consisting of a 3⅞ by 5 T-head motor fitted with Connecticut ignition and a Schebler carbureter, a cone instead of a disk clutch and a three-speed gearset. The rear axle is practically the same as that of the former four but the tires now are larger, being 33 by 4 instead of 32 by 3½. The body is an entirely new one, the wheelbase is 112 in.

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Driggs-Seabury Ordnance Co. with $4,000,000 Capital

NEW YORK CITY, Aug. 14—The Driggs-Seabury Ordnance Co., incorporated in Delaware last week with $4,000,000 capital stock, will take over the control of the old Driggs-Seabury Ordnance Corp. The company's capital consists of $500,000 first preferred stock, $500,000 second preferred stock, and $3,000,000 common. It is understood that the common stock will be put on the curb to-day by Herrick & Bennett. The preferred stocks will not be offered to the public.

The incorporators are C. M. Egner of Elkton, Md., H. L. Mullin and N. P. Coffin of Wilmington, Del.

The new company will take over the entire plant and assets of the corporation and will at once resume the manufacture of trucks and other war munitions and will take over the manufacture of about $600,000 in truck parts, contracts for which were held by the corporation.

Borie for President?

It is understood that E. A. Borie, formerly vice-president of the Bethlehem Steel Co. is slated for the presidency of the newly organized company. Strong New York interests, among which is the banking firm of Wm. Morris Imbrie & Co., are connected with the new organization. The board of directors have not been announced, but the operating end of the business will be in the hands of former officers of the Bethlehem Steel Corp. The latter company states that it is not trying to buy out the Driggs-Seabury Ordnance Co., as rumored.

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Woman Takes Chalmers Distribution for France

NEW YORK CITY, Aug. 13—The Chalmers Motor Company has announced that Helene Dutrieu, a prominent French aviatrice, has been appointed Chalmers distributor for all of France.

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Hughes Falcon Chief Engineer

DETROIT, MICH., Aug. 14—W. S. Hughes has been appointed chief engineer of the Falcon Motor Truck Co. He was with the Findeisen & Kropf Mfg. Co., manufacturer of Rayfield carbureters, during the past five years, being with the Detroit branch during the last two years.

Coffin and Riker on Navy Board

Elected by Secret Mail Ballot of S. A. E. Members from Six Candidates

NEW YORK CITY, Aug. 18—At the headquarters of the Society of Automobile Engineers it was announced to-day that the successful candidates for election to membership on the naval advisory committee are A. L. Riker and Howard Coffin. The counting of mailed votes for the six candidates was made yesterday.

A. L. Riker is vice-president of the Locomobile Co. of America, Bridgeport, Conn., and is actively in charge of the engineering policies of this concern.

Howard Coffin is vice-president of the Hudson Motor Car Co., Detroit, Mich., and directs the engineering work of this company.

Mr. Riker was the first president of the Society of Automobile Engineers, serving for three terms. Mr. Coffin became S. A. E. president in 1910, and was the originator of the movement which has resulted in its great increase in size and activity since that time, the standardization of materials and parts being prominent examples. Both men have recently done effective work on the Membership Committee, the Finance Committee and the Miscellaneous, Electrical Equipment, Frame Sections and Nomenclature divisions of the Standards Committee.

Mr. Riker and Mr. Coffin were the directing officials of the mechanical branch of the Association of Licensed Automobile Manufacturers.

Mr. Coffin was educated in the engineering department of the University of Michigan. He served 5 years in the postal service. From 1902 to 1905 he was chief of the experimental department and chief engineer of the Olds Motor Works. In 1906 he was vice-president and chief engineer of the E. R. Thomas Detroit Co. and consulting engineer of the E. R. Thomas Motor Co. Subsequently he became chief engineer of the Chalmers-Detroit Co. and the Chalmers Motor Co.

Mr. Riker is an electrical as well as mechanical engineer. As early as 1888 he devoted attention to electric motors with a view to developing a type suitable for vehicle propulsion. It is understood that the Riker Electric Motor Co. produced the first toothed armature. Its first electric vehicle was brought out in 1894. In 1900 Mr. Riker built 5-ton electric trucks. He has been vice-president of the Locomobile Co. for 13 years. In 1900 he was awarded by the French Government a medal for car design.

Stearns Has Knight V Eight

3¼ by 5 Motor to Be Mounted in 123-In. Chassis—Five Body Types

CLEVELAND, OHIO, Aug. 17—An eight-cylinder V Knight motor has been added to the Stearns line and incorporated in a chassis which follows the line of the Stearns four described in this issue of THE AUTOMOBILE. The development of this type of motor is of interest due to the difficulty attached to the design of a V Knight motor and the resulting product has been made exceptionally clean. The engine has a fairly long stroke in proportion to bore, the dimensions being 3¼ by 5. The chassis in which the motor is fitted and the wheelbase of 123 in. and the body styles will include a seven-passenger touring, three-passenger roadster and a four-seated coupé. Limousine and landaulet bodies will also be marketed.

The new Stearns motor is the result of the experience gained after the construction of several experimental models. There are two eccentric shafts situated close together in the V, this position being the same as that usually occupied by the camshaft in a poppet engine. For driving these eccentric shafts a silent chain is used, but this drives one only, the second shaft being driven from the first by a spur gear. The gears are, of course, of same size, and are contained in a small chamber cast in the front end of the crankcase so that they can be used as the oil pump and they are naturally wide enough in face to deliver a large supply of lubricant at a high pressure.

Oil goes to a hollow crankshaft 2¼ in. in diameter and is thence taken to every point as the connecting-rods are hollow and serve as leads to the piston pins.

There is a double carbureter, and this is situated in the V, the exhaust manifolds being on the outside of each cylinder block, which makes for convenience and neatness. For electrical equipment a Westinghouse double unit system is employed and there is also a Remy distributer for ignition.

Side-by-side connecting-rods are employed after experiments with the forked type in conjunction with other experiments with the arrangement adopted, and the cylinder blocks are staggered 1½ in. to allow for the rod layout.

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Locomobile Grants 8-Hour Day and Withdraws Profit-Sharing

BRIDGEPORT, CONN., Aug. 12—The Locomobile Co. of America has granted an 8-hr. day to its employees and has withdrawn its profit-sharing plan. Fifteen hundred employees of the company at a mass meeting accepted a settlement with the company and will not go on strike. The company granted the demands made by the employees, with some exceptions. The new time schedule goes into effect Aug. 30.

The company did not agree to the demand that all hours over eight a day, or forty-eight a week, should be considered overtime, to be paid for at time and a half. The company will pay time and a half over 10 hr. a day. The men state that they will adjust that difference by refusing to work over 8 hr. a day. Night hands will not work more than 48 hr. a week and will receive a bonus of 15 per cent for that work. The wages for 48 hr. piece work will be the same as 55 hr.

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Haynes Gets Restraining Order Against Sun Co.

BUFFALO, N. Y., Aug. 14—The Haynes Automobile Co., Kokomo, Ind., has been granted a temporary restraining order by the Circuit Court of Erie County, N. Y., August 12, restraining the use of the Haynes name in connection with that of the Sun light six, to be made by the Sun Motor Co., this city.

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Bosch Gives Higher Wages

SPRINGFIELD, MASS., Aug. 12—The Bosch Magneto Co., employing about 1000 men, will put into effect on Sept. 1 an 8-hr. day instead of 9½ hr., as at present. Piece work wage schedules will be increased, so that the employees will receive as much for 8 hr. as they are now getting for the longer day.

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Spicer Machinists Demand 8-Hour Day

PLAINFIELD, N. J., Aug. 12—At a meeting of the machinists employed by the Spicer Mfg. Co., it was decided to give the management until to-morrow to grant an 8-hr. day, on pain of a probable strike. Seven hundred men are affected.

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Standard Welding Co. Expands

CLEVELAND, OHIO, Aug. 17—The first addition to the Standard Welding Co. plant is nearly completed. It is a brick building 100 by 200 ft. facing West Seventy-fourth Street. This building is to be devoted entirely to the manufacture of bent tube parts.

The second addition is to be of the mushroom reinforced concrete type built in the form of an L. One leg will extend 200 ft. north and south on West Seventy-third Street, the other leg 240 ft. east and west from West Seventy-third to West Seventy-fourth Street.

Later two more additions will be built parallel to the Seventy-third Street section and connecting with the main building. Double railroad sidings will enter between each section, giving excellent shipping facilities.

Detroit Plants Run at Capacity

Many English Dealers Want Cars—Retail Sales Recover from Slack Condition

DETROIT, MICH., Aug. 16—There was little change in the manufacturing and sales conditions of the manufacturing field of this city nor of the local selling of cars during the past week. Manufacturers are all running full tilt, and dealers say that the territory served by this city is in healthy condition, with a pleasing contrast to the war and panicky conditions which affected business for the corresponding period of last year immediately following the declaration of the great conflict.

It is rather a surprising fact that there are so many of England's representative dealers in cars in this country at this time, but they are here with the sole intent of buying cars, and they have plenty of money to buy them with. Naturally they come immediately to Detroit, and there were several Englishmen in the city last week seeking to place large car orders. In fact the English field is strongly demanding Detroit vehicles, but they are hard to get, so tied up are the factories with domestic business at this time.

While the rainy weather conditions which have prevailed most uniformly all over the country were somewhat improved last week, allowing the resumption of the dealer crusade, the slackening of retail sales which this weather necessarily was responsible for was only temporary, for with the coming of more sunshine the rush is on again, if indications as echoed here are any criterion. In fact, the weather has had no slackening effect upon the activities of the factories, which are still as pressed as ever since the opening up of the season.

Raw Materials Scarce

There is one aspect of the business situation with the Detroit plants that bids fair to becoming a serious thing if the resourcefulness and business acumen of the motor car fraternity do not find some way of getting around it. That is the growing shortage of certain of the raw materials that are all important to the car maker and the parts and accessory manufacturer as well. Take iron and steel, for instance. The war orders and war business with the suppliers of these materials have curtailed greatly the supply which they have for domestic trade, and prices are bound to be affected by this dearth of the requisite materials. Iron castings are becoming harder to get, as well as those made from other metals.

Detroit Plants Need Workmen

Great Shortage of Skilled Labor Prevents Many Factories from Capacity Work

DETROIT, MICH., Aug. 14—There is still a great shortage on skilled labor in the local automobile and parts manufacturing concerns. Notwithstanding advertisements in local and out-of-town papers and standing orders with employment agents, many plants are not being run to full capacity on account of their inability to get all the men they need.

Under normal business conditions it would be possible to get these men, but since so many manufacturers outside of the automobile industry have started to make what is generally termed war materials for the European countries these concerns have been enlarging their plants and increasing their production, and in adding new men have given the preference to those formerly connected with the automobile industry. In fact, it is reported that agents from such manufacturers, also employment bureaus, have been offering increased wages to men now employed in local automobile and parts factories.

Advertise for Workers

The Packard Motor Car Co, which now has 8200 men on its pay roll, which is the largest number in its history, has been advertising for the last five or six weeks for such workers as all-around machinists, hand and automatic screw machine operators, drill press and milling machine men, drop-forge hammer men and heaters, J. & L., Gisholt and P. & J. operators, tool makers, panelers.

The Continental Motor Mfg. Co. has been advertising for tool and crankshaft lathe hands, grinders, punch press operators, J. & L. and hand-screw machine operators, block testers and braziers.

The Chalmers Motor Co. wants tuners, first-class machinists for experimental department, inspectors and electricians, lathe hands, W. & S., B. & P. & W. screw-machine hands, Lanis grinders, cutter grinders, Acme, Cleveland and Gridley automatic-machine hands.

The Russell Motor Axle Co. needs rear-axle assemblers. The C. R. Wilson Body Co. needs body finishers, door hangers, wood milling machine men.

The Maxwell Motor Co. has been advertising for weeks for tool makers, tool lathe hands, screw-machine operators, P. & J. operators, crankshaft lathe hands, inspectors.

The Auto Parts Mfg. Co. requires Healy cylinder grinders and Gisholt men. The Sterling Motor Co. is advertising for bearing scrapers and motor assemblers.

The Kelsey Wheel Co. needs B. & O. operators. The Rands Mfg. Co. desire experienced windshield assemblers. The Briscoe Mfg. Co. needs more die makers. The Fisher Body Co. is in need of No. 1 aluminum panelers on enclosed bodies. The American Auto Trimming Co. is in need of final assemblers, applying hardware on finished bodies. The Detroit Nut Co. has room for B. & S. automatic screw machine operators and machinists.

At many other plants, such as Dodge Bros., the Cadillac Motor Car Co., the Hayes Mfg. Co., and the Briggs Mfg. Co., it was stated that men are being added to the force when found to be skilled workers in the kind of work for which they apply.

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Homes for New Employees Pontiac Manufacturers' Problem

PONTIAC, MICH., Aug. 13—At a meeting of many of the city's business men, especially manufacturers or their representatives, it was recognized by all that something will have to be done quickly to meet the urgent local requirements for more houses for workingmen, otherwise the expansion of the manufacturing concerns may be halted.

1000 to 1200 More Men

Briefly stated, between 1000 and 1200 more men will be employed by the plants this year, and according to an investigation, out of 176 houses found available only fifty-one were found to be up to date, modern and entirely acceptable, while fully 20 per cent were undesirable.

Such men as Charles B. Wilson, president of the Wilson Foundry & Machine Co.; W. D. Kelly, factory manager of the Oakland Motor Car Co.; W. L. Day, vice-president and general manager of the General Motors Truck Co.; O. J. Beaudette, president of the O. J. Beaudette Co., and many others spoke earnestly about the conditions and made it plain that the city and its citizens must get together and do something at once. A suggestion was made for the formation of a stock company which would build at least fifty houses which could be rented at $20 a month or less or sold on monthly payments.

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Fifty Oldsmobiles a Day

LANSING, MICH., Aug. 12—Reports received at the Olds Motor Works from its distributers and dealers show that business is far ahead of last season in practically all the country. It means that production will have to be increased. At the present time, in fact for some time, fifty four-cylinder cars have been the average daily output, and this schedule will be maintained indefinitely. Production on the eight-cylinder car will materially increase the daily output.

N. Y. Sales Continue To Gain

Dealers Begin To Get Calls for Enclosed Bodies—Some Are Sold Out

NEW YORK CITY, Aug. 17—Good weather and the return to the city of vacationists were responsible for a brisk sale of automobiles last week. The dealers report that sales are remarkably large, when it is considered that the month of August has been in former years a poor month. Many inquiries are coming in now for winter cars and a few of the dealers are making sales in closed cars.

A number of the dealers are at present doing no business, being completely sold out, some of them as far back as five weeks. A few of the low-priced agents have been waiting nearly two weeks for deliveries of the 1916 models and report that without even a demonstrator, they are making large sales.

Harry S. Houpt, the Hudson dealer, has set a sales record, his books showing that he has disposed of more than 500 cars since June 10. C. T. Silver, president of the C. T. Silver Motor Co., Overland dealer, reports that he has recently lost a number of sales owing to his inability to make delivery immediately to persons who wanted to drive the cars away from the showroom. He expects to be able to make fairly prompt deliveries in a week.

Some Make Bonus Offers

The Briscoe agent was sold out five weeks ago and is waiting for the 1916 cars. Buick has every car sold for two months. This agency reports that if it could get immediate deliveries, fifty to sixty cars a day could be sold. Buyers are so urgent in their demand for cars that a number of them are making large bonus offers to procure cars.

Sales this week are heavier than ever and the floors of the agencies, especially in the low- and medium-priced cars, were crowded with prospective buyers. A number of the dealers with high-priced cars were also busy last week. Simplex reports good sales and is sixty-five cars ahead in sales. It is just beginning deliveries. The Pierce-Arrow agency, which has a few cars on hand, had quite a number of inquiries for cars last week. Sales are normal. The Packard company is completely sold out.

The Mitchell agency reports good sales during last week. It is fifty-two cars behind in orders. Many inquiries are coming in on closed cars. Last week twelve closed cars, with specially built bodies, made in this city, were sold.

The Maxwell company has just received a fresh shipment of cars. Sales

for the month will amount to over 100 cars. Sales for last week up to last Saturday amounted to twenty-nine cars. The company is expecting a large business in September when a majority of the automobile buying public will have returned from the summer resorts.

Even now there are a large number of people who want cars for summer touring. The dealers report that motorists this year are using their cars more than ever for vacation purposes and state that in general this is responsible for some of the large sales records.

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Sales Good in Missouri and Adjoining States

ST. LOUIS, MO., Aug. 9—The great majority of automobile dealers in the St. Louis district—including Missouri and its adjoining States—found business during the last week ranging from "Normal" to "Best in the history of the industry." A few reported a slackening in the rush for cars—due chiefly to the fact that farmers are too busy harvesting to find time to spend their rapidly accummulating wealth—but even these dealers said all indications pointed to unusually heavy sales in the near future.

Moon 33 per Cent Gain

The Moon company claimed a 33 per cent increase over last year's business and said conditions were especially rosy in the northern parts of the Central States. "Our only trouble," the sales manager said, "is in getting parts fast enough. We have more orders than we can fill now.

The Maxwell dealer here said, "Never in my life have I seen the automobile industry so healthy. We are working day and night filling orders."

The Federal Truck distributors said they were doing 400 per cent more business now than during a similar period last year. The Hudson-Phillips and Chalmers people enjoyed normal business.

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Inter-State Behind Orders

INDIANAPOLIS, IND., Aug. 13—Increasing orders for Inter-State automobiles has caused the factory at Muncie to be 300 cars behind and will necessitate the doubling of the present force of workmen, numbering several hundred. It is hoped to have 300 new men at work by Sept. 15. Lack of workmen because of the great demand for them created by automobile parts companies and others engaged in supplying automobiles and accessories to the allies in the European war, has delayed the Inter-State company from increasing its production as rapidly as it had desired. All shipments to dealers are now pro-rated. Part of the increased demand, also, is due to the drop in price from $1,000 to $850.

Kelly-Springfield Tire Rushed

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Is 27,000 Tires Behind Orders —Will Earn 27 to 30 Per Cent on Common

NEW YORK CITY, Aug. 14—The Kelly-Springfield Tire Co. is now 27,000 tires behind orders. As the company manufactures between 1000 and 1100 tires a day, this means that it is approximately a month behind orders on its books. The Akron, Ohio, plant continues to operate at capacity, and officials say that business on hand in sight insures a continuance of this rate of operation throughout the remainder of the year.

The company recently entered the truck tire field. By the first of the year it is estimated that it will be possible to make 400 truck tires a day. Enlargement of the plant in order to make this a possibility is now under way. These tires will sell from 10 per cent to 15 per cent higher than the average truck tire.

The directors estimate a rock-bottom earning of about $1,500,000 for 1915. Allowing for the difference in dividends after conversion of preferred into common this would mean close to 27 per cent for the common shares. Net may run as high as $1,700,000. It is expected that the company will distribute a substantial extra cash dividend this fall.

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Record July Shipments of 12,515 Carloads

NEW YORK CITY, Aug. 14—Continued heavy demand for automobiles is reflected in the traffic statistics of the National Automobile Chamber of Commerce. The figures indicate shipment of 12,515 carloads in July, compared with 4870 carloads in July last year. These figures easily establish a new high record for automobile shipments at this season and the railroad earnings on this traffic are now well over $1,000,000 a month.

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Pontiac Plants Rushed—Unfilled Orders Large

PONTIAC, MICH., Aug. 13—According to a statement made by W. D. Kelly, factory manager of the Oakland Motor Car Co. that concern now has orders for 11,000 cars all of which are to be ready for shipment by Jan. 1, 1916. There are 511 men on the pay roll now and the force is to be increased by at least 200.

Orders for 500 Trucks

W. L. Day, vice-president and general manager of the General Motor Trucks Co. stated that the company has orders now for at least 500 trucks and that the number of unfilled orders on the books is greater than the total number of trucks shipped during an entire year during any year except the fiscal year just ended. This past year has been the best in the history of the company and showed after all bills had been taken care of a net balance of $250,000 in the treasury. The company will add 100 men.

The Wilson Foundry & Machine Co., according to president Charles B. Wilson, will eventually make all the cast iron and machined parts for the Willys-Overland Co., Toledo. During the week the company acquired further land bringing its total up to 21 acres. Mr. Wilson stated that just as the Willys-Overland Co. grows so it will be with his concern, and every further expansion of the Toledo concern will mean a further needed expansion of his company. The Wilson company will add 600 men.

The American Forge & Socket Co., a new concern, is to employ seventy-five to 100 men.

Other Concerns Increase Forces

The Hess-Pontiac Spring & Axle Co. which added about 150 men recently will need at least fifty more. A score of other concerns are also adding or will add more men to their force.

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Northway Motor to Double Space

DETROIT, MICH., Aug. 14—Additions now being erected, together with a new building not yet started, will eventually double the floor space of the Northway Motor & Mfg. Co. and bring the total up to 450,000 sq. ft. When completed the working force is to be increased, and it is said that about 4000 men will then be on the pay-roll.

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Velie Factory at High Speed

MOLINE, ILL., Aug. 13—Changes are being made at the factory of the Velie Motor Vehicle Co., Moline, Ill., to facilitate increased production.

The six-story building heretofore used for storage purposes will now hold the final assembly departments and shipping rooms. With this new arrangement rough material is received at the west end of the main plant and finds its way through the machine shop, first assembly and test, hence to the final assembly, where the bodies await installation after which the completed cars are shipped without delay or further handling.

All Velie factories in Moline are working overtime. The truck factory is handling two large European orders for heavy-duty trucks.

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Oldsmobile Sells Buffalo Branch

BUFFALO, N. Y., Aug. 14—The Buffalo branch of Olds Motor Works, has been bought by Louis Engel, Jr., who will conduct the business under its former name, the Oldsmobile Co. of Buffalo.

200 Per Cent Gain in Los Angeles

Arizona and Southern Cal. Agents Order Carloads—Allotments Dwindle

LOS ANGELES, CAL., Aug. 10—Heat seems to be a stimulant to the automobile industry in Southern California. The opening days of August, the hottest of the year, have brought a great increase in the car sales of Los Angeles, Southern California and Arizona.

100 per Cent Gain for Week

The total business of the representative Los Angeles dealers shows a gain of more than 200 per cent for the first week of August, 1915 over the first six working days of August, 1914. An increase in business of almost 100 per cent is reported for the first week in August of this year over the first week of July.

Almost 600 Maxwells have been sold by the Lord Motor Car Co., since the new car was announced here Aug. 1. Six carloads arrived in Los Angeles, Aug. 8, were unloaded and delivered early the following morning, leaving the agency without a car except the two demonstrators which arrived the day before the announcement of the new models was made in this city. The suburban dealers are ordering cars in great numbers. In one day, Aug. 9, six carloads were ordered over the wire by agents in Arizona and Southern California towns.

The Los Angeles Ford plant is working hard to keep up assembling on an average of fifty cars a day.

The run on the new Overland continues. Since Aug. 1 forty cars have been delivered by the J. W. Leavitt Co., in this city and if the cars had been available, the local manager, L. V. Starr, claims that he could have delivered eighty or 100 machines. The new Willys-Knight has in no way affected the sales of the Overland. Twenty-nine of the new Knight machines have been delivered in this territory since Aug. 1.

The Packard Twin-Six has made a hit in Los Angeles. The demonstrator has not been in service here quite two weeks, yet more than a fourth of the entire allotment for Southern California 200 cars have been sold by Earle C. Anthony, although no deliveries can be made until about Sept. 10.

400 Orders Behind

The Howard Automobile Co., Los Angeles Buick dealers, is 400 orders behind now. The company is making deliveries right along through its subagents and at the main salesroom in this city, but the cars sell faster than they can be shipped out from the factory.

The new Cadillac reached Los Angeles to-day. The 1916 model caused almost as great a sensation as the arrival of the first "eight," more than nine months ago.

The Reo is being well received in the suburban cities. Earle C. Anthony contracted for 1500 cars for the entire State this season and with five carloads going at wholesale during the past two weeks, just to the Southern California sub-agents, it begins to look as if the 1500 cars will not be enough.

Dodge Bros. car is one of the most popular in Southern California at this time. Harold L. Arnold, Los Angeles dealer, has sold and delivered 586 Dodge cars since Jan. 1 and eighty-one cars this month.

Hawley, King & Co. have sold twenty-five more Oakland cars already this month than during the first half of July. Wm. R. Ruess, Stearns-Knight and Mitchell distributor, has sold eighteen cars in the past seventeen days. Ralph C. Hamlin has sold seven more Franklins and five more Scripps-Booth machines the first ten days of this month than during the first ten days of July. The Enger dealers, Irving Motor Car Co., sold three more cars this month than during the same ten days of last month.

Truck Sales Brisk

Truck sales have also been brisk during the opening days of August. Last month nine Mack trucks were sold during the first ten days. This month the Mack Motor Truck Co. has sold fourteen trucks.

The Studebaker Corp. sold 150 cars at retail in Los Angeles for the month of July and with fifty cars sold during the first ten days of August, this month promises to be the best in the history of the branch here.

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Holley Business Better

DETROIT, MICH., Aug. 14—In comparison with business during the first half of 1914 Holley Bros., carbureter manufacturers, report that their business thus far this year has been twice as heavy. Conditions are better all around, and the outlook for the future is excellent. The plant will be running to its full capacity for an indefinite period.

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Kelsey Wheel Adds

DETROIT, MICH., Aug. 14—The Kelsey Wheel Co. has now under construction additions which will increase its plant by nearly 80,000 sq. ft. of floor space. Officials of the company say that business thus far this year shows an increase of more than 25 per cent over the corresponding period in 1914. From reports received by the company from all parts of the country indications point to a banner year for the automobile industry as well as the allied industries.

70 Morton Tractors to Russia

Many Orders on Hand—U. S. Army Officials Test Machines —Plant to Be Enlarged

HARRISBURG, PA., Aug. 13—The Morton Truck & Tractor Co., this city, has completed and now has on the sea to Russia seventy tractors, which is a small part of an order received several months ago from the Russian Government. The tractors, which left New York last week, are of 60-hp. rating, weigh about 6 tons each and are capable of making from 2 to 10 miles an hour with a draw-bar pull of 8,500 lb.

Many Orders Going Through

This is the first shipment of an original order of 300 of this style of tractor, and there is now in course of construction at the local plant eighty 3-ton Morton trucks for the same government, as well as seventy-five high-powered armored cars capable of carrying two machine guns mounted on revolving turrets and an assignment of six men. The company also has additional orders for 80 and 120-hp. tractors, and for many more motor trucks from both the Russian and French governments, while the United States Government engineers have been inspecting the work of both tractors and trucks.

Th armored cars which are now being constructed have a six-cylinder motor of 125 hp., and are of the regular Morton type. While in London during the winter Robert L. Morton designed the armored car after the needs expressed by representativs of the Russian government.

Carry Two Guns, Men and Supplies

In addition to carrying its two guns and men the cars carry 50 lb. of ammunition for each gun and the necessary spare parts to keep the cars in active service. The guns and men are protected by armor plate of a thickness capable of withstanding nickel bullets of muzzle velocity of 2750 ft. per second at a range of 15 yd. Tests of various steels, both in this country and abroad, were made, and a special heat-treated steel of the Pennsylvania Steel Co. proved the most satisfactory. In the tests this steel withstood fourteen shots within a 3-in. circle, while most of the other steels were pierced or cracked.

Factory Increased

The plant of the Morton company has been greatly increased, and negotiations are now on for more grounds for additional buildings. Day and night forces are working, and the big orders have

made it one of Harrisburg's leading industries.

The tractors and trucks have many features, the most prominent being the four-wheel double-worn drive, with the flexibility of the four wheels under uneven road conditions. The worm is self-contained in the axle case, with its universal joint within the worm on the tractors, allowing great flexibility and full drawing power from all wheels. There is an automatic stop for the engine steel, and the trucks are equipped with both engine and hand steeling devices.

Foreign government officials are almost constantly at the local plant conducting tests of the finished tractors and trucks, and every machine finished has more than met with all the requirements asked by the visiting officials.

—

To Build Studebakers for Foreign Trade in Canada

WALKERVILLE, ONT., Aug. 13—Canada's automobile industry will receive a decided impetus through the decision of the Studebaker Corp. just announced, to build all its cars for the foreign market in its Canadian factory in Walkerville. This decision means the employement of several hundred skilled workmen and the operation of the Canadian plant to full capacity during the entire year. Heretofore Studebaker cars for the foreign trade have been built in Detroit, but an investigation proved that this branch of the business could be carried on much more economically and efficiently from Canada, and as a result, the output of the Studebaker factory in this town will be multiplied several times. Already work has started on fitting up the Canadian plant to meet the increased demand, and in a short time upward of 500 men will be employed. New traveling cranes and air compressors installed, rubbing decks and finishing rooms built and railway sidings re-arranged and increased.

—

Wetmore Laboratories for Test Work

MILWAUKEE, WIS., Aug. 14—The Wetmore Mechanical Laboratories Co., Milwaukee, has been organized with $20,000 capital to do inventive, research and test work for manufacturers. The concern intends to specialize in the development of motor car parts. C. P. Wetmore, until recently general superintendent of the Dial Cash Register Co., Milwaukee, and and an engineer of note, is at the head of the new company. A laboratory and machine shop will be established in Milwaukee on Sept. 1.

—

Kidd Paige Representative

DETROIT, MICH., Aug. 16—S. W. Kidd, formerly with the Briggs-Detroiter Co. has been appointed a district sales representative by the Paige-Detroit Motor Car Co.

Ford Averages 1027 Cars a Day

—

Total of 308,213 Built in Fiscal Year — Estimate 4,000 Daily Now Possible

DETROIT, MICH., Aug. 16—Based upon 300 working days for the year, the average daily production at the Ford Motor Co. during its fiscal year which ended July 31 was 1027 automobiles, as the company just announced that a total of 308,213 Fords had been built and sold between Aug. 1, 1914, and the end of July, 1915.

When the total output of the Ford company for its past year is analyzed it is obvious that, big as the total is, it is far from what the actual output of that concern would be when work is performed under pressure; that is to say, when day and night shifts and a full force of 20,000 men or more is working, as was the case in March, April and May.

2096 Cars in 1 Day

It was March 17 that the record production of 2096 cars in one day was established. A few days later 2026 were made. April there were also days when the 2000 cars a day schedule was maintained. The total for April was 46,510 cars, the biggest month in the Ford history. In computing these figures with the more recent activities at the plant it will be remembered that on July 16 car No. 300,000 of the 1915 output was completed. In the fourteen working days from July 16 to 31 the total output of Fords was 8213, or at the rate of only 586 cars a day, or 1510 less than the March record day and 441 less than the daily average for the whole past season.

Speaking on the subject of output, an official of the company said: "I believe that this year a production of more than 4000 cars in one day will be possible. No special effort was made during the past season when we reached the 2000 mark. It was merely a test to see what we could do under normal conditions. Furthermore, at that time few of our assembling plants were all working under full pressure. By Jan. 1 the production facilities will allow every assembling plant to assemble from seventy-five to 150 cars a day. Some of the plants, like Philadelphia, Los Angeles, San Francisco, Long Island City, Chicago, will be supplied with sufficient stock to turn out 200 or more cars a day. However, if such an output will be maintained for any length of time is something no one can predict. We are sure about one thing, and that is that we are in a position to meet any emergency in so far as producing cars is concerned. If we received an order for 50,000 cars to be completed in 2 weeks I have not the slightest worry that every one of them would be ready 24 hours before the day stipulated.

"There are two all important factors to be taken into account with regard to quantity production such as we turn out. First, the raw and other materials needed for such production, and secondly, the public demand.

56,000 Behind Orders

"There is no question that the Ford company could have and would have made and sold at least 25,000 more cars during the past season. As a matter of fact, there have been from 50,000 to 60,000 back orders on the books for the last six months. The one and only reason of not making as many cars as could have been sold was the lack of needed material. If present conditions prevail for any length of time not only the Ford company but many other concerns will be greatly affected in making as many cars as intended. The tremendous amount of war orders is taking precedent over everything else with the steel mills and other plants which furnish raw materials. The agents from the foreign countries are willing to pay any price to be served first and there are plenty of instances to be cited where the automobile manufacturers find that they have but little to expect, and must look elsewhere for their requirements."

From Five to 1027 a Day

The accompanying table will give a correct idea of the growth of production at the Ford Motor Co. since this concern has been in existence:

YEARLY OUTPUT OF FORD CARS

Year	Total Output of Cars	Increase or Decrease	*Daily Average
1903-1904	1,708	..	5
1905	1,695	— 13	5
1906	1,599	— 96	5
1907	8,423	+ 6,824	28
1908	6,398	— 2,025	21
1909	10,607	+ 3,209	35
1910	18,664	+ 8,057	62
1911	34,466	+15,802	115
1912	68,544	+30,078	228
1913	164,452	+95,908	545
1914	248,307	+83,855	827
1915	308,213	+59,906	1,027
Total 12 years	873,076		

*Based on 300 working days.

According to Ford salesmen, as well as to state registration records, it appears that 80 per cent of the Ford cars sold in 1915 were touring cars, 15 per cent were runabouts and the remaining 5 per cent consisted of town cars, coupelets and sedans.

$15,410,650 in Rebates

Based upon these percentages, the Ford company sold 246,570 touring cars having a total value of $110,819,300; 46,231 runabouts having a total value of $20,341,640 and 15,402 town cars, sedans and coupelets of an average value of

$800, or a total value of $12,341,600. This brings the total estimated value of the cars sold by the Ford company in 1915 to $143,502,540.

To the purchasers of the 308,213 cars sold during the past season, the Ford company will return as a rebate a total of $15,410,650.

—

$500,000 Ford Assembly Plant for Oklahoma City

OKLAHOMA CITY, OKLA., Aug. 13—The Ford Motor Co. will build a $500,000 fireproof assembly and service plant here to employ 300 men. Construction will begin in September. It will have 180,000 sq. ft. of floorspace.

Since the Ford company commenced doing business in Oklahoma, the company has enjoyed a fine business. Up to date, the company has sold 16,000 cars. Last year 4000 were sold, and according to J. M. Morriss, the assistant manager of the local branch, this branch could have sold 4000 more. The estimate for the next year, which dates from Aug. 1, has been placed at 11,500 for this State.

On the ground floor will be the 50 by 75 ft. display and salesrooms. At the rear of the salesroom will be the store room and garage, which will be 200 by 75 ft. The manager, assistant manager, and the head of the wholesale department will have private offices on the second floor.

Painting, upholstering, car assembling and storing of stock will use the entire third and fourth floors. An electric sign will top the building.

—

Chicago Sales Good Despite Severe General Rains

CHICAGO, ILL., Aug. 17—Reporting on trade conditions in Chicago, Reo has done 50 per cent more business this week than last, and in the first 2 weeks in August there was 100 per cent increase over the same period last year. Locomobile reports extraordinary business the past few weeks, about 50 per cent more than same period last year. Pierce-Arrow business is quieter now and has been since Aug. 1, because many customers are out of the city. Nothing was done last year at this time but a few sales are being made now. Dodge reports business not so active during the last 2 weeks on account of the severe general rains. Many dealers have cars on the floor which they cannot deliver on account of mud. Studebaker reports twice as many orders as at this time last year.

—

Nesbitt Directs King Advertising

NEW YORK CITY, Aug. 18—W. B. Nesbitt of the Ward & Gow Agency, New York, has been appointed advertising manager of the King Motor Car Co., Detroit. Ward & Gow have complete and exclusive charge of King advertising.

New Series Genemotor Is Out

—

G. E. Electric System for Fords Awarded Gold Medal at Coast Exposition

NEW YORK CITY, Aug. 14—A. J. Picard & Co., this city, general distributors of the Genemotor starting and lighting systems for Ford cars, manufactured by the General Electric Co., have completed their plans for the distribution of the new series Genemotor which has just been brought out. The Genemotor was awarded the gold medal at the Panama-Pacific International Exposition. The new series incorporates a number of improvements which are designed to make the system more reliable and to fortify it against the possibility of misuse in the hands of the novice.

Two particular improvements are to be noted in the new series, which is the second model of Genemotor offered since Jan. 1. These are a double-point contact relay and a flexible driving pinion which is designed to eliminate chain trouble. The new contact relay arrangement enables the generator to start charging the battery at a lower car speed than before; on high gear the battery starts charging with the new model at a car speed of 9 m.p.h.

The reduction of speed at which the battery charges is due to changes in the electrical characteristics of the Genemotor and also to the employment of the improved reverse current cutout, which has a double instead of a single contact. With the lower charging speeds drivers who travel at an average speed of 15 m.p.h. or less will not be troubled by a shortage of current available for operating their lamps.

The flexible driving pinion is a cushion sprocket much along the lines of that used during the past season, but improved in details of construction to provide smoothness and adjustability. The price remains $75.

—

Swan Carbureter Gets Medal

SAN FRANCISCO, CAL., Aug. 12—The Swan Carbureter Co. this city has been awarded the gold medal at the P. P. I. E. This is the highest award made to any carbureter exhibited there.

—

Bowser's Summer Convention Closes

SOUTH BEND, IND., Aug. 14—The annual summer convention of the district sales managers of the S. F. Bowser Oil Tank & Pump Co., Fort Wayne, was held at the home office last week. The meeting was for the purpose of discussing winter sales policies, president S. F. Bowser addressing the meeting, S. B. Bechtel, general manager presided over the meetings. Those attending were western manager B. F. Savercool, San Francisco; L. J. Little, Fort Wayne; B. L. Prince, Dallas; W. M. Mann, Albany; W. R. Hance, Toronto; H. C. Carpenter, Jr., New York; R. S. Colwell, Harrisburg; H. W. Brown, Atlanta; T. D. Kingsley, Chicago; G. H. Hastings, St. Louis; A. W. Dorsch, Washington, D. C., and E. J. Gallmeyer, Louisville.

—

100 Chalmers Service Men in Annual Convention at Factory

DETROIT, MICH., Aug. 16—To-day and to-morrow over 100 of the service men of the Chalmers Motor Co. are taking part in the annual convention which is being held at the plant.

At to-day's meeting president Hugh Chalmers greeted the service men and talked to them on the Chalmers' 1916 policy and plans. Vice-president C. A. Pfeffer also greeted the visitors. Sales manager Paul Smith outlined the object and plans of the convention. Chief engineer C. C. Hinkley spoke about valve-in-head overhead camshaft motors. Service manager A. B. Hanson introduced the service men to the heads of the various divisions of his department and under the direction of vice-president in charge of works S. H. Humphreys, the service men made a tour of the plant. During the afternoon a trip to Grosse Pointe was taken and in the evening a dinner was served at the Ponchartrain Hotel.

Tuesday's session will open with a general discussion on service. This will be followed by a discussion of the Chalmers 6-40 motor which will be illustrated with practical demonstrations. Other speakers are to be A. Atwater Kent, president of the Atwater Kent Mfg. Co., Philadelphia; H. F. Willard, manager of agencies of the Willard Storage Battery Co., Cleveland; Frederick Purdy of the Findeisen & Kropf Mfg. Co., Chicago, manufacturer of the Rayfield carbureter; H. S. Barter, of Gray & Davis, Boston, will talk on the Gray & Davis starting and lighting system.

During the afternoon there will be an open meeting presided over by chief engineer Hinkley and in the evening a dinner and entertainment at the Ponchartrain Hotel.

—

Bondholders to Buy Speedwell Plant

DAYTON, OHIO, Aug. 12—Bondholders of the defunct Speedwell Automobile Co. have decided to purchase the plant when it is sold at public auction on Sept. 1. The plant will continue to be occupied by the Record & Computing Machines Co., which holds a 15-year lease on the property.

New Process Gear Buys Plant

To Take Over Monarch Typewriter Factory Oct. 1—To Employ Over 1000

SYRACUSE, N. Y., Aug. 17—The New Process Gear Corp. will acquire ownership of the Monarch typewriter plant, Syracuse, Oct. 1.

The buildings of this plant cover 2 acres and the surrounding land, which adjoins the property of the New Process Corporation, includes an additional 3 acres. The main building is five stories high, is of brick and slow-burning mill construction. After alterations the Monarch plant will be used by the New Process Gear Corp. as the job gear and axle and transmission department and present plant will be devoted exclusively to the manufacture of automobile materials.

It is the intention of the corporation to employ more than 1000 employees at once before spring, at which time the additional five-story building now being erected on property purchased recently will be completed and equipped.

—

277 More Cars for Delaware

DOVER, DEL., Aug. 13—The State of Delaware received 277 new registrations during the month of July, bringing the total number of cars in that State up to 4412, there having been 4135 cars registered up to July 1. The list of licensed owners and their cars, issued by G. H. Ellis, Secretary of State, shows that the Ford leads in number, followed in order by the Overland, Maxwell, Studebaker, Buick, Hudson, Cadillac, Pierce, Oldsmobile and Packard.

The following list gives the name of car and the number registered during the month of July:

Name	Number	Name	Number
Ford	68	Cadillac	7
Buick	21	Pierce-Arrow	7
Hudson	17	Paige	5
Overland	16	Oldsmobile	5
Maxwell	13	Packard	4
Studebaker	9	Mitchell	4

—

Maxwell Denver Service Branch

DENVER, COL., Aug. 13—The Maxwell Motor Co. has opened a distributing service branch in Denver at 1248 Broadway. The new branch is run under the name Maxwell Motor Sales Co. with D. S. Eddins as district sales manager, W. N. Lindberg as service manager and N. B. Walsh sent from the factory to take charge of the parts stock. Mr. Eddins formerly was in Texas for both the Maxwell and Studebaker people and Mr. Lindberg has been with the Maxwell concern several years, recently opened the company's new branch in Pittsburg.

The business will be under the general direction of Zone Supervisor John Yoke, who also has charge of the business in the Kansas City and Texas districts. This is one of sixteen branches being established by the company throughout the United States.

The Denver branch will supply Colorado, Wyoming, Utah and New Mexico.

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Hercules Motor Car Co. Plant Bid In for $20,800

NEW ALBANY, IND., Aug. 14—The property of the Hercules Motor Car Co. was sold here to-day by County Sheriff Charles W. Long. The plant was bid in by E. B. Stotsenburg, attorney for the bondholders, at $20,800. The value of the property is estimated at $40,000. For the present, it was announced following the sale, the plant will be occupied by the Hercules Sales Co., which has it under lease from the receiver. The Hercules Sales Co., which has its headquarters in Louisville, Ky., took over the patterns, name of the car and blueprints of the Hercules Motor Car Co. the first part of this year, while the Kentucky Wagon Mfg. Co. is manufacturing Hercules cars, an agreement to that effect having been made in March with the Hercules Sales Co.

It is rumored that the plant will pass into the hands of the Kentucky Wagon Mfg. Co., the Ford Motor Co. or the Studebaker Corp.

The property consists of 6½ acres, on which are half a dozen two-story and three-story buildings, together with the machinery of the plant.

The sale was made on a decree issued by Judge John M. Paris in the Floyd Circuit Court in a foreclosure suit of the Fidelity & Columbia Trust Co. of Louisville, trustee for first mortgage bondholders, against the Hercules Motor Car Co., the Hercules Sales Co. and others. The term "others" includes about 100 stockholders in various parts of the country, who hold stock certificates to the amount of $110,325.

The bonds amount to $19,865; the judgment is for $20,658.76, including interest and attorneys' fees, which, with court costs and the expense of the sale, bring the aggregate up to $21,285.02. The amount realized does not quite cover the judgment and costs.

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Elwood Iron Works Petitioned

CHICAGO, ILL., Aug. 14—An involuntary petition in bankruptcy was filed today in the Indianapolis federal court against the Elwood Iron Works, Elwood, Ind. This concern planned to manufacture the Elco 30, rights to which later were secured by the Bimel Buggy Co.

Bay State Headlight Regulation

Measure Probably Will Go Into Effect Oct. 1—Test 40 Dimming Devices

BOSTON, MASS., Aug. 14—The regulation of motor headlights in Massachusetts will probably go into effect about Oct. 1, or shortly thereafter, according to the present plans of the Massachusetts Highway Commission. At the headlight test a few nights ago there were forty cars with devices put through a series of maneuvers over various roads. First the cars were started through one of the long avenues of the Country Club where there are no lights. Chairman Sohier and Commissioners Synan and Kemp of the Highway Commission stood in the road and halted the cars. The three men stood about 30 ft. in front of each machine when it stopped and then noted how far up on their bodies the lights threw their rays. Then they stood on the roadside and asked the drivers if they could see them with their lamps.

The cars were then sent around the avenue and out on the main street near the grounds. There the commissioners with their engineers and other officers of the department together with an advisory committee of motorists rode in every machine around several streets, some lighted and some dark. They made notes of how the lights work in picking out objects; how the dimmers responded to the control, etc. Some devices were operated by a pedal, others by hand, and others were merely the lens or globes in the headlights. There were men with devices from Detroit, Chicago and Los Angeles.

The advisory committee is to meet next week and draw up a report to submit to the highway commission, and the latter body will then formulate some regulation which will become law when the Governor and council approves of it after it is advertised throughout the State.

—

45,000 Cars for Detroit

DETROIT, MICH., Aug. 14—No separate record being kept for any city, the exact number of automobile licenses issued thus far this year to residents of Detroit could not be determined at the office of the Secretary of State, but the number is estimated by officials to be nearer 36,000 than 35,000. This means that thus far this year between 12,000 and 13,000 new cars have been registered by Detroiters. Officials estimate that by the end of 1916 Detroit will have from 45,000 to 50,000 automobiles.

Haynes 100% Stock Dividend

Capital Increased from $600,000 to $1,200,000—Factory Runs Night and Day

INDIANAPOLIS, IND., Aug. 16—At the annual meeting of the stockholders of the Haynes Automobile Co., held Tuesday, Aug. 10, a resolution was adopted declaring a stock dividend of 100 per cent, increasing the concern's capitalization from $600,000 to $1,200,000. A resolution increasing the number of directors from nine to eleven was adopted.

The year just closed has been the most profitable the company has ever enjoyed. The factory has been running day and night for months. Last Saturday every stockholder received a dividend of 22 per cent.

The company has announced it will immediately spend $250,000 enlarging its plant. It will erect a four-story machine shop, a three-story paint shop and a large test barn. It will also expend $75,000 for new machinery. The new buildings will be of steel and brick. They will increase the floor space of the plant about 150,000 sq. ft. and will enable the company practically to double its output of cars.

—

Largest Edition of National Used Car Market Report Out

CHICAGO, ILL., Aug. 16—The sixth edition of the National Used Car Market Report has now been sent to its subscribers and is the largest edition so far published by the Chicago Automobile Trade Assn., which controls its issue. The present edition has 123 9 by 12-in. pages as against 119 9 by 10-in. pages in the previous number. The sixth edition lists the names and values of 154 gasoline passenger cars and 14 electrics. The national system of obtaining valuations is continued with the addition that Minneapolis prices are also quoted in the new edition bringing the list of cities from which information is drawn in compiling the report to Boston, New York, Philadelphia, Cleveland, Baltimore, New Orleans, Chicago, St. Louis, Minneapolis, Kansas City and San Francisco. Each of these cities is the center of a zone in which the prices given for used cars are noted.

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Studebaker's ½-Year Earnings Estimated at $6,300,000

NEW YORK CITY, Aug. 16—Studebaker earnings for the ½ year are being estimated in trade circles here and in Chicago at nearly $6,300,000. The second half should be better, because the plant improvements are largely completed. The corporation requires approximately $900,000 for its preferred dividends. Net earnings, therefore, of $6,300,000 for six months would leave $5,400,000 for $27,000,000 common stock. This is equal to 20 per cent for the six months, or at the rate of 40 per cent for the full year.

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Few Market Changes

NEW YORK CITY, Aug. 17—The markets this week declined. Steel on Wednesday rose 50 cents. The failure of the anticipated renewal in the demand for copper during the past week resulted in a decline of 1 cent, with the market weak. Tin futures showed greater activity when consumers, as anticipated, entered the market for August and September shipments. Lead was inactive, with the market weak. Producers marked down quotations and buyers are still absent due to the effect of overproduction. The cottonseed oil market is in an unsettled state, with a heavy undertone. Trading was very dull owing to the cheapness of competing products and the difficulty of trading with foreign countries. Trading was active in crude rubber yesterday though there was no material change in prices. Gasoline rose 1 cent on Friday, making the price per gallon 14 cents. The rest of the markets remained quiet with no changes.

—

Overland $750 Delivery Commences to Come Through Plant

TOLEDO, OHIO, Aug. 14—The new Overland delivery cars are commencing to come through the Willys-Overland plant in regular production. The chassis used is identical with the model 83 touring car and the body a very strong one. Steel is used for most of the body where possible and strength is well combined with light weight. Special care has been taken to insure that the rigidity of the body shall be maintained, however roughly the van may be used. The rear doors have a spring-controlled locking device which holds them tight against vibration and the finish of the bodies is excellent. The car is not intended for heavy work but should be eminently suitable for the needs of retail trade where the loads are moderate and everything depends upon speedy delivery of small parcels to customers.

—

Canadian Ford Stock Has Sold Up to $1,500

DETROIT, MICH., Aug. 17—Stock of the Ford Motor Co. of Canada, Ltd., has recently sold at $1,500 a share, as the records of the Detroit Stock Exchange show. The par value of the stock is $100. On Dec. 17, 1914, the stock sold at the lowest price it had been selling for more than a year, $475 a share. The sale made July 26 shows an increase of 216 per cent in the last eight months.

How the stock has increased in value is best shown by the following table:

Date	Last Sale	Bid
December 17, 1914	$475	$475
January 21, 1915	475	475
February 5, 1915	475	500
March 2, 1915	525	500
March 27, 1915	525	550
April 6, 1915	525	600
April 14, 1915	625	600
April 30, 1915	700	700
May 18, 1915	700	750
May 19, 1915	925	800
May 21, 1915	925	900
May 29, 1915	925	950
June 19, 1915	925	1,000
June 29, 1915	1,250	1,100
July 1, 1915	1,325	1,275
July 13, 1915	1,350	1,275
July 15, 1915	1,350	1,350
July 16, 1915	1,350	1,350
July 19, 1915	1,425	1,400
July 22, 1915	1,450	1,425
July 24, 1915	1,450	1,475
July 26, 1915	1,500	1,475

—

Dodge Plant Raises Town Population

DETROIT, MICH., Aug. 7—Here is a good and strong example of what the automobile industry really means to a community. In 1910, when the census of the village of Hamtramck, a suburb of Detroit, was taken, it showed that there were 3559 inhabitants. The plant of Dodge Bros. is located there and at that time the concern did not make automobiles, and employed between 600 and 700 men.

Last year it was decided by the U. S.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Frl.	Sat.	Mon.	Week's Changes
Aluminum	.33	.33	.33	.33	.33	.33	.....
Antimony	.35	.33½	.33½	.33	.33	.31	—.04
Beams & Channels, 100 lb	1.47	1.47	1.47	1.47	1.47	1.47	.....
Bessemer Steel, ton	22.00	22.00	22.50	22.50	22.50	22.50	+.50
Copper, Elec., lb	.17⅞	.17¾	.17¼	.17	.17	.17	—.00⅞
Copper, Lake, lb	.18¼	.18¼	.17½	.17¼	.17¼	.17¼	—.01
Cottonseed Oil, bbl.	5.83	5.77	5.73	5.80	5.80	5.70	—.13
Cyanide Potash, lb	.23	.23	.23	.23	.23	.23	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.14	.14	+.01
Lard Oil, prime	.87	.87	.87	.87	.87	.87	.....
Lead, 100 lb	4.45	4.45	4.45	4.45	4.45	4.45	.....
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	22.50	22.50	23.00	23.00	23.00	23.00	+.50
Petroleum, bbl., Kan., crude	.55	.60	.60	.60	.60	.60	+.05
Petroleum, bbl., Pa., crude	1.35	1.35	1.35	1.45	1.45	1.45	+.10
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	.....
Rubber, Fine Up-River, Para	.57	.57	.57	.57	.57	.57	.....
Silk, raw, Ital.	..	..	3.80	..	..	3.80	.....
Silk, raw, Japan	..	..	3.42½	..	..	3.45	+.02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb	34.50	35.12½	34.75	34.50	34.50	34.50	.....
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04⅜	.04¾	.....

rnment to have a special census
of the village. The returns showed
there are now 21,242 inhabitants,
has caused the village of Ham-
ck to be raised from the status of
rd or fourth class city to that of a
class city. It means, among many
things, that the people will get free
ry of mail and that the pay of the
ks of the post-office is to be raised.
this is due practically entirely to
ct that Dodge Bros. are now motor
nufacturers. They now employ
,000 men in their plant.

—

Tires Reduced Temporarily 25 Per Cent

W YORK CITY, Aug. 16—The Gau-
re Corp. has reduced its tire prices
r cent, effective only for this week.
llowing prices are given on a few
popular-sized tires:

	32 x 3½	34 x 4	36 x 5
...ad	$15.11	$20.29	$28.65
... .	18.19	24.34	34.27

more than two tires will be sold
ne purchaser and orders received
on of Aug. 21, will not be exe-
except at full list price.

—

Crawford Now in Detroit

T, MICH., Aug. 14—Chief Engi-
S. Crawford of the Cole Motor
Indianapolis, is now a Detroiter.
the fact that the largest part
terials and parts used by the
pany come from Detroit it has
d advisable and more satisfac-
have the chief engineer of the
in closer touch with these con-
which parts and components
ased. All designing work will
done here in Detroit, which is
reason of the removal.

Security Prices Higher

Sturdy Demand in All Stocks —Willys-Overland Makes High Mark

NEW YORK CITY, Aug. 16—Substantial gains in the security markets occurred last week. The gains this week range from a half to thirty-eight points. The losses were light, ranging from one-quarter to three points. The highest gain was noted on Wednesday when Willys-Overland rose thirty-eight points. This rise was the feature of the market. The next highest gain was made by Studebaker, a rise of fifteen and a quarter points. General Motors was also a feature, with a fifteen-point gain. There were also noted many substantial gains in the tire markets, the highest of which was Kelly-Springfield second preferred, which rose twenty points. The rest of the rubber gains were heavy, ranging from one to fifteen points. The Detroit issues also showed very large gains, General Motors common being the feature of the market with a twenty-point rise. Reports of good earnings brought Studebaker common up fifteen and a quarter points. The inactive stocks remained quiet; the only gain that occurred was that of the Atlas Drop Forge Co., making a rise of two and a half points.

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Air Spring Co. Formed in Bradford

BRADFORD, PA., Aug. 12—Articles of incorporation of the Bradford Air Spring Co. have been applied for. This company has been building and testing on a small scale for the last three years, and now will start producing on a larger order. The directors of the company are J. A. Fraunheim, W. W. Hughes and F. M. Nash, the offices being located in the Schoenblom Building at Main and Kennedy Streets.

The company controls several patents on pneumatic springs for vehicles. The spring itself is automatic. The air is pumped into the cylinder by the motion of the car, and as each spring is individual, three of the wheels may ride on the road and only one be raised when the car comes in contact with an impediment. The individuality of each spring permits of uneven distribution of the load in a car without affecting the level position of the body.

In addition to the plant of the Bradford company, the shops of Bovaird & Co. will be utilized for the present.

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Wayne Wheel & Bow Elects

WAYNE, MICH., Aug. 14—At a meeting of those interested in the recently organized Wayne Steering Wheel & Bow Co. the following officers were elected: William Wetherell, president; J. C. Coleman, vice-president; A. A. Snyder, treasurer; Miss E. John, secretary. The board of directors consists of the first three named officers and C. Papke, V. Vallance, E. Hoops and H. Ditmer.

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Baughman Winton Sales Mgr.

NEW YORK CITY, Aug. 16—O. F. Baughman has been appointed sales manager of the Winton company, Cleveland, Ohio. Mr. Baughman has been connected with the sales department of that company since 1903.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
...ber Co. com			300	..	..
...Rubber Co. pfd			101	110	..
...Castings pfd			100	102	+2
...pfd			70	79	..
...Motor Co. com			87	90	—3
...Motor Co. pfd			94	97	—2
...Storage Battery Co			62½	64	+10½
...Tire & Rubber Co. com			510	515	+4
...Tire & Rubber Co. pfd			111	..	+2
...Motor Co. com			218	220	+15
...Motor Co. pfd			107	110	+2
...Rubber Co. com			58	59	+7¼
...Rubber Co. pfd			117½	108	+13½
...Tire & Rubber Co. com			268	270	..
...Tire & Rubber Co. pfd			107	108½	+2
..., Inc., pfd			..	..	..
...Motor Co. com			25½	26¼	+6½
...Motor Co. pfd			48½	49	+5½
...Tire Co. com			184	185	+14
...Tire Co. 1st pfd			86	88	+ ¾
...Tire Co. 2d pfd			180	183	+20
...Co. com			40	42	+11
...Co. 1st pfd			86½	87½	+2½
...Co. 2d pfd			34½	35½	+1¼
...Co. com			..	195	..
...Co. pfd			107	107½	+3
...Mfg. Co. com			..	..	..
...Mfg. Co. pfd			..	..	..
...Car Co. com			..	120	..
...Car Co. pfd			97½	100½	..
...Car Co. com			70	73	+3
...Car Co. pfd			81	83½	+1
...Co. com			42	..	+6
...Co. pfd			92	94	..
...Truck Co			17¼	18	..
...Car Co			33	34	— ¼
...Co. pfd			..	..	..
...Speed Corp. com			66	68	+5½
...Speed Corp. pfd			105	107	..

No quotations available at this time on account of war.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Studebaker Corporation com			99	100	+15¼
Studebaker Corporation pfd			104	105	+1
Swinehart Tire & Rubber Co			85	90	..
Texas Company			143	143½	+4
U. S. Rubber Co. com			47½	48	+ ½
U. S. Rubber Co. pfd			103	103½	—1
Vacuum Oil Co			218	221	—2
White Company pfd			110	..	+7
Willys-Overland Co. com			184	186	+38
Willys-Overland Co. pfd			104	107	+1
ACTIVE STOCKS					
Chalmers Motor Co. com	..	99½	87	..	..
Chalmers Motor Co. pfd	..	..	96¼	97¼	+8¼
Continental Motor Co. com	155	180	..	300	..
Continental Motor Co. pfd	..	75	83	86	..
General Motors Co. com	66	70	216	220	+20½
General Motors Co. pfd	80	86	108	110	+3
Maxwell Motor Co. 1st pfd	..	..	40	43½	+5¾
Maxwell Motor Co. 2d pfd	..	..	86½	88½	+3
Maxwell Motor Co. com	..	..	35	37	+3
Packard Motor Car Co. com	..	..	114	..	..
Packard Motor Car Co. pfd	..	97	99	..	..
*Reo Motor Car Co	20	21	33	33¾	— ¼
*Reo Motor Truck Co	11½	12	17⅛	18	+ ¼
Studebaker Corporation com	..	..	95	98	+13¼
Studebaker Corporation pfd	..	..	103½	106	+2¾
INACTIVE STOCKS					
*Atlas Drop Forge Co	19	..	28	..	+2½
Ford Motor Co. of Canada, Ltd	..	560	1475	..	..
Kelsey Wheel Co	..	..	205	..	..
*W. K. Pruden Co	..	20½	20¼	..	..
Regal Motor Car Co. of Canada pfd	23	..	..	21	..
BONDS					
General Motors, notes, 6s, 1915	100	..	..	..	..
Packard Motor Car Co., 5s, 1916	..	..	98¼	..	..

*Par value $10; all others $100 par value.

Twenty-Seven Entries for Elgin

Eleven Contestants for C. A. C. Cup Race and Sixteen for Elgin Trophy

CHICAGO, ILL., Aug. 17—Twenty-seven entries have been received for the fifth annual Elgin road races which will be run over the 8.36 mile Kane County course on Friday and Saturday of this week. The Chicago Automobile Club Cup event, which will be held Friday, and for which cars of a piston displacement of 300 cu. in. or less are eligible, has attracted eleven nominations while there will be sixteen contenders for the Elgin trophy in Saturday's event for which the maximum piston displacement is set at 450 cu. in.

Many Stars Entered

With the exception of Dario Resta and Bob Burman, the Elgin meet has attracted the majority of the stars of America's speed firmament and the two races, each of which will be 301 miles in length, promise to be bitterly contested and faster than those of last year when Ralph De Palma averaged a fraction better than 73 miles per hour in scoring a double victory with his Mercedes.

De Palma Defends Trophies

De Palma will be on the starting line to defend both of the trophies that he captured last August. He will have some stubborn opposition for among his challengers are Earl Cooper, winner of the 1913 American road-racing championship; Gil Anderson, the pioneer of the Stutz team who captured the Elgin trophy 2 years ago; Barney Oldfield, the master driver of the world in his Delage, and Eddie O'Donnell, the star of the Duesenberg forces.

Ten for Both Days

Ten of the drivers will appear on both days of the speed carnival, the entrants of the following cars believing that their mounts have sufficient stamina to withstand the high-speed test of 602 miles; De Palma's Mercedes, Bragg's Stutz, Cooper's Stutz, Anderson's Stutz, Henderson's Duesenberg, O'Donnell's Duesenberg, Brown's Du Chesneau, Patrick's Mercer, Alley's Ogren and Oldfield's Delage. In fact, the Cornelian, to be driven by Frank Justen, is the only car in the C. A. C. Cup race that has not been entered in the Elgin trophy contest.

Six for Elgin Cup Only

Six cars have been groomed solely for Saturday's speed battle as follows: A Duesenberg, which probably will be driven by Eddie Rickenbacher; Andy Burt's Stutz, Scott's Anderson special, Otto Henning's Mercer, Fred Robillard's Lozier and George Buzane's De Dietrich.

Ralph Mulford, who captured the 300-mile race on the Des Moines speedway 10 days ago, originally was scheduled to drive the third Duesenberg Saturday, but yesterday wired the promoters that it would be impossible for him to compete because of a business engagement in New York. An effort is now being made to induce Eddie Rickenbacher to take the mount. The Elgin course is faster than ever before, according to the drivers, who predict that the winners will be forced to average better than 80 miles an hour in order to annex the major portion of the prize money. The roads have been widened, rolled and oiled and two of the four turns have been reconstructed since last year.

The prize money for this year's races is the same as last year, $3,000 each day, but the Elgin promoters have introduced an innovation in that they will give $100 to each driver completing 100 miles and $200 to each driver finishing 200 miles, provided they do not run one, two, three and therefore are not eligible to participate in the division of the regular purse, which will be split $1,800 for first, $700 for second, and $500 for third.

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Practice Starts at Elgin

ELGIN, ILL., Aug. 14—Practice for the Elgin races Aug. 21 and 22 started on the 8-mile course lying in the outskirts of Elgin. The track is immeasurably superior to former years and an average speed of 80 m.p.h. may not be impossible if weather conditions are favorable. The course has been oiled for several weeks and times made over it in practice were well above those of last year. Speeds of over 100 m.p.h. are being maintained on the straightaways.

ENTRIES FOR ELGIN FIRST DAY

Car	Driver	Car	Driver
Mercedes	De Palma	Du Chesneau	Brown
Stutz	Bragg	Mercer	Patrick
Stutz	Cooper	Ogren	Alley
Stutz	Anderson	Cornelian	Justen
Duesenberg	Henderson	Delage	Oldfield
Duesenberg	O'Donnell		

SECOND DAY

Car	Driver	Car	Driver
Mercedes	De Palma	Anderson Special	Scott
Stutz	Bragg	Du Chesneau	Brown
Stutz	Cooper	Mercer	Henning
Stutz	Burt	Mercer	Patrick
Stutz	Anderson	Ogren	Alley
Duesenberg	Henderson	Lozier	Robillard
Duesenberg	O'Donnell	DeDietrich	Buzane
Duesenberg	Rickenbacher	Delage	Oldfield

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20,814 Cars in Oregon

SALEM, ORE., Aug. 14—Figures compiled by the Secretary of State show that at the close of business July 15, 20,814 automobiles had been licensed since the first of the year. This figure is more than 4000 in excess of the entire registration for 1914.

$250,000 Speedway for Louisville

2-Mile Oval Planned — 300 Acres Bought—Ready for Race by Spring

LOUISVILLE, KY., Aug. 14—If the present plans of local capitalists and men from Cincinnati and Indianapolis are carried out, Louisville will have a $250,000 motor speedway, with a 2-mile oval course. Property aggregating 300 acres has been purchased and leased immediately south of and adjoining the Douglas Park race track, and it is proposed to construct a track which will attract the leading stars in the automobile racing field.

Incorporation of the Louisville Automobile Speedway and organization of the controlling company will be completed within 30 days, it is announced, and work will be started on the course within the following 30 days. Although it is declared to be possible that the first meet will be held in October, if the course can be completed by that time, the promoters announce that the speedway will be in shape for a big meet by spring.

The plans of the company call for the erection of a grandstand having a seating capacity of 10,000 persons. This stand will be arranged so that others can be added if needed.

Big Men Behind It

George L. Martin, of the real estate firm of Mueller & Martin, is one of the principal promoters. He secured the ground for the speedway. Interested with Mueller and Martin in the speedway project are Carl G. Fisher, originator and president of the Indianapolis Motor Speedway; Louis Seelbach, president of the Seelbach Hotel Co.; Patrick J. Hanlon, former vice-president of the American Tobacco Co.; Frank Fehr, president of the Frank Fehr Brewing Co.; Basil Doerhoefer, a local capitalist, and J. H. McKee, a Cincinnati capitalist.

With the exception of a tract of 55 acres leased from the J. F. Callaway estate for a term of years, all of the property was bought. Stonestreet & Ford, engineers in the Louisville Trust Building, are working out plans for the course, which will be designed to overcome defects apparent in other speedways. Built of 2 x 4 timbers set on end, it will enable drivers to attain a speed of 90 to 95 miles an hour.

It is proposed to offer purses of similar proportions to those given in Indianapolis and Chicago, aggregating probably $50,000, thus attracting all the speed kings whose performances have drawn great crowds to the Indianapolis and Chicago races. Accommodations will be

ided for out-of-town motorists. s will be held at least one each year. e controlling company will be in- rated with a capital stock of ,000, this sum covering the amount for fourteen pieces of land included e 300 acres and for the cost of ruction.

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Corona Race for November 20

NA, CAL., Aug. 12—Definite ar- ments for the Corona race to be November will be made early this and it has been practically decided Nov. 20 will be the date.

first action to be taken will be the poration of the Corona Auto Assn., which conducted the two races. Immediately after the anization passes into history a ociation will be incorporated.

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Orleans $1,000,000 Speedway Co.

, DEL., Aug. 14—The New Motor Speedway Assn., to carry mobile racing in New Orleans, incorporated with a capital $1,000,000. The incorporators W. Lindsay and J. C. Williams go, Ill.

company plans to construct a to cost about $500,000, which finished in time for a long-dis- e in February, 1916, the Satur- Mardi Gras. The Mardi Gras be made an annual event.

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Sheepshead Tickets on Sale

YORK CITY, Aug. 16—The d Bay Speedway Corp. to-day the sale of tickets at its ticket Broadway, this city. The the opening meet on Oct. 2 ows: Grand stand, $3; bleach- automobile parking spaces d of track, $25, $15, $10 and , $50 and up, general admis- Each box accommodates six A diagram of the entire field, d parking spaces, together from this city to the track, ailed upon request to the man-

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Aug. 20 Cadillac Day

NCISCO, CAL., Aug. 12—The the Panama Exposition have Aug. 20 as Cadillac Day at the is the first time that such an been conferred on a motor car, connection a State-wide tour cars has been announced ing Cadillac owners from all California.

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Automobile Force Planned

CITY, Aug. 13—Members mobile Club of America have a plan to organize a de- of armored automobiles.

Detroit to Have Show Building

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Auditorium 165 by 330 Ft. To Be Built — Next Detroit Show May Be Held There

DETROIT, MICH., Aug. 16—At last Detroit is to have an exhibition building and to local automobile dealers, especially to C. C. Starkweather, formerly president of the Detroit Automobile Dealers' Assn. and who is manager of the local branch of the Buick Motor Co. most of the credit is due for the success in launching the organization.

Upon property facing 205 ft. on Woodward and Cass Avenues and 450 ft. on Antoinette Street, there will be erected an auditorium and convention hall 165 by 330 ft. The hall will have a seating capacity for at least 24,000 people and it is expected that the next Detroit automobile show will be held in it.

The organization is known under the name of Merchants' and Manufacturers' Auditorium and will be incorporated. C. C. Starkweather is president; Walter Wilmot, who has been in charge of the local automobile shows for many years, is vice-president and general manager; W. J. Gordon, president of the Gordon Auto Sales Co. is treasurer and H. C. Bulkley, of Campbell, Bulkley & Ledyard is secretary.

On the street frontages the building is to be two stories high, 60 ft. deep on Woodward and Cass Avenues and 40 ft. deep on Antoinette, this for the purpose of providing a number of stores or show rooms 20 ft. wide for automobile supply dealers and manufacturer's agents or automobile dealers.

The interior of the exhibition hall will have two mezzanine balconies which may be used at show time for parts and accessory exhibits and which ordinarily will provide space for manufacturers agents and others.

Work on the new building is to be started within 30 days and it is expected that it will be ready by Jan. 1.

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Mulford Special Stars on Track

FLEMINGTON, N. J., Aug. 13—A Mulford Special, driven by Ira Vail of Brooklyn, starred in the four 5-mile events and a pursuit race held at the ½-mile track here to-day, by taking three firsts and two seconds. In the Australian pursuit race, Joseph Lambert's mechanician, Amos Miller, in a Stutz was seriously injured when their car crashed through the fence in the final lap. Vail won this race.

Vail took first in the special invitation race with Lambert second, the time being 6:18. The next 5-mile event was for cars under 30 cu. in. piston displacement, which was won by Vail, in 6:39½. The fastest time of the day was made by Theobold in a Mercedes, who won the free-for-all in 6:15½. Lambert's Stutz won the 5-mile handicap in 6:19.

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5-Day Business Tour To Replace Wisconsin Reliability Run

MILWAUKEE, WIS., Aug. 14—To take the place of the annual Wisconsin reliability tour, admittedly a stimulant for motor car sales in Wisconsin, and to advertise the fall motor show to be held Sept. 13 to 17 in connection with the Wisconsin State Fair here the Milwaukee Automobile Dealers, Inc., will conduct a 5-day tour covering approximately 1000 miles Aug. 23 to 28. The pathfinder, an Overland, returned Saturday, Aug. 14, and reports unprecedented interest in the run. The tour will be purely of a business and social nature, with no contest features, and at least seventy-five cars are expected to participate. The exact mileage of the route is 965, and embraces every city of consequence in southern, eastern, western and the central part of Wisconsin.

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Trying Out New Denver Traffic Rules

DENVER, COL., Aug. 14—Three new traffic regulations are being tried out in Denver under ordinances just put into effect, following a recent avalanche of fatal and otherwise serious accidents involving motor cars, other vehicles, street cars and pedestrians.

One prohibits cars from parking on streets in the business section with either of the inside wheels farther than 2 ft. from the curb, or the front line of the car closer than 4 ft. to the rear line of the car next in front. This restriction applies especially to the business streets having street car lines, where crowded conditions have become a menace to all kinds of traffic.

Another requires headlights on all bicycles and motorcycles while in motion, and rear lights on all carriages and all other kinds of vehicles, whether moving or standing, with the exception of vehicles used for transporting oil or gasoline. These headlights must show a white light visible a distance of 50 ft. in the direction of travel, and the rear lights must show a red light visible 20 ft. to the rear. All vehicles loaded with materials projecting from the rear must carry the red signal light at the extreme rear point of such projecting materials.

The third establishes marked courses for pedestrians to cross the streets inside the curb line at street intersections, and prohibits crossing an intersection at an angle or crossing a street in the middle of a block. White lines in both directions form a square for vehicle traffic at all street intersections in the business district, and pedestrians are not allowed inside this square.

Predict Rise in Crude Oil Price

Scarcity Will Affect Gasoline Price, Say Texas Oil Men —650,000 Bbl. Yearly

HOUSTON, TEX., Aug. 13—It is the expressed opinion of leading oil operators of Texas that there will be a big increase in the price of light crude oil, suitable for refining, during the next few months. In consequence of the growing scarcity of the product the prices of gasoline will naturally show a corresponding raise. W. H. Gray of Houston, who has made a study of the situation, said:

"The world is now using approximately 650,000 barrels of lubricating and light crude oils daily. If the present rate of increase of consumption of these oils continues for seven years there will be at that time a total of more than 1,000,000 barrels used daily. Of the present consumption Texas produces about 40,000 barrels daily and Oklahoma about 325,000 barrels daily. The balance of the daily production comes from the Eastern fields. Of course, new fields of light crude oil may be found that will make a change in the situation which the consumers and operators are now facing. Prospecting for such fields is going on in many parts of the world. Unless the production is materially increased prices will rise."

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Dunkirk Leads Europe in American Cars and Trucks

DUNKIRK, FRANCE, July 24—American automobiles are to be found in this town in greater number and wider variety than in any other place on the Continent of Europe. This is due to the fact that while Dunkirk is a French town, it is also an important military center for both the Belgians and the British. The town is actually within sight of the Belgian frontier, and as there is now no big town in Belgium left to the Belgians, Dunkirk forms a most convenient refuge.

The British Army Service Corps is making a big use of Peerless trucks; the Canadians also have a number of Peerless. The French in this neighborhood are mostly supplied with trucks and cars from their own factories, although not far from here there are a number of 2-ton Whites used almost exclusively for carrying troops to and from the trenches. The Belgians have enough American automobiles to run a New York show: Fords, King, Overland, Krit, and other light rigs, used mostly for ambulance work; Pierces predominate in trucks, and Italy has supplied them with a number of Fiats and Diattos. These Italian cars are mostly touring car chassis. Since Italy came into the war the Belgians have had much trouble in getting spare parts for their Italian cars.

The Pierce 2-ton trucks are looked upon as a luxury. All drivers I have been able to talk to are delighted with them—but are unanimous in kicking against the governors. As the officers insist on governors being fitted, and would not allow them to be taken off under any condition, the drivers' kicks are altogether ineffective. All the Belgian drivers are speed mad, and they dislike being held down to 20 kilometers an hour by a little governor which they cannot take off.

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St. Louis Gasoline Cut Raises Crude Oil Price

ST. LOUIS, MO., Aug. 14—The alleged war of the Standard Oil Co. against independents in St. Louis will be called to the attention of the Independent Petroleum Marketers Assn. of the United States at its annual convention in Milwaukee, Wis., on Aug. 25 and a reciprocal slap at John D. Rockefeller's company will be demanded by the local dealers.

Announcement to this effect was made here to-day by F. C. Bretsnyder, president of the Bell Oil Co. and an officer in the national organization. The fight during the last eighteen months has brought the retail price of gasoline down from 17½ cents a gal. to 8.9 cents a gal., a cut of almost 50 per cent and has raised the price of crude oil 25 per cent, Mr. Bretsnyder said.

While the price of gasoline has been reduced in many eastern cities also, local dealers claim that nowhere has it been cut so frequently and deeply as in St. Louis. Almost invariably the cuts of 1 cent each were first announced here by the Standard Oil. The Pierce Oil Corp. soon followed and the smaller dealers fell into line.

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N. Y. Safety First Society Recommends New Laws

NEW YORK CITY, Aug. 12—The Safety First Society of New York to-day concluded an investigation of street accidents during several months by recommending to the Board of Aldermen to pass ordinances on the following:

Providing for the elimination of dazzling head and side lights on automobiles.

Requiring parallel parking at the curb for all vehicles of the delivery type.

Requiring the use of mirrors on all motor vehicles in Greater New York.

Requiring owners of all motor vehicles with chain drive to inclose the chains with suitable guards.

Making it a misdemeanor for any person to "hitch on" or trespass upon a motor truck or horse-drawn vehicle, unless employed by the owner of such vehicle.

The society also favored provision in buildings for runways for loading and unloading vehicles so as to relieve street congestion.

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135,000 Cars for Michigan

LANSING, MICH., Aug. 14—Officials of the Secretary of State's Department have been indulging in some figuring as to what the new Michigan automobile tax law will mean to the state in the way of revenue. Basing their estimates upon the issuance of 135,000 license numbers, and the average tax per car at $12, the state would receive a minimum of $1,620,000 from the owners or users of automobiles during the first year the new law is in force. This would be more than double the amount estimated when the law was discussed.

The Newell Smith automobile tax law which goes into effect Jan. 1 provides for a tax of 25 cents per horsepower plus 25 cents per each 100 lb. of weight. Up to the end of this week more than 102,000 tags have been issued for 1916 cars, and at the rate they are being applied for the officials believe that 135,000 cars will be licensed by the end of the year.

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Gasoline Up 1 Cent in New York City

NEW YORK CITY, Aug. 17—Gasoline went up a cent to-day, from 13 to 14, delivered to the garageman. The Standard Oil Co. and the Texas Co. both raised. The last previous raises were: Standard, July 27, from 12 to 13; Texas, July 28, from 12 to 13.

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Ohio's New Laws in Effect

COLUMBUS, OHIO, Aug. 13—The announcement is made by the Ohio Automobile Department that the new laws governing the operation of automobiles in the State, passed by the Ohio Legislature at the last session are now becoming effective.

The law making it a felony to change a manufacturer's serial number or to have a car with a changed number in his possession became effective July 29. The law permitting the transfer of number plates from one car to another by the same owner by the payment of a fee of $1 became effective Aug. 1. The law reducing the fees for registering manufacturers and dealers from $20 to $10 became effective July 25.

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Donaldson, Sr., Killed in Race

SPIRIT LAKE, IOWA, Aug. 13—R. E. Donaldson, owner of the Emden car, which finished in eleventh place in the Indianapolis 500-mile race, and father of H. G. and L. C. Donaldson, both of whom participated in the race as mechanics, was killed instantly in an automobile race here this afternoon. The sons won first and second places.

Martin Body to Add—The Martin Metal Co., Wichita, Kan., builder of metal automobile bodies, is planning an addition to its plant.

Covert to Build—The Covert Motor Vehicle Co., Lockport, N. Y., has let a contract for a three-story and basement, 44 by 96-ft. factory building.

Hancock Co. Adds—The Hancock Mfg. Co., Charlotte, Mich., manufacturer of automobile sundries, is completing the erection of a brick and steel addition to its plant, 80 by 160 ft., doubling its capacity.

F. W. D. Extending—The Four Wheel Drive Co., Clintonville, Wis., is erecting a large addition to its present factory, to cover an area of 100 by 185 ft. New machinery and equipment will also be purchased.

To Make Bodies—The Nineveh Coach & Car Co., Nineveh, N. Y., has increased its capital stock and will erect additional buildings for the manufacture of automobile bodies. New equipment will also be installed.

Western Supply Enlarges—The Western Auto Supply Manufacturing Co., Bellingham, Wash., will construct a 50-ft. addition to its plant and install new machinery, including testing machine, generator, cylinder boring machine, etc.

Moreland Truck Doubles Capacity—The capacity of the Moreland motor truck factory is to be more than doubled. This will mean that more than 100 motor trucks of this make are to be manufactured in Los Angeles every month. This company is also prepared to spend $1,500,000 each year in bringing the Los Angeles plant up to its full capacity. Moreland distributing and service stations are to be established in all the important towns of southern California.

Chester Rubber Adds—The Chester Rubber Tire & Tube Co., Chester, W. Va., a subsidiary of the New York firm, is erecting extensive additions to its plant, which is expected to increase its capacity about eight times.

New Akron Tire Co.—A new tire-making plant will be established in Akron, Ohio, by the Western Tire & Rubber Co. A three-story building, 60 by 150 ft., will be erected and a power plant will be installed.

Overland Warehouse Started—Construction of the Willys-Overland $250,000 warehouse plant in the Midway, St. Paul, has been begun. Excavation is being done with an immense crew of men, steam shovels and dinky trains.

Simple Engine Co. Moves—The Simple Gas Engine Co., Brainerd, Minn., has moved its offices and works to Ashland, Wis., and is now producing a line of internal combustion engines. The company occupies the former plant of the Ski Mfg. Co., and its foundry work is done under direct supervision at the Nelson Roen Foundry Co. C. A. Anderson is general manager and chief engineer.

To Make Carbureters, etc.—Thomas Spence, president, and W. G. Spence, vice-president of the Rundle-Spence Mfg. Co., 100 Second Street, Milwaukee, manufacturing plumbers' and steamfitters' supplies, are the moving spirits in the organization of the Turbo Motor Devices Co., capital stock $30,000, which intends to manufacture and market a number of appliances for internal combustion engines, including a carbureter. Associated with the Spence interest in the new concern are M. L. Fykse and L. M. Smith.

Linde Air Products' Milwaukee Plant—The Linde Air Products Co. of New York has purchased a large factory site at Thirty-eighth and National Avenues, Milwaukee, and will at once establish a branch plant to serve Milwaukee and Wisconsin users of welding and cutting apparatus. The site is 150 by 700 ft. and is located on the joint belt line railroad. The building will be of concrete and brick, one-story, 150 by 250 ft. in size and cost about $50,000. Until now the Chicago branch has been supplying this territory, but the growth of the use of the oxygen welding and cutting process, together with the use of the equipment for cleaning gas engines, necessitated the establishment of a direct branch in the heart of the Milwaukee manufacturing district. The new shop will be ready by May 1 and there will be 100 operatives engaged for its operation. The Linde company, an $18,000,000 corporation, recently was licensed to do business in Wisconsin.

The Automobile Calendar

Aug. 20-21	Elgin, Ill., Road Races.
Aug. 23-28	Milwaukee, Wis., Wisconsin Reliability Tour.
Aug. 26	Ventura, Cal., Show.
Aug. 30	Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept.	Peoria, Ill., Second Northwestern Road Congress.
Sept. 4	Twin City, Minn., 500-Mile Race; Twin City Motor Speedway Co.
Sept. 6-9	Worcester, Mass., Show, Dealers' Assn.
Sept. 6-10	Indianapolis, Ind., Show, Indiana State Fair.
Sept. 6-15	Detroit, Mich., Show, Michigan State Fair.
Sept. 8-11	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13-17	Milwaukee, Wis., Show, Automobile Dealers' Assn.
Sept. 13-17	Oakland, Cal., Pan-American Road Congress.
Sept. 17-18	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18	Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Sept. 18-25	Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Sept. 24	Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 27-Oct. 10	Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Oct.	Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct.	Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2	New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 2	Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9	Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 3-10	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6	Columbus, O., Garage Owners Convention.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9	Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14	Chicago, S. A. E. Standards Committee Meeting.
Oct. 16	Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 18-19	Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Nov. 1-3	Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18	Arizona 150-mile Grand Prix.
Nov. 20	Corona, Cal., Road Race.
Nov. 29-Dec. 4	Electric Prosperity Week.
Dec. 31	New York City, Show; Grand Central Palace.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Smith Sales Mgr.—A. J. Smith has returned to automobile circles in San Francisco, and has taken the position of sales manager with the Reliance Automobile Co., northern California distributors of the King car.

Schramm Resigns from Packard—R. I. Schramm, until recently assistant advertising manager of the Packard Motor Car Co., Detroit, Mich., recently resigned to become distributor in Ottawa, Canada, for the Ford Motor Co. of Canada, Ltd.

McKenzie Goes to Portland—L. E. McKenzie, formerly in charge of the Studebaker interests in Pittsburgh, has been appointed assistant manager of the Portland branch, succeeding Clete Mulick, who has been transferred to the San Francisco Studebaker branch.

Knoble Hyatt Assistant Advertising Mgr.—Cliff Knoble, formerly with the National Cash Register Co., Dayton, Ohio, where he was connected with the advertising department, has been appointed assistant advertising manager of the Hyatt Roller Bearing Co., Detroit, Mich., and will assist Advertising Manager W. E. Biggers at the Detroit headquarters.

Bunnell Heads Portland Chalmers—Portland, Ore., has been chosen as the executive headquarters for the Chalmers Motor Co., with Marc Bunnell as district manager. The territory will consist of the field north of California and west of the Dakotas. In the immediate future Mr. Bunnell will open up factory offices in Portland. The Chalmers agency for Oregon and Washington will be retained by the veteran dealer, H. L. Keats.

Garage

Regal to Move—The Regal Motor Co. of Boston, Mass., has signed a lease to occupy part of the new building just erected on Commonwealth Avenue and Beacon Street, Boston, Mass., the other sections of which will be used by the Reo and Hupmobile agencies.

Willard Branch in Cleveland—A new branch of the Willard Storage Battery Co. has been opened by the company in its home city of Cleveland. The location selected for this branch is 2027 Euclid Avenue. Full equipment for recharging, repairing and renewing has been installed, and a complete stock of batteries is carried. Thus the new station will be a great convenience, not alone for car owners, but for dealers.

Motor Men in New Roles

Conrad Resigns from Pullman—H. W. Conrad has resigned as sales manager of the Pullman Motor Car Co., York Pa., taking effect July 31.

Brodhead Joins N. Y. Marmon—Walter Brodhead has been made manager of the Marmon used car department in New York City.

Willemin Makes Hupp Change—A. B. Willemin, who has been with the Hupp Motor Car Co., Detroit, Mich., for the past 3 years, and who was director of purchases, has been appointed assistant general manager.

Remsen Gets Studebaker Promotion—A. H. Remsen has been appointed assistant office manager of the Studebaker Corp., Detroit, Mich. He was previously connected with the parts order department.

Baeder Stewart-Warner Rep.—J. J. Baeder has been appointed traveling representative for the State of Michigan by the Stewart-Warner Speedometer Corp., Detroit, Mich. He was heretofore with the Cleveland headquarters of the concern.

Merrill Winton Sales Mgr.—A. J. Merrill, who has been connected with the Los Angeles branch of the Winton Motor Car Co., has been elevated to the position of sales manager. Mr. Merrill fills the vacancy caused by the resignation of J. S. Wiese.

Sherbondy Resigns—F. P. Sherbondy, chief electrician for S. F. Bowser & Co., Fort Wayne, Ind., for the past 5 years, has resigned and has assumed the management of the Exide storage battery and service station, South Bend, Ind., now being established.

White Detroiter Eastern Rep.—The Detroiter Motor Car Co., Detroit, Mich., has appointed A. F. White its Eastern representative. His territory will include China, Japan, the Philippine Islands, India, the Federated Malay States, Burma, Ceylon.

Arner Heads Columbus Tire Co.—George A. Hasson & Co. is the name of a new tire concern located at 75 North Fourth Street, Columbus, Ohio, with G. A. Arner as manager and G. H. Fisher district sales manager. The company is agent for the Chester and Traveler lines of tires and tubes.

Sells Joins Chandler Agency—The Chandler Motor Car Co. of Los Angeles, Cal., has acquired the services of E. N. Sells. Mr. Sells has been placed in charge of the Chandler interests in Santa Barbara, Kern, San Luis Obispo, Ventura and Inyo Counties. Sells was formerly with the Earle C. Anthony forces and for the past 2 years was in charge of the San Francisco branch of the company.

Barnwell Waverley Mgr.—S. E. Barnwell, formerly sales manager of the truck department of the Kentucky Wagon Manufacturing Co., has been appointed manager of the Louisville office of The Waverley Co., 206 East Broadway. He succeeds K. A. Ridenor, who resigned several weeks ago to become assistant to Roy Potts, vice-president of the Madison Motor Co., Anderson, Ind.

Jenkins Master Carburetor Rep.—W. M. Jenkins, who left Los Angeles last summer to take up active work in the East when the Master Carburetor Co. opened the Detroit factory, has returned to Los Angeles as Pacific Coast representative of the Master interests with headquarters there. F. A. Hartwell, formerly with the Southwestern Carburetor Co. at Phoenix, Ariz., distributors for Master carburetors in Arizona, New Mexico and Texas, is now in charge of the new Master salesroom in Los Angeles, having been appointed city sales manager for the local branch of the Detroit factory, which supplies the Pacific Coast.

Dealer

More Room Needed—Mitchell & Smith, one of the big accessory companies of Boston, Mass., has been obliged to enlarge its quarters and has secured more space in the building 1090 and 1092 Commonwealth Avenue.

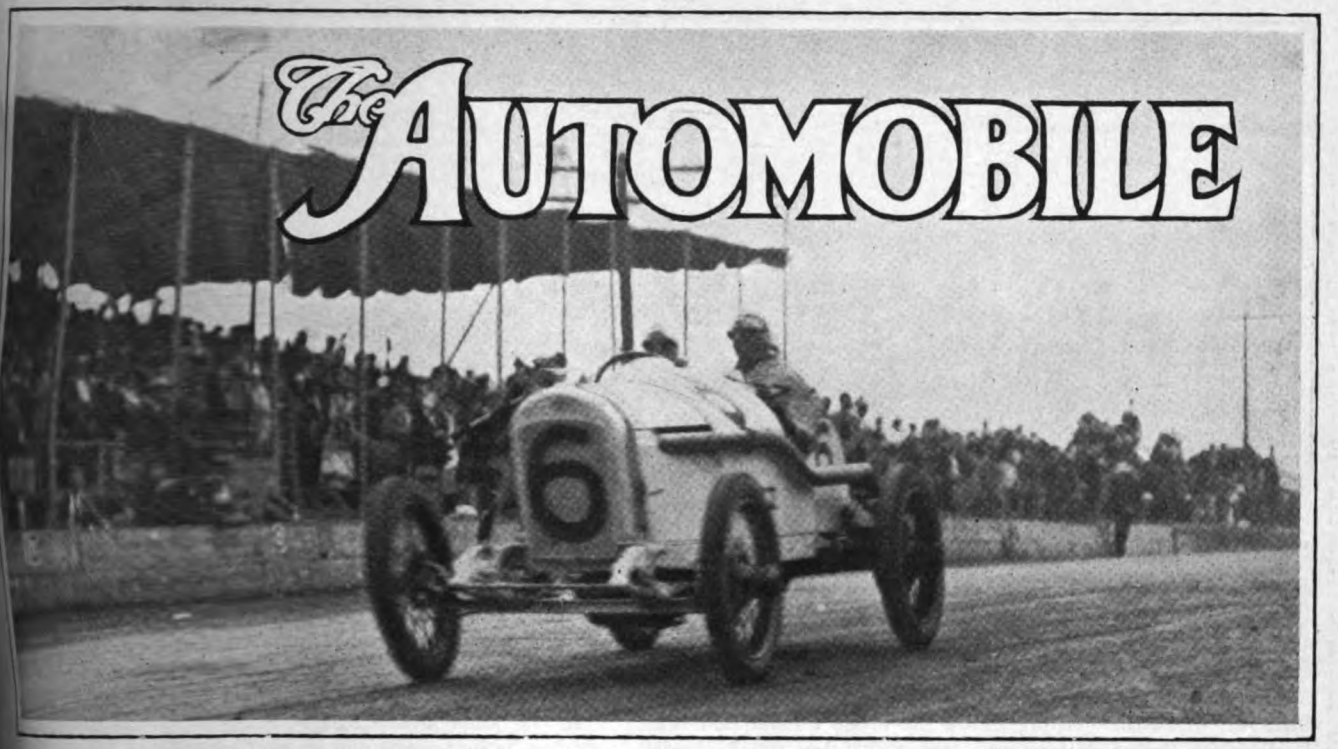
Stutz Moves Again—The Becker-Stutz Automobile Co., which took over the Stutz in Boston, Mass., last week and moved to 911 Boylston Street, has again moved, this time to 793 Boylston Street, where it has the entire building.

Oldsmobile Service Station—The Oldsmobile Motor Co., Boston, Mass., has just leased the building on Landsdowne Street, Cambridge, formerly used by the Buick Co. as a service station, and it will maintain a repair department there.

Lee Takes On G. M. C. Truck—Don Lee, Los Angeles, Cal., will handle the General Motors Co. truck line in California in the future. Lee now represents the largest and most complete line of any California dealer. He has the Cadillac for the entire State and the Oakland for northern California.

Vol. XXXIII New York—Thursday, August 26, 1915—Chicago No. 9

The Automobile



Gilbert Anderson's Stutz getting the flag at the finish line on the winning lap of the Elgin national trophy race

Stutz Cars Triumph at Elgin Road Races

Cooper and Anderson Take First and Second in Both Races—Elgin Trophy Won at 77.256 M.P.H.—C. A. C. Cup at 74.979

ELGIN, ILL., ROAD RACE COURSE, Aug. 21—Stutz racing cars came into their own in road racing to-day and yesterday when the new sixteen-valve racing cars took first and second places in the 301-mile race Friday for the Chicago Automobile Club trophy; and to-day, Saturday, when Stutz finished first and second in the Elgin national trophy for the same distance, both races being run over the eleven 8.38 mile road race course lying on the outskirts of Elgin.

Friday Earl Cooper won from a field of nine starters averaging 74.979 m.p.h. with his team mate Gilbert Anderson second averaging 73.859 m.p.h., the two defeating such road racing masters as Barney Oldfield, who was driving in his new Delage and De Palma who had trouble with his Mercedes that captured both races a year ago and each broke a valve rocker arm, covering a little over 100 miles.

To-day, Saturday, Stutz more than duplicated its Friday performance, Anderson and Cooper again finishing one, two, with a Duesenberg driven by O'Donnell third and De Palma's Mercedes fourth.

While yesterday saw Elgin road records fall, to-day's race toppled existing records like the proverbial house of cards. Anderson averaged 77.256 m.p.h., over 2 miles higher than the Friday pace, and Cooper at 76.258 m.p.h. was also well ahead of all previous marks; in fact, to-day was record-breaking day as all four cars finishing averaged over 75 m.p.h. This speed is best realized when compared with the 1914 mark of 73.5 and yesterday's mark of 74.97.

The Winners at Elgin

Elgin National Trophy

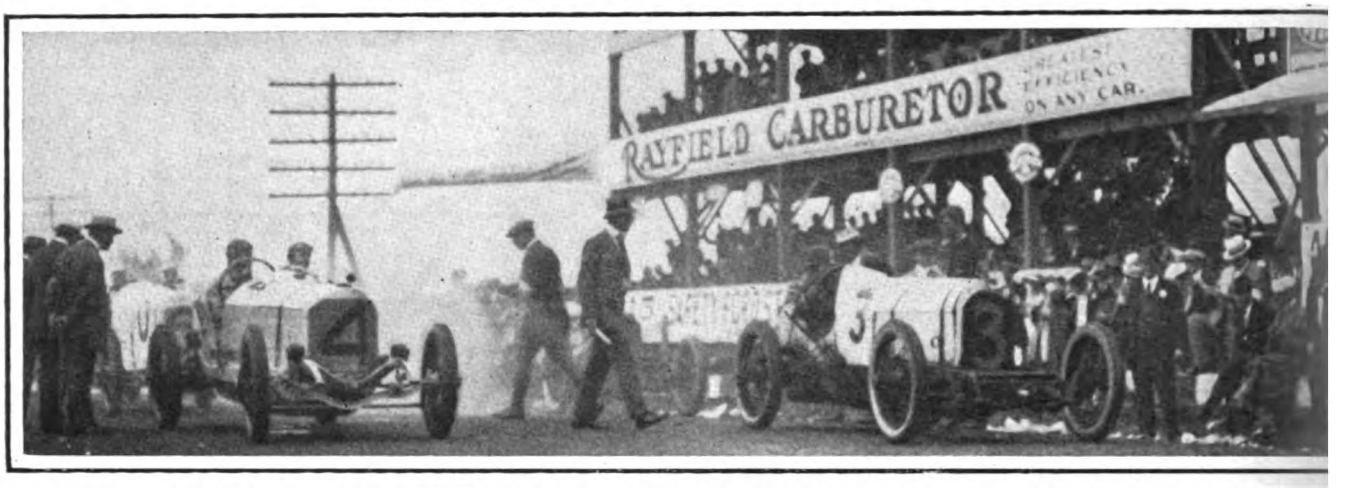
Car	Driver	M.P.H.
Stutz	Anderson	77.256
Stutz	Cooper	76.258
Duesenberg	O'Donnell	75.769
Mercedes	De Palma	75.690

C. A. C. Trophy

Car	Driver	M.P.H.
Stutz	Cooper	74.979
Stutz	Anderson	73.859
Delage	Oldfield	72.467
Ogren	Alley	71.163
Duesenberg	O'Donnell	70.836

A Spectacular Finish

To-day's race for the Elgin National trophy with the $4,200 cash divided among the winners was not only the fastest ever held on the course but one of the most spectacular finishes in the



Start of the sensational 301-mile race for the Elgin national trophy held on the Elgin, Ill., road race course Saturday, August 21

history of American road racing. The four finishers all completed the 301 miles inside a 5-min. interval. Anderson was first over the tape. He carried No. 6 and thus had 1 min. road lead over Cooper carrying No. 8. De Palma carrying No. 4 was second car to cross the tape but he had a road lead of 2 min. on Cooper, the cars being started at intervals of 30 sec. Approaching the finish Cooper had been leading De Palma, but on the second last lap the Mercedes passed the Stutz, and the grandstand wondered if the Stutz lead could be overcome. When De Palma hove into sight over the top of Briton's hill a quarter mile from the grandstand where the finish line was everybody watched the scoreboard to see where Cooper was, the moving figures showed him close behind. A few seconds later De Palma got the checkered flag at the grandstand and scarcely had he received it when the white Stutz shot into view over the hill crest. It was Cooper. 10 sec. more he, too, had the black-and-white flag and was in second place.

Two finishers had flashed across the tape at over 100 m.p.h. in less than 15 sec.

But this was not the end. It was not certain whether De Palma was to be third or not. The Duesenberg driven by O'Donnell was in the home stretch. He carried No. 5 on his hood, meaning that he started just 30 sec. back of Mercedes No. 4, so that w De Palma crossed the tape O'Donnell had 30 sec. left to c the tape and still capture third money. Again all eyes on the crest of Briton's hill, watches were in all ha seconds were being counted. But there was not long pense. Scarcely had the starter's flag dropped to the gr than the score board figures showed O'Donnell nearing crest, a second more and he shot over it. Ten seconds he finished. He had captured third place. There was e time enough for him to cross the tape and when he waved off he had just nosed into third place by 15 sec. De Palma's Mercedes.

Rest 30 Miles Behind

Thus within the short space of 4 min. and 51 sec. the four cars had finished; the other four cars still ru were over 30 miles back, and the race was declared of remaining cars being fla It was the most ex finish that road-race siasts have been treate many years, one of th instances in road rac fitting climax to a breaking day.

Friday's race was spectacular. Early race it was a forego

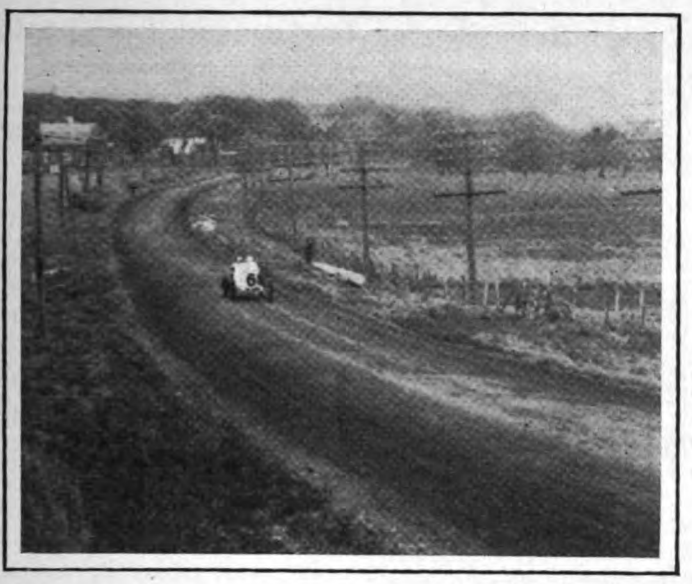
Fastest Laps Over 8.38-Mile Course in Elgin National Trophy Race, Held Saturday, Aug. 21

CAR	DRIVER	LAP	TIME	M.P.H
Mercedes	De Palma	36	6:15.85	80.496
Duesenberg	O'Donnell	26	6:18	79.857
Stutz	Anderson	17	6:19	79.642
Stutz	Cooper	3	6:26	78.206
Duesenberg	Chandler	15	6:39	75.645
Delage	Oldfield	25	6:40	75.461
Stutz	Burt	3	6:46	74.346
Duesenberg	Henderson	8	6:48	73.985
Mercer	Henning	2	6:51	73.445
Lozier	Robillard	4	8:00	62.887
Du Chesneau	Jones	1	8:14	61.108

Table Showing Times for Each Lap of the 301-Mile Race for the I

Car	Driver	Lap... / dist...	1 8 M. 2030 Ft.	2 16 M. 4060 Ft.	3 25M. 810 Ft.	4 33 M. 2840 Ft.	5 41 M. 4870 Ft.	6 50 M. 1620 Ft.	7 58 M. 3650 Ft.	8 67 M. 400 Ft.	9 75 M. 2430 Ft.	10 83 M. 4460 Ft.	11 92 M. 210 Ft.	12 100 M. 3240 Ft.	13 108 M. 5270 Ft.	14 117 M. 2020 Ft.	15 125 M. 4050 Ft.	1 13
		Time																
Stutz	Anderson	Elap.	6:59	13:35	20:12	26:43	33:12	39:40	46:07	52:34	59:03	1:05:37	1:12:01	1:18:25	1:24:51	1:31:22	1:37:44	1:
		Lap.		6:36	6:37	6:31	6:29	6:28	6:27	6:27	6:29	6:34	6:28	6:24	6:26	6:31	6:22	
Stutz	Cooper	Elap.	6:44	13:12	19:38	26:01	32:38	39:11	45:41	52:12	58:42	1:05:17	1:11:49	1:18:27	1:25:03	1:31:28	1:37:57	1:
		Lap.		6:28	6:26	6:55	6:31	6:33	6:30	6:31	6:40	6:45	6:32	6:38	6:36	6:25	6:29	
Duesenberg	O'Donnell	Elap.	6:57	13:40	20:24	27:05	33:48	40:36	47:16	53:59	1:00:38	1:07:16	1:14:04	1:20:38	1:27:14	1:33:49	1:40:26	1:
		Lap.		6:47	6:44	6:41	6:43	6:48	6:40	6:43	6:39	6:38	6:48	6:34	6:36	6:35	6:37	
Mercedes	DePalma	Elap.	6:47	13:27	20:05	26:44	33:24	40:07	46:50	53:32	59:59	1:06:35	1:13:15	1:19:58	1:26:47	1:33:38	1:40:14	1:
		Lap.		6:40	6:38	6:39	6:40	6:43	6:43	6:42	6:27	6:36	6:40	6:45	6:49	6:51	6:36	
Delage	Oldfield	Elap.	7:07	13:56	20:44	27:34	34:35	42:23	49:17	56:10	1:03:03	1:09:54	1:16:45	1:23:37	1:30:24	1:37:12	1:43:55	1
		Lap.		6:49	6:48	6:50	7:01	7:48	6:54	6:53	6:53	6:51	6:51	6:52	6:47	6:48	6:43	
Mercer	Henning	Elap.	7:22	14:13	21:32	28:27	35:22	42:36	49:56	56:53	1:04:02	1:14:53	1:22:19	1:29:43	1:37:02	1:44:15	1:51:30	1
		Lap.		6:51	7:19	6:55	6:55	7:14	7:20	6:57	7:09	10:51	7:26	7:24	7:19	7:13	7:15	
Duesenberg	Chandler	Elap.	7:12	14:05	20:55	27:42	34:34	41:19	50:40	1:01:15	1:08:03	1:15:01	1:21:51	1:28:36	1:35:22	1:42:08	1:48:47	1
		Lap.		6:53	6:50	6:47	6:52	6:45	9:21	10:35	6:48	6:58	6:50	6:45	6:46	6:46	6:39	
DuChesneau	Brown	Elap.	8:14	16:40	25:24	34:10	42:56	51:42	1:00:19	1:09:07	1:17:35	1:26:48	1:35:46	1:46:48	1:55:20	2:03:58	2:12:34	2
		Lap.		8:26	8:44	8:46	8:46	8:46	9:37	8:48	8:28	9:13	8:58	11:02	8:32	8:38	8:36	
Duesenberg	Henderson	Elap.	6:59	14:15	21:22	29:02	36:09	43:15	50:42	57:30	1:04:33	1:11:14	1:18:54	1:26:08	1:33:26	1:40:33	1:41:56	1
		Lap.		7:16	7:07	7:40	7:07	7:06	7:27	6:48	7:03	6:41	7:40	7:14	7:18	7:07	7:23	
Stutz	Burt	Elap.	7:14	4:05	20:51	27:39	34:27	56:41	1:03:40	1:10:34	1:17:25	1:24:23	1:31:17	1:45:30	1:53:57	Out		
		Lap.		6:51	6:46	6:48	6:48	22:14	6:59	6:54	6:51	6:58	6:50	14:13	8:21			
Lozier	Robillard	Elap.	8:29	16:40	24:45	32:45	40:51	56:38	1:23:16	1:31:46	1:45:49	2:02:56	Disqua	lified				
		Lap.		8:11	8:05	8:00	8:06	15:47	26:38	8:30	14:03	17:07						
Dedietrich	Buzane	Elap.	1:03:04	Out,	brok	en cr	ank	shaft	at 5 mil	es								

clusion that Stutz cars had it all their own way from the early miles, De Palma stopping at 40 miles to repair a broken rocker arm and losing over 1 hr. There was no hope of his even being a contender but he went out for some of the 100-mile cash that was offered: In the meantime Barney Oldfield was experiencing some of his customary bad road racing luck. He stopped at the end of the first lap to change a right rear, his pit men doing poor work with the hand jack, the stop taking 73 sec. This handicapped him and it was soon seen that his new Delage, which was in its second American contest, was not yet tuned up and would not be able to battle on even terms with the Stutz makes. Barney's fastest lap was 6:36 as compared with 6:31 for the Stutzes. The two Duesenbergs were setting a little slower pace, the fastest lap being 6:37, leaving the real honors of the day to the two Stutzes. The Ogren driven by Thomas Alley eventually landed in fourth place, putting the Duesenberg fifth. The other five cars that started had dropped out by this time, for various causes, which are given, for the most part, on pages 366 and 367, where the mechanical and tire troubles are reviewed.



Rounding hairpin curve on the 8.38-mile Elgin course, one of the places which required the most skilful driving

Racing Conditions Ideal

Racing conditions on the course were ideal for time except for high winds which held the cars back Friday; and Saturday the oiled road was slippery in places, owing to a heavy all-night rain Friday which lay in pools Saturday morning. Fortunately the high wind dried them, but the pace was not at record speed until the race was three-quarters over. As a result the lap record of 6:11 established last year by Spencer Wishart in the Mercedes was not broken, De Palma putting his Mercedes around in 6:15.85 for the second last lap Saturday, a pace of 80.5 m.p.h. Second honors went to O'Donnell's Duesenberg in 6:18, or 79.857 m.p.h. Anderson's Stutz made the third fastest in 6:19, or 79.642 and Cooper was fourth in 6:26 or 78.206 m.p.h. The race was not a question of fastest laps but rather one of well-sustained speeds with the minimum of stops at the pits. Both races were gray-matter ones rather than matters of maximum speed and brute strength. It was measuring up and carefully balancing tire endurance with motor speed possibilities.

New Tire Record

Never has a road race of such distances been run with so few tire stops. Adding the races of both days gives a total mileage of 603.66. Anderson's Stutz made this entire distance without a single tire stop, a new road tire record. He used Silvertown cords. Cooper made but one tire change in both days, this being made the first day at 250 miles. O'Donnell's Duesenberg made but one change in both days. De Palma did not make a single change in his Mercedes which covered 477 miles in the two days. Oldfield was the tire Jonah changing one the first day and four the second, a total of five. Of the other cars which were slower only one or two tire changes were made.

The entire race was a great demonstration of cord tires, which made their American debut in a road race, the Elgin course being a typical country gravel road with a well-oiled surface. The road was scarified last fall, all loose stones removed and the surface dragged regularly. Over a month ago it was oiled and to all intents and purposes is a typical road, wide enough in all places for two cars to pass and in many places wide enough for three cars to race abreast at 100 m.p.h. It must be remembered in connection with this tire performance that the track was cool. The sun scarcely shone on both days and the all-night rain Friday left the road particularly cool for Saturday.

Tires Not the Weak Links

Notwithstanding road and weather conditions it cannot be said that now tires are the weak links in racing and that

Elgin, Saturday, August 21, Over the 8.38 Mile Road Course

21 [illegible] M. [illegible] Ft.	22 184 M. 2420 Ft.	23 192 M. 4450 Ft.	24 201 M. 1200 Ft.	25 209 M. 3230 Ft.	26 217 M. 5260 Ft.	27 226 M. 2010 Ft.	28 234 M. 4040 Ft.	29 243 M. 790 Ft.	30 251 M. 2820 Ft.	31 259 M. 4850 Ft.	32 268 M. 1600 Ft.	33 276 M. 3630 Ft.	34 285 M. 380 Ft.	35 293 M. 2410 Ft.	36 301 M. 4440 Ft.	Miles per Hour	Order of Finish
[illegible]	1:23:09	2:29:33	2:35:56	2:42:20	2:48:48	2:55:19	3:01:45	3:08:18	3:14:51	3:21:22	3:27:54	3:34:27	3:41:00	3:47:41	3:54:25.87	77.256	1
[illegible]	6:35	6:24	6:23	6:24	6:28	6:31	6:26	6:33	6:33	6:31	6:33	6:32	6:33	6:41	6:44		
[illegible]	2:24:12	2:30:59	2:37:38	2:44:26	2:51:20	2:57:52	3:04:32	3:11:07	3:17:49	3:24:19	3:31:09	3:37:41	3:44:21	3:50:58	3:57:29	76.258	2
[illegible]	7:00	6:47	6:39	6:48	6:54	6:32	6:40	6:35	6:42	6:30	6:50	6:32	6:40	6:37	6:31		
[illegible]	2:26:18	2:32:45	1:29:18	2:46:29	2:52:35	2:59:11	3:05:47	3:12:17	3:18:51	3:25:33	3:33:21	3:39:41	3:46:00	3:52:41	3:59:01	75.769	3
[illegible]	6:29	6:27	6:33	7:09	6:18	6:36	6:36	6:30	6:34	6:32	7:58	6:20	6:19	6:41	6:20		
[illegible]	2:26:40	2:33:50	2:40 56	2:47:36	2:54:21	3:01:09	3:08:00	3:14:35	3:21:11	3:27:31	3:33:54	3:40:13	3:46:44	3:53:01	3:59:16.85	75.690	4
[illegible]	7:10	7:06	6:40	6:45	6:48	6:51	6:35	6:36	6:20	6:23	6:19	6:31	6:17	6:15:85			
[illegible]	2:33:36	2:40:18	2:46:59	2:53:39	3:01:03	3:09:40	3:16:55	3:24:27	3:32:03	3:50:27							5
[illegible]	6:43	6:42	6:41	6:40	7:24	8:37	7:15	7:32	7:36	18:24							
[illegible]	2:41:26	2:48:32	2:55:58	3:05:14	3:17:21	3:24:47	3:32:01	3:39:25	3:46:38	3:53:54							6
[illegible]	7:04	7:06	7:26	9:16	12:07	7:26	7:14	7:24	7:13	7:16							
[illegible]	2:51:16	2:58:48	3:06:34	3:14:46	3:22:29	3:29:30											
[illegible]	8:18	7:32	7:46	18:12	7:43	7:01											
[illegible]	3:14.23	3:23:01	3:31:39	3:40:07	3:48:45	3:57:53											
[illegible]	8:40	8:38	8:38	8:28	8:38	9:08											
[illegible]	150 miles																

Table Showing Time for Each Lap of 301-Mile Race for the Chica

Car	Driver	Lap Distance	1 8 M. 2030 Ft.	2 16 M. 4060 Ft.	3 25 M. 810 Ft.	4 33 M. 2840 Ft.	5 41 M. 4870 Ft.	6 50 M. 1620 Ft.	7 58 M. 3650 Ft.	8 67 M. 400 Ft.	9 75 M. 2430 Ft.	10 83 M. 4460 Ft.	11 92 M. 210 Ft.	12 100 M. 3240 Ft.	13 108 M. 5270 Ft.	14 117 M. 2020 Ft.
Stutz	Cooper	Elap. Time.	6:54	13:28	20:03	26:31	33:02	39:30	46:04	52:36	59:08	1:05:41	1:12:14	1:18:45	1:25:17	1:31:5
		Lap Time.		6:34	6:35	6:28	6:31	6:28	6:34	6:32	6:32	6:33	6:33	6:31	6:32	6:3
Stutz	Anderson	Elap. Time.	6:58	14:25	20:56	27:23	33:56	40:26	46:07	52:43	59:15	1:05:51	1:12:21	1:18:54	1:25:20	1:31:4
		Lap Time.		7:27	6:31	6:27	6:33	6:30	6:31	6:36	6:32	6:36	6:30	6:33	6:26	6:2
Delage	Oldfield	Elap. Time.	7:27	15:07	22:36	29:21	36:03	42:51	49:41	56:30	1:03:14	1:10:00	1:16:47	1:23:48	1:30:37	1:37:1
		Lap Time.		7:40	7:29	6:45	6:42	6:48	6:50	6:59	6:44	6:46	6:47	7:01	6:49	6:3
Ogren	Alley	Elap. Time.	7:13	14:16	21:18	28:17	35:15	42:10	49:02	55:54	1:02:56	1:09:57	1:16:41	1:23:34	1:30:36	1:37:2
		Lap Time.		7:03	7:02	6:59	6:58	6:55	6:52	6:52	7:02	7:01	6:44	6:53	7:02	6:5
Duesenberg	O'Donnell	Elap. Time.	7:24	14:38	21:44	28:51	35:57	42:57	49:57	56:53	1:03:55	1:10:51	1:17:47	1:24:47	1:31:44	1:38:3
		Lap Time.		7:14	7:06	7:07	7:06	7:00	7:00	6:56	7:02	6:56	6:56	7:00	6:57	6:5
DeChesneau	Brown	Elap. Time.	8:20	16:35	24:48	32:52	41:01	49:35	57:58	1:06:15	1:14:30	1:22:48	1:31:02	1:39:17	1:48:35	1:56:5
		Lap Time.		8:15	8:13	8:04	8:09	8:34	8:23	8:17	8:15	8:18	8:14	8:15	9:18	8:1
Mercedes	DePalma	Elap. Time.	6:36	13:09	19:44	26:35	39:44	1:55:07	2:01:34	2:08:04	2:14:33	2:21:03	2:29:22	2:36:36	2:43:15	2:49:5
		Lap Time.		6:33	6:35	6:51	13:09	75:23	6:27	6:30	6:29	6:30	8:19	7:14	6:39	6:3
Duesenberg	Henderon	Elap. Tme.	7:22	15:19	21:36	28:41	35:44	42:46	49:50	56:51	1:03:52	1:10:59	1:43:58	1:53:42	2:01:43	2:09:3
		Lap Time.		7:57	6:17	7:05	7:03	7:02	7:04	7:01	7:01	7:07	32:59	9:44	8:01	8:0
Cornelian	Justin	Elap. Time.	21:23	1:16	1:26:43	1:42:14	1:58:21	2:15:37	2:26:08	2:38:02	2:51:39	3:07:28	3:18:26			
		Lap Time.		54:37	10:43	15:31	16:07	17:16	10:31	11:54	13:37	15:49	10:58			

races are lost by them. The two Stutzes on both days traveled 1207.32 miles and made only one tire change. Take the four cars Anderson-Stutz, Cooper-Stutz, O'Donnell-Duesenberg and De Palma-Mercedes and only three tires were changed by all four in the two days of racing, totalling 2287 miles or one change for every 763 miles, a remarkable record as compared with a few years ago. Of these four cars all but O'Donnell used cords, the latter fabrics. All told only fourteen tires were changed on both days of racing with nine starters one day and twelve the next. Not a single front tire was changed.

Few Mechanical Troubles

For 602 miles of racing crowded into 2 days there were very few mechanical troubles yet Cooper's Stutz was the only car to go through both days without having to raise the hood or give a single thought to mechanical details, a phenomenal record and one that would indicate that the sixteen-valve construction has been well handled by the Stutz company; and further that the high-speed motor has finally taken its place as a reliable factor in racing in this cou Anderson made one stop of 2 min. the first day at the with what apparently was valve-spring troubles.

De Palma's Troubles

De Palma had his Mercedes out for the first time sin wrecked the crankcase at Indianapolis in May. Since th has had a new crankcase, new pistons, new connecting and new wristpins. The trouble of a broken rocker arm due to a too thin section in one place. The second day h difficulty with his car at high speeds, due to the shoc sorbers being out of adjustment, the car not riding wel

O'Donnell's Duesenberg made but one stop for a loo celerator spring. Chandler's Duesenberg stopped due back fire in the carbureter; and Henderson's Duese had more serious troubles, first breaking a valve rock Friday and a timing gear case on Saturday.

Oldfield's Delage Not Tuned Up

Barney Oldfield's Delage with its valves opened and by cams, in short, positively-opened and positively valves, is not yet tuned up properly but ran both days out a stop for mechanical troubles until the last lap second day. This is the only motor in this country mechanically-closing valves, a construction which ins definite valve opening at all speeds. It was first used ago in the French grand prize race.

Course Tests Cars

All of these troubles are minor ones, not concern the major problems of design involved in the leadin tions of high-speed racing motors such as sixte motors, high-speed characteristics, lubrication, igni carburetion. A road race does not test the motor as as a speedway race in that there are two right-angl on the Elgin course, which mean momentary motor r the other hand, these turns are good tests for the bra the constant curving of the course is a severe test for running gear parts and steering gear and connectio

Management Excellent

Race management throughout was the best that desired. Soldiers guarded the entire 8.38 miles a tators were kept back of the road fences and not a cross the course at any point. Around the entire co a series of telephone stations connected with the sc at the grandstand, this board showing by moving fi course of each car around the route on every lap. grandstand could see when leaders changed place part of the course. The Chicago Automobile Cl conducts the race for the Elgin Road Race Assn. the entire affair in a highly creditable manner. T the race was announced by a series of megaphone to the grandstands but all around the course, the in being furnished by telephone from the grandstan

Fastest Laps Over 8.38-Mile Course in C. A. C. Trophy Race at Elgin

CAR	DRIVER	LAP	TIME	M.P.H
Stutz	Cooper	16	6:26	78.206
Stutz	Anderson	13	6:26	78.206
Mercedes	De Palma	7	6:27	77.955
Delage	Oldfield	16	6:36	76.227
Duesenberg	O'Donnell	15	6:44	74.721
Ogren	Alley	11	6:44	74.721
Duesenberg	Henderson	8	7:01	71.607
De Chesneau	Brown	15	8:01	62.754
Cornelian	Justin	7	10:31	47.836

Left—Gilbert Anderson, who won the Elgin national trophy race in his Stutz at 77.256 m.p.h. Right—His team mate, Earl Cooper, who captured the C. A. C. cup at 74.979 m.p.h.

bile Club Trophy at Elgin, Friday, August 20 on the 8.38 Mile Road Course

17 142 M. 2830 Ft.	18 150 M. 4860 Ft.	19 159 M. 1610 Ft.	20 167 M. 3640 Ft.	21 176 M. 390 Ft.	22 184 M. 2420 Ft.	23 192 M. 4450 Ft.	24 201 M. 1200 Ft.	25 206 M. 3230 Ft.	26 2'7 M. 5260 Ft.	27 226 M. 20 0 Ft.	28 234 M. 4040 Ft.	29 243 M. 790 Ft.	30 251 M. 2820 Ft.	31 259 M. 4850 Ft.	32 268 M. 1600 Ft.	33 276 M. 3630 Ft.	34 85 M. 380 Ft.	35 293 M. 2410 Ft.	36 301 M. 4440 Ft.	Miles per Hour
1:51:20	1:57:57	2:04:32	2:11:04	2:18:25	2:25:02	2:31:43	2:38:19	2:45:03	2:51:49	2:58:42	3:05:35	3:12:27	3 19:22	3:26:10	3:32:58	3:41:02	3:47:47	3:54:42	4:01:32	74.979
6:29	6:37	6:35	6:32	7:25	6:33	6:41	6:36	6:44	6:46	5:53	6:53	6:52	6:55	6:48	6:48	8:04	6:45	6:55	6:50	
1:51:25	1:57:54	2:04:21	2:11:27	2:18:05	2:24:37	2:31:17	2:37:51	2:47:02	2:54:16	3:01:23	3:08:35	3:15:41	3:22:54	3:29:56	3:37:04	3:44:08	3:51:10	3:58:08	4:05:04	73.859
6:36	6:29	6:27	7:06	6:38	6:32	6:40	6:34	9:11	7:14	7:07	7:12	7:06	7:13	7:02	7:08	7:04	7:02	6:58	6:56	
1:57:14	2:04:00	2:10:45	2:17:33	2:24:25	2:31:18	2:38:15	2:45:02	2:51:54	2:58:52	3:05:48	3:13:43	3:21:30	3:28:29	3:35:34	3:42:19	3:49:16	3:56:03	4:03:02	4:09:55	72.467
6:47	6:46	6:45	6:48	6:52	6:53	6:57	6:47	6:52	6:58	6:56	7:55	7:47	6:59	7:05	6:45	6:57	6:47	6:59	6:53	
1:58:19	2:05:14	2:12:04	2 19:05	2:25:51	2:32:29	2:39:31	2:46:19	2:53:07	3:02:15	3:09:10	3:16:52	3:23:54	3:30:42	3:37:42	3 44:36	3:51:39	3:58:06	4:06:05	4:14:29	71.163
6:50	6:55	6:50	7:01	6:46	6:38	7:02	6:48	6:48	9:08	6:55	7:42	7:02	1:48	7:00	6:54	7:03	6:27	7:59	8:24	
1:58:43	2:05:48	2:12:25	2:19:32	2:26:28	2:33:24	2:40:20	2:47:17	2:54:28	3:04:00	3:11:14	3:18:32	3:25:39	3:32:40	3:39:42	3:46:47	3:53:56	4:01:07	4:08:12	4:15:40	70.836
6:36	7:05	6:37	7:07	6:56	6:56	6:56	6:57	7:11	9:32	7:14	7:18	7:07	7:01	7:02	7:05	7:09	7:11	7:05	7:28	
2:22:29	2:36:55	2:45:41	2:54:01	3:02:33	3:10:51	3:19:49	3:30:07	3:42:15	Out.	broken	connec	ting-rod	25th la p							
9:16	14:26	8:46	8:20	8:32	8:18	8:58	10:18	12:08												
3:09:59	3:16:40	3:23:30	3:30:05	3:37:26	Out 21	st lap														
6:39	6:41	6:50	6:35	7:21																
2:34:22	2:42:17	2:50:17	2:57:38	4:36:22	4:54:18	Flagged														
8:08	7:55	8:00	7:21	1:48:44	7:56															

straw was used to protect the cars at the two right-angled turns in case they should skid.

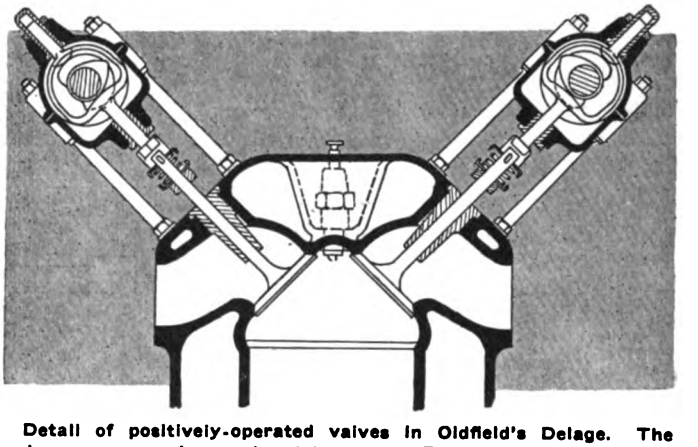
Weather Affects Attendance

Unfortunately, owing to the weather the attendance was much smaller than in former years, scarcely more than 25,000 witnessing Saturday's race. It rained all Friday night and was raining in Chicago, 38 miles away, nearly all day Saturday, thus preventing thousands from attending. The central west has had a wet season for the last three months. Because of this it is thought that the Elgin Road Race Assn., which manages the race, will be practically $15,000 behind on both days. Cash prizes aggregating $8,000 were given. The winner each day received $2,000; second man $650 and third $350. Each car completing 100 miles received $100 and those completing 200 miles $200.

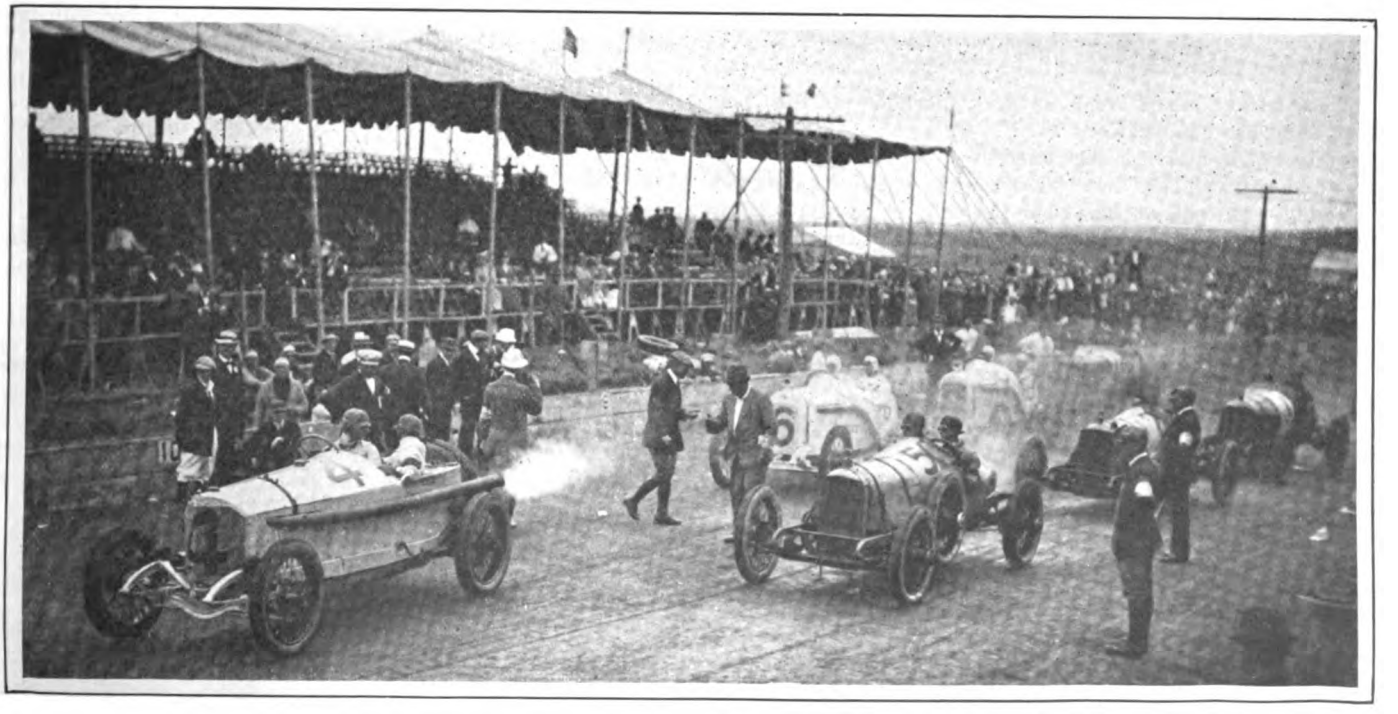
In the Way of Equipment

Both Cooper and Anderson used Bosch magnetos and plugs; O'Donnell used a Bosch magneto and Rajah plugs and Oldfield used a Mea magneto and Rajah plugs. Cooper and Anderson both had Stromberg carbureters, Oldfield used four Claudels and O'Donnell used Master on Saturday and a Schebler on Friday. Cooper and Anderson both rode on Houk wire wheels and Oldfield and O'Donnell rode on Rudge-Whitworths. All four used Hartford shock absorbers.

The Stutz cars driven by Cooper and Anderson had aluminum alloy pistons, while O'Donnell's Duesenberg used magnalium and Oldfield's Delage, steel. In the way of tire equipment the two Stutzes used Silvertown cords, O'Donnell used Riverside and Oldfield, Firestones. For lubrication Oilzum was a favorite, being used by all four drivers mentioned as was Dixon's grease.

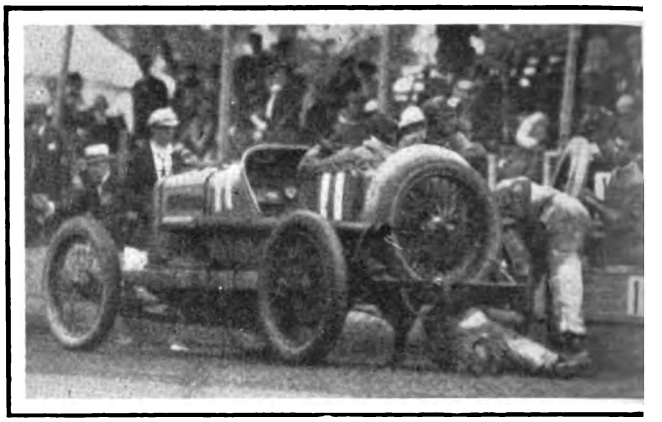


Detail of positively-operated valves in Oldfield's Delage. The valves are opened and closed by cams. The Elgin contest is the first road race in which this type of valve operation has appeared



Start of the race for the Chicago Automobile Club trophy held on the Elgin road race course on Friday, August 20

De Palma makes a stop at the pits for gasoline and oil



Oldfield in for repairs. Note pit man under rear axle

Cord Tires Score in Road Racin

Anderson Goes Through Both Days on Same Set, Covering 603 Miles—Few Changes—Little Mechanical Trouble

ELGIN, ILL., ROAD RACE COURSE, Aug. 21—Cord tires invaded a new field in the C. A. C. and Elgin National classics to-day and yesterday when they had their first tryout in actual road racing. Anderson, Cooper, De Palma and Henning carried Silvertown cords and Robillard in the Lozier had a cord tire of Marathon make. Anderson, who finished first in the 450-in. event to-day and second in the 300-in. race of yesterday, rode on the same tires throughout both races though he had different cars. They looked as good at the end of the 603 miles of the two-day meet as they did at the beginning.

Cooper went through the two days with one tire change, which was caused by a horseshoe nail picked up Friday. De Palma likewise had a puncture which necessitated a tire change, but all of his casings looked good for double the distance; in fact, there is only one mark showing on De Palma's tires and this came from his vigorous braking when he overran the turn to-day.

Cars Better Balanced

Tires on the whole stood up very much better this year than they have in previous races. This cannot be credited entirely to the tires, for the course is so much smoother than it has been previously that less tire wear was to be expected. The day was cool, as has been the case in previous Elgin meets which would be accountable for less heating and consequently longer life of the tires. Another factor is that the cars, particularly the speedier ones, are better balanced each year so that they hold the road better and thus relieve the tires of added strain.

Friday's race saw only three tire changes, the two of De Palma and Cooper already mentioned, one of Oldfield's who changed at the end of the first lap. The Saturday race was more prolific in tire trouble than was the Friday one. This was to be expected inasmuch as many of the tires were used on the second day that had gone through the first day's 301 miles. Also, the average speed was over 2 m.p.h. faster on Saturday, a difference that would make quite an appreciable lessening of tire life. Altogether there were eleven cars changed Saturday.

Not a Front Tire Changed

O'Donnell made a change on the back stretch, Oldfield replaced four, Robillard lost one by a blowout, Chandler lost two, and Henderson in the Duesenberg lost three. I worthy of note that not a front tire was changed at the during the two days' racing.

Delage Has Positively Operated Valves

Elgin was the first road race in which a positively-cl valve motor has been used. This is the Delage which field drove. It is unique in that there is no necessity valve springs. A cam insures the opening of the v also the closing, a feature that makes it similar to the sl valve engine, where the uncovering and covering of the p is positive. With this arrangement it is possible to inc the speed of the engine as the valve spring is one of limiting factors in motor speed in poppet-valve eng There is a single overhead camshaft with eight pairs of and for each valve there is a three-arm rocker, one of v is connected direct to the stem valve and the two o are in contact, one with the opening and the other wit closing cam. This is illustrated on page 365.

Little Pit Work

There was an unusually small amount of pit work d this year's Elgin classic, but in a number of case troubles which brought the cars into the pits were of

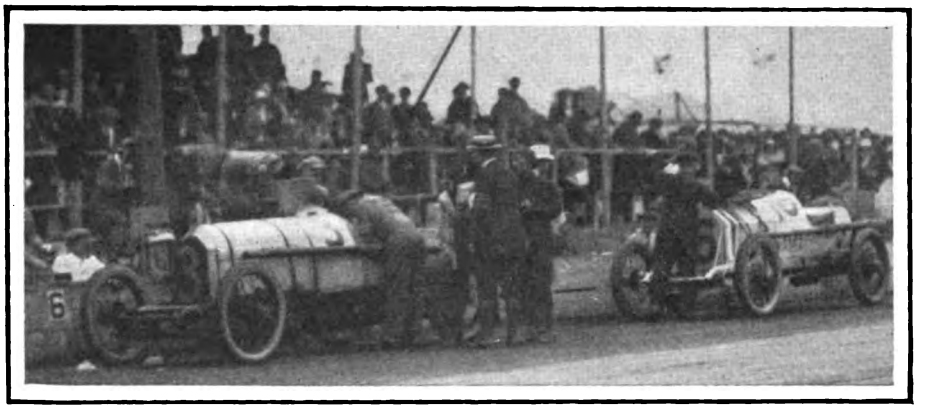
Specifications and Eq

Car	Driver	CYLINDER	
		Cast	Bore and Stroke
Mercer	Patrick	Pairs	4.375x5
Cornelian	Justin	Block	2 1/16x4
DuCheaneau	W. W. Brown	Single	3.26x5 1/4
Mercedes	De Palma	Single	3.661x6.47
Duesenberg	P. Henderson	Block	3.984x6
Stutz	Anderson	Block	3.812x6.5
Duesenberg	O'Donnell	Block	4.375x6 / 3.984x6
Stutz	Cooper	Block	3.812x6
Stutz		Block	3.812x6
Ogren	Alley	Block	3.984x6
Delage	Oldfield	Block	3.703x6.3
Duesenberg		Block	4.375x6.0
Lozier	Robillard	Block	3.259x6.6
Stutz	Burt	Pairs	5.1x5.5
Mercer	Henning	Block	3.75x6.7

*Saturday's race.

serious nature that they required rather unusually long stops, so that there was a car undergoing repairs of some sort most of the time.

To take up the troubles of the individual tires in the Chicago Automobile Cup race on Friday, we find that Cooper came into the pits on only two occasions, the first time when he halted for 21 1/5 sec. to take on gasoline and tightened up the shock absorbers. The second and last stop was when he changed a right rear tire which was punctured by a horseshoe nail. This held him for 33 sec. so that the Californian's total time lost at the pits was less than 1 min.



In spite of the few mechanical troubles, the pit men had plenty to do. Some of the troubles which brought the cars to the pits required a long time to repair

Anderson, his team mate, likewise made but two stops. The first one was at 167 miles when he took on gasoline, getting away in 20 sec. After he had run over 200 miles he came into the pit missing on one cylinder. After looking at the ignition and valves Anderson started out without doing any work to remedy the trouble and finished on three cylinders in second place.

Eddie O'Donnell, in the Duesenberg, made only one stop and this was at the end of 206 miles when he took on fresh supplies of gasoline and water; at the same time he attached the accelerator spring which had become loose.

Oldfield First to Stop

Oldfield in his Delage made the first stop of the day, when he changed a right rear tire at the end of the first lap. He made a halt for gasoline and oil after running 217 miles.

De Palma made three stops and lost a total of 1 hr. and 15 min. before he finally retired with a broken rocker arm. When he first came in it was on three cylinders after he had run about 35 miles. The rocker was giving him trouble but after spending 5 min. and 30 sec. at the pit he got away without doing anything other than changing two spark plugs. The next lap, however, which took nearly 13 min., ended at the pits with the rocker arm broken and De Palma waited while a mechanic went to his garage in town after another rocker arm. By the time the new one was fitted 1 hr. and 9 min. had elapsed. De Palma, however, started out to finish 100 miles with a view to running-in the motor, which had new pistons and also to get some practice for the next day's event. He was out of the race to all intentions when his first trouble developed.

Henderson's Duesenberg was a contender until it came in with a stuck valve and broken valve spring and went out of the race.

Tom Alley also was running well and made only one stop while he took on supplies and changed a broken spark plug. Alley managed to put the Ogren into fourth place but finished on three cylinders, the other, missing on account of a broken rocker arm.

Cooper Had No Troubles

In Saturday's race, Cooper was shown to be the only one who was immune from mechanical troubles among the finishers of the two days' racing. Cooper went through the 603 miles of the two events without lifting the hood of his car. His only stop on the second day was in the twenty-second lap when he refilled the gasoline tank in preparation for his dash for the checkered flag. He did not spend much time at the pits, getting away 13 sec. after his wheels came to a standstill. His team mate, Anderson, also hesitated only once, this was a pause of 17 sec. while a gasoline can was upended over his tank.

O'Donnell lost a few seconds more, being held 36 sec. while he took on gasoline and oil in the twenty-fourth lap. De Palma lost 16 sec. in the twenty-third lap while he refilled his gasoline tank.

Oldfield made three stops, changing four tires altogether. The first one was in the fifth lap when he changed the left rear, the second he changed the right rear and took on gasoline and oil, and the last time he put on some Pirelli tires which had studded treads.

In the 2-days racing at Elgin in 1914 there were eighty-eight pit stops, forty-seven of these being made on Friday during the Chicago Automobile Club cup race and forty-one on Saturday in the Elgin trophy contest. It was remarked at the time that there were but sixteen stops for tires on the first day and but seventeen on the second.

Cars in the 2-Day Road Races at Elgin, Ill., on Friday and Saturday, August 20 and 21

	VALVES				Lubrication †	Oil	Grease	Magneto	SPARK PLUGS		Carbureter	MAIN BEAR'GS		PISTONS		W.B.	Wheels	Tires	Shock Absorbers
No.	Arrangement	How Operated	Diameter	Lift					No.	Make		No.	Kind	Material	No. Rings				
8	T-hd.	.....	2¼	9/16	Splash	.....	Havoline	Bosch	..	Split.	Rayfield	3	Plain	Iron	2	106	Houk	Firestone	Hartf.
8	In hd.	Push rods	1¼	...	Splash	Texaco	Dixon	Atw.-Kent	..	Bosch	Master	2	Plain	Magnal	2	100	Own	Goodyear	....
16	In hd.	Ovhd camshft.	...	...	Force	Mobile	.....	Bosch	8	Rex	Rayfield	5	Plain	Magnal	2	.....	R.W.	Qualityre	Hartf.
16	In hd.	Ovhd camshft.	1¾	.3937	Force	Monogram	.....	2 Bosch	16	Eisem.	Packard	5	Plain	Lynite	4	112	R.W.	Silvertown	Merced.
8	Side hd.	Vert. rockers.	2¼	7/16	F. & S.	Oilzum	Dixon	Bosch	..	Rajah.	Schebler	2	Plain	Magnal	3 in 1	106	R.W.	Riverside	Hartf.
16	In hd.	Ovhd camshft.	...	...	F. & S.	Oilzum	Dixon	Bosch	..	Bosch.	Strom	3	Ball.	Al. Alloy	2 in 1	102	Houk	Silvertown	Hartf
8	Side hd.	Vert. rockers.	2¼	7/16	F. & S.	Oilzum	Dixon	Bosch	..	Rajah.	*Master Schebler	2	Plain	Magnal	3 in 1	106	R.W.	Riverside	Hartf.
16	In hd.	Single ovhd	...	...	F. & S.	Oilzum	Dixon	Bosch	..	Bosch.	Strom	3	Ball.	Al. Alloy	2 in 1	102	Houk	Silvertown	Hartf.
16	In hd.	Single ovhd	...	...	F. & S.	Oilzum	Dixon	Bosch	..	Bosch.	Strom	3	Ball.	Al. Alloy	2 in 1	102	Houk	Silvertown	Hartf.
8	Side hd.	Vert. rockers.	2¼	7/16	F. & S.	Oilzum	Dixon	Bosch	8	Bosch.	Rayfield	2	Plain	Magnal	3 in 1	...	Houk	Nassau	Hartf.
16	In hd.	2 ovhd camshs.	1 31/32	.4724	Force	Oilzum	Dixon	Mea	..	Rajah.	4 Claudel	5	Ball.	Steel	2	104	R.W.	Firestone	Hartf.
8	Side hd.	Vert. rockers.	2¼	7/16	F. & S.	Oilzum	Dixon	Bosch ZR4	..	Rajah.	Scheb. L.	2	Plain	Magnal	3 in 1	106	R.W.	Riverside	Hartf.
8	Side	Push rods	...	...	Splash	Castor	.....	*Rajah / Bosch	4	.....	Rayfield	3	Plain	Iron	2	...	Wood	Mara. Cord	Hartf.
8	Side hd.	Push rods	3	½	Force	Veedol	Dixon	Split. DD.	8	Bosch.	Strom. H.	3	Plain	Iron	2	101	Houk	Nassau	Hartf.
8	Side	Push rods	2¼	7/16	Force	Castor	Dixon	Bosch ZR4.	8	.....	Rayf. AA.	3	Plain	Steel	2	108	R.W.	Silvertown	Hartf.

† F. & S.—Force and splash.

Brass and Bronze—Offsprings of Copper—Part II

Nine Alloying Substances Added to Copper-Tin and Copper-Zinc Alloys for Special Purposes—Lead, Manganese and Phosphor Especially Important

By J. Edward Schipper

BRONZE and brass are the two major members of the family of copper alloys. Zinc and copper as has been pointed out form brass. Tin and copper form zinc, thus zinc and tin are the two leading alloying substances of the non-ferrous family. The qualities of these have been shown, but besides these great leaders in the non-ferrous family there are many other members which have important relations to the qualities of the alloys of which they form a part. Copper is the mother metal and brass and bronze the two leading offsprings, but besides these there are many others which are modified by the use of additional alloying substances and which merit attention in the study of the make-up of the non-ferrous family.

Before leaving zinc a word to summarize what it does with copper in the composition of brass may be of use. In the first place it is generally accepted that brass is a mixture and not a compound. The addition of the zinc gives to copper, which is proverbially one of the hardest metals on earth on tools, the quality of being readily worked. In fact yellow brass is so readily worked while cold that thousands of pieces an hour are turned out on fast machinery without any lubrication of the cutting tools. Many articles are made under a drop hammer while cold, and brass is even rolled while in that state. An interesting method of working brass which is rendered possible by the zinc is spinning. A tool pressed against a rapidly rotating or spinning piece of brass gives it an entirely new shape and it can be burnished to take a fine polish by the pressure and friction of a smooth steel tool.

Kalchoids—The Connecting Branch

So far the non-ferrous family has been divided into two separate branches, the bronze on one side including the alloys of copper and tin and the brass on the other composed of the alloys of copper and zinc. These are the two distinct offsprings of the mother metal copper, but between them there is another class which forms the connecting link between the brass and bronze being composed of copper and both tin and zinc. These are known as the Kalchoids. By varying the content of copper, tin and zinc, an endless number of permutations and combinations are possible, but the metals between certain zones of content have characteristics which are of immense value. The alloys in this class include the strongest and hardest combinations which can be effected with copper as a base. At the same time, ornamental metals can be made from different combinations, an imitation gold being produced with a copper percentage of 81.5, zinc 18 and tin .5. Another ornamental metal which is used for decorating small fire arms, etc., is composed of copper 80, zinc 17 and tin 3. Medals, brass buttons, and an endless variety of other useful articles are made from the Kalchoids which have have been christened thus after the Greek Kalchos.

Metals known as white brass, and government bronze, and several other metals in common use, belong to this classification of copper-tin-zinc metals. They can be varied to such a great extent and furnish such a large number of possible metals that the field of experimentation has always been of interest. It is said that Sir F. Chantrey actually formed a razor blade as hard as tempered steel from a metal composed of 76 per cent copper, 12 tin and 12 zinc. Some idea of the way the copper-tin-zinc alloys vary can be had from the accompanying table given by Thurston, page 370.

Nine Important Alloying Metals

Copper, tin and zinc are the three leaders in the non-ferrous family, but they are not the only members which con-

Ancient Bronzes, Brasses and Kalchoids

	Date	Copper	Zinc	Tin	Lead	Iron
Large brass of the Cassia family	B.C. 20	82.26	17.31	..	..	.35
Large brass of the Nero family.	A.D. 60	81.07	17.81	1.05	..	..
Large brass of the Titus family.	A.D. 79	83.04	15.84	..	..	.50
Large brass of the Hadrian family	A.D. 120	85.67	10.85	1.14	1.73	.74
Large brass of the Faustina family	A.D. 165	79.14	6.27	4.97	9.18	.23

Thurston Matls. of Engrg.

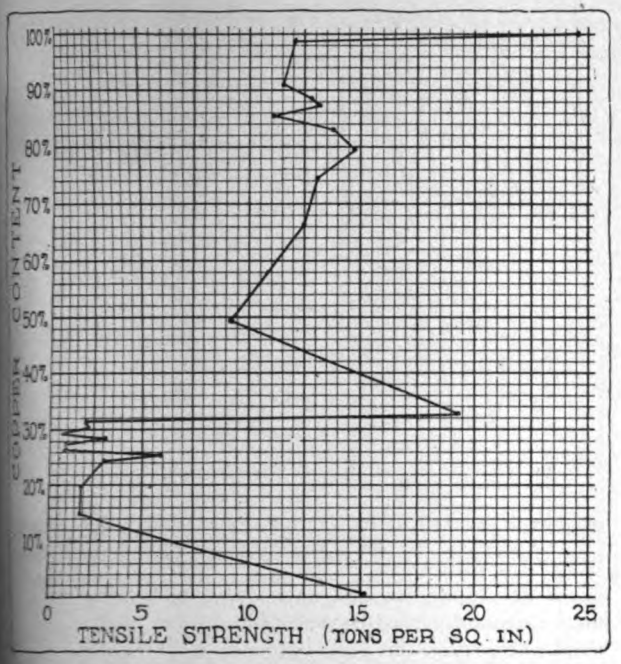
Composition of Non-Ferrous Relics

	Copper	Tin	Lead	Iron	Cobalt	Analyst.
1—Chisel, from ancient Egyptian quarry	94.00	5.90	.....	.10	....	Wilkenson
2—Bowl, from Nimroud	89.57	10.43	.....	...	....	Dr. Percy
3—Bronze overlaying iron	88.37	11.33	...	..	....	Dr. Percy
4—Sword-blade, Chertsey, Thames	89.69	9.58	...	.33	....	J. A. Phillips
5—Axe-head	88.05	11.12	.78	..	....	Prof. Wilson
6—Celt	81.19	18.31	.78	..	....	Prof. Wilson
7—Roman Ax, B.C. 500	69.69	7.16	21.82	.47	.57	J. A. Phillips
8—Julius Caesar	79.13	8.00	12.81	..	....	J. A. Phillips

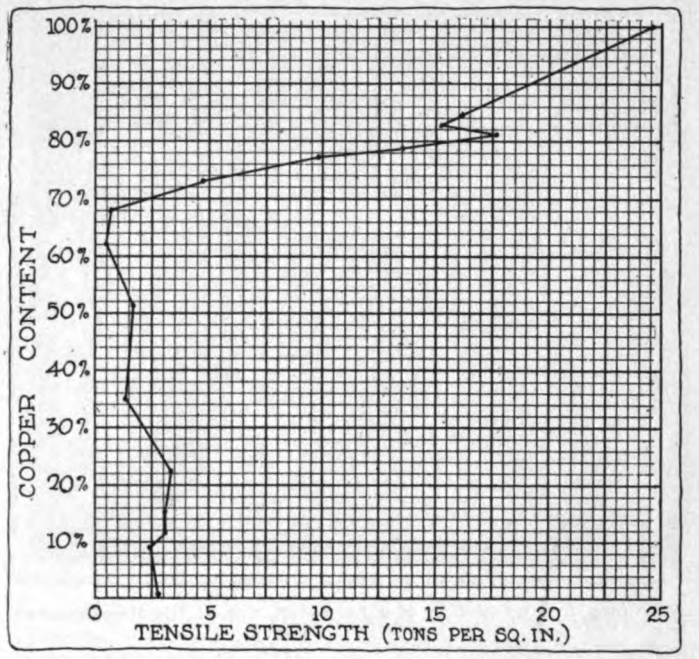
Thurston Matls. of Engrg.

Physical Specifications of Cast Phosphor-Bronze

Reduction of Section, per Cent	Elastic Limit		Ultimate Resistance	
	Per Sq. Mm.	Per Sq. In.	Per Sq. Mm.	Per Sq. In.
8.4	16.05 Kil.	10.6 T.	37.0	23.5 T.
1.5	17.38	11.05	32.5	20.6
33.4	11.6	7.2	31.3	19.9



Tensile strengths of copper-zinc alloys with different percentages of copper content as plotted from a tabulation of tests



Tensile strength of copper-tin bronzes for varying copper content from a tabulation of tensile strengths of samples

their share to the bewildering variety of combinations possible. In fact, what can be done with the three alone has only been touched upon lightly. The tabulations which are given in connection with these three alloys do little more than scratch the surface of a possibility. But there are other alloys in this great family which have their influence and perform certain duties for specific purposes and some of them which are of great importance such as lead, antimony, manganese, phosphor, aluminum, nickel, bismuth, silicon, and others have marked effects which render them of value.

Lead when used on the brass branch of the non-ferrous family tree is found in the metals which are desired for easy working. Thus lead is found in yellow brass, sheet brass, for brazing, red, gilding, coldworking, free-cutting and other cases where easy working is desired. On the bronze side, the lead is found in the metals which are used for bearing purposes. It is mixed with copper and tin to form so-called babbitt and is included in the formula for phosphor bronze. These are soft and hard bearing materials which are used in connection with steel shafting and where it is desired to have a non-abrasive and good friction quality of bearing material.

Lead a Softener

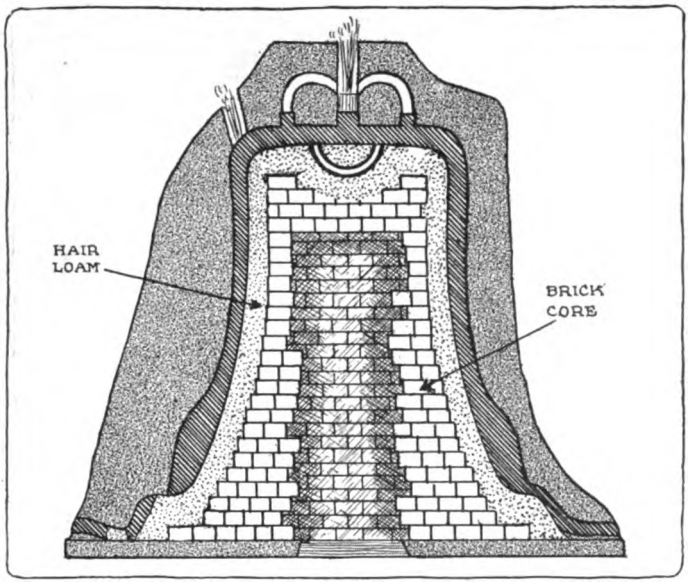
The qualities of lead give a ready clue to what it might be expected to do with other metals. It melts at about 625 deg. Fahr. becoming soft and pasty at about 617 deg. It has a specific gravity of 11.25 and a tensile strength of 1600 to 2400 lb. per square inch. It has very little elasticity and flows under a slight strain. In structure it is crystalline as will be noted by the fracture on breaking. When added to a copper-zinc alloy it allows the resulting material to be readily cut, but it cannot be added blindly as when present in certain quantities the metal becomes difficult to handle. For instance, when added up to as high as 10 per cent with copper 60 and zinc 30 it is difficult to obtain a homogeneous mixture. This is shown by the fact that the metals crack and segregate

Properties of Copper-Zinc Alloys

No. Comp. Cu	Zn	Copper by Anal. per Ct.	Sp. Gr.	Color	Fracture	Tenacity, Tons per Sq. In.	ORDER OF Mall.	Hard.	Fus.
0	0	100.00	8.667	Red	.....	24.6	8	22	15
1	1	98.80	8.605	Red-yellow	Coarse	12.1	6	21	14
2	1	90.72	8.607	Red-yellow	Fine	11.5	4	20	13
3	1	88.60	8.633	Red-yellow	Fine	12.8	2	19	12
4	1	87.30	8.507	Red-yellow	Fine	13.2	0	18	11
5	1	85.40	8.591	Yellow-red	Fine fibre	11.1	5	17	10
6	1	83.02	8.415	Yellow-red	Fine fibre	13.7	11	16	9
7	1	79.65	8.448	Yellow-red	Fine fibre	14.7	7	15	8
8	1	74.58	8.397	Pale yellow	Fine fibre	13.1	10	14	7
9	1	66.18	8.299	Deep yellow	Fine fibre	12.5	3	23	6
10	1	49.47	8.230	Deep yellow	Coarse	9.2	12	12	6
11	2	32.85	8.263	Dark yellow	Coarse	19.3	1	10	6
17		31.52	7.721	Silver white	Coarse	2.1	*Very brittle	5	5
18		30.36	7.836	Silver white	Coarse	2.2	Very brittle	6	5
19		29.17	7.019	Light gray	Coarse	0.7	Very brittle	7	5
20		28.12	7.603	Ash gray	Vitreous	3.2	Brittle	3	5
21		27.10	8.058	Light gray	Coarse	0.9	Brittle	9	5
22		26.24	7.882	Light gray	Coarse	0.8	Brittle	1	5
23		25.39	7.443	Ash gray	Fine	5.9	*Slightly ductile	1	5
3		24.50	7.449	Ash gray	Fine	3.1	Brittle	2	4
4		19.65	7.371	Ash gray	Fine	1.9	Brittle	4	3
5		16.36	6.605	Dark gray	Fine	1.8	Brittle	11	2
1		0.00	6.895	.....	.....	15.2	.....	23	1

*Very brittle, and slightly ductile.
In the above table, the minimum of hardness and fusibility is denoted by 1.

Thurston's Matls. of Engrg.



Arranging for the casting of a huge bell, one of the time-honored uses for bronze

on rolling. With lead 2.5, zinc 37.5 and copper 60, the cutting qualities are excellent, but the material can only be hot-rolled and forged with difficulty.

In a word, lead is the softening element. It lends the qualities of mildness to the alloys of which it forms a part. Having a nature that can almost be classified as plastic, it lends this quality to the metals with which it is mixed. When mixed alone with copper, as it is in some type metals, it is more or less unstable and will separate readily. When in combination with copper and tin or, in other words, when forming part of a bronze it forgets its plastic disposition and makes the bronze durable and capable of resisting wear. Some of the white metals for bearings contain anywhere between 0 and 80 per cent lead although the original babbitt does not contain any. It is however, an ingredient in many of the main bearing materials in automobile work.

Antimony a Hardener

Antimony finds its best uses on the bronze side of the non-ferrous family. Here it is of particular value due to its hardening influence on tin. In itself it is a brittle, bluish white metal with a laminated structure having a specific gravity of 6.8 and melting at 842 deg. Fahr. Having the hardening influence on tin it is of great value in the bearing metals and in fact was one of the constituents of the original babbitt which was composed of copper, tin and antimony. In bearing metals it is most frequently used between 4 and 6 per cent. According to most authorities the good influence of antimony ceases when it is used in the proportion of about 18 per cent and above this it should not be employed.

Like other members of the non-ferrous family antimony is of ancient lineage being known to the early Greeks and being referred to in the Old Testament. It has always been of value as a hardening agent and forms a part of the metal used in the making of printing types. It is of great value in this as it imparts to the metal the quality of expansion upon solidification thus permitting of a sharp impression of the mold.

Phosphorus a Bronze Tonic

Phosphorus, the poison of steel, is a veritable tonic when added to bronze. The introduction of this member into the family lends a strength and purity to what may be called the heavy duty bronzes that could never be reached without it. Phosphor bronze has been used for many years and in it the phosphorus acts as a flux increasing the purity by acting as such and furthermore lending its friendly offices in the closer amalgamation of the tin and copper. By adding small proportions of phosphorus to copper in the form of a phosphoret of copper or tin, the oxides of copper which are generally present as an impurity are removed by deoxidization, with the result that the grain of the resulting alloy is much finer.

(To be continued)

Properties of Copper-Tin-Zinc Alloys

No.	Copper	Tin	Zinc	Remarks
1	100	100	100	Very white, brittle, subject to liquidation.
2	100	50	50	Very white, but finer grain.
3	100	25	50	Yellowish tint, hard, fine not malleable.
4	100	25	25	Brittle.
5	100	20	20	Brittle, hard, yellow.
6	100	16	16	Brittle, hard, yellow, close grained.
7	100	14	14	Yellow, slightly malleable.
8	100	12.5	12.5	Yellow, more malleable.
9	100	11	11	Yellow, more malleable.
10	100	10	10	Fine yellow, fine grain, malleable.
11	100	8	8	Yellow, softer, more malleable.
12	100	7	7	Golden, malleable, soft.
13	100	6	6	Golden, malleable, soft.

Thurston Matls. of Engrg.

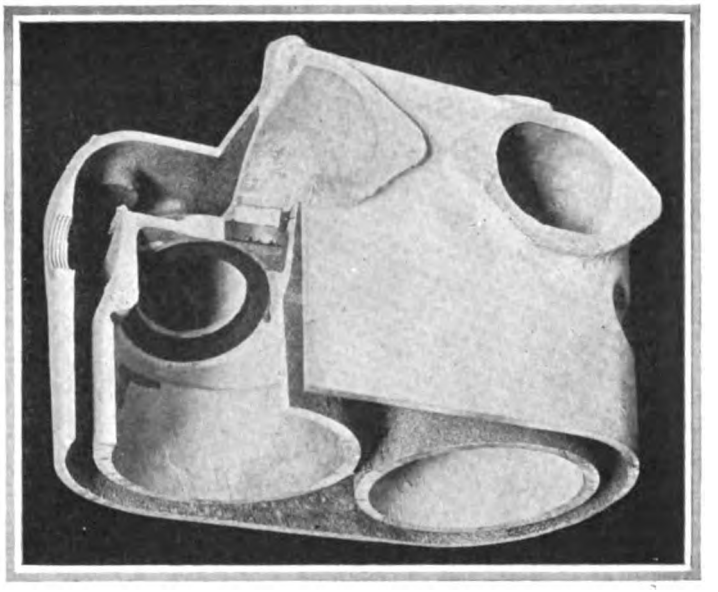
Properties of Copper-Tin Alloys*

At. wt.: Cu. = 31.6; Sn = 58.9

At. Comp.			Copper per Ct.	S. Gr.	Color	Fracture	Tenacity, Tons per Sq. In.	ORDER OF		
	Cu	Sn						Mall.	Hard.	Fus.
	1	0	100.0	8.607	Red-yellow	.....	24.6	1	10	16
a	10	1	84.29	8.561	Red-yellow	Fine grain	16.1	2	8	15
b	9	1	82.81	8.462	Yellow red	Fine grain	15.2	3	5	14
c	8	1	81.10	8.459	Yellow-red	Fine grain	17.7	4	4	13
d	7	1	78.97	8.723	Pale red	Vitreous	13.6	5	3	12
e	6	1	76.29	8.750	Pale red	Vitreous	9.7	Brittle	2	11
f	5	1	72.80	8.575	Ash gray	Conchoid	4.9	Brittle	1	10
g	4	1	68.21	8.400	Dark gray	Conchoid	0.7	Friable	6	9
h	3	1	61.69	8.539	White gray	Conchoid	0.5	Friable	7	8
i	2	1	51.75	8.416	White	Lam. grain	1.7	Brittle	9	7
j	1	1	34.92	8.056	White	Vitreous	1.4	Brittle	11	6
k	1	2	21.15	7.387	White	Lam. grain	3.9	Brittle	12	5
l	1	3	15.17	7.447	White	Lam. grain	3.1	8 Tough	13	4
m	1	4	11.82	7.472	White	Lam. grain	3.1	6 Tough	14	3
n	1	5	9.68	7.442	White	Earthy	2.5	7	15	2
o	0	1	.....	7.291	White	.....	2.7	.....	16	1

a, b, c, are gun-metals; d, hard brass for pins; e, f, g, h, i, bell-metal; j, k, for small bells; l, m, n, o, are speculum alloys.
*Dingler's Journal, lxxxv., p. 378; Watts's Dict. ii., p. 43.

Sawn-up section of large aluminum motor for aeroplane work. The dark rings are the cast iron valve seats which were given a thin coat of copper before making the casting so that the aluminum and iron have become almost welded together



Another view of the section shown at the left of the accompanying illustration, showing uniform thickness of the walls of the casting both as regards the main bores and the jacket. The iron ring has a dove-tailed circumference

Aluminum Aeroplane Motor Casting

Close Contact Between Cast Iron Valve Seat Rings and Aluminum Body Shown in Sawn-Up Cylinders

A VERY large aluminum motor for aeroplane propulsion is about to be tried out by one of the leading engine manufacturers and the photograph hereunder shows the method of construction. There are to be two valves per cylinder, arranged in the head and operated, apparently, from long push rods.

The first casting made has been cut up in order to see how the cores had stood up and the remarkably interesting thing about it is the extraordinary close contact between the cast iron rings which will form the valve seats and the aluminum which retains them in place. Each ring is cut with a dove-tailed circumference and there are a few notches to guard against any tendency the ring might have to revolve while being machined. Before making the casting the iron rings are given a thin coat of copper and the sawn-up casting shows that the aluminum and iron have become almost welded together.

In examining the castings which are in pair form, it seems absurd to be able to pick up the block with one hand for the bore is about 5 in. and the stroke a good deal more than this. Very even thickness of wall is another striking feature of this casting, both as regards the main bores and the jacket.

Why Aluminum Means Economy

SIDNEY, OHIO.—Editor THE AUTOMOBILE:—The problem of eliminating weight in automobile construction is being considered very seriously. A number of engineers have already adopted the use of aluminum alloy to cut down weight. Pistons of this material are being used very successfully and cylinders should also be used of the same material.

If a motor 3⅛ by 4 or 4½ was constructed of aluminum alloy instead of the present material used in some motors, it would cut down the weight 75 lb., which would mean about 3% hp. more efficiency. Figuring that there are now 3,000,000 in use, it would make 11,002,050 lb. of unnecessary weight to be carried around, also figuring labor, machine work and cost of handling, the extra 75 lb. weight at 7 cents per pound would mean a loss to manufacturers of $787,500, besides a great many thousand dollars' worth of tires needed to carry this weight.

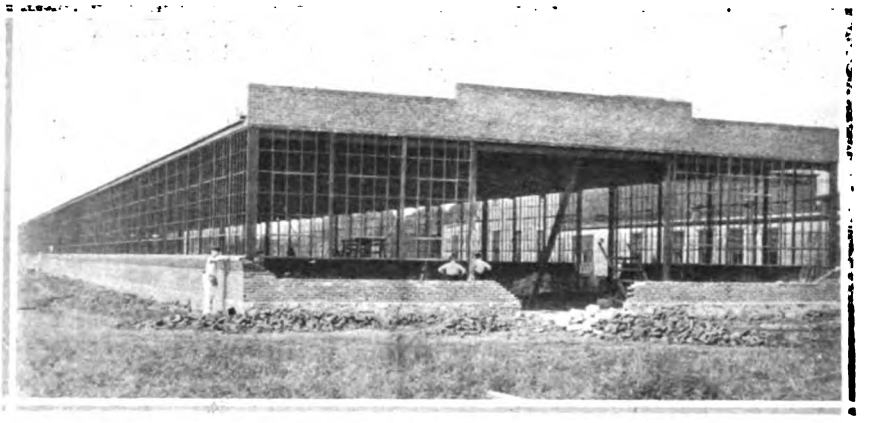
It is surprising to see how fast automobile engineers are progressing. Only a few years ago there were no motors built under a 4 by 4 and up. The speed of these cars would be about 32 to 40 miles per hour, and they would do about 16 miles on a gallon of gasoline. There are motors 2⅞ by 4½ that are able to make 35 to 45 miles per hour and 20 to 22 miles on a gallon of gasoline, in a car weighing 1700 to 1800 lb.

If we continue to progress in the future as in the past a great deal will be accomplished.—GEO. BAILEY, Superintendent Automobile Department, Bimel Buggy Co.

Automobiles for Scout Work in War

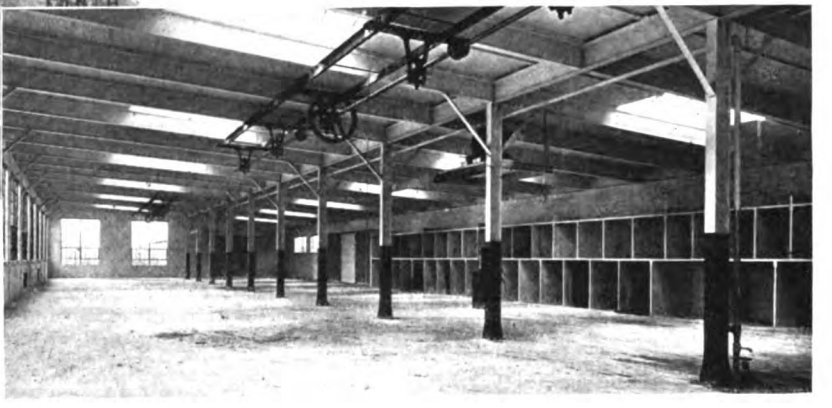
REPORTS from the battle front in Europe are to the effect that while aeroplanes are greatly used for scout work, automobiles are even more extensively employed in this capacity. Often these cars are equipped with portable stands which permit their occupants to elevate themselves to a considerable height above the surrounding territory and thus secure a wider horizon for their reconnoissance. Frequently the cars are driven into clumps of bushes or trees, which serve to screen the observers while at their work.

Three Factory Additions—Building a Speedway



The building illustrated above is the most recent addition to the factory of the Mercer Automobile Co., Trenton, N. J. This structure, which is of steel and glass construction, is now rapidly nearing completion and when it is finished will be used to house the paint and final assembly departments. The building measures 60 by 400 ft. and is one story in height, giving 24,000 sq. ft. of additional floorspace to the Mercer plant

Above — Five-story addition to the factory of the Federal Rubber Mfg. Co., Cudahy, Wis. The new building will add 50,000 sq. ft. to the manufacturing facilities of the Federal company. Most of this space will be devoted to the manufacture of automobile castings



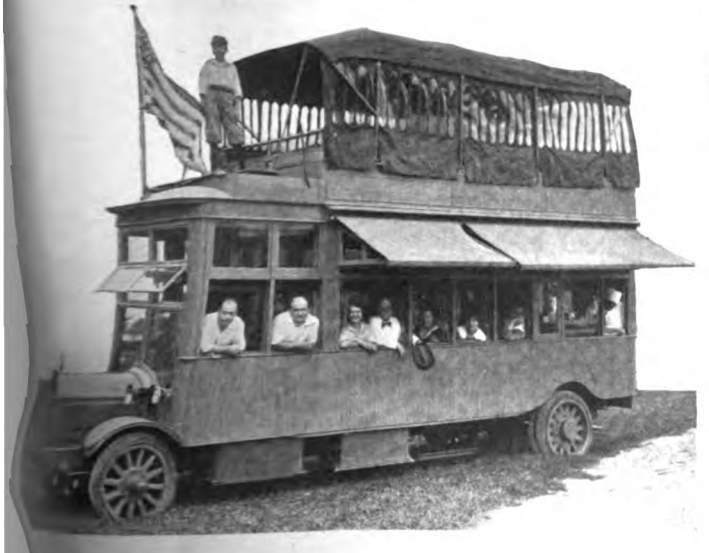
New assembly department of the Russel Motor Axle Co., North Detroit, Mich. This is 60 by 192 ft. and adds 11,000 sq. ft. to the Russel factory's floor space. The axles to be assembled in this building will be largely those of the internal gear drive type. This structure is designed to form one-half of a building which, when completed, will be 120 ft. wide. It is planned to complete this before the end of the year

Building the Twin City Motor Speedway. The illustration shows how the work of excavation and the grading and surfacing of the track are being carried on at the same time to facilitate the completion of the course. Note the grandstands under construction and nearly completed in the background. This course is near Minneapolis and St. Paul, Minn.

Dodge Bros. Artificial Test Hill, Sand Pit and Speedway

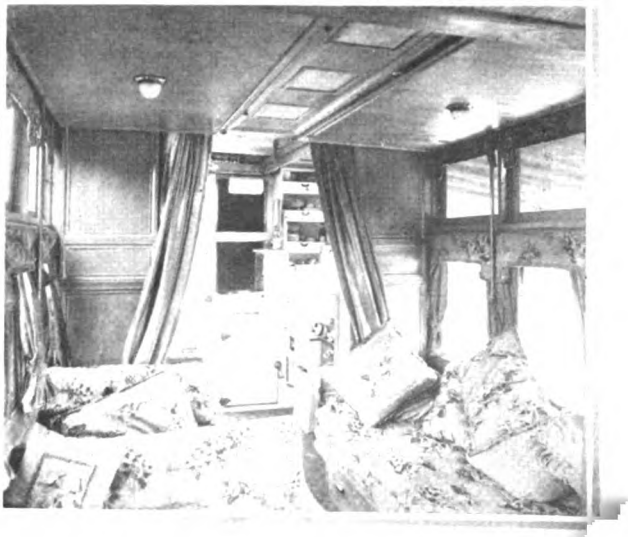
Dodge Bros., Detroit, Mich., have completed a ½-mile speedway, test hill and sand pit on the factory grounds for the purpose of keeping their test men off the public streets and roads. The hill is 542 ft. long by 30 ft. wide and has two approaches with varying grades. Over 215,000 ft. of lumber is used in the track, on which no pedestrians are allowed

Automobile Land Yacht on Way to Coast

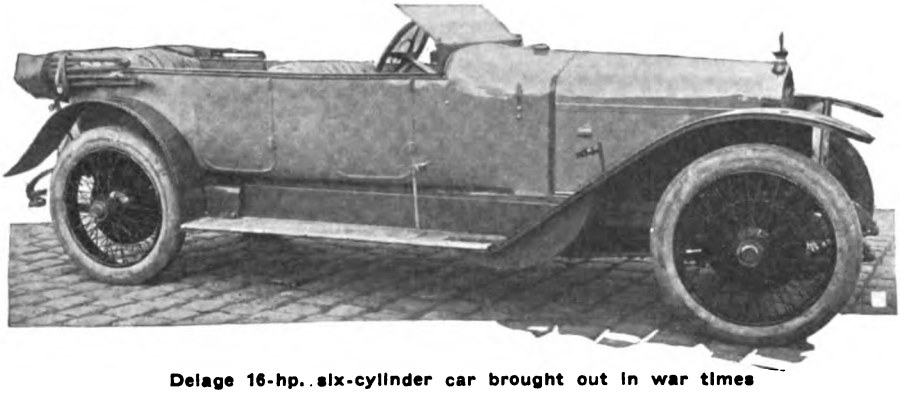


The above illustration shows the automobile land yacht, as its owner has it, built for Roland R. Conklin of New York and Huntington, L. I., which left last week on its way to San Francisco. As president of the New York Motor Bus Co., Mr. Conklin developed the idea of converting such a body and mounting it on an omnibus type chassis fitted with a 60 hp. motor. The machine, which is fitted with every possible convenience, is divided into three compartments; the forward one 5 ft. long containing the driver's seat, tank and crew's berths; the center compartment, illustrated at the right, is 10 ft. long and contains a bed-couch, two armchairs convertible into a bed and four berths which raise up to the ceiling when not in use; the kitchen is in the rear. Inside dimensions of the body are 21 ft. length, 7½ ft. width, and 6½ ft. height. Floors are of cork and a double gearbox giving nine speeds forward and three reverse is used

One of the new Beardsley electric roadsters manufactured in Los Angeles, Cal., which is claimed to do better than 30 m.p.h. and to be good for 85 to 100 miles per charge



Racing Influence in Delage Design



Delage 16-hp. six-cylinder car brought out in war times

New Six-Cylinder, 16-H.P. Has Front Wheel Brakes Double Carbureter and Exhaust Unusual Manifold

RACING experience has been very largely drawn on in the design and construction of the new six-cylinder 16-hp. Delage. The new model has been completed during the war period, and such arrangements have been made that as soon as hostilities come to a close the car will be manufactured in big series. At the present moment Delage, like all other European automobile manufacturers, is so occupied with war material that it is impossible to produce big quantities of touring cars. The car is the work of engineers who have made all the Delage racing cars for the last seven years. The object has been to embody all the lessons learned with small, high-efficiency motors, and at the same time produce a car of simple design capable of being handled efficiently by the ordinary motorist.

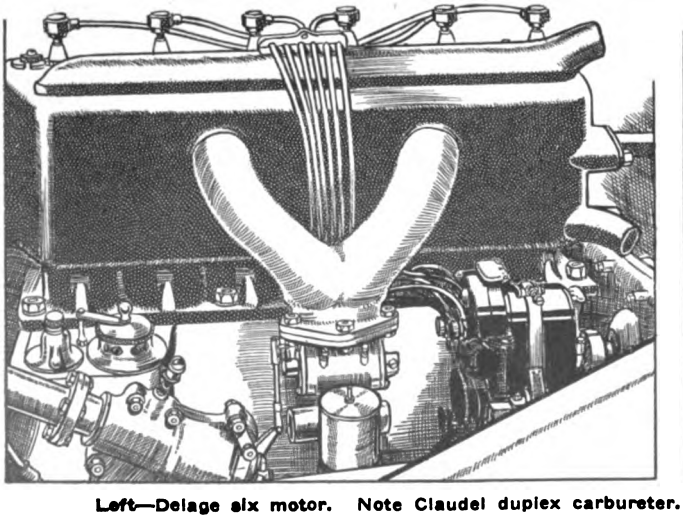
48 Hp. at 1800 R.P.M.

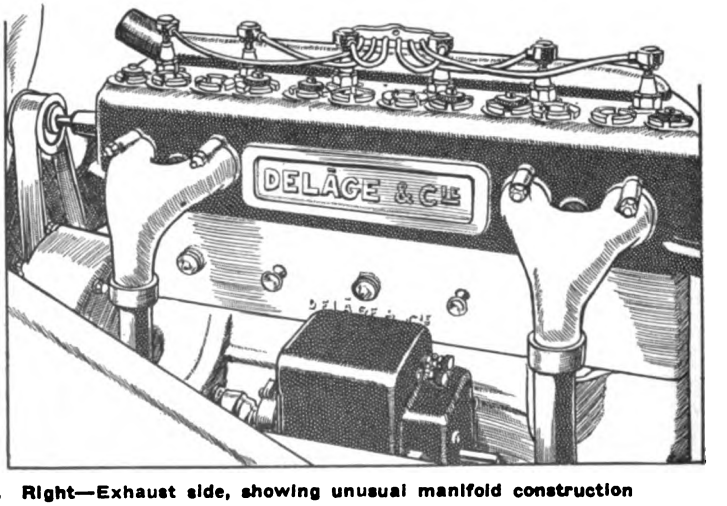
The cylinders measure 75 by 150 mm., 2.9 by 5.9 in. bore and stroke, giving a cubic capacity of 244 in. At 1800 revolutions the horsepower is 48; at 2100 revolutions 55 hp. is obtained. With a total weight of 4100 lb., the load being equivalent to an ordinary touring body and six passengers, the car has been tested to give an average of 68.9 m.p.h. over the measured kilometer. The tests were made over a 3-mile stretch of ordinary road, the run being made in both directions and the average taken, thus eliminating any advantage which may have accrued from wind or gradient. Fully equipped with touring body, spare wheel, windshield, fenders, headlights, top, and carrying five passengers, a test run of 140 miles was made at an average speed of 46.6 m.p.h. A similar test over more hilly country showed an average of 43 m.p.h. over a distance of 125 miles. These tests were made under ordinary touring conditions, on French roads, no allowance being made for examination of passes by military guards, grade crossings, or the passage through villages.

Externally the motor follows standard design, being a block casting with inclosed valves on one side. To get the best form of combustion chamber the valve stems are inclined outward, and the valve pocket is placed close up to the cylinder barrel. The crankshaft is carried in four plain bearings; pistons are steel forgings, unusually light, and fitted with two rings. Connecting-rods are I-section, machined over all. These cars are to be supplied complete with electric lighting and electric self-starting equipment. The electric generator is carried between the crankcase hangers, on left-hand side of motor, but sufficiently low not to interfere with accessibility of valve springs. The high-tension magneto and water pump are on the opposite side, the pump being ahead of the timing gear housing and the magneto to the rear of it. Non-adjustable silent chains are used for driving camshaft, magneto and generator. The electric motor is under the floorboards, engaging with external gear cut on flywheel.

Unusual Exhaust Manifold

Arrangement of exhaust manifold is somewhat unusual. There are four ports, to which a couple of branched manifolds are bolted, the exhaust pipes having a straight drop just ahead of the crankcase hangers. Delage claims to have overcome usual carbureter difficulties inherent to six-cylinder motors by the use of a double carbureter, as developed on racing models. The car is certainly remarkable for its rapid acceleration. The duplex carbureter is a Claudel production,





Left—Delage six motor. Note Claudel duplex carbureter. Right—Exhaust side, showing unusual manifold construction

uniting two carbureters with a common float chamber. The two tubes and jets are side by side, although independent, and have a common throttle. A Y-shaped intake manifold connects up the two portions of the carbureter with the two ports on right-hand side of motor, the gas passages being surrounded by the circulating water. This model marks Delage's conversion from thermo-syphon to pump so far as stock cars are concerned. Thermo-syphon, however, had never been used on Delage racers. Lubrication is pressure throughout, including direct feed up the connecting-rod to the wristpin.

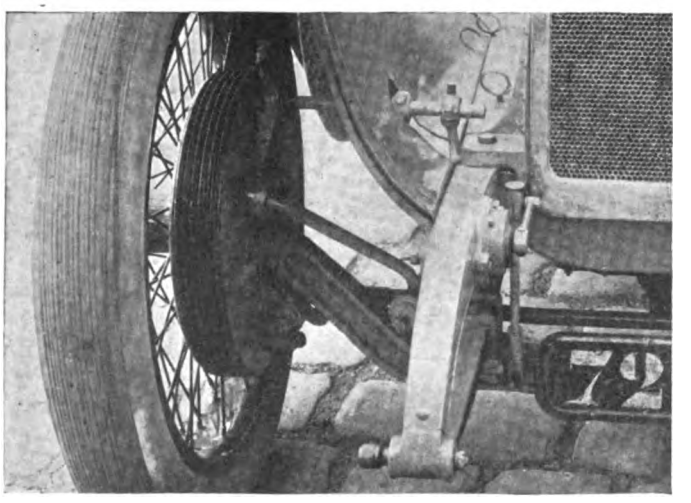
Motor and Gearbox Separate

In designing this new model Delage has decided against unit construction of motor and gearbox. He admits its apparent simplicity, but objects to its lack of balance, the weight being thrown too far forward except when a closed body or full load of passengers are carried. Motor and gearbox are thus separate, and carried on a subframe.

Leather-faced cone clutch has been abandoned in favor of plate clutch lined with Ferrodo. Gearbox is of same design as on racing cars, shafts being short and hollow and ball bearings used throughout. In final drive the only difference between this model and the racing cars is that the differential housing is cast steel instead of aluminum. The bevel driving pinion is supported in ball bearings front and rear, and the drive shafts are hollow. Drive is taken through the rear springs, which have a width of 2.5 in. and a length of 52 in. In the racing models rear springs are semi-elliptic; on the touring cars they are five-eighths elliptic; in each case they are underslung.

Front Wheel Brakes

Another innovation for which racing is responsible is the use of front wheel brakes. They are of exactly the same design as those on last year's Grand Prix racing models, when the hilly and winding nature of the course made braking an important factor. Brake drums are ribbed to assist cooling



Front wheel brakes on the new Delage, a racing adaptation

and are machined all over; shoes are aluminum, lined with Ferrodo. The pedal operates the road wheel brakes and the lever acts on the brake to rear of gearbox. Delage engineers are so satisfied with front wheel brakes, even in the hands of ordinary users, that it is possible the differential brake will be abolished. At present its only use is to hold the car when left on a gradient.

Aluminum Dashboard

An aluminum dashboard is fitted, with the gasoline tank bolted within it. This design makes the tank independent of any portion of the bodywork and facilitates the work of the coach builder. This model will be produced in three chassis lengths; ordinary for full touring car; extra long for closed bodies, and short for sporting type, this latter being sold with a guarantee of 65 m.p.h., but declared to be capable of much more.

Adjustable Stop on O'Kill Indicator

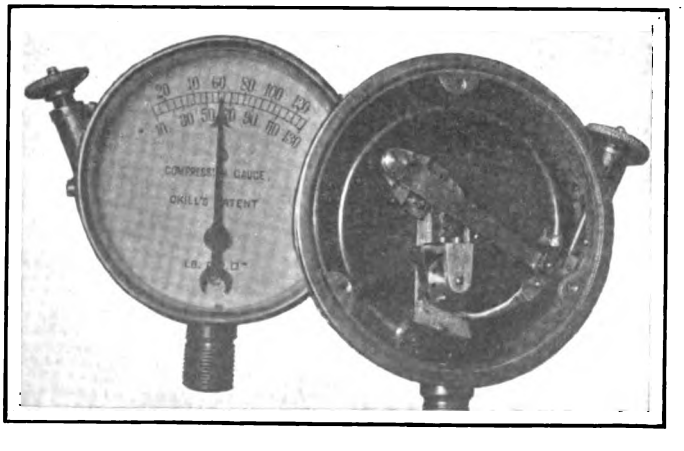
THE accompanying illustrations show an improvement on the O'Kill indicator embodying all the principles of the piston and spring pressure indicating device in that it is provided with an adjustable stop which eliminates all motion of parts and consequent inertia errors when the instrument is adjusted at the instant of taking a pressure reading.

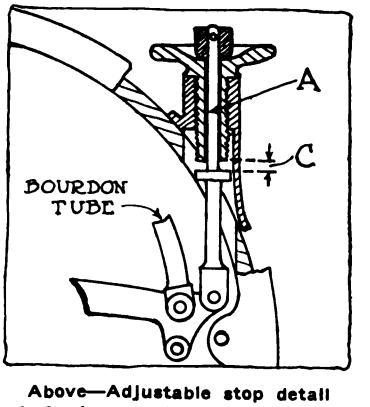
From the working diagram it will be noted that the end of the Bourdon tube is constrained to move in a definite path and the index finger can be made to travel over the entire face of the compression dial by rotating the milled nut shown at the side of the gage. Referring to the sectional drawing, the milled nut together with the rod A which slides through it, constitutes a double stop for the end of the Bourdon tube.

The small amount of clearance at C allows the tube end to move and to vibrate the index finger through a small arc when the gas pressure in the tube and motor cylinder is greater than the tension given to the tube by the milled nut. Thus when the gage is correctly adjusted on a running engine, the finger is at rest, all inertia effect being eliminated and no shaking of the needle is noticeable.

This dial gage, while not as yet placed on the market, neither in America nor abroad, is patented in this country under number 1,042,958; Oct. 29, 1912.

The O'Kill indicator, which was first described by Prof. W. C. Marshall in THE AUTOMOBILE for May 29, 1913, has been greatly improved and simplified in form since that time when it measured 7 in. in height with a maximum diameter of 2½ in., being entirely different in appearance from the up-to-date instrument illustrated herewith. The latest improvement described above, the adjustable stop, should prove a feature of added convenience.

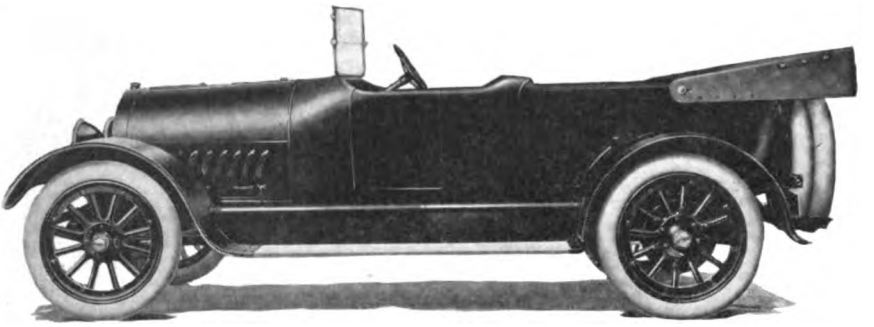




Above—Adjustable stop detail
Left—Improved O'Kill indicator

McFarlan Cars Larger for 1916

Single Chassis with Either 4½ by 6 or 4 by 6 Motor Is Continued—Price $90 Higher—New Spring Suspension —Aluminum-Alloy Pistons



Seven-passenger McFarlan for 1916 which sells, completely equipped, for $2,990 with a 4½ by 6 six-cylinder motor and at $2,680 when fitted with a 4 by 6 six-cylinder motor

BY the clever application of engineering skill the riding qualities, appearance, balance and speed of the McFarlan for 1916 have been greatly improved by the McFarlan Motor Car Co., Connorsville, Ind. While the policy of the concern of marketing one chassis with either a large or smaller six-cylinder motor installed is continued, there have been some material changes of unusual interest and of such a nature as to cause the unfamiliar motorist to pronounce the 1916 model entirely new. Because of the very nature of the alterations, a price increase has been made necessary, and now the large McFarlan, which is equipped with a 4½ by 6 motor, is listed at $2,990 instead of $2,900, and the smaller model, the same in every respect with the exception of the motor size, which is 4 by 6, is listed at $2,680, an increase of $90 over the former model.

Flat Cantilever Suspension

While the motor is more powerful because of changes in the interior, and while there have been changes made in the drive and body, that of utmost importance is the new form of rear spring suspension which almost approaches in design that used by the English Rolls-Royce. In the McFarlan, cantilever springs are used, but instead of these being arched they are perfectly flat and further are shackled at both ends. They take no drive and torque stresses and hence the double shackling is possible. In the Rolls-Royce the flat spring is used, but the rear portion is under the axle and operates between rollers, while in the McFarlan the spring is fastened on top of the axle housing and uses a shackle for play instead of the rollers.

This form of suspension allows the springs to be flat under normal load, and an exceptionally easy riding car is obtained because of the comparatively slow return after the wheels have encountered an obstruction. Furtherance of the easy riding is also obtained by making the springs long and wide, the dimensions being 58 in. and 3 in. There are fourteen leaves.

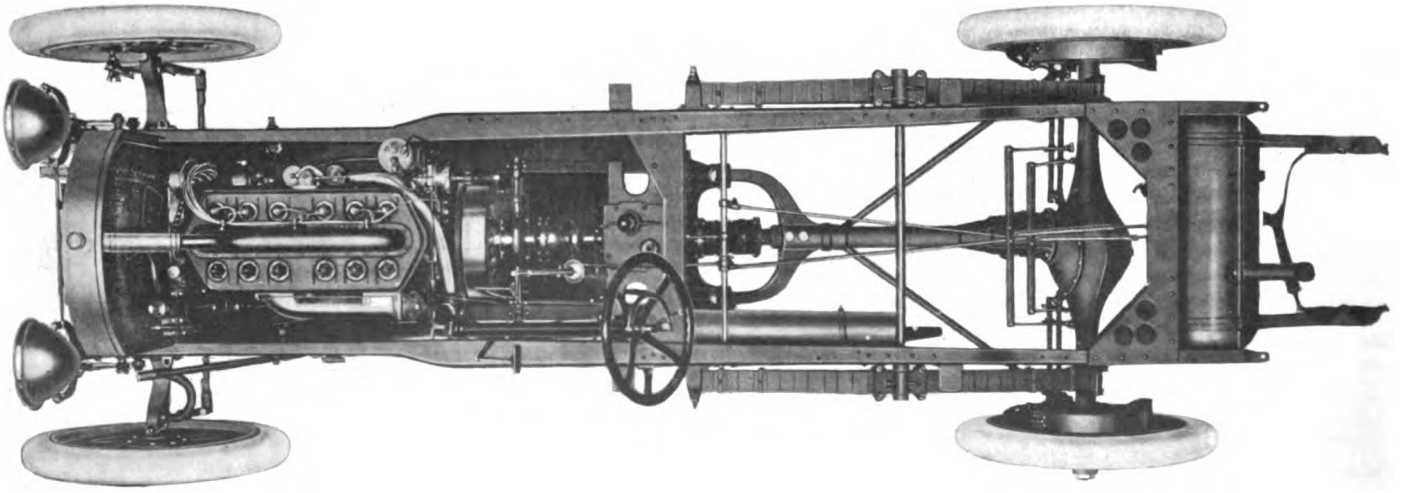
Frame Is Stronger

As in all cases where a cantilever supplants a three-quarter elliptic, frame strengthening is necessary, and in the McFarlan a reinforcement has been placed along the line extending from the front shackle to the oscillating point. The pin here upon which the spring is fulcrumed is of 1¼ in. diameter and extends across the frame.

With the new spring suspension there has been a better all-round balance obtained by removing the gearest from the rear axle and placing it amidships upon a sub-frame and at the same time bringing the motor down to rest upon this sub-frame instead of in the regular frame channels. A general stiffening of the whole assembly has been brought about by this re-arrangement of units and in conjunction with the new cantilevers give a car which is extremely free from air riding, that is the wheels stick to the ground even in rough going. Riding qualities have been improved two-fold over the previous model with the three-quarter suspension.

Aluminum Alloy Pistons

The motor still is a T-head design with block cast cylinders, but its speed capabilities have been increased to some degree



Plan view of McFarlan six chassis for 1916, showing new flat cantilever spring suspension. Note cross rod to insure strength

because of the fitting of aluminum-alloy pistons instead of cast iron and lighter rods, although the latter have the same section. Just what maximum speed now is obtainable is yet an uncertainty, but one will not be far from correct by saying a good one-third greater speed is possible.

Now that the r.p.m. is greater than before, it has been thought advisable to install a plunger pump, driven from the exhaust camshaft, this pump forcing oil directly to the four main bearings. The pistons and cylinders are lubricated by constant-level splash as before. The carbureter still is a Stromberg and the feed as before by a short manifold to the valves. These are 2 in. in the clear and have cast-iron heads.

Cranking Motor on Right

While the cranking, lighting and ignition system remains of Westinghouse make, there have been changes in location, the cranking motor now being on the right side instead of the left and turning the engine over by means of a toothed flywheel instead of through a train of gears connecting with the crankshaft at the forward end. It also is lower than in the 1915 model.

The combination generator and ignition apparatus is on the left as before, but it is lower so as to offer less restriction in making valve tappet adjustments and stands slightly further away from the motor. The latter change has been necessary because the water pump formerly an integral part of the crankcase now is a separate unit driven directly from the timing gears. Pump capacity is 10 per cent greater than in 1915.

The separation of the pump as a portion of the case has been done to make replacement easy, in the remote event that is necessary. The water pump shaft continues to drive a two-cylinder O. B. air pump.

Aluminum Cone Clutch

In the cone clutch there has been but one alteration, a change from a pressed-steel cone to one of cast-aluminum. The clutch is a leather-faced type of 14 in. diameter and 4 in. face with twelve flat springs under the leather. Now that there has been a weight reduction in the cone there is a lower turning momentum and hence less chance for spinning with its consequent harsh gear changing.

Propeller Shaft Inclosed

The gearset, which as previously stated, is amidships on a sub-frame, is a Brown-Lipe using ball bearings instead of rollers and a squared shaft of 1⅝ in. diameter, making it lower than before. It uses a four-point mounting and drives an inclosed propeller shaft, the tube having a wide-flared end as before. This tube, braced by rods running to the axle housing, takes both drive and torque.

Axle Knuckles Castered

There is only one other mechanical change of importance and that is the front axle knuckles are castered slightly as against being straight as used in 1915. This has helped to make the front wheels hold to the ground.

The wheelbase still is 132 in., but the tires fitted now are Firestone cords 36 by 4½ in.

A visit to the McFarlan factory is convincing evidence that the concern makes a detail study of body design. A large portion of the factory is devoted to the building of all types, including special creations which many buyers consider, together with those which the company uses as stock equipment.

Other Body Lines

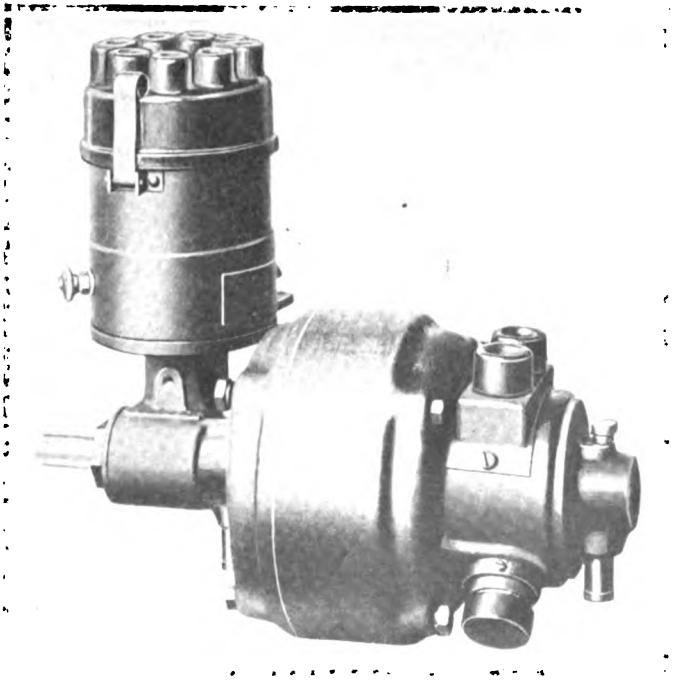
The standard body for 1916 is a seven-passenger design, showing detail improvement over the previous design, this being especially true of the front portion. While the body still is a double-cowl design, it is hung lower than before and has a better rounding out of the cowl and hood. This has been helped by widening the cowl, and by raising it the leg room in front has been increased. The rounded front has called for a new design of radiator and windshield, both of which harmonize better with the rest of the design. The upholstery has a wider piping, but is of the same material as before.

McFarlan Cubist roadster, a new body type for 1916

Westinghouse Ignition for Eights

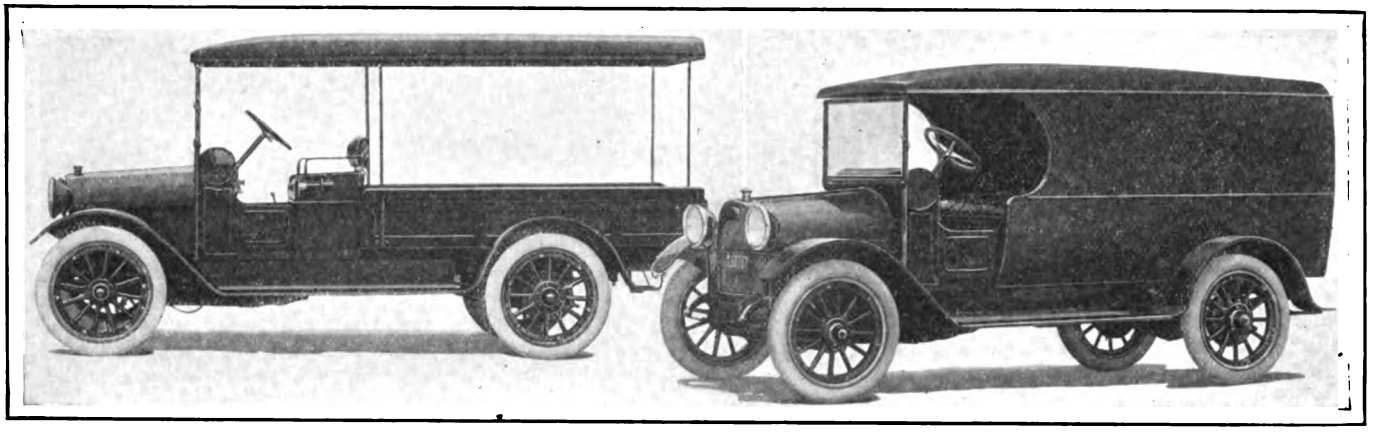
To accommodate the needs of eight-cylinder motors, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has brought out a distributer to suit its vertical type of ignition and which will provide current for an eight-cylinder motor. The outfit comprises a vertical ignition unit, an ignition switch, a ballast resister and the battery. These equipments are made to operate on a 6 or 12-volt circuit and are suitable for four, six or eight cylinders.

The Westinghouse vertical ignition unit is made up of four essential parts, namely: the interrupter, the condenser, the induction coil and the distributer, contained in one housing. The ignition switch is a simple single pole; the ballast resistor, which is part of the equipment, is in series with the primary circuit. Its use prevents burning of the contact points. Any standard make of battery may be used.



Westinghouse vertical ignition unit mounted on lighting generator for eight-cylinder cars

Electric System on Reo ¾-Ton Truck



The new Reo ¾-ton delivery wagon with open express body

The same chassis equipped with full panel delivery body

THE Reo Motor Truck Co., Lansing, Mich., has brought out a ¾-ton delivery car having a normal capacity of 1500 lb. and a maximum capacity including the weight of the body of 1800 lb. It is designed to run at a speed of 22 m.p.h. and is mounted on a 120-in. wheelbase with standard 56-in. tread.

The price of the complete truck with the standard express body and canopy top is $1,075 f.o.b. Lansing and for the chassis only, including the equipment but minus the express body, driver's seat, canopy top, windshield, is $1,000 f.o.b. Lansing.

Motor 4⅛ by 4½

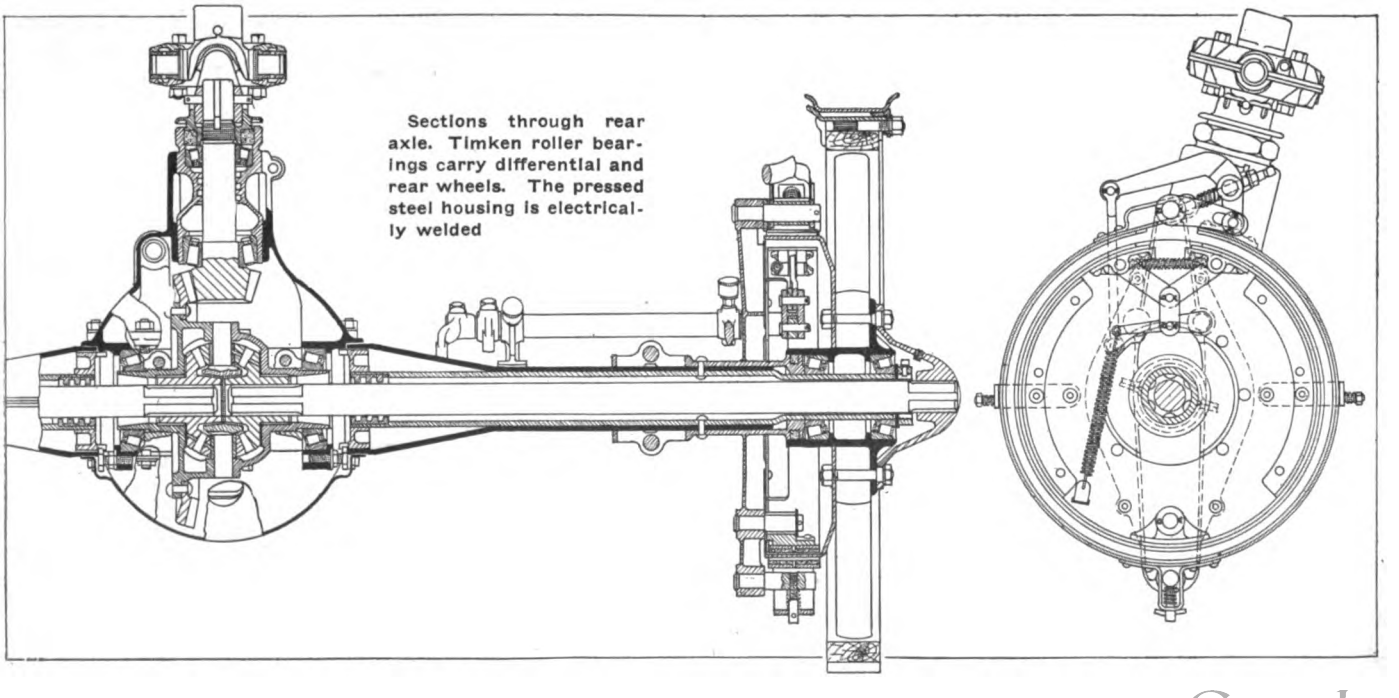
The motor has a nominal rating of 35 hp. It is a pair-cast 4⅛ by 4½ four having the heads integral. The valves are the conventional 45-deg. poppet, having a clear diameter of 1¾ in. The inlet valves are mounted in the head and the exhaust on the side. The pistons are of gray cast iron provided with two three-piece rings delivering the drive to I-section drop-forged connecting-rods 9½ in. long with 1¼ by 2¼-in. bearings lined with babbitt. The crankshaft is a drop forging from manganese steel, heat treated and ground to size. The main bearings are lined with nickel babbitt, each 1½ in. in diameter with a 2¾ length in front and center and 4 in. long in rear. These bearings are adjustable from the exterior of the crankcase. The camshaft carries the cams forged integrally running in die-cast bearings. The timing gears are helical.

Oiling is combination force-feed and splash. The reservoir is in the crankcase bottom and feed is by a plunger pump under pressure to the main bearings and timing gears. The cylinders are lubricated by splash.

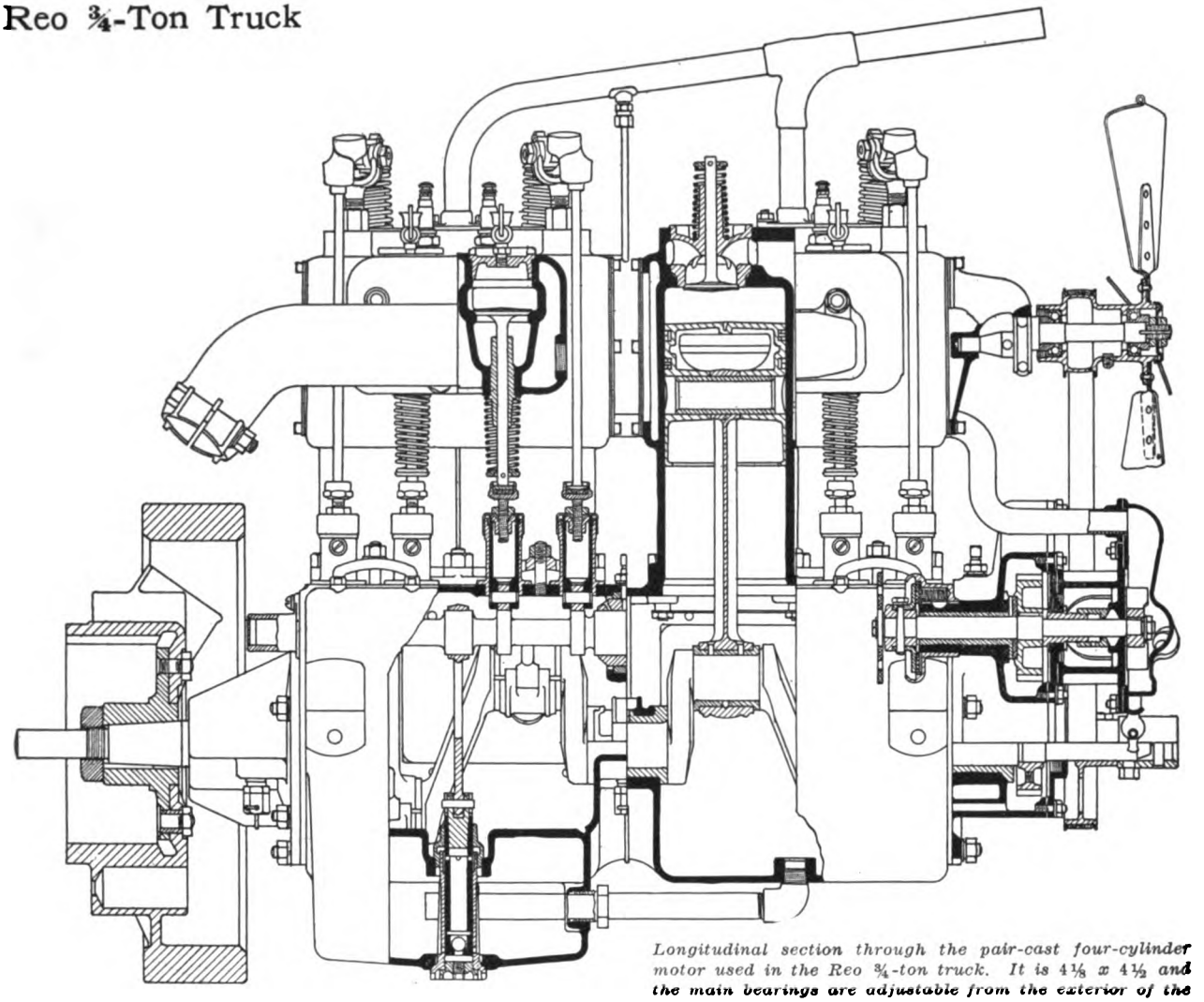
Carburetion is by a Johnson float-feed automatic water-jacketed carbureter fitted with an air intake connected with a stove on the exhaust and provided with dash air control.

Ignition is provided by a Remy generator, which also furnishes current to the storage battery for lighting and starting. The entire electric system is operated at 6 volts and is a two-unit device with the starting motor mounted over the front end of the gearset. The car has head lamps with dimmers and also an instrument and tail lamp.

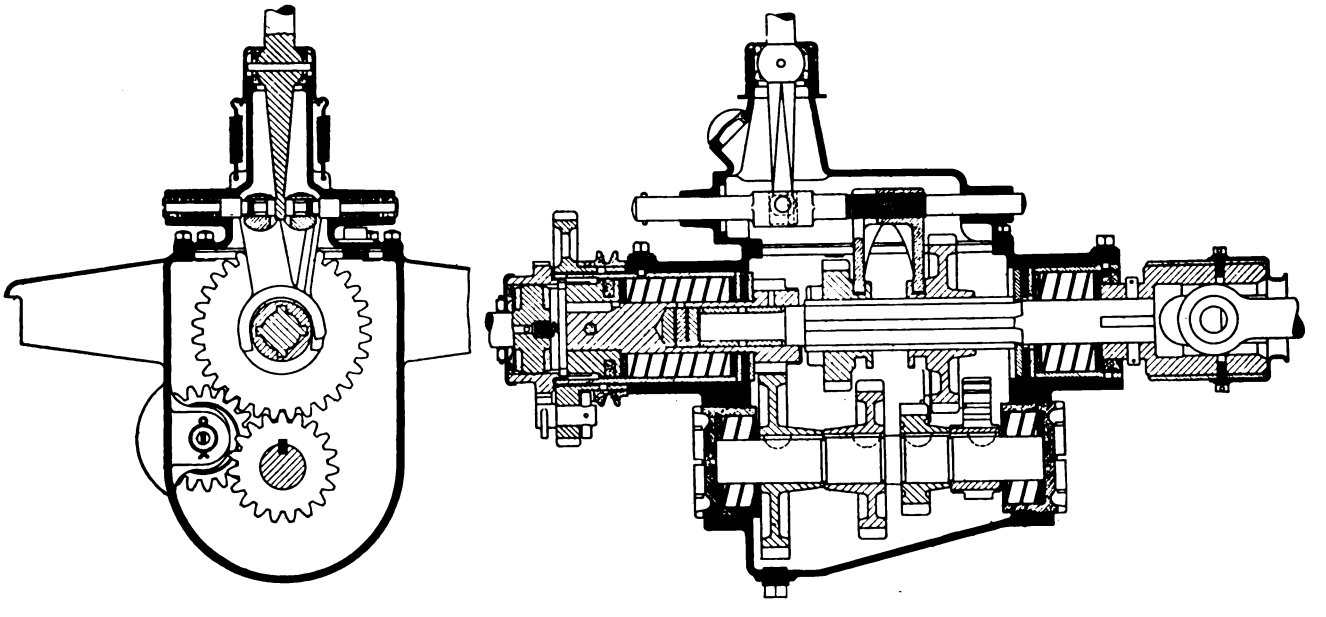
From the motor the drive is taken through a thirteen-plate dry-disk clutch through a three-speed sliding selective gearset provided with case-hardened gears having ⅞-in. face width. The axle ratio is 4 to 1 on high speed, 7.2 to 1 on second and 14.8 to 1 on low.



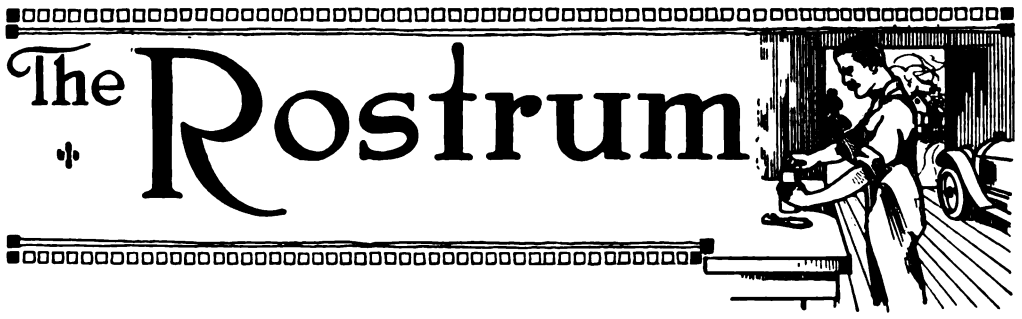
Reo ¾-Ton Truck



Longitudinal section through the pair-cast four-cylinder motor used in the Reo ¾-ton truck. It is 4⅛ x 4½ and the main bearings are adjustable from the exterior of the crankcase



The three-speed selective gearset is carried throughout on roller bearings and is arranged to provide center control, being mounted amidship on a subframe. The gears are case-hardened and have a ⅞-in. face width



Suggests Wider Turns at Corners

EDITOR THE AUTOMOBILE:—At most street intersections the radius of the curb at the street corner is such that a motorist desiring to turn the corner finds it impossible to describe an arc of turn that will enable him to maintain a moderate rate of speed and still keep his machine on the proper side of the pavement while turning into the cross street. The radius of the curb curve is usually but little over a foot, hence the driver cannot commence to turn until he has practically passed the corner. Increasing the radius of the corner curve up to, say, 12 or 14 ft., will permit most types of cars to turn a corner at the same distance from the curb as when driving down the street.

Changes such as suggested by the accompanying sketch, Fig. 1, have been made at several street intersections in Chicago, notably at Lincoln Parkway and Diversey Boulevard, and at Devon and Evanston Avenues.

How materially the possibilities of making the desired turn within the proper confines are facilitated will be seen by referring to the sketch. The double dotted lines show the curb at the usual street corner, while the double solid lines back of these illustrate what has been accomplished at the two localities mentioned—the change at Lincoln Parkway and Diversey Boulevard being shown in an accompanying photograph.

Without such construction a driver following the line *A* in the direction noted by the arrow, and turning into the intersecting street, would have to cross its center line and could not pass two cars coming toward him as indicated by the arrows *B*. Increasing the radius of the curve, as shown by the solid lines, permits the driver to follow the arc of the curb and thus keep to the right of the center line of the street where he properly belongs. This is clearly illustrated by the line *C*.

Such an improvement is particularly desirable on boulevards or where other streets intersect with boulevards. It is likewise desirable at intersections of narrow streets. This subject deserves the attention of engineers in charge of street improvements, and the practice suggested should be universally adopted, if for no other reason than to increase safety.

Chicago, Ill. W. M. V.

Battery Voltage Determines Circuit Voltage

Editor THE AUTOMOBILE:—I have a 1914 Case 25 which has a Westinghouse electric system and storage battery. My battery is out of order and I want to have it adjusted. Will I have to disconnect my generator or can I connect the generator to the lights without harming the generator or lights?

2—If I can use the generator without the battery, please give a diagram of how this can be done.

Geren, Miss. P. P. M.

—The winding of this generator is such that the series and shunt fields oppose one another with the values so proportioned that with the battery connected in circuit the charging rate is determined by the specific gravity of the electrolyte in the battery and the car speed in m.p.h. The battery voltage determines the voltage of the entire electrical circuit. If the battery were to be removed this voltage would attain a very high value approximating 28 to 30 volts since the differential effect of the field winders cannot be obtained unless current is flowing through the series field to the battery.

It is suggested that you use another battery while the present one is being repaired in case you desire to drive at night, and if you desire to drive only in the daytime successful operation may be secured by withdrawing one brush from the brush holder. If you do this you should take great care to replace the brush in exactly the same manner as it is removed after your battery has been reinstalled.

2—This question is answered in the preceding paragraph.

Information on Owen Magnetic Car

Editor THE AUTOMOBILE:—In a recent issue of THE AUTOMOBILE I read an explanation and description of the Owen Magnetic car. I would like to know where this car is built and by whom, as we are very much interested.

Quincy, Ill. EDGAR J. R.

The Owen Magnetic chassis was described in THE AUTOMOBILE for July 15, page 102. It is manufactured by the Owen Magnetic Car Co., 1760 Broadway, New York City.

Twelves Are Small But Powerful

Editor THE AUTOMOBILE:—Who builds the new Fiat radiator?

2—Who built the 1913 Regal including the frame?

3—Who manufactures the Weidely motor?

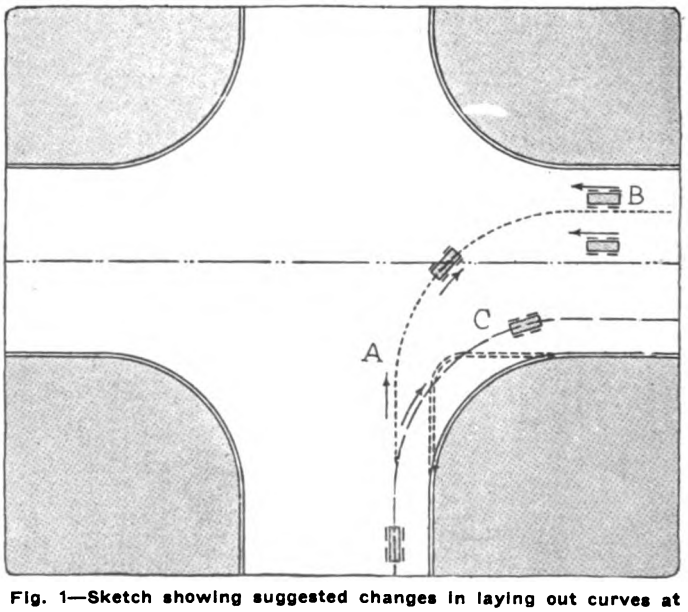


Fig. 1—Sketch showing suggested changes in laying out curves at street corners

Proper curb radius to allow of turn at medium speed

Improper radius which causes vehicles to swing to the wrong side

—What company manufactures hoods for the Fiat and Singer respectively?

—Has any motor builder yet brought out a small, light twin-six motor?

—How many small eight-cylinder engines are there, and who builds them?

Bridgeport, Conn. W. J. B.

—The makers of the Fiat radiator are known only to the Fiat Co. and to these makers as the information is held confidential by them.

—The 1913 Regal car was built practically entirely by specializing concerns and assembled by the Regal Motor Car Co. at Detroit. The frames were manufactured by the A. O. Smith Co., Milwaukee, Wis., from Regal dies.

—The Weidely motor is manufactured by the Weidely Motor Co., Indianapolis, Ind.

—The Fiat hood is manufactured by the Fiat Co., Poughkeepsie, N. Y., and the Singer by the Singer Motor Car Co., Long Island City, N. Y.

—The twin-six motors announced this season have all been of the small and light variety. It must be remembered that even with a small horsepower per cylinder a twelve-cylinder motor would be very powerful. For instance, if each cylinder were capable of developing only 4 hp. a twelve-cylinder motor of this size would have 48 horsepower. By small eight-cylinder motors it is difficult to know what you mean as all of the eights so far as small bore, long stroke, high speed designs with small piston displacement considering the number of cylinders. Some of the later cars such as the Briscoe are using eight-cylinder units, however, which are quite small and these are manufactured by motor specialists. Eight-cylinder motors in small size can now be purchased from any of the larger motor manufacturers.

Referee Can Disqualify for Smoke

Editor THE AUTOMOBILE:—The Galax, Va., Fair Assn., is planning an automobile race during the County fair, Sept. 1, 2 and 3.

If there is a set of rules for sale will you please give me the name and address of the company who can furnish this to me? Would thank you if you would tell me whether a car should be ruled off the track on account of the engine emitting too much smoke, and if a driver should be put off the track for cutting across in front of the car that was about to pass.

Mt. Airy, N. C. C. O. S.

You can secure a set of rules from the American Automobile Association, 437 Fifth Ave., New York. This association has charge of all the sanctioned races held in this country and its rules are followed in all the official races. According to the rules of the A. A. A. a car can be ruled off the track by the referee if in any way it endangers the safety of other contestants or spectators. Should a car be smoking to such an extent as to fall under this head it could certainly be ruled off the track. A driver who cuts in front of another trying to pass him is certainly acting in a way which should merit disqualification and it would be the duty of the referee to disqualify him.

Improper Gear Adjustment Causes Hum

Editor THE AUTOMOBILE:—Kindly advise me how I can eliminate a noise occurring in the differential on a Mitchell 1914 car model A.

Would like to know how to adjust this so that I will not have to buy a new gear.

Westville, Conn. A. R.

—The only adjustment of the rear axle gears necessary is to obtain the proper mesh of the two driving gears. If these gears get out of proper adjustment there will be an excessive humming noise in the rear axle.

To adjust the gears remove the plate at the top rear of driveshaft housing. Turn the adjusting collar by placing a tool in one of the small holes through the collar, turning the collar to the right meshes the gears tighter. It is a very good plan to make this adjustment while driving the car on a smooth road. Adjustments can easily be reached by removing the floorboard in the tonneau.

Sandpaper Leaves Commutator Mica High

Editor THE AUTOMOBILE:—I have had trouble with my Rushmore generator. The ammeter shows only a slight current. After I clean off the commutator with sandpaper it seems to work all right for a short time, but very soon the old trouble sets in. Have had the car in a shop undergoing the same treatment for this trouble, but with no success.

San Francisco, Cal. C. P. GRIFFIN.

—The difficulty which you are having is no doubt due to a rough commutator. Cleaning with sandpaper while it cleans the bars of the commutator, will leave the mica high, with the result that the brushes make imperfect contact and the commutator bars soon burn black. The only way to correct this trouble is to remove the armature and have the commutator turned down in a lathe. There is also a possibility that the brushes which you are using are too soft.

Economic Causes of the War Traced to Mushroom Growth of German Industries

Picture of Teuton States as One Vast Money-Making Trust Whose Suction Tentacles Circle the Earth

A Lecture by Henri Hauser, Professor at the University of Dijon and Correspondent of the Institut de France, reported by A. Dumas, Editor of Le Génie Civil

CONTRARY to the common opinion that the war is solely due to the military party, Professor Hauser shows clearly that it was through an excessive and especially a too rapid development of the industries and commerce of Germany that the war became if not a necessity for her government at least such a favorable prospect that the temptation of resorting to it could not be resisted. In the unanimous enthusiasm, he says, with which this people greeted the bloody dawn of armed conflict the voices of the commercial and industrial classes were not the least clamorous. Financiers, factory managers and even workingmen figured in the front ranks among the defenders of imperialism.

The economic causes played a predominating part in the explosion of July, 1914. It is perhaps not true, as has been so frequently contended, that Germany was menaced with overpopulation and stood in urgent need of colonies. But it is not, in fact, necessary to know if Germany was really choking. She thought she was choking and acted in a haunting fear of constrictive forces whose hold she wanted to break at any cost. Mr. Hauser undertakes to explain this "pathological phenomenon of collective psychology."

I—Evolution of the German Industries

What strikes one first of all in the evolution of the German industries is the real grandeur of the phenomenon. There is something impressive in the spectacle of this people which forty years ago scarcely counted in the geography of world economics and which just before this war had managed to become one of the great forces. With a foreign commerce amounting to nearly 5,000 million dollars in volume it ranked second among commercial people, following England. It had become second in the production of castings and of iron, beating England, second also in the production of steel. Its merchant marine, which was inferior to ours [the French] in 1870, was outclassed in 1913 only by those of England and the United States.

Genius for Organization

We have admired all of that. Should we, because Germany has now dishonored herself by crimes, deny our previous admirations? No, for us Frenchmen the truth remains always the truth. It is therefore not difficult for us to recognize that the German people have given proof of remarkable qualities since the foundation of the Empire. The leading quality was a determined enthusiasm for work, not a feverish spell which raises mountains in a few days but the tenacious patient labor of every day, regular and systematic. Ostwald is right when he attributes to the Germans the sense and the spirit for organization. They have brought to perfection the art of utilizing men, of putting each in his place, of getting the maximum performance from every individual. If the genius for great discoveries seems to have deserted their soil of late years, they are past masters in the industrial application of scientific discoveries. As has been often said, it is the union of the laboratory and the workshop which has created the German wealth.

Next to the union of shop and laboratory there should be mentioned the utilization by commercial managers of the research work of economists, geographers and historians. For the methods which they applied to the production of a new aniline color they also brought to bear on the search for markets and on the organization of trade channels. The German chemist and the German commercial traveler marched at the same gait to accomplish the conquest of the earth.

Leap from Poverty to Wealth

The rapidity of the German evolution has been almost catastrophic. From the complex of agricultural states sprinkled with industrial spots which comprised the *Zollverein* (customs union) in 1870 the industrial Empire has risen in a few years by a sort of historical face-about without any of that slow secular preparation which characterizes for example the English growth of power. Industrial Germany is a consummation in which Time has no share. Among the captains of industry, as nearly everywhere in modern Germany, the upstart abounds.

The following facts illustrate this industrial development: In 1893 the consumption of pig iron per capita did not quite reach 99 kilograms per year; in 1899 it was 155. The coal consumption passed from 1940 to 2740 kilograms. During the same time the production of iron and castings climbed from less than 5 million tons to more than 8; that of charcoal from 95 millions to 136. The increase of production was so intense during this period that it seemed unsound, and the great commercial crisis of 1901 had to be weathered. But the poor country had become, of a sudden, a very rich country. In 1895 the income from the fortunes of the Empire was estimated at somewhat above 4,000 million dollars; in 1913 the corresponding valuations fluctuated from 8,000 to 10,000 millions, and German wealth was estimated at 64,000 millions, of which nearly 2,000 millions was deposited in commercial banks and 3,600 millions in savings banks. These were the figures to which Dr. Helfferich, director of the *Deutsche Bank* and now Prussian minister of finance, pointed with pride on the occasion of the twenty-fifth anniversary in the reign of William II.

(Other figures from the *Journal de Génève* of Aug. 1, 1915, give an idea of the enormous increase in the commercial operations of Germany which has taken place during the past few years. The imports and exports of merchandise and precious metals were as follows, in round millions of dollars:

	Imports.	Exports.
1909	1771	1371
1911	2001	1645
1913	2241	2040

Adding the figures for imports and exports one obtains a trade volume for 1909 of 3,142 million dollars and for 1913

the sum of 4,281 million dollars, being an increase during these four years of 1,139 millions or more than 40 per cent.

Other figures are given by Edmond Thery and show that in ten years from 1903 to 1913 the volume of the foreign commerce of Germany passed from 2,863 to 5,217 million dollars, an increase of 82 per cent).

This sudden growth of German wealth has had the gravest influence upon the living conditions of the German people. The two most notable effects have been the gradual disappearance of the rural class and the sudden stopping of emigration.

Scarcity of Farm Labor

No conception could be more false than that of Germany as an overpopulated country. While the population has grown since 1871 from 40 to 70 millions and 800,000 new Germans see the light of day every year (despite a decreasing birth rate), this increase cannot be considered excessive, as 700,000 Slav laborers are engaged every year to work the large Eastern estates and large numbers of Italian, Croatian and Polish workmen are in demand for the mines and various enterprises in the cities.

The German emigration exceeded 200,000 annually from 1880 to 1883 but has now dwindled to 20,000, or about the same as the French.

There is, to be sure, a German migration, but it is interior, from the country to the towns, from the plough to the industries. Since 1895 the rural population has been less than half of the total; it is now 44 per cent. Out of 67 million Germans barely 17 millions are farmers or derive their living from agriculture. An enormous number of peasants quit the soil every year and find work in the colossal factories. This has brought the number of towns with more than 100,000 inhabitants to at least 45 and accounts for the armies of workingmen at disposal for the large concerns. The Mannesmann shops employ 15,000, Thyssen more than 30,000 and the Krupp works 73,000, almost two army corps. Germany has passed definitely from the type of the agrarian state to that of the industrial state.

II—The Needs of the Industrial State

Now, the industrial state has needs and exigencies which the agricultural state has not. The latter lives on itself and for itself, and it can live on itself. The industrial state is by nature "tentacular," to use Lamprecht's term, being specially founded upon the importation of commodities and raw materials and on the export of the manufactured products. It requires first of all the importation of foodstuffs. It is calculated that about 20 million Germans out of 67 millions depend for their nourishment upon foreign harvests and foreign cattle. The industrial state has need of certain materials which are either not produced at all within her boundaries, as in this case for example cotton, or which exist there only in insufficient quantity, as for example iron. By reason of the enormous development of its iron and steel industries the German Empire, while remaining rich in fuels, depends for its ore in ever increasing degree upon Sweden, Spain, North Africa and France. It is this fact which explains her ardent lustfulness for the Briey valley.

Cotton in bales represents the largest single import article of the Germans, amounting in value to more than $125,000,000. The cotton industry employs more than 1,500,000 workers and turns out goods valued at over $250,000,000.

Credits in Place of Capital

The industrial state needs capital and though Germany has become prodigiously rich the German industries remain terrible gluttons for capital. They absorb it as fast as it can be provided, to use it in building new works and replacing old machine tools. In the formidable battle in which Germany has engaged herself she is condemned to gain victories every day, for any defeat and in fact any let-up would be mortal. She swallows new capital before it is born, so to say, since she anticipates it through credit. Corporations with imposing capitals which lean on the industrial banks, the latter drawing upon the central banks and especially on the *Deutsche Bank*, and these large banks in turn absorbing all the country's available wealth and to some extent foreign capital as well—all this is a marvelous financial edifice but frail. The very denials of German financiers prove that the influx of foreign money is not negligible.

Socialists Turned Imperialists

Further, Germany needs customers even more than capital. Despite its increase in numbers, its rapidly growing wealth and taste for high living the German people is incapable of digesting all of the enormous production of German factories. It must more and more be sold abroad.

Everything conspires thus to turn Germany into a Tentacle State, to make it push its trade into all corners of the world. The country's financial staff must have recourse to world politics to replenish its capitals, to pay the wages of its workers; the proletariat depends upon them in order to have steady work and to satisfy its growing wants. Therefore the German socialism has become imperialistic.

III—Industry and World Politics

Among the means for developing exports the leading one is the system of bounties. Since the German industry must work more for the foreign than for the home trade, it is logical to sell at low prices abroad, sometimes even to sell at a loss, in order to gain new outlets and discourage all competitors. Thanks to the grouping in *Kartells* (trusts) of the principal economical forces, nothing is easier. In 1902 the coke syndicate forced the German consumer to pay 15 marks per ton at the same time as it conceded the price of 11 marks on large foreign sales. In the latter half of 1900 the wire syndicate made sales abroad at 14 marks per 100 kilograms while the home price was 25. It lost 859,000 marks on the foreign turn-over but made a profit at home of 1,177,000 marks. The difference was net gain. But in this instance, for that matter, the trick was overdone, for speculators managed to buy back the German wire abroad and to resell it in Germany with profit.

The Precarious Treaty System

The bounty system is supplemented by that of commercial treaties which favor the entry abroad of commodities and travelers and which secure a moderation of the customs tariff for German products. Such was the tenor of the German-Russian treaty of 1904, which tended to turn Russia into an economic colony of Germany. In the interior politics it is the avowed object of these treaties "to compensate by means of increased wages for the increased cost of foodstuffs" or, in other words to maintain the balance of interests between the industrial population of the West and the agrarian population of the East.

Hungry for Iron

To fend off an iron famine it was necessary to secure control of new ore deposits, and for this purpose numerous German corporations, more or less disguised, acquired mining properties in the Briey basin [the principal iron mining region of northern France, now occupied by the German army]. Thyssen, the great German iron king, not only installed himself there but sent his prospectors as far as Diélette, near Cherbourg, to search for ore—even under the sea—and he contributed to the erection of the ore smelters at Caen. He finds the double advantage in these operations of securing our ore and of selling us coke—an advantage in which, however, the French operators are also beneficiaries.

With iron from Lorraine and Normandy and the coal of Westphalia under control, Germany can dominate the world, says Mr. Hauser. And to assure such domination it is of importance to remove all competition, to install the German

industry in the very heart of rival countries. The extraordinary manipulations by which the German operators worked themselves into French chemical and electrical works were described before the war began. At Neuville-sur-Saône it was the *Badische Anilin und Soda Fabrik* of Ludwigshafen which under a French name furnished alizarine for dyeing French miltary trousers red, and perhaps the same company moreover inspired the press campaign in favor of this dangerous military color which was conducted with a grand display of sentimental argumentation. What else was the *Compagnie parisienne des couleurs d'aniline* but a branch of Meister, Lucius & Brüning of Hoechst? It has been told how a Darmstadt company manufacturing pharmaceutic preparations came to Montereau to establish a branch factory and kill a similar French factory which had been established there, and how the *Allgemeine Electricitäts Gesellschaft* pounced upon Rouen, Nantes, Algiers, Ora and Chateauroux.

Secret Invasions Everwhere

Similar conquests were engineered at Sevilla and Granada in Spain, at Buenos Aires, at Montevideo, at Mendoza, at Santiago and Valparaiso, while the other large German electrical company, the Siemens-Schuckert, installed itself at Creil. Turkey, Russia, Italy, Switzerland fared the same as France. A few weeks ago a Swiss journal enumerated the following enterprises. *Société anonyme pour l'industrie de l'aluminium* at Neuchatel with 8 German, 1 Austrian and 6 Swiss directors; *Banque des chemins de fer orientaux* at Zurich, with 8 German, 1 French, 1 Belgian, 1 Austrian and 5 Swiss directors; *Banque pour enterprises électriques* at Zurich, with 15 German as against 5 Swiss directors; *Société des valeurs des metaux* at Basel, with 10 Germans against 5 Swiss. It is notable that the capital stock is mainly in German hands while the bonds, whose modest rate of interest does not tempt the Germans, are placed in Switzerland. "Thus," concludes the *Gazette de Lausanne*, "the money of the Swiss bondholder serves to nourish the German enterprises which come into our own country to compete with our national industries."

Italy Under Tribute

In Italy's case a remarkable study of the subject has been published by Giovanni Preziosi in a series of articles now appearing in pamphlet form under the title: *La Germania alla conquista dell'Italia* (Germany at the Conquest of Italy). The question is in fact of a war of conquest, and one conducted with an admirable sense for organization. At the center there is a financial general staff constituted by the *Banca commerciale italiana;* of course *italiana*, as the companies established in France are *francaises* or *parisiennes*. This is only a little bit of Germanic strategy in which we find the very image of the Tentacle State. By installing itself in the directorates and practising, by means of a system of secret emoluments, a plan for commercial espionage which ruins stubborn opponents over night, it has been able to absorb by slow degrees the economical energies of a whole people, their credit establishments, their navigation companies, their industrial enterprises. It has been able to corrupt the political life, to unmake ministers and to control elections. Here, as in Switzerland, the German or pseudo-Italian banks "act as suction pumps in Italy and as force pumps for Germany." Italy, while rated as a poor country, furnishes capital for rich Germany.

IV—The Hand of the State

Mr. Hauser furnishes some data on the manner in which the prestige and force of the Empire are placed at the disposal of financiers in order to uphold the politics of economical conquest.

To make of the German nation, of the state, an instrument for German expansion is the object of the politics whic German economists have so fittingly termed *Handels un Machtpolitik* (commerce and power politics). The blendin of the two objects [commerce and power] appears nowhe more clearly than in the report delivered in London in Fe ruary, 1914, by Sir Edmund Goschen on "An Official Germa Organization to Influence the Press of Other Countries What a situation it discloses!

Reptilian Press Bureaus

The *Norddeutscher Lloyd*, the *Hamburg-America*, t *Deutsche Bank*, the *Diskonto Gesellschaft*, the A. E. G., t Siemens-Schuckert, Krupp, Gruson, etc., form together private corporation which is subsidized by the Imperial Offi of Foreign Affairs. In alliance with the Wolff Bureau, t corporation has for its object "to promote the industr prestige of Germany abroad." It furnishes foreign journ gratis or at a nominal price and in their own language kinds of information relating to Germany and favorable Germany. It suppresses this service when the recipients not prove themselves docile. "To react against tendenti news regarding Germany or attacks upon her and to spr knowledge of the true situation of German industries" is ostensible program. In other words, an organization for dustrial espionage, to use the term employed by Prezi placed under the control of the Empire.

The Little German Books

Russia is for Germany a reservoir of labor and a mar If Russia in 1917 should refuse to renew the disastr treaty which was forced upon her during the unfortu period of the Jananese war, if she should discontinue the isting system of passports for agricultural laborers, w would become of the capitalistic agriculture—more and n industrialized, more and more in the hands of banking stitutions—of the large estates in Brandenburg, in Po ania and in Prussia?

France is for Germany a banker and a furnisher of What a temptation to go and grab with both hands in wool stocking which now on occasion is tied up so jealo What a temptation also to go and get rectified the erro moderation committed in 1871! As early as 1911 the *Ga du Rhin et de Westphalie* gave voice to the opinion tha ore deposits in Lorraine and in Luxenburg ought to be u the same government as those of Westphalia and the valley.

As for England, the direct competitor of Germany i the markets of the world, and maker of the same proc she is the enemy that must be downed. Has she not ad the habit, and made France adopt it too, no longer to money to poor states except with the accompanime good commercial orders? The time is passing when German business could be done in Turkey with Briti French gold. The rivals of Germany are learning to pr *Handels und Machtpolitik* themselves. But what will h to Essen, Gelsenkirchen and the whole immense indu city that Westphalia has become, if the Roumanian Greeks, the Serbs order their cannon and their armor their rails or their locomotives at Glasgow or at Creu

War seemed preferable to Germany to this econ crush, and the hand of iron took the place of the glove.

Situation of Russia, France and England

Little by little the idea of the necessary war, of the desirable war, took possession of the industrial classe proof is found as far back as 1908 in a popularizer-t Prof. Paul Arndt, one of those little 1 mark which serve to shape German public opinion. All of reproach ourselves for not having read enough of thes books which would have warned us of the peril. In thi

let the author opens with a pæan to German greatness followed by a chapter on "The Dangers of Germany's Participation in World Economics." He shows that such participation would increase the dependence of Germany upon foreign countries and render her vulnerable at sea as on land. If the international relations should be disturbed, there would then be "many workingmen without bread, many depreciated stocks for reasons which in great degree would escape all control by Germany," having their origin in countries which "could seize the occasion to weaken Germany." And with prophetic hypothesis he describes the effect of a blockade. But he accepts the risks of independent world politics without hesitation. "Surely," he writes, "if we want to be and remain a great people, a world power, we expose ourselves to serious conflicts. But this should not deter us. There is a profound truth in the saying that man becomes weakened by peace. Often the appeal to arms is needed to shake a world which has become stupefied in apathy and effeminacy. The battlefield appears often to those who see far and deeply as a blessing for humanity."

There is thus exposed, says Mr. Hauser in conclusion, the fatal mechanism of things by which the too-rapid industrialization of Germany has led us all into the German war. If one were to doubt the part played by the economical causes, or rather the peculiar psychosis superinduced by these factors, it would be sufficient to observe in what manner the Germans in their day dreams imagine the victory of Germany. It is an industrial victory—the forced wedlock of German coal with foreign iron. It is the reduction of the other peoples to the rôle of perpetual vassalized customers of the German factory. The German dream is a business dream, a romance of the office.

V—The Fatality of Mushroom Growth

According to this dream the war shall also solve the colonial questions. As will be remembered, during the tragic days last July (1914) Chancellor Bethmann-Hollweg offered England the integrity of European France but refused to guarantee the colonies, especially northern Africa [with larger iron ore deposits].

The dream has vanished. The giddy edifice has crumbled, and once more the old proverb has been confirmed: Time does not spare what is made without its help (*Le temps n'épargne pas ce qui s'est fait sans lui*).

Longuemare Carbureter Now Made in America

New Model Has Slight Changes in Jet and Throttle—All Models 40 Per Cent Lighter than Last Year

THE Longuemare carbureter, which up to the present has been manufactured abroad and imported here, is now to have an American model, arrangements for manufacture at Syracuse, N. Y., having been completed by the Longuemare Carburetor Co., New York City. Some changes have been made to suit American requirements, and other changes which are general improvements in operation, fitting and assembling.

The waterjacket which surrounded the throttle has been dropped and there are two changes in the throttle valve. The opening *H* in the accompanying illustration through which the fuel is drawn in the idling position has been enlarged to permit a longer dwell, and another smaller hole at the left of *H* has been added to supply a little extra air when starting.

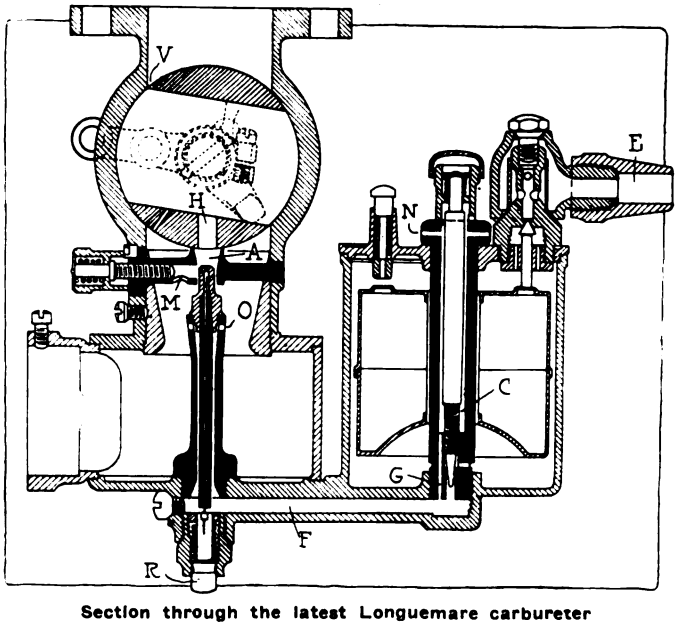
More Accessible Choke Tube

Other improvements are a more accessible choke tube which can now be withdrawn by removing a screw at the left, a swiveling connection of the float chamber to make the carbureter easily adaptable to any engine and the adoption of S. A. E. standard connections. The operation of the carbureter was described in THE AUTOMOBILE for Feb. 4, 1915, and remains practically unaltered. Gasoline enters by the needle valve through *E* and in passing the central adjustable needle at the base of the chamber fills the channel *F*. From here there is access to the compensating chamber *C*, which thereupon fills to the same level as the main float chamber. There are two jets, the main one *O* consisting of a few holes drilled horizontally at the top of the outer jet tube, and a central idling jet above it. Both are in direct communication with the channel *F*. When starting the throttle occupies the position shown with the opening *H* immediately above the idling jet. In this position there is practically no suction on the main jet. The air is drawn in past the idling jet through the inlet *M*, which is adjustable, the mixture passing the throttle by the small beveled opening *V*.

Automatic Fuel Regulation

When the throttle is opened the suction around the main jet increases but diminishes around the idling jet. A freer flow of fuel being always required at this moment the compensating chamber *C* empties into the channel *F* supplying the extra fuel demanded by pick up. As soon as the chamber *C* is empty, air is drawn in through the openings *N* and passing through *G* mixes with the gasoline in *F*. In doing so an emulsion is formed which renders vaporization easy on issuing from the jet. An automatic regulation of the fuel supply is claimed for this carbureter through the action of this additional air in the following manner: The natural tendency on high speeds is to increase the richness of mixture. By introducing air into the gasoline on its way to the jet the density of the mixture is lightened thereby retarding the increasing flow of fuel from the float chamber. Thus the virtual effect is a thinning of the mixture at high speeds.

A cleaning device for the idling is incorporated in the form of a needle operated by the push button *R* underneath the jet.

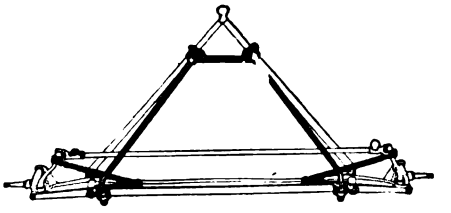


Section through the latest Longuemare carbureter

ACCESSORIES

Cox Ford Safety Pilot

THE Cox safety pilot for Ford cars is a front axle and radius rod support combined with an automatic steering device. It is claimed not only to prevent the radius rod bending out of line and consequent breakage of the axle under strain but also to materially strengthen the car and to make driving safer and easier. The radius rod support is attached to the front axle and clamped to the rods near the apex of the triangle formed by their junction. The automatic steering device is attached just inside the radius rod supports on the axle connecting with the clamp of the radius rod. It is a strong, tempered flexible spring which acts as a stabilizer, preventing the car from swerving on rough or sandy roads and relieving the strain of a continuous tight grip on the wheel. The combination attachment sells for $3.75.—Cox Brass Mfg. Co., Albany, N. Y.



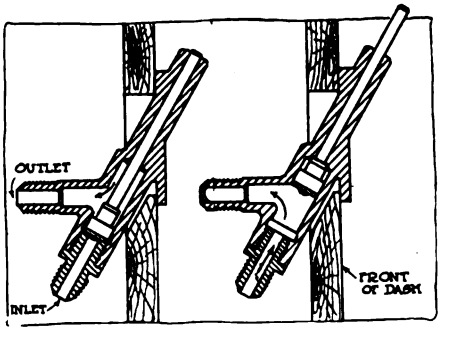
Cox safety pilot for Ford cars

Morris Dash Oil Indicator

The Morris dash board oil indicator is for the purpose of showing how the oil pump is operated. It is adapted for both gear and plunger pump or where the flow of lubricating oil is constant and in considerable volume.

As will be noted from the accompanying illustrations, the plunger projects through the dash and its height indicates the quantity of oil which is passing through the outlet. There is a piston at the lower end against which the oil impinges to raise the plunger. On the lower end of the piston is a leather cushion which acts both as a silencer and a washer, and also effectually prevents oil being forced past the piston rod in in case the delivery or discharge pipe should become choked.

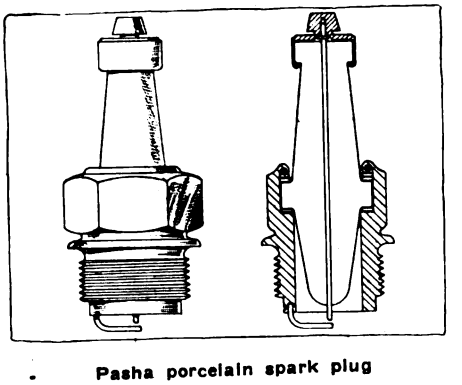
The flange for attaching the indicator to the dash can be of any desired diameter and at any angle to the axis of the plunger. The device is easily attached and is finished in nickel. The price is $2. —George W. Morris, Racine, Wis.



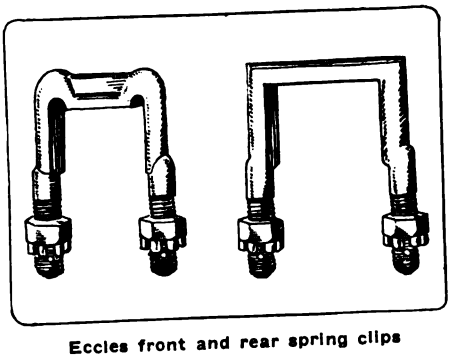
Morris dash board oil indicator

Pasha Spark Plug

A sectional view is shown herewith of the Pasha spark plug. As will be noted, the central electrode is in one piece solidly baked in imported hard fire porcelain. At the top is the brass cap for a clip terminal, and no screw is provided. The shell of the plug is curled over to hold the porcelain tightly in position with spring tension. The points of the electrodes are carefully finished, and in order to prevent leakage two copper asbestos gaskets are put above and below the porcelain flanges in the shell.—Pasha Spark Plug Co., Bloomfield, N. J.



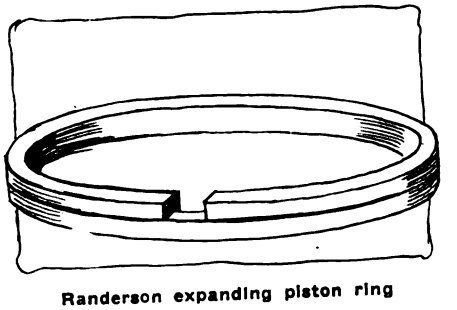
Pasha porcelain spark plug



Eccles front and rear spring clips

Eccles Spring Clips

Front and rear spring clips for automobiles with special attention to the requirements of the Ford model T are listed. The spring clips are made in all sizes to fit all makes of cars, and are of such dimensions as to provide equipment for any desired spring. The price varies with the size and the pattern. They are made in half oval, full oval and flat designs, and are threaded drilled for cotter pins and equipped with castellated nuts, a pair being furnished with each clip. Twenty-five of these are packed in a box, and a representative price for Ford cars is $75 per hundred.—Richard Eccles Co., Auburn, N. Y.



Randerson expanding piston ring

Randerson Piston Ring

This ring is designed to work against pressure on an entirely different principle than that employed generally in piston ring construction. The automatic ring idea is based upon making the ring act as a valve in the piston. The ring is so designed that when compression and explosion take place the ring is automatically expanded by the pressure which reaches back of the ring between the piston and the ring itself, thereby automatically expanding the ring against the cylinder wall. It is intended with the ring that no other ring need be installed in the piston.—Du Bois Machine Shop, Inc., Albany, N. Y.

Becco Tool Set

The Becco tool set consists of a steel case, with wood forms lined with felt and fitted with a selection of tools, each being held in place by a catch. The case is 15 in. long, 8 in. wide and 2 in. thick, and is finished in black enamel. The tools are as follows: Punch, cold chisel, cotter-pin remover, round file, flat file, file handle, large screwdriver, small screwdriver, hammer, large monkey-wrench, small monkey-wrench, three double-ended S-wrenches and a pair of combination pliers. Price, $7.75.

Becco wrenches are made in sets held together when not in use by a special clip. The wrenches are of flat steel, non-adjustable. Two sets are turned out. Set No. 1 consists of four wrenches, all double-ended and one having two openings in one end and one in the other and one having alligator jaws. The sizes are from 5/16 to 11/16, and there is also a small opening for gas-tank valves. The steel used is ⅛-in. thick. Set No. 2 has the same number of wrenches, but the sizes run from 5/16 to ¾; the alligator is the same size. The steel used is 5/32 in. thick. Set No. 1 is nickel plated and set

No. 2 is finished in black enamel. Price, set No. 1, 50 cents; No. 2, 65 cents.—Michigan Motor Specialties Co., Detroit, Mich.

Erickson Spring Separator

This tool spreads apart spring leaves and injects grease between them. It consists of a heavy steel rod with an adjustable sliding head, a stationary head carrying a screw and an intermediate sliding member movable toward or away from the adjustable head by means of the screw. As shown in the accompanying illustration, the screw-operated head has a hollow steel point which the screw forces between the leaves, the adjustable head being brought against the opposite side of the spring.

A large grease cup mounted at the top of the screw-operated head supplies the grease through the hollow steel point when turned, making a quick and clean job.

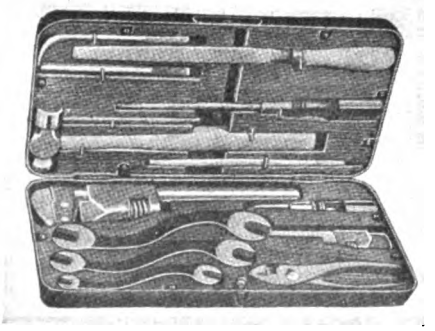
The screw-operated head is pressed out by a coil spring when the screw is backed off. The back head is adjustable for any width of spring. In case of breakage of the steel point, this can be readily renewed as it is screwed on. The device sells for $1.—P. E. Erickson & Son, Inc., Port Chester, N. Y.

Aderente Non-Blinding Device

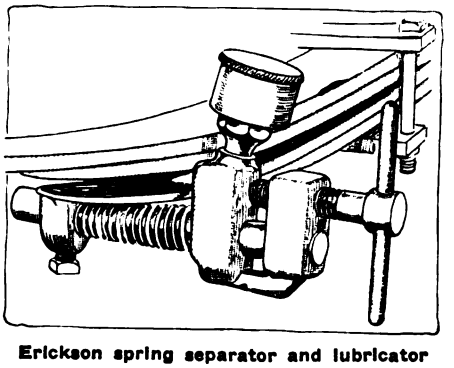
The Aderente is a non-blinding device which is so arranged as to cut out the glare and at the same time have many of the rays of light thrown directly ahead of the car in order to illuminate the roads. According to the manufacturer, the device is not a dimmer, but rather increases the power of the projected light by deflecting the rays to the road which would otherwise be thrown upwards or in a straight line ahead of the car, thereby blinding approaching pedestrians or drivers. The device is attached to the lamp door and although made of metal is said to have the appearance of cut glass. It does not require adjustment and does not have to be touched whether the car is being driven through the city streets or in the country. As the device is attached inside the door, it should not require frequent cleaning. The price per set of two, is $3.50 and in ordering it is necessary to give the overall dimensions of the glass and door.—Aderente Non-Blinding Device Co., Inc., Jersey City, N. J.

Smith Encased Joint Pliers

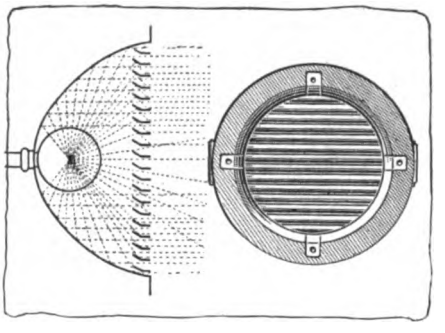
A new type of pliers, illustrated herewith, has been put on the market, having an encased joint, or one that is inclosed in contrast to the usual type which uses a lap joint and a rivet to hold the parts together. The new Smith pliers also employ a rivet but merely for the purpose of additional strength. Cutting can be done on both sides and it is claimed that a small diameter wire can be handled as well as one which fills the cutting slot.—H. D. Smith Co., Plantsville, Conn.



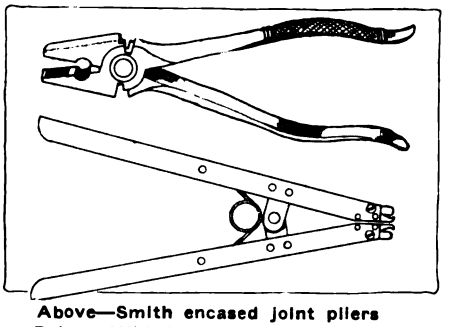
Becco automobile tool set



Erickson spring separator and lubricator



How Aderente non-blinding device operates



Above—Smith encased joint pliers
Below—Wilhelm piston ring remover

Vaughan safety signal on a car

Wilhelm Piston Ring Remover

The Wilhelm piston ring remover is designed to be of service in removing any style of piston ring. The device differs but little from the conventional type, depending for its spreading action on the bringing together of two rod ends, causing the opposite extremities to spread the ring ends, allowing the ring to be slipped over the piston top. As illustrated herewith, the Wilhelm consists of two bars pivoted to a common point near one end and connected by a spring which effects return action. The jaw is shaped so that it will not slip when used to spread diagonally split rings. Price is $1.—Wilhelm Smith Machine Co., Reading, Pa.

Vaughan Safety Signal

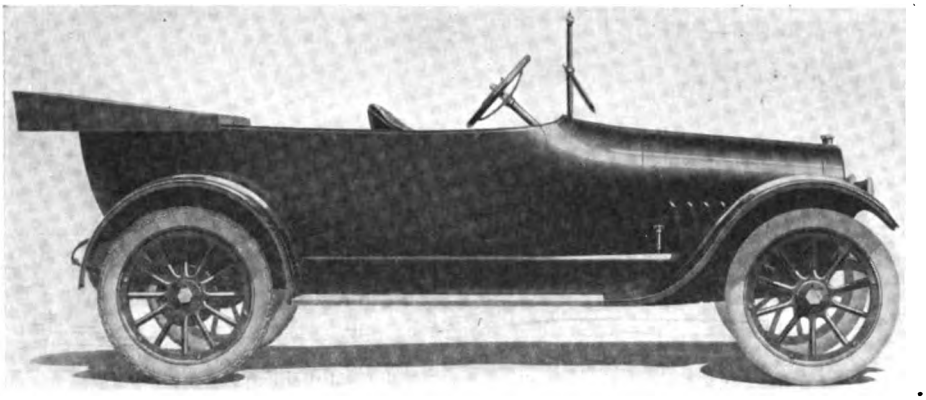
The Vaughan safety signal is of the rear-mounting type and is operated by a lever on the steering wheel, telling the driver of cars in the rear which way the machine which carries the signal is about to turn. The device consists of two plates mounted in a casing as illustrated, so that either side of the plates may be displayed. The words shown are: Turn Right, Turn Left, Slow and Stop, arrows being used to indicate the direction when the car is about to turn. Fiber gears in the casing operate the plates, Bowden wire connecting the gears to the control levers.—C. S. Vaughan, New Rochelle, N. Y.

Hertner Charging Outfit

The Hertner is a vertical motor-generator set with switchboard is for use in charging batteries from an alternating-current source. Being a motor-generator, it continues to run when the line voltage is cut off or drops for an interval, the generator acting as a motor with a slight draught of current from the battery until the line voltage comes on when the generator action is resumed.

In operation, the alternating current line is attached to the board, where it is controlled by a simple switch. The direct current line is at the bottom of the set. A feature of the Hertner outfit is the cooling fan mounted in the middle which is said to more than compensate for the slight amount of current used for this purpose by the results obtained.

In order to make the machine as well-balanced as possible and to make it run smoothly and also to render it possible to dismantle it readily, the motor and generator shafts are separate units and are connected by a coupling. A ball bearing immediately below this coupling supports both shafts midway between the top and bottom of the machine.—Hertner Electric & Mfg. Co., Cleveland, Ohio.



The new Paterson light six with high-speed motor listed at $985

New Paterson Six Chassis

Four Continued with Improved Body Lines — Six Sells for $985 — Uses New High-Speed Continental Motor

THE W. A. Paterson Co., Flint, Mich., will continue its well-known four practically unchanged for the 1916 season, the only alterations being in the body which has lines more in accordance with modern streamline ideas. The new six, however, is an entirely original job and the specifications show that it is remarkable value for the price of $985. The motor is a Continental 3¼ by 4½ in. and the body a seven-passenger with ample internal space and excellent finish. Wheelbase is 117 in., tires 32 by 4 in. and the equipment is extensive, one little detail of the latter especially worthy of mention being the utilization of the left front door pocket for tools most frequently needed. On lifting the flap of the door the most important tools are found, arranged each in a separate leather container so that any one required can be picked out in an instant.

Motor Is High-Speed Type

The motor has a formula rating of 25.4 hp. and a piston displacement of 224 cu. in. and is the type of Continental light six which was described fully on page 1130 of THE AUTOMOBILE for June 24, 1915. The engine is designed for high-speed operation, having its horsepower peak at about 2200 r.p.m. and developing 35 hp. at 1600 r.p.m. approximately. All the intake passages are integral, so the carbureter can be bolted directly to the casting, which is an excellent place from the warmth viewpoint and saves the need for a jacket. On the Paterson the standard carbureter will be a Stromberg, which seems to suit this motor very well.

Three-Bearing Crankshaft

There are three main crankshaft bearings, each being supplied with pressure oil from the plunger pump which is driven from the camshaft and located on the crankcase side. An oil lead also goes to the helical timing gears, and there are dip troughs for the connecting-rods. To eliminate vibration at the high speeds at which the motor is meant to be run, a large diameter has been chosen for the crankshaft, the main journals being 2½ in. The left side of the engine is absolutely clean, save for the carbureter and the oil filler, while the water pump and the generator are arranged on the right side in such a manner as to interfere as little as possible with the valve accessibility.

Not long ago attention was to the prevalence of heavy pre needed for the operation of clutc brake pedals on many cars. Th portant point has not been neg in designing the Paterson wit result that the effort needed to r the clutch or to apply the s brake is amazingly small; so lit fact, that a child could operate controls. The clutch itself is a type with leather face anc Warner gear provides the usual forward speeds, but here again of operation has been studied, s the gear shift lever moves p tionally as freely as the clutch This means that to change spee easy almost as to advance the lever which should make the Pa very much appreciated in mou ous districts.

From the gearbox there is a jointed shaft with its one un designed to take the torque That is to say the torque tube nates at a bearing on the driv just behind the universal, so th withstands the stress of torsion at the point where greatest (near the axle) and only transfers the stress driveshaft close up to the universal and where the st at its lowest.

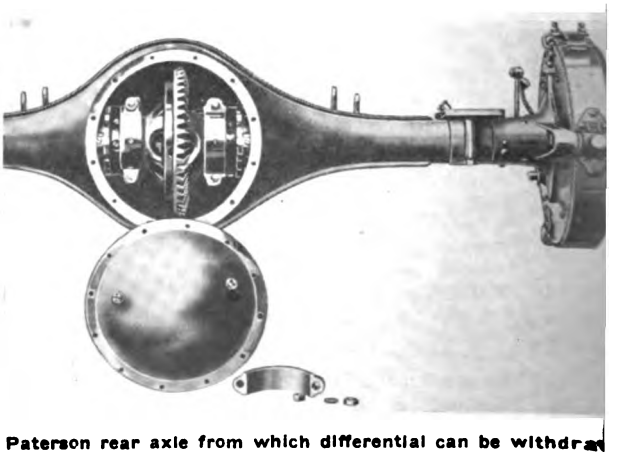
Rear Axle Accessible

For the rear axle a built-up construction is use differential and drive gears being mounted upon Ne parture bearings, while Hyatt roller bearings take c the support of the wheels and the driveshafts. These can be removed easily, and the differential taken out t the rear part of the housing, without removing th from the springs.

Rear springs are three-quarter elliptic with a large tude, giving easy riding, and the drive is taken throug front portions. The steering is laid out with good, s connecting links and is irreversible by virtue of the worm and nut gear which is adjustable for wear.

In the body, width of seat is the outstanding cha istic, this being above the average, and upholstery is

It is not quite certain at the time of writing, which electrical systems will be employed, but in either cas will be two units the generator having the igniti tributer integral.



Paterson rear axle from which differential can be withdra out removing the axle from the springs

THE AUTOMOBILE

PUBLISHED WEEKLY

Vol. XXXIII Thursday, August 26, 1915 No. 9

THE CLASS JOURNAL COMPANY

Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
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231-241 West 39th Street, New York City

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SUBSCRIPTION RATES

United States and Mexico -One Year, $3.00
Canada -One Year, 5.00
Foreign Countries -One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Valve Accessibility

WHAT is the real value of accessible poppet valves? It is a question that many an automobile engineer would like to be able to answer, and a question that opinion answers in many different ways. In most engines, whether V-type or L-head, the accessibility of the tappets is not really good, not good in the way that a spark plug is accessible, or even as is the jet of a well-placed carbureter. It is not to be questioned that the efficiency and the [illegible] of a poppet valve motor depends very greatly upon the accuracy of tappet adjustment, and it is a fact that, however good the materials, tappets will not operate long without wear. Yet it is often argued that the average man never bothers himself about his valves and depends entirely upon his repairman to overhaul all the valves at once when they are very bad.

This introduces the speculation of whether a very [illegible] adjusted tappet would receive any more attention from most automobile owners than an en[illegible] inaccessible push rod mechanism, and it is [illegible] contested that accessibility is not worth while [illegible] it is not made use of.

This seems a poor sort of argument. That a tappet should require adjustment is a fundamental fault [illegible] engine, because the id[illegible]ine should [illegible] adjustments wha[illegible] need adj[illegible] as of co[illegible]or the ma[illegible] of any [illegible] that adju[illegible]ment ought to be rendered as easy as possible. It is surely the manufacturers' duty to make automobiles with the maximum of convenience for the type of owner who treats his machine as it ought to be treated. It is not good business to excuse a poor design by a statement of belief that the average user is mechanically inept.

1916 Car Prices

FROM January, 1912, till January, 1914, the average price of automobiles rose from a little less than $2,500 to a little above that amount. In January, this year, the price had fallen $600, and so far as can be judged at the present time January, 1916, will show at least an equal drop.

Studying the curve it suggests that the great changes in equipment which took place from 1911 to 1914 pushed the average price to a peak, and this was a natural development. As the electric starting motor and other refinements became more settled things, it was natural that there should be a falling off in price, but the fall from 1914 to 1915 must show more than this. It can be accounted for only on the assumption that the manufacturers found they had set the price too high for the average buyer and the drop which took place last year was provoked by the desire to expand the market.

Now there is a limit to everything, and it is probable that we shall find January, 1916, will show a low spot in the curve that will correspond in years to come, with the high peak of 1914. This is surmise only, but the idea is fostered by the striking success of medium-priced cars. Any good car can be sold if it is cheap enough, and five-passenger cars at less than $750 are bound to find buyers in very large numbers. Average price may fluctuate. It seems that the customer who wants to spend from $1,250 to $2,250 represents a large and permanent class so that there should be plenty of cars in this field for a long time to come.

Winning on Performance

THOSE who have waited to see how cord tires would work out in road races have the tire reports from the Elgin races, covering 600 miles spread over 2 days, a demonstration that indicates that the cord construction is apparently as well suited for high speeds on the average country road as on the brick or board speedways. The Elgin circuit is a typical country road, gravel surface well oiled, just such a road as can be found in thousands of places throughout the country.

One of the two winning Stutz cars made the 600 miles at an average speed of over 75 m.p.h. without a single change and the other Stutz changed but one tire in that distance. No longer are tires the determining factors in winning or losing they once were. In Elgin's 2 days of racing it was small mechanical troubles with cars, or lack of speed, that put certain cars back from first and second place. The winning cars won on good performance, freedom from mechanical troubles and not from handicaps imposed by tire troubles.

$1,200,000 Co. To Build Cars

Buyers of Pope Westfield Plant Form Westfield Mfg. Co.

BOSTON, MASS., Aug. 20—A certificate of incorporation has been issued at Boston to the owners of the Pope plant at Westfield, who recently bought the property at public auction for $725,000. The new company will be known under the name of the Westfield Manufacturing Co. and it will make automobiles. The capital is $1,200,000. The petitioners for the charter are Richard Mortimer, Jr., W. B. Cook, J. B. Donovan and Richard Gregg, all of New York. It is understood these men are only representatives of the real owners.

The time for completion of the purchase of the Pope plant has been extended 30 days by Judge Aldrich of the U. S. district court. New York interests, headed by E. Preston Courson, were to have paid $700,000 on Aug. 18, thereby completing the sale of the plant. The time has been extended until Sept. 16.

—

U. S. L. Gets Large Contracts

NEW YORK CITY, Aug. 21—The stockholders' protective committee of the United States Light & Heating Co. of Maine has issued a circular to holders of subscription-paid certificates of deposits for the stocks of the company, which states that all the claims against the old company have been paid and settled, excepting three or four, the validity of which is being contested.

The new company is now operating the plant and several new contracts have been secured. Two of the contracts call for $9,000,000 worth of starters, delivered over a period of 3 years.

—

Traffic Managers Meet Sept. 14

NEW YORK CITY, Aug. 23—For the purpose of taking up the matter of delays in transit of automobiles, and to arrange the classification on automobile parts, a meeting of traffic managers representing all the automobile factories in this country that are members of the National Automobile Chamber of Commerce, Inc., will be held at the Board of Commerce Bldg., Detroit, at 10 a. m., Sept. 14.

—

Little Giant Six-Wheeler

CHICAGO, ILL., Aug. 23—The six-wheeled motor truck manufactured by the Chicago Pneumatic Tool Co., Chicago, under license from the Trailer Transportation Co., New York City, is now ready for the market. It consists of a 1½-ton Little Giant chassis and a two-wheeled trailer coupled to the rear thereof. A fifth wheel upon the trailer supports most of the body load, the front end resting on the load platform of the truck upon a ball-race so that it is free to move in relation to the truck. The fifth wheel arrangement, in conjunction with the steering draw-bar attached to the end of the truck frame, causes the trailing wheels to track exactly with the rear wheels of the truck. Thus the driver takes his turns just as sharply with the trailer as he would with the truck alone, although the load space permits of material 40 ft. in length being carried.

—

Ross Motor Sales Co. Formed

DETROIT, MICH., Aug. 23—The Ross Motor Sales Co. has been organized with headquarters in New York City to take the entire output of the Ross Automobile Co., which announced an eight-cylinder car the first of the year. This sales company is made up of eastern men, and includes T. C. P. Forbes, recently resigned as sales manager of the Monarch Motor Car Co., G. S. Patterson, and M. W. Kerr.

This company will undertake the entire distribution of the Ross cars for a period of 3 years, undertaking the advertising and selling campaigns, and freeing the factory here of anything save the making of the cars.

—

Clearing House for Truck Concerns in New York

NEW YORK CITY, Aug. 21—Emerson Brooks, formerly vice-president of J. M. Quinby & Co., Newark, N. J., and more recently in the motor truck field, has evolved a plan of operations which should be of value to the industry. In addition to the regular representation of one truck company, he has adapted his office to act as a sort of clearing house for companies which have no metropolitan agents. By such arrangement, he makes it possible for out of town concerns to arrange deliveries through his office, and also to have their catalogs and literature on file there. THE AUTOMOBILE, in its January issues, published tabulated statistics of 370 makes of trucks, many of them not represented in New York and this new plan should prove a convenience to them, as well as a source of profit. Mr. Brooks is well known in the automobile industry, having served two terms as vice-president of the Motor Truck Club and one year as treasurer of the Automobile Club of America. His office is at 250 West Fifty-fourth Street.

Independents Raise Gasoline Price

St. Louis Firms Add 1.1 Cents to Figure—Standard Oil Unaffected

ST. LOUIS, MO., Aug. 21—After following the lead of the Standard Oil Co. nine times in the last 18 months by cutting the price of gasoline 1 cent each time, Independents here balked. They raised the price 1.1 cents this week.

The Pierce Oil Corp., which the Independents had termed an ally of the Standard Oil in stories of an alleged sham battle to freeze out the small dealer, announced increases in its gasoline prices soon after the smaller independents. The Standard, however, three days after the Independents' cut, had not yet brought down its prices.

The price of No. 1 gasoline was raised from 12.4 cents to 13.5 cents per gallon; No. 2 from 10.9 to 12 cents per gallon; No. 3 from 8.9 to 10 cents per gallon. These prices are for 10 gal. lots.

The Independent dealers say they expect the Standard Oil to follow their lead, and that they will continue to increase the price of gasoline until it is the same as before the so-called war, that is, from 15 to 17.5 cents per gallon according to grade.

The Independents denied that prices had been raised by agreement, although stories have been printed here of a recent secret meeting in Kansas at which it was said the increase was decided upon. There has been some talk of an investigation by State officials into these charges. Attorney General Barker announces that no request for an investigation has been received at his office and that until such a request is made his office for the present will not undertake an investigation.

—

Gasoline Advance in Eastern States

NEW YORK CITY, Aug. 23—Within the past week there has been a general advance of 1 cent a gallon in gasoline prices throughout New York State, New Jersey, New England, eastern Pennsylvania, and Delaware. The big companies are now selling gasoline wholesale in New York at 14 cents a gallon, compared with 11 cents in the early summer.

The Standard Oil companies affected by those changes are: Standard Oil of New York, Standard Oil of New Jersey, and Atlantic Refining Co. The Texas Co. and Gulf Refining Co. are quoting prices similar to the Standard.

The Independent oil companies in the St. Louis district have advanced the price of gasoline 1.1 cents a gallon to 13½ cents, for the best grades.

Yuster Axle Now Columbia

Combines Management of Output with Torbenson Co., Though Separate

CLEVELAND, OHIO, Aug. 20—The Yuster Axle Co., this city, manufacturer of automobile axles, has changed its name to the Columbia Axle Co. The business of manufacturing axles for high grade automobiles is to be carried on as heretofore, but a change of trade name has been thought advisable, owing to the withdrawal of W. L. Yuster from the company, and for the reason that arrangements have been made with the Torbenson Gear & Axle Co. of Newark, N. J., whereby that company has recently moved its entire plant, machinery, equipment and inventories to the Cleveland factory of the Columbia Axle Co. Hereafter the combined product of both companies will be manufactured under one management and overhead expense in the same shop. It is believed that this step will add strength and materially improve the facilities of both companies whose separate identities are to be maintained, and at the same time place the foundation for extensive extension of the business of each.

New Building

Consideration is now being given to plans for a new building, and new machinery is being purchased to take care of increased business.

—

Not Responsible for Disobedient Chauffeur in Accident

ST. PAUL, MINN., Aug. 14—The Minnesota Supreme Court has ruled that the owner of an automobile is not liable for the negligent acts of his chauffeur when committed while wrongfully operating the automobile outside the scope of his employment and, contrary to directions, on his personal affairs. E. A. Conrad of Minneapolis is relieved from payment of a judgment of $2,100 allowed J. B. Lee in the lower court. The latter was run down by the Conrad chauffeur. Conrad directed his driver to go home for supper and then come back after him. The chauffeur went eight blocks out of the way on a mission of his own, when the accident occurred. The upper court held that as long as the driver did not obey orders no liability rests on the owner.

—

Asks for Government in Mexican Disturbances

WASHINGTON, D. C., Aug. 21—War Department officials have been informed that Maj.-Gen. Frederick Funston, commanding the southern department, with headquarters at Fort Sam Houston, Tex., has a plan for using motor cars extensively in the transportation of troops and supplies in Texas. He has recommended the purchase of four machines for use in rapid transportation between various points where it is necessary to maintain patrols, etc., it being stated that the disturbed conditions, due to marauding bands from the Mexican side, as well as bands of outlaws located in Texas, result in urgent calls for troops to meet emergencies at different places and that quick means of transporting troops and supplies from points on the railroads to places where they are needed in emergencies are absolutely necessary if the best results are to be obtained. Several trucks and cars are now in service along the Mexican border.

—

Now the Cummins-Monitor Co.

COLUMBUS, OHIO, Aug. 20—In accordance with the announced plans of developing the four and the eight-cylinder Monitor by the Cummins Auto Sales Co., Columbus, papers were filed with the Secretary of State changing the name of the present corporation to the Cummins-Monitor Co. The plant, where the Monitor is assembled, is located at 402-404 Mount Vernon Avenue.

—

Texas Co. Earnings Gain $272,234

NEW YORK CITY, Aug. 23—The net earnings of the Texas Co. in 1915, the fiscal year ending June 30, shows an increase of $272,234, while the surplus decreased $242,647. The net earnings in 1915 amounted to $8,024,692 and in 1914 to $7,752,458. The company last year paid out $3,000,000 in dividends, compared with $2,550,000 in 1914.

—

Hupp Promotes Willemin

DETROIT, MICH., Aug. 23—A. B. Willemin, who has been director of purchases for the Hupp Motor Car Co. for three years, has been promoted to assistant general manager. He first entered the automobile field as purchasing agent of the Brush Runabout Co., later joining the Lion Motor Car Co. Subsequent to this he closed out the Elmore business for General Motors, and then came to Hupp.

—

Fuller & Sons to Add

KALAMAZOO, MICH., Aug. 23—At the last meeting of its stockholders, Fuller & Sons Mfg. Co., maker of automobile parts, voted to erect an addition to plant to take care of increasing business. This addition is to measure 100 by 61 ft., and four stories high. It is to be of reinforced concrete factory construction.

—

Trenton Body Builds

TRENTON, N. J., Aug. 23—Fitzgibbon & Crisp, Trenton, maker of automobile bodies, will build an addition to its plant.

N. Y. Exports to S. A. Gain $809,277

South America Receives $1,991,801 in Vehicles During Second Week of Aug.

NEW YORK CITY, Aug. 23—Passenger cars, to the value of $672,262, and commercial vehicles, at $1,319,539, left the port of New York during the week ended Aug. 14, 1915, as compared with only $182,524 in passenger cars, in the same period in 1914. During the month of July passenger cars, to the value of $72,350, were shipped from this port to the principal countries in South America. In point of value, Venezuela led with $19,189, with Argentina next with $16,858, Chile, $13,665, Brazil, $12,064, Uruguay, $6,154, Colombia, $4,260, and all other countries, $13,224.

—

European Cars Lead in Big Cities of South America

RIO DE JANEIRO, Aug. 19—This city and Buenos Aires contain a large number of high-priced European automobiles, a certain barometer of the great and extravagant spending by the rich in these two South American metropolises. In the camps and the other capitals are to be found cars of a cheaper type, and here the low-priced American-made machines are very popular. Not so many, however, can be seen in the above mentioned cities as European makes, and many others have a strong foothold on fashion, and this is an extremely hard custom to break. The necessity of economy may do what selling agents have not been able to accomplish.

Motoring is the foremost in the list of amusements in Rio de Janeiro. The Brazilians have spent money lavishly on improving their roads, especially the famous Gavea-Tijuca drive, that follows the rocky coast for miles, and then spurts up into the mountains. This drive is 60 miles long. In Brazil, as in other South American cities, there is no law prohibiting speeding. People crossing the streets must look out for themselves if they wish to take a chance of being run down when the traffic is going the opposite direction. If a man is run down by an automobile, he is to blame for being in the way, not the driver, and if he has damaged the machine he can be sued by the owner.

—

Houk to Add

BUFFALO, N. Y., Aug. 24—The Houk Mfg. Co., Buffalo, has completed plans for an addition to its plant at Elmwood Avenue and the New York Central Railroad Belt Line.

Trade Review of the Week

Detroit Plants at Work on Fall Business—Material Shortage Continues

DETROIT, MICH., Aug. 24—Last week appears to have been up to the average of output and sales with the majority of the car and parts manufacturers of this city. Intensive buying of cars has been resumed throughout the country, from the indications that have come to the sales departments, this probably having a direct relation to the improved weather conditions that now obtain.

Fall Outlook Excellent

The recent resumption of manufacturing activity by the Ford Motor Co. after a shut down for inventory—the customary thing with Ford—has had its effect on several other of the city's manufacturing plants, a large part of whose output is sold to the Ford company, so that it may be said that practically every plant in the city is now quite busy with the early fall business. The outlook for fall trade is regarded as excellent in all quarters, and everywhere there is a strikingly optimistic trend, all the big producers thinking that they will be able to make and sell enough more vehicles than last season to make up for the almost general reduction of prices.

In some quarters the shortage of raw materials is still worrying. One motor maker, for instance, says that he has been obliged to turn down many orders for engines because of the shortage. In some lines, he says, it will take many months to get a normal supply, and that it would be folly to accept contracts specifying dates of delivery, when he knows that the necessary material is not on hand, and will not be for some time. War business in steels, brass, aluminum, etc., curtails greatly the amount available for domestic use, and prices have felt the increasing demand. Pig iron, among others, is higher, and desired deliveries are hard to get. This shortage is apt to affect the smaller consumer before the large buyer, and the larger concerns are able to get fairly reasonable attention through their large buying power.

Dealers in this city and vicinity are well satisfied, on the average, with the amount of business either in sight or already closed. They say that there was a perceptible picking up during last week, with most of the days clear. People will not buy cars when the weather is bad.

New York Sales Good

NEW YORK CITY, Aug. 24—Sales conditions last week in this city showed the same inquiry on the part of prospective buyers as in former weeks. The dealers have the same complaint to make—completely sold out and no new cars in sight until the last of September. A few of the dealers were, however, more fortunate this week in the way of shipments. The Studebaker factory has adopted the plan of consigning two trainloads of new models each day to its branches, from which the cars are passed along to dealers. Accordingly last Monday, two trainloads started for the Atlantic coast, for distribution among dealers tributary to those branches. Tuesday two more trains were under way and on Wednesday another double trainload was sent out, this program to continue until each branch house will have received its quota of cars. The Maxwell agency received two carloads yesterday and expects that number each day to the end of the month. Sales to date this month for the Maxwell in this city have numbered sixty-nine. The Stutz agency received a fresh shipment from the factory but not enough to make full deliveries on, its sales last week numbering fourteen.

Influence of War

A few of the agents report slack business on account of scarcity of cars and also on account of the closing of the vacation period. Dealers state that there have been more people in this city this year than ever before, and consequently many sales have been made. Most of these visitors were people who usually go to Europe for the summer. This year, a majority of them have turned their attention to touring and while in this city, have bought new cars for that purpose.

The dealers, however, are expecting a rush for cars in about a month, when there will be a demand for winter models. Harry S. Houpt is anticipating this demand by having on exhibition on Sept. 1, a complete line of closed cars. The Pierce people state that most of their sales have been in closed cars. Sales last week numbered nine, as compared with one during the same period last year.

The Mercer company is sold out and will not be able to make deliveries until October, when the new series will be out. It states that if it could have had the cars, 100 could have been sold.

The Oldsmobile agency sold twenty-five cars last week. Shipments are fair.

Oklahoma's Prospects Rosy

OKLAHOMA CITY, OKLA., Aug. 20—The automobile buying possibilities in the State of Oklahoma this year are better than in the history of the new State. At present there are 32,000 automobiles in the State, according to the estimated figures of the State highway department. If abundant crops, he production of oil, gas, coal, lead, zinc other minerals have anything to do w automobile buying the business in Ol homa this year will grow by leaps bounds.

45,000,000 Bushels of Wheat

Wheat is a big money crop in O homa. This year the yield will re 45,000,000 bushels. It is selling for n than $1 a bushel, therefore the mo from this crop alone will be in exces $45,000,000. Oklahoma this year ra 80,000,000 bushels of corn, which br about $65,000,000 to the farmers.

Oil is Oklahoma's greatest m "crop." Oklahoma produces more than any other State in the union cording to the report of the State g gist. For two years the price o dropped off to 40 and 50 cents a ba but within the past two weeks the for crude oil has been advanced 20 a barrel, increasing the price to 60 c The history is, when the price of lowered, the buying companies dec the price 5 and 10 cents a barrel time. And, when it is advanced price is increased 5 and 10 cents a rel. The producers have resumed in all the fields of the State, in ant tion of dollar-a-barrel oil in the future.

Oklahoma coal sells for many n dollars every year; her zinc, and minerals, sell for millions; and th crop this year will bring in at $20,000,000.

During the past year, Oklahoma mobile dealers have enjoyed the b business in the history of the Sta

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Oklahoma to Tax $25 for Failure t ister Cars

OKLAHOMA CITY, OKLA., Aug. Automobile owners of Oklahoma, who have failed to get a new 1915 tag, were warned by State Hi Commissioner George Noble to p tax on or before Sept. 1 or they subject to a fine not to exceed $25 warning was directed especially t mobile owners in Oklahoma who linquent.

"There are 500 or 600 cars in homa City that have not been tered," said Commissioner Noble

According to Mr. Noble, not mo half of the cars in Oklahoma ha registered with the highway depa On the records of his office th accounted for a few more than automobiles, 600 motorcycles a traction engines. Commissioner estimates that there are from 2 25,000 automobiles in Oklahom said, however, that he would not prised if there were 30,000 to 32, here. His first estimate placed t ber at the latter figure.

Niagara Four To Sell At $740

Niagara Automobile Co. Formed in Buffalo—Capital To Be $500,000

BUFFALO, N. Y., Aug. 24—The Niagara Automobile Co. has been formed here to manufacture the Niagara four-cylinder five-passenger car to sell for $740. G. H. Poppenberg is president of the company, with W. G. Miller as vice-president and general manager, and Albert Poppenberg, secretary and treasurer. The plant of the company, which is to be capitalized at from $500,000 to $750,000, will be located in Buffalo and it is the idea of the promoters to use materials produced either in Buffalo or its vicinity. The new car will be light in construction.

Mr. Miller was associated with the Pierce company and other automobile concerns for many years, while the Poppenbergs are local business men.

Have Personal Representation to Sell Cars in China

SHANGHAI, CHINA, Aug. 2—It has been demonstrated that in order to secure profitable results American firms which contemplate engaging in the export trade would do well first to secure personal representation in the market they intend to enter. A new firm entering the field would be somewhat handicapped if depended absolutely upon an advertising campaign to create a demand for its goods.

China is considered a great possible market for automobiles, and recently a representative of a prominent firm of automobile manufacturers in the United States, who is now visiting Shanghai, appears optimistic as to the future possibilities of this trade not only in China but in other countries of the Far East.

The smaller type of touring cars, those with four or five-passenger capacity, seem to be most favor. The touring car of seven or eight-passenger capacity, numbers among which are some of the real high-cylinder models, and the limousine, seem to be popular. There are 1,000 cars in Shanghai.

Vehicles in the State of Kansas Valued at $19,814,116

TOPEKA, KAN., Aug. 25—Some very interesting facts concerning the use of motor vehicles in Kansas are revealed by assessors' reports. Kansas is now taxing on $19,814,116 worth of motor vehicles, for instance, against a valuation of $6,192,224 7 years ago—since that time the valuation of horses has declined from $5,077,399 to $3,045,290, indicating the tremendous increase in the comfort and pleasure of the citizens from the availability of motor vehicles. It can fairly be estimated that fully $10,000,000 was spent for automobiles that would not have been spent for any sort of conveyance except for the development of the automobile. What this signifies for the added facility of inter-communication among the residents of the smaller towns and farms of Kansas, and their improved social and commercial conditions, can scarcely be estimated. The value of automobiles has jumped in the 7 years from $1,056,913 to $16,298,763, and their number from 2156 to 48,261. There were no motorcycles listed in 1908—their value now is $425,913. The value of bicycles has dropped from $57,912 to $44,145. There has been a small increase in the number of horses in the 7 years, from 1,035,878 to 1,053,753, and a decline of 400,000 in the number of cattle, to 2,393,427. Mules have increased from 169,526 to 274,826—and these figures are well to keep in mind in the next 7 years, during which the recent exploitation of tractors for farm use will be having its effect.

New 4-Wheel Drive Truck

ST. PAUL, MINN., Aug. 25—The Twin City Four-Wheel Drive Co. has bought the J. L. Ware patents for trucks. The company is capitalized at $500,000 and opened temporary quarters at 2324 University Avenue. The company has 200 ft. frontage of property in the vicinity, and plans are being drawn for a three-story office and factory building. Officers elected are: President, J. L. Ware, Minneapolis; vice-president, T. J. McDermott; treasurer, F. J. Drew, Minneapolis; secretary and general salesmanager, M. T. Roche. It is the intention to have trucks ready in 1916.

Russell Plant Making Shells

TORONTO, ONT., Aug. 20—The Russell Motor Car Co. of Canada has started the manufacture of shells for the British Army, a contract having been signed through the shell committee in Canada. This order will keep all the available plant working to capacity until about the end of the year.

Federal Rubber Holds Outing

MILWAUKEE, WIS., Aug. 23—Eight thousand two hundred and fifteen persons attended the annual outing given by the Federal Rubber Mfg. Co., Milwaukee, to its employees and their families at Waukesha Beach on Aug. 21. It was the largest outing ever given by the company, and one of the largest crowds that have ever attended a picnic given by any Milwaukee industry to its forces. It required eighty-two large interurban street cars to convey the crowd to the beach.

Hollier 8 to Double Output

Buys Plant of Harris Bros., Chelsea, Mich.—To Build 20,000 Cars

DETROIT, MICH., Aug. 25—*Special Telegram*—The Lewis Spring & Axle Co., Jackson, Mich., manufacturer of the Hollier eight, has purchased from Harris Brothers Co. the plant at Chelsea, Mich., which was formerly occupied by Flanders Mfg. Co., for the manufacture of motorcycles. The plant is completely equipped with machine tools, and can be put into manufacturing condition easily. The Lewis concern intends manufacturing complete cars both in this new plant and in main factory at Jackson. Purchase will practically double the Hollier output, making it possible to manufacture from 20,000 to 25,000 cars in the two plants.

Hamilton Beach Co. Will Build

RACINE, WIS., Aug. 21—The Hamilton-Beach Co., Racine, Wis., manufacturing small electric appliances of all kinds, will break ground in about 10 days for a plant of its own on High Street and the North-Western tracks at Racine. The company has been occupying leased quarters in the works of the F. J. Greene Engineering Works for several years, and recently was obliged to take additional space in the Racine Stool Co.'s plant because of an unprecedented rush of orders. The decision to build a plant of its own followed the receipt of several large contracts for electric motor devices from the automobile and sewing machine industries. Frederick Osius is general manager. The Green works, which have much to do with the automobile industry, will immediately occupy the space vacated by the Osius concern.

Globe Seamless Tubes Co. Adds 100 Men

MILWAUKEE, WIS., Aug. 25—The Globe Seamless Steel Tubes Co., Milwaukee, a large producer of steering gear tubing, boiler flues, axle shafts, driveshafts, etc., has added 100 men to its forces and extended its schedule to a 24-hr. day to meet the extraordinary demand for its goods. The principal source of the demand is from the motor car and farm implement industries.

7000 Cars in Manitoba

WINNIPEG, MAN., Aug. 20—Over 7000 automobiles have been registered in Manitoba this year, according to returns at the Parliament Buildings. This represents a considerable increase over the number registered during the same period last year.

Perlman Wins Decision in Long-Contested Demountable Rim Patent Suit

Court Decides Patent Shows Invention—Declares Standard Welding Co.'s Rim Infringes and Issues an Injunction—Orders Accounting

NEW YORK CITY, Aug. 19—Judge Hunt yesterday handed down a decision in favor of Louis Perlman in his suit against the Standard Welding Co., charging infringements of claims 8, 11, 12 and 13 of patent No. 1,052,270 covering demountable rim construction. The Court issued an injunction restraining the Standard Welding Co. from making or selling rims alleged to infringe Perlman's patent and ordered an accounting of the concern's profits therefrom.

Suit Filed in 1913

The patent No. 1,052,270 involved in the suit, which was filed Oct. 7, 1913, in the United States district court for the Southern district of New York, was issued to Perlman on an application filed June 29, 1906, which was a continuation of and substitute for an application filed May 21, 1906. The object of this patent, as outlined in Judge Hunt's opinion, was to provide "a demountable rim sustaining a tire capable of ready application to and removal from a fixed rim and felly of a wheel, the demountable rim being so constructed as to facilitate application and removal of the shoe. Means are provided for firmly and rigidly retaining the demountable rim on the fixed felly and rim while in use. The fixed rim has an annular flange on one edge. There are threaded apertures in the body of the fixed rim intermediate at its edges through which are threaded bolts formed with a frusto-conical entering end. The demountable rim, which is slid onto the fixed rim from the flangeless side of the latter, has conical or frusto-conical apertures into which these bolts enter and lock the demountable rim firmly in place. Locking nuts prevent the loosening of the bolts. The bolts serve as connectors between the wheel body and the demountable rim, and are adapted to exert outward pressure on the latter. The demountable, or tire-carrying rim, is made in two sections, each of which is cut away for a portion of its thickness, forming an annular shoulder, and one of which overlaps the other for the width of the cut-away portion, with the free edge of each lapping portion engaging the shoulder of the other. These shoulders are secured together by screws. Each section has at its outer edge a clincher flange curved to produce an annular groove to receive the annular beads of the tire shoe. The demountable rim has an aperture for the valve stem and the fixed rim and felly have a notch into which the stem enters. Short-stem lugs designed for use in connection with a detachable operating tool are employed to engage the tire tool and press it into position with its beads on the grooves of the flanged edges of the rim. The tire-carrying rim is of such diameter as to be easily slipped over the fixed rim, the valve stem as it enters the notch in the fixed rim serving as a guide for the proper positioning of the demountable rim on the fixed rim. When the radial bolts are screwed into the conical openings, and the nuts are tightened, the demountable rim is fast on the wheel. The bolts cause the demountable rim to be moved radially away from the fixed rim and also laterally against the annular flange of the fixed rim. A witness of the plaintiff testified that the bolts also serve to prevent the demountable rim from creeping or rotating upon the body of the wheel."

Perlman's Contention

According to the opinion, Perlman's contention was that each of his locking elements consists of a wedge acting against an inclined space of a demountable rim and driven by a power element which anchors the wedge to the wheel; that the fact that the inclined space is that of a conical opening is merely an incident not altering the dual action of the locking element; that the wedge is the tapered end of a bolt, and the bolt itself the power means; that the locking means consists of a series of wedges and that the bolts which carry the wedges are the actuators; that each bolt in the Standard Welding Co.'s device is threaded through the wood felly and fixed rim and has a movable rim which actuates the wedge and that there is but a reversal of parts with the same functions attained in the same way as with the movable bolt in a fixed nut actuating a wedge; that the immediate actuator of the wedge in the Standard Welding device is a nut threaded on the bolt and that there is no substantial distinction between moving a wedge by threading a bolt through a stationary nut, as in the Perlman device, and moving a wedge by threading a nut along a stationary bolt as in the Standard Welding construction.

Claims of the Defense

The Standard Welding Co., contended that in 1906 and 1907 with other manufacturers of automobile wheels and rims in this country, it began to make what is known as the "Old Style Continental Demountable Rim," the characteristic features of which are substantially those of the exhibit introduced by Perlman as the Standard Welding Co.'s wheel. The company also stated that the construction of this wheel was an adaptation of one previously produced commercially in Europe and particularly in France where it was known as the Vinet demountable wheel. The Standard Welding wheel has ordinary spokes and wood felly and a fixed metal felly band with an upturned flange on the inner side. There is an opening in the felly and band to receive the tire valve stem. The clincher demountable rim has a block fitting between two plates on the fixed rim so that they will not creep. The demountable rim has a series of holes for nuts for short-stem lugs and also with a valve stem hole. There are eight locking devices, these consisting of a bolt and a metal wedge, the bolts passing axially through the wood felly and each having a head on its inner end so shaped as to prevent its rotation. There is a nut on the outside end of each bolt. The wedges go between the demountable rim and the fixed rim and exert an inclined pressure upon the demountable rim radially away from the wheel body, spacing it from the fixed rim, and also press it laterally against the flange at the other end of the fixed rim. The wedges are propelled by threaded bolts, the immediate actuators being a nut threaded on a bolt.

Similarity of Construction

The Court ruled that "the same result is accomplished in both devices, a demountable rim is supported on a small amount of surface and is capable of ready application and removal, and yet is firmly locked on the fixed rim while in use. While in the case of one there is a bolt with a frusto-conical end which enters a conical cavity in the demountable rim, and in the other (a) a bolt which enters the felly axially and (b) a wedge plate, in each there is produced this effect: Radial pressure outward from the wheel body, and lateral pressure against the curved flange of the fixed rim is exerted on the demountable rim. The demountable rim of the defendant, like that of the plaintiff, is of rolled sheet metal, comparatively thin, capable of an amount of distortion, yet sufficiently rigid to carry the full load between the points of support. Again, the demountable rim of the defendant is cylindrical, like plaintiff's, is made so as to have certain spaced inclined surfaces engaged and locked by small wedges like plaintiff's and provided with locking wedges for engaging the rims at spaced points, the wedges being constructed to present the least amount of surface in contact with the rim.

"I can perceive no distinction in function between the two wheels and as a fact the question that presents itself is whether or not such a similarity exists between the patented device and the defendant's wheel to sustain the claim of infringement."

The Short-Stem Lug

The Court then takes up the question of invention in the use of the short-stem lug by Perlman, pointing out that long-stem lugs had been in use for some time previous to his conception of the possibility of the use of the short-stem variety by the use of a detachable handle and comes to the conclusion that "the device of Perlman was a practical solution of the problem of replacing a deflated automobile tire in a quick and easy way." The Court also mentions the early activity of Perlman about 1900 in endeavoring to devise a way of facilitating tire replacement on the road and reviews the steps of his invention, taking out of patent, etc. In regard to the alleged prior art cited by the defendant, the Court ruled that either of these were foreign to the matter or not of such a character as to invalidate Perlman's invention. As for Q. D. rim devices, the Court states that these are based upon having a close, continuous bearing contact with all possible surface of the tire against the bed, whereas the principle applied in the demountable rim art is just the reverse.

In reference to the French patent to Vinet, No. 347,651, issued Nov. 4, 1904, the Court says, "The plaintiff should not be defeated by reference to the Vinet patent because the evidence convinces the Court that the plaintiff has proved his invention as antedating the foreign publication of date March 18, 1905."

The opinion continues, "the evidence satisfies me that in 1903 plaintiff completed, and in 1904, in a successful way, operated his invention."

In reference to the steps taken by Perlman to obtain recognition from the patent office, the opinion says, "Many claims were presented and many canceled and yet I find no claim of the same scope as the claims of the patent and none, which, being conceded to be non-patentable, can be construed as an estoppel against Perlman's right of protection against infringement by a rim wheel, demountable, embodying locking elements placed to press the demountable rim radially outward and thrust it at right angles to the radial action in the final or operative position and to lock there tensioned during use, but capable of being readily released from tension, allowing the rim to assume a loose position before it starts to move off the wheel."

"I find claims 11, 12 and 13 of Patent No. 1,052,270, which are directed to the demountable rim locking means and the combination thereof, with a wheel body and its demountable rim, are infringed.

"Claim 8 relating to the wedge-shaped clamping plate for clamping the clincher bead of a tire, and the combination therein set forth, is for a device used with defendant's structure when the apertures and recesses of defendant's demountable rim are made use of at all. The evidence shows that the depressed portions in the median line of defendant's demountable rim, each of which is apertured centrally, is of no utility except when employed for receiving the nut of a short-stem lug with the stem of the lug extending through the aperture, and the apertures are used in no way other than to receive a short-stem lug. The combination set forth in Claim 8 is present in the parts furnished by the defendant as if the complete combination were sold by it.

Features of Invention

"Finally, Perlman's patent shows invention, completed by him in 1903. Two distinct features mark the inventions: (1) The demountable rim combination with its locking means; and (2) the short-stem lug combination for clamping the tire to the demountable rim. The invention claimed was based upon a provision for a demountable rim which is loose on the wheel when applied, but is locked by locking means which may be unlocked and thereby may restore the loose condition before commencing removal. This same combination has been adopted by defendant and the same combination as disclosed and claimed in the patent in suit has been taken. Plaintiff disclosed to the defendant the patented invention before defendant began to manufacture demountable rims.

"The evidence requires the finding of infringement and the granting of an injunction and accounting in usual form."

Claims in the Suit

The claims of the patent involved in the suit, 8, 11, 12 and 13 read as follows:

"8. The combination of a demountable rim having radially disposed clencher flanges, a tire shoe having beads engaging said flanges, a wedge-shaped clamping plate bearing against said beads and adapted when moved to force said beads against said flanges, and means accessible from the inside of the rim for drawing the clamping plate radially toward the rim."

"11. The combination, with a wheel body, of a demountable rim therefor, a locking element, have a tapering portion, that is adapted to be moved radially and to thereby exert pressure against the rim outwardly radially of the wheel body, and to act as a wedge laterally, said locking element having an engagement with the wheel body whereby it may be moved radially of the wheel body."

"12. The combination with a wheel and its felly of a demountable rim therefor, a locking element having a tapering end that is adapted to be moved radially and to thereby act as a wedge laterally and exert pressure against said rim radially of the wheel, said locking element having a threaded engagement with the wheel structure whereby it may be moved radially of the wheel."

"13. The combination with a wheel body, of a demountable rim therefor, and a locking element, having a tapering portion, that is adapted to be moved to exert pressure against the rim outwardly radially of the wheel body, and to act as a wedge laterally, said locking element having an engagement with the wheel body."

Detroit S. A. E. Is in Own Home

Headquarters Large Enough for Committee, Though Not for Section Meetings

DETROIT, MICH., Aug. 23—The Detroit Section of the Society of Automobile Engineers, though it has been located in its own headquarters since May, is making public announcement of the fact that its permanent headquarters are at 601 Kerr Building. While the new office is not large enough for the section meetings, it is of sufficient size for any committee gatherings, and a permanent office of this kind is of great value, the section previously having no established headquarters.

This is the first section to have a home of its own, and also one of the few to have a salaried secretary, the financing of this as well as the office being carried on by private subscription among the manufacturers.

New 1-Ton Garford

NEW YORK CITY, Aug. 24—The Garford Motor Truck Co., Lima, Ohio, has brought out a new 1-ton truck similar to the 1½-ton model. It differs from the worm-driven 3000-lb. vehicle only in the size and strength of principal parts. The main characteristics of the 1-tonner are: capacity, 1 ton; price, $1,450; wheelbase, 120 in.; tires, front, 34 by 4½; tires, rear, 36 by 4; drive, worm. The motor is located under the hood with the radiator in front and is the same one used in the ¾-tonner. It is mounted direct on the main frame and is assembled with the clutch and gearset in a unit power plant. The motor develops 19.6 hp., its bore being 3½ and stroke 5⅛.

Smith with Chalmers

DETROIT, Aug. 23—F. H. Smith, formerly with the Studebaker Corp., and later northwest district manager for the Hudson Motor Car Co., has joined the Chalmers Motor Co. as special representative.

Borie Heads Driggs-Seabury

Stevenson Board Chairman—Permanent Officers and Directors Elected

NEW YORK CITY, Aug. 25—The permanent officers and directors of the Driggs-Seabury Ordnance Co. have been elected as follows: Chairman of the board, John Stevenson, Jr.; president, A. E. Borie; vice-president and general manager, W. L. Wright; treasurer, H. H. Myers; and secretary, S. B. Pratt.

The board of directors is: A. E. Borie; G. W. Burleigh, director Lackawanna Steel Co.; E. C. Delafield, vice-president Franklin Trust Co.; James Imbrie, Wm. Morris Imbrie & Co.; J. C. Jay, Jr., vice-president Pennsylvania Steel Co.; John Stevenson, Jr., Sharon, Pa.; J. A. C. Stevenson, Sharon, Pa.; and W. L. Wright.

NEW YORK CITY, Aug. 19—In addition to the $500,000 non-cumulative 7 per cent first preferred, $500,000 non-cumulative 7 per cent second preferred and $3,000,000 common stock, the Driggs-Seabury Ordnance Co. has an authorized issue of $1,500,000 first mortgage 6 per cent serial bonds.

These bonds mature serially, $300,000 each year, starting Aug. 1, 1916, and are callable at 101 and interest.

Two series, 1916 and 1917, amounting to $600,000, have been sold at par. The remainder, $900,000, are being offered for subscription at 97 with a 10 per cent bonus in common stock. The second preferred stock is convertible at par into common stock at any time.

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Cleveland-Ford Tire Co. Elects

CLEVELAND, OHIO, Aug. 19—J. L. Smith was elected president and P. C. Remick vice-president of the Cleveland-Ford Tire Co. at a recent meeting of the directors. Other officers elected were W. J. Leinbach, secretary-treasurer, and A. E. Pearce, general manager. The directors named were J. L. Smith, P. C. Remick, W. J. Leinbach, F. L. Kerr and A. E. Pearce. Work on the new factory, to be located at the north end of Benefit Street, Ashtabula, Ohio, will probably begin in a few days. The main building is to be 300 by 46 ft., with a wing 60 by 50 ft. It will have two stories and a basement. There will be a one-story power plant, 40 by 100, at one end of the main structure.

The first section of the building, which will be started soon, will be 170 by 46 ft., with a wing 60 by 15 ft., and a power plant 40 by 50. The building will be of brick and reinforced concrete.

Although the name of the company indicates that it will make nothing but Ford tires, this is not the case. Molds and cores for the larger sizes of tires have already been ordered, and it is thought this stock will be available within 60 days. The sizes to be manufactured will run up as high as 37 by 5½.

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Overland May Show 1915 Gain of Nearly $3,000,000

TOLEDO, OHIO, Aug. 23—It is expected that earnings of the Willys-Overland company for 1915, its fiscal year having closed June 30, will show a gain of nearly $3,000,000, or 55 per cent over the $5,231,274 earned during the 1914 session. That would mean 35 per cent to 38 per cent on the common. In the last 2 months profits have been at the rate of over 50 per cent on the common stock.

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Market Changes Few

NEW YORK CITY, Aug. 24—News of the sinking of the Arabic on Friday was the cause of a quick drop in prices in the markets which, although somewhat lower, were not unusually severe. The decline was soon checked, however, when it was learned that the passengers and the crew had been saved and the principal products which were under pressure on the first reports recovered sharply to within small fractions of the prices that were in force. The steel markets were somewhat quiet this the only gain taking place on W day when it rose 50 cents abov week's rating and continued thi throughout the rest of the week copper markets were easier. Co able interest was shown by the copper producers in the prospect diplomatic crisis with Germany result of the sinking of the Arabi copper producers held strong hop better inquiries from munition ma turers, and while they are assid quoting 17 cents and up for the n is a well-known fact that the fi will bring the price nearer to 16 Tin markets were very weak whe ing each day a downward tren noticed and at the end of the we $1.25 less than Monday's rating rest of the metal markets ma changes. The oil and lubricant kets were a bit unsteady. Wed Kansas crude oil rose 5 cents Thursday rose 10 cents more, the total rise 15 cents. Cottons was fairly active, closing lower ever. There was no improvement consuming demand while the s situation lent further discoura regarding the export situation. was a decline of 20 cents at the the week. There was no change rest of the markets.

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New Factory for Hyat

DETROIT, MICH., Aug. 22—In to the new office building of the Roller Bearing Co., of which a graph was published in THE A BILE last week, there is a new building in course of construction will have six floors 260 ft. by 60 there will also be a full basemen same area. It is stated that th of this new building when finish be given over to the heat treat partment. Reinforced concrete ar are the materials being used.

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McNaull Tire to Add

TOLEDO, OHIO, Aug. 20—Plans ing drawn for a large addition plant of the McNaull Tire Co., loc Miami Street. It is expected t contract will be awarded so wo be started within a few weeks. dition will be used as a calend mill room. A lot of new machin be installed and it is expected crease the output four-fold. Ex are also being made in the vulc department.

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Case Has Pension System

RACINE, WIS., Aug. 21—The J. T. M. Co., Racine, Wis., emplo tween 4000 and 5000 operatives, stituted a pension system, effect 1, 1915. The plan provides tha employee will be entitled to a pe

Daily Market Reports for the Past Week

	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.33	.33	.33	.33	.33	.33	.....
Antimony	.31	.31	.31	.31	.31	.31	.....
Beams & Channels, 100 lb.	1.47	1.47	1.47	1.47	1.47	1.47	.....
Bessemer Steel, ton	22.50	22.50	23.00	23.00	23.00	23.00	+.50
Copper, Elec., lb.	.16½	.16½	.16¼	.16	.16	.16	—.00½
Copper, Lake, lb.	.17¼	.17¼	.16¾	.16½	.16½	.16½	—.00¾
Cottonseed Oil, bbl.	5.50	5.43	5.40	5.25	5.25	5.30	—.20
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.39	—.01
Gasoline, Auto, bbl.	.14	.14	.14	.14	.14	.14	.....
Lard, Oil,, prime	.87	.87	.87	.87	.87	.85	—.02
Lead, 100 lb.	4.40	4.40	4.40	4.40	4.40	4.45	+.05
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	23.00	23.00	23.50	23.50	23.50	23.50	+.50
Petroleum, bbl., Kans., crude	.60	.60	.60	.65	.75	.75	+.15
Petroleum, bbl., Pa., crude	1.55	1.55	1.55	1.55	1.55	1.55	.....
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	.....
Rubber, Fine Up-River, Para	.57	.57	.57	.57	.57	.57	.....
Silk, raw, Ital.	3.80	..	3.80	..	..	3.80	.....
Silk, raw, Japan	3.47½	..	3.45	..	..	3.52½	+.05
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	34.75	34.75	33.87½	33.50	33.50	33.50	—1.25
Tire Scrap	.04¼	.04¼	.04¼	.04¼	.04¼	.04¼	.....

f sixty-five years, if retiring, the retirement on pension be- pulsory at the age of 70 years. on will be based on the annual he rate of 1 per cent per year so that a workman employed ly for twenty years will be at 65 or 70 years of age ate of 20 per cent of the ge. The maximum pension to l is $50 a month and the mini- per month. The company im- pensioned twenty aged men served thirty to thirty-four

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tory Addition for Dodge

r, MICH., Aug. 20—Dodge Bros. g plans prepared for a large to the present factory. The new will be in conformity with the dern concrete and glass build- he Dodge groups, and will be ft. long by 80 ft. wide, and six n height. Information as to additional space will be de- s not available at this time.

—

May Purchase Akron Plant

OHIO, Aug. 20—It is believed American Hard Rubber Co., of which is now completely ed by buildings of the B. F. Co., will move to a new loca- ween Campbell and Bartges ving up its present location for sion of the Goodrich company. rich company has been wanting se the plant of the American or some time and it is believed ent has been reached, although uld verify the report.

Security Prices Are Dull

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Loss of Arabic Checks Optimism — Losses Range from One-Half to Fifteen Points

NEW YORK CITY, Aug. 23—The heaviest decline in stocks since the Lusitania was sunk took place at the opening of the market to-day when news of the sinking of the Arabic was heard. While many stocks broke two to fifteen points the heaviest loss was sustained in the common stock of the Willys-Overland Co. which dropped fifteen points. Nervousness was evident throughout the commission houses, but heavy buying left the price list well above the lowest figures. Naturally, the stocks that had scored the most extensive advances in recent days were the heaviest sufferers.

Heavy Declines

Studebaker, which had risen more than thirty points in ten days, dropped back seven and a half points in the first sale, and General Motors fell nine points in a few days. Goodrich went down five points. In many respects the resiliency of stocks under the stress of bad news brought encouragement to partisans of the constructive side of prices. The rapid rise of certain war issues, stocks of companies which had received large orders for munitions, had called forth from market observers earlier in the week warnings that unfavorable developments might easily cause a serious setback. The decline was not considered of a grave nature, and the latter action of prices showed that urgent selling had quickly been checked.

The Detroit market was unsettled throughout the last hour of trading and was subjected to renewed pressure wholly apart from the Arabic incident. Reo Motor Truck Co. advanced from ninety-five to 107 points, a total gain of twelve. The rest of the active stocks remained quiet. In the inactive stocks the Ford Motor Co. of Canada made a gain of fifteen points. Atlas Drop Forge Co. rose two points. The bond markets were quiet with no trading in sight.

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Ford's Washington Plant Started

WASHINGTON, D. C., Aug. 22—Work of excavating for the foundations for the new assembly plant of the Ford Motor Co., at Pennsylvania Avenue and John Marshall Place, has been started. The building will be six stories in height and will be 139 ft. on John Marshall Place and 165 ft. on Pennsylvania Avenue. The cost will be about $400,000. Pending the erection of the building the Ford Motor Co. has taken two floors of the Union Garage.

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8200 Men on Packard Payroll

DETROIT, MICH., Aug. 20—The Packard Motor Car Co. is now employing a greater working force than ever before in its history. The payroll now totals about 8200 men, who are entirely devoting their attention to the various phases of the production of the new twin six and to the manufacture of the Packard truck.

Automobile Securities on New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Rubber Co. com			300	..	..
Rubber Co. pfd			101	110	..
Castings pfd			100	103	..
d			70	79	..
otor Co. com			89	92	+2
otor Co. pfd			94	97	..
age Battery Co			62½	63	..
e & Rubber Co. com			518	525	+8
e & Rubber Co. pfd			111	..	..
pfd			..	..	..
ors Co. com			202	207	—16
ers Co. pfd			106	107	—1
ch Co. com			55	57	—3
ch Co. pfd			107	108	—10½
e & Rubber Co. com			271	275	+3
e & Rubber Co. pfd			108½	110	..
, Inc., pfd			..	..	..
Motor Co. com			23	25	—2½
Motor Co. pfd			50	52	+1½
eld Tire Co. com			174	177	—10
eld Tire Co. 1st pfd			85	87	—1
eld Tire Co. 2d pfd			170	180	—10
r Co. com			40	41	..
r Co. 1st pfd			86	87	— ½
r Co. 2d pfd			34	35	— ½
Co. com			..	195	..
Co. pfd			107	107½	..
Mfg. Co. com			..	..	..
Mfg. Co. pfd			..	..	..
Car Co. com			112	119	..
Car Co. pfd			99	100½	+1½
Car Co. com			130	145	+30
Car Co. pfd			..	..	..
Co. com			42	..	..
Co. pfd			92	94	..
ruck Co			17	18	— ¼
ar Co			32½	34½	— ½
ic Co. pfd			..	..	..
Speed. Corp. com			65½	67	— ½
Speed. Corp. pfd			105	107	..
rporation com			99	101	..

No quotations available at this time on account of war.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Studebaker Corporation pfd			102	103	—2
Swinehart Tire & Rubber Co			85	90	..
Texas Company			..	..	..
U. S. Rubber Co. com			48½	50	+1
U. S. Rubber Co. 1st pfd			104	105	+1
Vacuum Oil Company			219	220	—1
White Company pfd			110	..	..
Willys-Overland Co. com			169	171	—15
Willys-Overland Co. pfd			105	106½	+1

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com	..	99½	88	..	..
Chalmers Motor Co. pfd	..	..	96¼	97¼	+ ¼
Continental Motor Co. com	155	180	270	295	—5
Continental Motor Co. pfd	..	75	83	86	..
General Motors Co. com	..	..	211	216	—4
General Motors Co. pfd	..	..	107	109	—1
Maxwell Motor Co. 1st pfd	..	..	89	91	+2½
Maxwell Motor Co. 2d pfd	..	..	36½	38	+1
Maxwell Motor Co. com	..	..	43½	46	+2½
Packard Motor Car Co. com	..	..	115	..	..
Packard Motor Car Co. pfd	..	97	99½	..	..
*Reo Motor Car Co	20	21	33	33¼	..
*Reo Motor Truck Co	12	13	17⅜	18⅛	+ ⅛
Studebaker Corporation com	..	..	107	110	+12
Studebaker Corporation pfd	..	..	105	108	+2

INACTIVE STOCKS

*Atlas Drop Forge Co	19	..	27	30	+2
Ford Motor Co. of Canada, Ltd	..	560	1490	1525	+15
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	20¼	22	..
Regal Motor Car Co. pfd	23	..	21	..	..

BONDS

General Motors, notes, 6s, 1915	100	..	..	..	..
Packard Motor Car Co. 5s, 1916	..	..	98½	..	+ ¼

*Par value $10; all others $100 par value.

Mass. Headlight Report

No Discrimination in Matter of Design—Height Limit 4 Ft.—10 Ft. in Front

BOSTON, MASS., Aug. 24—At a meeting of the advisory committee selected to aid the Massachusetts Highway Commission in framing some legislation to govern motor headlights the committee today busied itself with a draft of a report its secretary wrote out following the last meeting a week ago. It was voted not to recommend any particular device to the Highway Commission, but to make a general recommendation that would allow the use of devices of various kinds so that the owner of a car need not go to a lot of expense to equip his machine, and visiting motorists would not be held up relentlessly. Members of the committee told of experiments they made with ground glass, pieces of tissue paper, and paint on bulbs and lenses showing that it would be possible to alter the rays and still give light to see the road.

One of the main points discussed was the lighting of the sides of the road. So it was voted to embody this feature in the report. Another matter discussed was the use of the searchlights that are being used now by some motorists and which may be operated to swing up, down and all around anywhere. It was voted that the regulation should cover their use to prevent their being operated promiscuously other than to find the road at night. The report was finally put into shape and all five members of the committee signed it and it was forwarded to the Highway Commission. No member of the committee is identified with any devices so their report will carry some weight.

The Report

The report drafted by the committee and those who signed it are as follows:

"We, the undersigned, comprising the advisory committee in motor headlights, in the interest of public safety recommend a regulation by the Massachusetts highway commission prohibiting the use of any headlights and searchlights which shall project their rays to a greater height than 4 ft. along level ground; and requiring such lights to illuminate the ground from 6 to 10 ft. from each side of the car at a point 10 ft. in front of the vehicle.

"From our investigations we find that to comply with such regulations will not impose a hardship upon any owner of a motor vehicle, for there are innumerable inexpensive devices available for lowering the light rays, some of which may be easily made at home in a few minutes."

J. H. MacAlman, President Boston Automobile Dealers Assn. Prof. C. E. Stewart, Franklin Institute. Dr. Herbert T. Boyd, Bay State A. A. W. G. Renwick, Massachusetts State A. A. Lawrence G. Brooks, Highway Safety League.

The report was forwarded to the Highway Commission this afternoon. The commission will put some such regulation in force, and it will become a State law so that no city or town may then pass ordinances on the subject. It will not go into effect, perhaps, until late in the fall after the touring season is over so it will not affect visiting tourists to any great extent.

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Springfield, Mo., Passes Glare Ordinance

SPRINGFIELD, MO., Aug. 20—The city council this week passed an anti-glare headlight ordinance providing penalties of a fine from $1 to $100 or jail sentence of from five to sixty days or both.

The new law provides that the uppermost ray of light from an automobile lamp must not be more than 6 ft. above the ground at a point 100 ft. or more ahead of the machine. The ordinance further provides that the center ray of light from any automobile lamp shall not deviate under any circumstances from a line parallel with the center line of the automobile. The latter clause prevents the use of revolving searchlights.

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Seattle Taxi Ordinance Wrong

OLYMPIA, WASH., Aug. 16—The Supreme Court, in a decision finds that the Superior Court of King county at Seattle, was in error when it enjoined taxicab companies from stationing cabs and soliciting passenger and baggage traffic anywhere except in a restricted area specified in a Seattle city ordinance.

The city passed the ordinance naming the streets near depots and wharves where taxis could solicit business, and resorted to wholesale arrests of drivers when taxicab companies insisted on soliciting near depots on private ground owned by transportation companies, with permission of the companies.

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100 Arrested for Headlight Glare

ST. LOUIS, MO., Aug. 20—One hundred automobile drivers and owners were arrested within a few minutes during one night here recently and were charged with violation of the new anti-glare ordinance. The first six of these to be tried in the police court were fined $6 and costs, but in each case the fine was stayed on the payment of court costs and the promise of the defendant never again to violate the ordinance.

Abbott Creditors Get Dividend

Amounts to 34% and Makes 90% Paid—10% More Coming

DETROIT, MICH., Aug. 20—Creditors of the Abbott Motor Car Co. have received a dividend of 34 per cent on their claims from the Security Trust Co., trustee. This makes a total of 90 per cent that has been paid back to the creditors, and within a short time another 10 per cent is to be distributed, making 100 per cent settlement.

This state of affairs was brought about by the Abbott company giving a mortgage in favor of its creditors. Then the Consolidated Car Co. succeeded the Abbott company and assumed this mortgage, agreeing to pay the trustee 40 per cent of its gross receipts monthly. By this method the mortgage is practically wiped out, and the Consolidated concern is said to be operating on a firm financial basis.

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Detroit Body Creditors Meet Aug. 27

DETROIT, MICH., Aug. 20—Creditors of the bankrupt Detroit Body Co. will meet on Aug. 27 to take action on the petition of the Security Trust Co., trustee, to consider certain offers of settlement made by two concerns which are creditors of the Detroit Body Co. One of these, Richard, Halstead & Quick, has instituted an attachment suit on the property of the bankrupt, but it agrees to take 50 per cent and discontinue this attachment suit. The other, the F. B. Ensley Co., for which the Union Trust Co. is acting as receiver, has agreed to take 60 per cent of its claim and release the money it has garnisheed. The Security Trust Co. recommends that the former offer be rejected and that the latter be accepted.

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Minneapolis Reduces Accidents

MINNEAPOLIS, MINN., Aug. 21—A large reduction in the number of automobile accidents has resulted since the Minneapolis Civic & Commerce Association opened its complaint bureau 2 weeks ago following nine deaths and more than 100 accidents in a single month. The postmaster has changed all mail collection boxes to the right side of the street for automobile trucks that gather the mail. W. S. Milnor, secretary of the State automobile examining board, has asked the committee for suggestions as to the main essentials applicants should master. This followed the failure of 100 prospective jitney drivers to pass the State examination. Complaints are being tabulated as a basis for this ex-

[redacted] Drivers will have to have [redacted] affixed to their licenses. [redacted] been made special officers [redacted] arrest of offenders against the [redacted]bile laws, in addition to the thirty [redacted]rs of the Automobile Club secretly [redacted] in the same capacity.

[redacted]Civic & Commerce Association has [redacted] list of Don'ts for drivers.

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[redacted]bate Checks Go Out in Order of Sales of Cars

[redacted]RT, MICH., Aug. 23—These days [redacted] Motor Co. is paying out money [redacted]ame enormous scale as it makes [redacted]en thousand of the profit sharing [redacted]re being mailed daily to all parts [redacted]ountry. At this rate the distribu- [redacted]more than 300,000 checks to buy- [redacted]ing under last season's refund [redacted]nt will be completed within [redacted]. Each check is for $50, and [redacted]going to all sorts of purchasers [redacted]rporations, small dealers, pri- [redacted]viduals are sharing alike.

[redacted]e at Once

[redacted]veral weeks now, a large force [redacted]graphers has been busily filling [redacted]names of the 300,000 on the [redacted]he amount of which is printed [redacted]face. Then they have to be [redacted]y one of the three assistant [redacted]which is a big job in itself. To [redacted]his labor, a device is used which [redacted]five checks on a sheet at one [redacted]of the pen.

[redacted]ly every case, the checks are [redacted]ued in chronological order, that [redacted]order in which the sales were [redacted]rom this it will be evident that [redacted]siderable trouble to give away [redacted]0.

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[redacted] Passenger Cars in Maryland

[redacted]NZ, MD., Aug. 21—That pas- [redacted]rs are on the increase at a [redacted]e in Maryland, is shown by [redacted]s compiled under the direction [redacted]Roe, automobile commissioner [redacted]nd. During the first 7 months [redacted]license were issued to more [redacted]total of 1914. During last [redacted]al of 18,269 licenses for pas- [redacted]rs were issued. During the [redacted]nths of this year the total [redacted]1,566.

[redacted]s for trucks are the only ones [redacted]s failed to beat out last year's [redacted]with 5 more months to go it [redacted]hough these licenses will far [redacted]r last year's total. This total [redacted]was 2940 and up to Aug. 1 of [redacted]it was 2650.

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[redacted]r Employees on Strike

[redacted]E, N. J., Aug. 20—Four hun- [redacted]fifty workers in the plant of [redacted]Motor Lighting Co., this city, [redacted]on strike.

Jitney Common Carrier in Wis.

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Placed Under Control of Utilities Board — Must File Bond and Carry Sign

MILWAUKEE, WIS., Aug. 21—Wisconsin's jitney bus law is now a law, Gov. E. L. Phillip having given his approval to Chapter 546, Laws of 1915, passed Aug. 18. The bill places jitney buses under the control and regulation of the railroad commission of Wisconsin, commonly known as the State public utilities board.

The act provides that every firm, person or corporation operating any motor vehicle for hire and affording a means of local, street or highway transportation similar to that afforded by street railways is declared to be a common carrier, and is required to furnish adequate service at reasonable rates and to operate over such general routes or within such territory, and during such hours as may be reasonably required for the accommodation of the public.

In brief, the act requires that every person, firm or corporation operating any motor vehicle for the purposes above described, must file with the railway commission an indemnity bond issued by some authorized surety or indemnity company providing direct liability for all damages, not exceeding $2,500 for any one person or $5,000 for any one accident that may be recovered against the operator of such vehicle. If any such bond so filed shall become inoperative, such vehicle shall not be operated until a bond meeting the requirements shall have been filed.

The bond is to be accompanied by an application for acceptance by the railroad commission, stating the name and residence of the applicant, the general route, or the territory over which it is proposed to operate the motor vehicle described in the bond, the proposed hours of such operation, and the rate of fare to be charged for carriage therein. The commission is to determine if the route, territory, hours of operation, character of service and the rates are reasonable and adequate.

The commission is required to issue certificates and the holder must plainly mark his vehicle with the words, "Bonded Carrier" in letters not less than 2 in. high and lines not less than ¼ in. wide, followed by the number of the certificate. The mark may either be painted on the sides of the vehicle or fastened securely in a conspicuous place on the sides.

Carrying Capacity Limited

The law prohibits any such vehicle from transporting a larger number of passengers than the number specified in the bond as the carrying capacity. Every city, village or township within or through which any such vehicle may be operated is permitted to require local consent for its operation, and as a condition of such consent it may be required that operators pay a reasonable compensation for the repair and maintenance of pavements and bridges; compensation for the regulation of street traffic or any other expense occasioned by the operation of such vehicle.

The law provides a fine of not less than $10 nor more than $100, or a county jail sentence of not less than 10 days nor more than 90 days for violation of the act.

The Independent Jitney Bus Assn. of Milwaukee, the largest and strongest organization of jitney operators, has accepted the new law and will work under its provisions at once without protest.

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Thompson Jitney Law Upheld

LOCKPORT, N. Y., Aug. 21—The Thompson jitney law has been upheld in this city by Justice C. H. Brown, of the Supreme Court, who has granted the Public Service Commission an injunction restraining the Lockport-Olcott Motor Bus Line from operation until it obtains a certificate of necessity from the State body and a license from the city of Lockport.

The court holds that the motor bus line is a common carrier for hire within the city limits and is thus amenable to the statute.

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N. D. Registrations Number 23,175

BISMARCK, N. D., Aug. 21—In the State of North Dakota more than $20,000,000 is invested in automobiles. Up to July 31, 1915, State Secretary Thomas Hall reported 23,175 cars registered, with expectation of 1000 more before the end of the calendar year.

As compared with the same period in 1914, the gain in automobiles registered is 6433. Fees received from automobile registration this year to date are $69,525. Last year the amount was $53,793.

In 1914, after July 31, only 605 cars were registered, but the outlook for 1915 is much better. The population of the State is estimated at 625,000, or there is one car for every twenty-six persons.

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Deaf Mute Cannot Drive in New Jersey

TRENTON, N. J., Aug. 20—A precedent has been established by the New Jersey Department of Motor Vehicles, which has revoked the driver's license of C. H. Over, Jr., of Asbury Park, a deaf mute. The ruling states that a deaf mute is not competent to operate an automobile. The use of special mirrors mounted on each side of the windshield of his car, so that he could see cars approaching from the rear on either side, was not sufficient.

35 Cars on Wisconsin 5-Day Tour

Business Replaces Competitive Feature — Schedule Calls for 22 M. P. H.

MILWAUKEE, WIS., Aug. 23—The 5-day sociability and business tour of the Milwaukee Automobile Dealers, Inc., started from the Hotel Wisconsin at 8 o'clock this morning. Twenty-five cars, including pilot, pacemaker and relief cars, were checked out on schedule time, and at least ten more cars are starting from Milwaukee to-day and to-morrow to join the tourists along the route.

As reported in THE AUTOMOBILE last week, the principal reason for the tour is to boost the annual Wisconsin State Fair, to be held at West Allis, Milwaukee, from Sept. 13 to 17, inclusive. Another reason is that no annual State reliability tour is being held this year, as for 5 years past, and the dealers require some fitting substitute to fill the gap. A third reason is that this is the psychological moment for stirring up and stimulating interest in the 1916 car of America, now out and ready for delivery.

The tour takes in the route traveled during the 1913 reliability tour of the Wisconsin State Automobile Association. The schedule is fast and averages about 22 m.p.h., allowing a maximum of ½ hr. at important points for the inspection of the cars by townspeople. At luncheon stops and night controls more time is given for this purpose. There is no competitive feature, and the tour is for show purposes only.

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Rector Marmon Distributor in Northern California—Parker in Washington

INDIANAPOLIS, IND., Aug. 21—The H. B. Rector Co. has contracted to handle the Marmon exclusively in San Francisco and in the northern California territory. The agency for the Marmon car was formerly held by Walter C. Morris. Mr. Rector, the head of the new company, was sales manager for the Pierce-Arrow Pacific Sales Co. for several years.

A contract has also been closed with the Parker Motor Car Co. of Seattle as dealer for the Marmon in the State of Washington. The Parker company has been agent for the Pullman for several years.

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Denver Co. to Distribute Hupp and Locomobile

DENVER, COL., Aug. 20—The Hupp Motor Sales Co., a $60,000 corporation, has been organized by W. R. Woods, P. E. Chamberlain and F. E. Simonton, Denver, to distribute the Hupmobile in Colorado and adjacent Rocky Mountain territory. They have opened temporary quarters at 220 Sixteenth Street, and are erecting a new building at 1260 Broadway. Belmont Walters, for some time traveling representative of the Hupp Motor Car Co., Detroit, is now employed by the new distributing agency to cover Colorado and a part of New Mexico and Wyoming. The new firm has also secured the agency for the Locomobile, which had not been represented in this territory for about 3 years.

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Trying to Unionize Boston Repair Shops

BOSTON, MASS., Aug. 21—The labor officials are making a determined effort to unionize all the motor repair shops in Boston. For some time the organizers have been working quietly and they have succeeded in getting a number of places unionized. Other shops are partly so. The only demand they have made so far is for an 8 hr. day.

Some of the dealers have held out, however, and they intend to keep an open shop if possible. But the labor men are working along outside lines to accomplish their ends. In the case of one big distributor who sells cars and trucks and who refused to bother with the union, the officials went to some of the big concerns that bought his trucks. One of these was a brewery, and the beer people were told that they had better install their own repair shop and have it run under union conditions. This was done. Then they found a shop that was unionized, and to other owners of trucks whose employees were unionized, they sent word to have the repairs made at the union shop. So the service station of the dealer has been losing the repair trade on the trucks right along. This plan is being followed with other concerns.

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Needham Tire Co. Busy

NEEDHAM, MASS., Aug 22—At the plant of the Needham Tire Co. the men are now working 16 hr. a day and plans are under way to make it a two-shift force. The company has had to install new machinery and the orders have been piling in so fast that the makers are working hard to catch up.

The company has been in existence about a year, but it has thrived so that plans have been made to erect a new four-story structure addition, and capital is available now for increasing the facilities to any extent that the officials desire.

Skilled workmen were hard to secure, and the factory officials decided to develop its own men and apprentices. In this way the plant has grown, and now an additional 1000 miles is being added to the guarantee.

Plan Boston Dealers' Syndicate

To Finance Dealers and Store Cars Pending Delivery to Purchasers

BOSTON, MASS., Aug. 23—Plans are under way to form a syndicate in Boston that will finance motor car dealers and store their cars pending the delivery of them to purchasers. W. J. McDonald, who is a real estate operator, is forming the syndicate, and the first move was to purchase property in Boston containing 275,000 sq. ft. It backs up on the Boston & Albany railroad. The plans call for the construction of an immense building with some 200,000 sq. ft. of floor space, and which will be capable of accommodating 1000 cars. It will be one-story, with plans for additional stories if needed later.

Spur tracks and loading platforms will be put in so that cars may be run right in from the freight trains and stored there. On their receipt the agents will be notified and then they may borrow money on the cars to finance their deals instead of going to banks. The warehouse will be fireproof and thoroughly modern. The syndicate will have a capitalization of $500,000.

At present some of the dealers are paying high rent for storage in buildings far removed from their plants, and this method will allow some of them to get along with less space in their regular headquarters, the space thus vacant being available for salesrooms or service departments. The location of the new warehouse is convenient, for it is not far from the big service station of the Packard, which marks the Western boundary of the motor district on Commonwealth Avenue. Full particulars have not been given out yet by Mr. McDonald, but it is expected that the plans will all be made public shortly. Stock in the enterprise may be offered to some of the dealers.

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Robertson Not to Enter Racing Field

NEW YORK CITY, Aug. 20—A report that George Robertson was to return to the automobile racing field, and was entered in the coming meet at Sheepshead Bay, is without any foundation.

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Newark Show in February

NEWARK, N. J., Aug. 21—This city is to have a show some time in February, probably shortly following the New York show. It will be staged under auspices of the New Jersey Automobile Trade Assn. in connection with the municipal committees arranging for the festivities planned for the 250th anniversary of the

ding of the city. The location of the has not been decided as yet, but e is a possibility of the erection of pecial building for exhibition pur-, which would serve for the holding the automobile show. Later, the ing would be occupied by the "Made ewark" association, and exhibits of factories, business organizations ures.

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Studebaker Branch Has Special Service for M. D.'s.

, MICH., Aug. 23—Recogniz- seriousness of having his car , the doctor who runs a Stude- ar in this city is to be insured any trouble with his own car by debaker branch here. In the y member of the medical profes- drives a Studebaker meets with ent or has his car disabled or out mission, the new service policy been inaugurated provides that within a radius of 25 miles of it will be only necessary for to notify the service station, car will be taken there for at- and during the time it is there, will be given the use of

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Gasoline Day in Halifax

, N. S., Aug. 20—C. L. New- ited, 16-22 Argyle Street, Hali- S., recently inaugurated what ed as Free Gasoline Day. It ded as follows: One day each gasoline sold by them was ab- given away. A sales slip was y purchaser of gasoline each ought gas, showing the amount chase. A duplicate was kept pany. On the first day of the week it was decided which day be free on the past week and to each customer the amount on that date.

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Crumley King Distributor

, MICH., Aug. 20—A. A. formerly factory sales repre- for the Hudson Motor Car Co. , lately factory representative Motor Car Co. in the same has formed the A. A. Crum- Inc., and will locate at Wood- Warren Avenues, Detroit, will be King distributor for

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Holds Annual Outing

, MICH., Aug. 21—The King Co., this city, held its annual ing when it entertained in sentatives of its parts makers ers. About 160 gathered at before the thirty cars started ing.

Fifteen Entries for Twin City

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Speedway Practically Completed—Race May Begin at 1 P.M. —Denver Tour Postponed

MINNEAPOLIS, MINN., Aug. 21—With the Twin City Speedway practically completed, interest in the preliminary trials, Aug. 28, 30 and 31, is aroused. A nominal fee is to be charged spectators. A circuit of the 2-mile concrete track at a speed of 80 m.p.h. is necessary for entry in the 500-mile World's Derby on Sept. 4. The request that the race begin at 1 p. m. instead of 10 a. m. for the benefit of tradespeople and office clerks is being considered.

Entries to Aug. 21 were:

Car	Driver
Ogren	Tom Alley
Sebring	O. F. Haibe
Duesenberg	Ed. O'Donnell
Duesenberg	Pete Henderson
Duesenberg	Billy Chandler
Stutz	Earl Cooper
Stutz	Gil Anderson
Peugeot	D. Resta
Peugeot	Ralph Mulford
Peugeot	Robert Burman
Peugeot	John Aitkin
Peugeot	Howard Wilcox
Delage	Barney Oldfield
DuChesneau	W. W. Brown
Mercedes	De Palma

Three F. R. P. cars are expected, also Sunbeam team.

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Denver Reliability Tour Postponed 1 Day

DENVER, COL., Aug. 20—The 860-mile reliability and economy tour scheduled to start from Denver through the mountains Sept. 6, has been postponed to start a day later. The change has been decided upon because of several Labor Day events thought liable to interfere with entries for the run. The tour will cover 6 days, with noon and night controls at Hot Sulphur Springs, Steamboat Springs, Meeker, Glenwood Springs, Grand Junction, Montrose, Gunnison, Salida, Canon City, Pueblo and Colorado Springs.

The official sanction of the American Automobile Association has been secured, and the contest will be conducted according to the regular A. A. A. rules, with necessary modifications to admit a wider range of cars than would come under the strictly stock-car requirements.

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Three Mercers for Corona

CORONA, CAL., Aug. 18—The Corona road race is to be held Nov. 20. This decision was reached at the final mass meeting held at Corona Monday night.

The committee appointed to raise the money to finance the race reported that all the stock had been sold with purchasers anxious to secure more than they had been allowed to buy.

were appointed and instructed to incorporate the new racing organization.

Three Mercers were entered as soon as it was announced that there would be a race. G. R. Bentel of Los Angeles, entrant of the cars, announced that Eddie Pullen, winner of the last Corona race would be on hand to defend his title at the wheel of a Mercer.

It was suggested at the meeting that the race be stretched to 400 miles but the project was not well received and while the committee has the right to lengthen the course, it is at present assured that the 1915 Corona classic will be a 300-mile event.

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Fisher Resigns from Sheepshead Bay Corporation—Harkness His Successor

NEW YORK CITY, Aug. 24—Carl G. Fisher, president of the Indianapolis Motor Speedway and of the Sheepshead Bay Speedway, has resigned as head of the Sheepshead speedway and H. S. Harkness, prominent in the early racing days, has succeeded him. Mr. Harkness will be remembered for his record drive on July 12, 1904, up Mount Washington, N. H., in a Mercedes, when he negotiated the 8-mile hill in 24:37 3/5.

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Three Duesenbergs for Narragansett

NARRAGANSETT, R. I., Aug. 19—Eddie O'Donnell, Willie Haupt and Peter Henderson, all driving Duesenbergs, are entered in the 100-mile race to be held on the opening event of the new Narragansett Park Speedway, Sept. 18. A Bugatti, owned by C. W. Fuller of Pawtucket, is the other entrant. It will probably be driven by George Hill.

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2-Day Race Meet for Spokane

SPOKANE, WASH., Aug. 16—The Spokane Interstate Fair has set aside 2 days Sept. 13 and 14 for automobile racing on the fair grounds. The purses offered are $1,000 a day to be divided into two classes. One purse each day of $600 will go to professional drivers, and $300 each day will go to local drivers and the balance or $100 each day will go to the winners of feature events.

Jim Parsons in his Parsons Special, Frank Elliott in a Gordon Special, Fred Barsby and F. Stratton are entered.

The race will be run under the sanction of the newly organized Inland Automobile Assn.

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1916 Kellogg Pump Design Unchanged

ROCHESTER, N. Y., Aug. 20—The Kellogg Manufacturing Co. of Rochester, N. Y., announces that its different models of Engine Driven Tire Pumps will be continued in their original design for 1916. The bearings in the new pumps will be lined with babbit, bronze having been used in the past.

The Kellogg company is building an

Cleveland Ford Buys Land—The Cleveland Ford Tire Co., Cleveland, Ohio, has purchased 4 acres of land at Ashtabula along the New York Central Railroad, foot of Benefit Street.

Parts Concerns Not Affiliated—The Auto Parts Co. of Chicago announces that it has no branch houses and is not affiliated with any firm in the United States using the same name.

Simplex Adds—The Simplex Automobile Co., New Brunswick, N. J., has awarded contracts for the construction of a two-story, 70 by 100 ft. addition to its plant. The estimated cost is $20,000.

McClurg Rubber Plant to Work—E. A. Crawford has been discharged as receiver of the McClurg Rubber Co., Coshocton, Ohio. The company is installing equipment and plans to start its plant within a very short time.

Rush Delivery Leases Plant—The Rush Delivery Car Co., Inc., Philadelphia, Pa., has leased the recently constructed four-story and basement building at 1007 North Front Street for the manufacture of commercial vehicles.

Firestone Issues House Organ—The Firestone Tire & Rubber Co., Akron, Ohio, has begun the publication of a new house organ, *The Firestone*. It is intended for circulation among all employees and includes the many branches throughout the country.

Touraine to Add—The Touraine Company, Broad and Huntingdon Streets, Philadelphia, Pa., manufacturer of the Vim truck, has had plans prepared for a factory building 85 by 250 ft. to be erected at the northeast corner of Twentieth Street and Montgomery Avenue.

Duff Extending—The Duff Mfg. Co., Pittsburgh, Pa., manufacturer of the Barrett lifting jack, is building an extension to the main plant, 150 by 125 ft. With the addition the main building will be 625 ft. in length and 125 ft. in width. All equipment has been furnished and is being equipped.

To Rebuild Howard Rim Plant—Plans are already under way to rebuild the plant of the Howard Demountable Rim Co. of Trenton, N. J., which was completely destroyed by fire on Wednesday of last week. It is proposed to enlarge the plant and to make the new building fireproof throughout. It is planned to resume operations in the new plant within ninety days.

Mogul Truck Builds—Increased orders have caused the Mogul Motor Truck Co., St. Louis, Mo., to erect a large assembling plant on Forest Park Boulevard, west of Sarah Street. This building will be a modern daylight factory, with every known modern appliance to facilitate the rapid assembling of motor trucks. This company has purchased enough ground west of this new building to enable it to erect an addition for storage and repairs, which it contemplates building in the near future.

Studebaker's Enameling Plant Progressing—The Studebaker Corp., Detroit, is soon to occupy its new building being erected for the enameling and stamping departments. This is a structure 320 ft. long by 70 ft. wide and four stories high. It is to be known as Plant 27, and adjoins the Plant 3 group of buildings. The most modern type of quantity enameling apparatus is being installed. Air in the enameling room is to be washed and the walls are to be specially prepared to catch any dust or dirt in the air. A large bank of enameling ovens will take care of the drying of the dipped metal parts.

Hartford Machine Screw Adds—Additions to the plant of the Hartford Machine Screw Co., Hartford, Conn., are rapidly nearing completion. In May several old buildings, including the offices, were torn down to make room for two spacious new buildings—one a six-story structure, 206 ft. long by 465 ft. wide, and the other a large two-story building with a convenient railroad siding which improves shipping facilities considerably. These two new buildings will give a total increase in floor space of about 80,000 sq. ft. In addition to housing the new general offices of the company, designs for furnishing of which contemplate the most modern and approved equipment and efficiency devices, the new buildings will afford space for extensive additions to the manufacturing facilities of the plant. It is expected that the new buildings will be completely occupied and running to full capacity by the first of September.

The Automobile Calendar

Aug. 23-28	Milwaukee, Wis., Wisconsin Reliability Tour.
Aug. 26	Ventura, Cal., Show.
Aug. 30	Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept.	Peoria, Ill., Second Northwestern Road Congress.
Sept. 4	Twin City, Minn., 500-Mile Race; Twin City Motor Speedway Co.
Sept. 6-9	Worcester, Mass., Show, Dealers' Assn.
Sept. 6-10	Indianapolis, Ind., Show, Indiana State Fair.
Sept. 6-15	Detroit, Mich., Show, Michigan State Fair.
Sept. 8-11	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13-17	Milwaukee, Wis., Show, Automobile Dealers' Assn.
Sept. 13-17	Oakland, Cal., Pan-American Road Congress.
Sept. 17-18	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18	Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Sept. 18-25	Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Sept. 24	Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 27-Oct. 10	Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Oct.	Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct.	Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2	New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 2	Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9	Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 3-10	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6	Columbus, O., Garage Owners Convention.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9	Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14	Chicago, S. A. E. Standards Committee Meeting.
Oct. 16	Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 18-19	Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Nov. 1-3	Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18	Arizona 150-mile Grand Prix.
Nov. 20	Corona, Cal., Road Race.
Nov. 29-Dec. 4	Electric Prosperity Week.
Dec. 31	New York City, Show; Grand Central Palace.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

McGonigal Office Mgr.—S. A. McGonigal has been appointed office manager of the Studebaker Corp., Detroit, Mich.

Retzel Assistant Manager—D. H. Retzel closely associated for some time with the Mott Wheel Works at Utica, N. Y., in an advertising and sales way, has been appointed assistant manager of the works.

Boyd Baltimore Mgr.—F. M. Boyd has been made manager of the Tire Mart, Baltimore, Md., recently opened at 1419 North Charles Street. Mr. Boyd was formerly with the Knight Tire Co. as sales manager. E. C. Heid will succeed him.

Baker, Ford Dealer, Resigns—The oldest dealer in point of service with the Ford Motor Co., Detroit, Mich., L. C. Baker, head of the Ford agency at Jacksonville, Fla., has retired. The agency will be converted into a branch under the management of F. P. Fariss of Atlanta.

Hayden Resigns—Don Hayden has resigned as district manager for the Saxon Motor Co. and joined the Higgins-Sutherland Motor Co., Indianapolis, Ind. This company was recently organized to handle the Hupmobile and Saxon cars, having forty counties on each car in the central part of the State.

Dealer Seattle Chevrolet Dealer—Frank Dulmage, until recently a prominent automobile distributor of Portland, Ore., has established the Northwest headquarters for the Chevrolet car at Seattle and opened sales rooms at 1400 Broadway. His contract calls for the distribution of 1500 of the Chevrolet cars in the Northwest this season.

Velie Export Heads K. C. Velie—E. D. Export is president of the recently formed Velie Motor Co. of Kansas City, which succeeded the Velie-Thorp Motor Co. The latter company has become the Thorp Motor Co. and continues at the previous location at 1506 McGee St. The Velie Motor Co. of Kansas City is establishing itself at 1616 McGee St.

Spokane Ford Dealer—H. O. Bell, who has been identified with the automobile business in Spokane for the past 9 years, formerly wholesale manager for F. Graves, Ford agent in Spokane, has secured the Ford agency for Missoula, Mont., and contracted to dispose of 300 cars for 1915 and 1916. Mr. Bell originally from Indianapolis, where he entered the automobile business under C. L. Fisher.

Motor Men in New Roles

Forbes Resigns—T. C. P. Forbes, who has been sales manager of the Monarch Motor Car Co., Detroit, has resigned that position.

Romig Kearns Sales Mgr.—Reide Romig has been appointed general sales manager of the Kearns Motor Truck Co., Beavertown, Pa.

Hines Is New Pres.—H. J. Hines is the new president of the Toledo Machine & Tool Co., Toledo, Ohio. He has been general maanger for many years.

Folger Marathon Tire Rep.—C. M. Folger has been appointed Southeastern representative of the Marathon Tire & Rubber Company, with headquarters at Atlanta, Ga., and will travel that section.

Stokes Goes to Boston—W. S. Stokes, formerly identified with one of the big advertising agencies in Chicago, has gone to Boston, Mass., to join the sales force of the Oakland Motor Car Co. and have charge of the retail sales.

Bell King Sales Mgr.—Kenneth Bell, who was formerly with the Pasadena Studebaker agency and later with the Love Motor Car Co., Washington, D. C., has been appointed sales manager of the Grace Motor Car Co., Pasadena, Cal., agent for the King line.

Blakeslee Heads Midgley Agency—The Midgley Tire & Rubber Co. of Lancaster, Ohio, has closed with the Crescent Automobile Co. of Jersey City to represent it in the northern half of New Jersey. George Blakeslee is head of the Crescent Automobile Co.

Holton Farmack Sales Mgr.—Hoover Holton, connected with the sales department of the Briggs-Detroiter Co., Detroit, and prior to that sales manager of the Monarch Motor Car Co., has taken the position of general sales manager of the Farmack Motor Co., Chicago.

Newell St. Louis Sun Agent—J. E. Newell, of the Motor Car Co. bearing his name in St. Louis, will direct the sales campaign of the recently organized Sun Motor Car Co., Buffalo, N. Y., in Arkansas, Mississippi, Louisiana, southern Illinois, eastern Missouri and parts of Indiana, Kentucky and Tennessee.

White Detroiter Rep.—A. F. White of New York City, has been appointed Far Eastern representative for the Detroiter. His territory includes Burma and Ceylon, India, Federated Malay States, Strait Settlements, China, Japan and Philippine Islands. Mr. White has direct representation at all points named.

Hough Makes Change—P. R. Hough, formerly assistant manager of the Ford Motor Co.'s branch assembling plant at Denver, Col., has gone into partnership with H. E. Maines, Chevrolet and Monroe distributor. The new firm, under the name of the Maines-Hough Motor Co., is located at 439 Broadway.

Schreiber Resigns—A. O. Schreiber, who has been connected with the Saxon Motor Co. for the past year in the capacity of district representative for the state of Ohio, has resigned from that company to assume the management of the Loveland Co., Seventeenth and Euclid Avenue, Cleveland, which handles the Saxon exclusively.

Rose Heads Frisco Chalmers—L. H. Rose, formerly serving in the capacity of district and coast representative for the Studebaker, Maxwell and Lozier factories, has recently re-entered the automobile trade in the West, taking charge of the northern California distributing agency for the Chalmers car, with headquarters in San Francisco.

Fillmore Pasadena Ford Mgr.—E. M. Fillmore, formerly traveling representative of the Los Angeles Ford branch, has been placed in charge of the newly opened Pasadena branch of the Ford company. C. D. Tucker has been appointed assistant manager to have charge of the sales department. There are to be twenty-five men employed by the new branch, which is the largest automobile house in Pasadena.

Dornfeld Making Engine—J. F. Dornfeld, president of the defunct Dornfeld-Kunert Iron Works, Watertown, Wis., has purchased the assets and organized as the Dornfeld Iron Works. The company will make a specialty of extras and repairs on automobiles and has established a well-equipped department for this purpose. A foundry and machine shop is being conducted and the concern is manufacturing gas engines and gas producers.

Crockett Hardman Tire Sales Mgr.—W. A. Crockett has been named as sales manager for the Hardman Tire & Rubber Co., Bellville, N. J. For some time Mr. Crockett has been in charge of the Baltimore branch of the Hardman factory for some time, and before coming there was responsible for the placing of a number of Hardman branches around the country. He assumed his new duties the latter part of the week. The Baltimore branch of the firm is now in charge of C. B. Brooks, who has been assistant manager to Mr. Crockett.

Auction Sales in Montreal—Pearce & Lakser have opened up automobile auction rooms in Montreal, where they purpose holding weekly sales.

Dunlop Co. Adds — Sayer & Ford, Vancouver, B. C., distributors of the Dunlop Tire Co., have enlarged their premises, acquiring an extra store recently vacated by the B. & B. Automobile Co.

Vancouver Co. Moves—N. L. Tullis, of the Wood-Milne agency, is removing from 851 Pender Street West to nearer Granville Street, Vancouver, B. C., where he will have more commodious quarters.

Gets Large Territory—The Wentworth-Fosdick Co., that has just taken the wholesale distribution of the Dort, has part of Maine, southern New Hampshire and Vermont, Massachusetts, Rhode Island and Connecticut for its territory.

Ajax Branch in Spokane—R. W. Hoerner and J. R. Jones have established an Ajax tire factory branch in Spokane, Wash. Contracts closed by the Ajax company on the Pacific Coast this year are 135 per cent in advance of last year.

Takes the Rauch & Lang—W. S. Jameson, who has been identified with the Peerless sales force in Boston, Mass., for some years, has taken the Rauch & Lang electric line for New England, with salesrooms at 618 Commonwealth Avenue, Boston.

Savannah Supply Co. Opens New Department—An up-to-date automobile department has been put in operation by the Georgia Supply Co. at 14-16 West State Street, Savannah. The new department will be under the management of W. S. Blun, assisted by Mr. Hockley M. Garmany.

Porterville Garage Moved—The Central Garage, Porterville, Cal., formerly located on Second Street, has moved into the newly erected Smith building. The proprietors, Messrs. Eckard and Niles, have extended their factory connections also. They now have the agencies for the Paige, Overland and Ford lines.

Topeka Tire Co. Moves—The equipment Tire Co., Robbins Bros., proprietors, has moved from its location at 117 East Seventh Street to 930 Kansas Avenue, Topeka, Kan., where it has increased its equipment, and now has an up-to-date vulcanizing tire repair shop with free tire oil and gasoline service; the free gasoline service is within 5 miles of the city and the free tire is within 10 miles of the city.

Los Angeles Firestone Adds—In order to secure greater storage capacity, the Los Angeles, Cal., branch of the Firestone Tire & Rubber Co. has leased the room adjoining its location at 1239 South Olive Street with the second floor and basement. The Firestone branch will acquire 5000 additional feet of floor space. The local branch receives at least three carloads of tires from the factory at Akron weekly and storage room is required for from 9000 to 10,000 tires.

New Garage Co. in Winnipeg — The Great West Motor Co., Winnipeg, has been organized for the purpose of taking over the business of the Canadian Motor Co. which has gone into voluntary liquidation. The new company has leased the two garages controlled by the Canadian Motor Co., and will conduct a general garage and repair business but will handle no car agencies. The capital stock of the Great West Motor Co. is $50,000 and the concern will be under the management of H. De Cew.

Announces a Motor Street Cleaner—The Kindling Machinery Co., Milwaukee, Wis., manufacturing a line of horse-drawn street cleaning, sprinkling and washing machines, has brought out a motor-driven washer which is being tested by the street department of the City of Milwaukee. In a recent test one machine cleaned 110,000 square yards of asphalt pavement in an 8-hour run. The machine resembles a conventional motor truck type, the body platform being occupied by a large steel tank. Water is sprayed at the front end and just in front of the rear axle there is a revolving rubber blade roller which scrubs the pavement.

Recent Minnesota Garage Changes—a garage at Wentworth Street and St. Anthony Avenue, Midway, in which to store twenty-eight cars. The building is 80 by 88 ft., one story and brick. The Motor Transfer Co., 137 Eleventh Street, St. Paul, will occupy a new $65,000 garage at Temperance and Grove Streets, on Sept. 15. M. J. O'Connor is erecting a one-story garage at 138 Fourteenth Street for the Michaud Transfer Co., Seventh and Wabasha Streets, St. Paul. W. L. Harris, W. L. Harris Realty Co., Marquette Avenue and Sixth Street, Minneapolis, is erecting a public garage at 912-914 Third Avenue S., to cost $15,000. It is one story and brick. Simon Kruse, Hotel Radisson Co., Minneapolis, is erecting a garage adjoining the building at Second Avenue South and Seventh Street. It will be two stories. The Mutual Auto Co., 313-319 West First Street, Duluth, will occupy a new garage, Oct. 1, at Superior Street and Third Avenue East. The garage will have 5000 sq. ft. of space more than in the old quarters. President E. J. Filiatrault expects to have a Ford assembling plant there in twelve months.

Trade News from Denver—G. E. Hannan, 1210 Broadway, Denver, Col., distribtuor of the Crescent, Allen and Vulcan cars, has dropped the last two and taken on the Pullman to handle along with the Crescent. L. G. Palmer, 1515 Cheyenne Place, Denver, has taken over the business of the Western Mo Car Co., of which he was president, a is now distributor for the Paige clusively, having given up the Abb Detroit and the Willys and Garf trucks.

The Platt-Fawcett Motor Co., 1 Broadway, Denver, has dropped Chalmers and is now distributing Stearns and Mitchell. This is the f time the Stearns has been represente this territory for a year or more. H Maines, distributor for the Chevrolet Monroe, has moved from 1811 Glen Place, Denver, Col., to 439 Broadv where he has larger quarters. The change Auto Co., which recently op a used car and garage business at Broadway, Denver, reports a substa business in used cars. Warriner & C ran, agents for the Maxwell at Den have moved from 1624 Broadway to new Maxwell branch headquarters 1248 Broadway.

J. H. Callahan & Co., have open Cleveland Spring Cranker agency 1616 Broadway, Denver, Col. One m ber of the new firm is Bert Clark, merly agent for the Boston Starter Co. L. E. Kelton, forr Haynes salesman for E. J. Johnson secured the Haynes agency for Colo and has opened temporary headqua at 1616 Broadway, Denver. The West Auto Sales Co., Colorado dist tors for the King, Jackson and F have moved from 220 Sixteenth S to 1512 Broadway, Denver. A. W. F formerly manager of the Denver b of the Underwood Typewriter Co., new manager of the Colorado Moto Co., 1512 Broadway, Denver, distrit of the Reo, Saxon and Cole. Mr. recently made a record drive o miles over the mountains from D to Glenwood Springs by way of Col Springs, Ute Pass, Buena Vista, ville and Tennessee Pass in 11 hou 50 minutes in an eight-cylinder Col averaged more than 15 miles per of gasoline. Bert Clark and W. H. have formed a partnership to han Chevrolet on a sub-agency bas Denver, and have located at 1616 way. The Regal Sales Co. is the of a new partnership formed by Tibbals and C. E. Anderson as th ver local agency for the Regal, J and King. The Overland Auto C been doing a lively business since into its new quarters at 1200 Bro Denver, and reports the outlook able for selling 1000 or more cars Rocky Mountain territory duri 1916 season. The 1915 sales went the 600 mark, as against a littl than 300 for 1914. The Aut Sales Corp., Studebaker and F distributors, have moved fror Broadway, Denver, into new an quarters at 1504 Cheyenne Place care of increased business.

Marsh Co. Formed—The H. C. Marsh ...les Co. has been formed in Pontiac, ...ich., by H. C. and W. A. Marsh to sell ...omobiles and accessories.

...llard Branch in Toledo—A new ...ch of the Willard Storage Battery ...has been opened at 2027 Euclid Ave-..., Toledo. C. H. Rempes is manager.

...tle Chandler Moves—The North-... Motor Car Co., Seattle Chandler ..., has moved into new and more ...cious quarters at 1708 Broadway.

...kle Tire Co. Moves—The Hinkle ... Rubber Co., Columbus, Ohio, dis-...or for the Mohawk tires, has moved ... 1... East Gay Street into larger ...s at 179 East Gay Street.

... Chalmers Station in Newark—...almers Motor Co., Newark, N. J., ...arded the contract for the con-... of a new automobile station ...vice department on Broad street.

...and Co. in New Quarters—The ... Motor Co., Cleveland, O., is now ... quarters at 1844 Euclid avenue. ...pany handles the Lozier and ...nd is planning to take on the

... Dealer Moves—The Wilson ...Co., dealer in Maxwell and ...ars, 1014 Morton Street, Balti-..., will move to 605 West North ... T. W. Wilson, Jr., is head of

...altimore Battery Agent—The ...rcar Co., Cathedral and Chase ...altimore, has become the serv-...ales station for Philadelphia ...battery.

...neapolis Cadillac Building—...thwestern Cadillac Co. has ... ft. of frontage at 23 Ninth ..., Minneapolis, for a new build-... business. The building will ...ry concrete.

...os Angeles Tire Firm—J. S. ... John Boss have opened a tire ... vulcanizing plant at 723 ...e Street, Los Angeles, Cal. ... is to do business under the ... & Wiese.

...rt in Baltimore—The Tire ... North Charles Street, Balti-..., has opened. F. M. Boyd, ...me time has been connected ...les force of the Lambert Au-... Co., has become the manager.

...achine to Add—The Gisholt ..., Madison, Wis., one of the ...ufacturers of turret lathes, ..., etc., in the Middle West, ... new steel buildings, a ma-... by 112 ft., and a store-... 112 ft.

... Accessory Co. Changes—... Flemming, San Diego, Cal., ... over the San Diego County ... the complete accessory, tire ... carried by the Weinstock-Nichols Co., one of the largest accessory concerns on the Pacific Coast.

To Make Ford Steering Device—W. J. Laughlin, a Beloit inventor, is establishing a small shop for the manufacture of auxiliary steering devices for Ford and other cars. It will be known as the Steerautomat and is a malleable iron appliance connected to the front axle, holding the wheels in a straight line.

Want to Handle Another Car—Potter & McCormick, Pomona, Cal., Chandler agents, have moved into their new building on South Thomas Street. The firm is now handling the Chandler exclusively but it has been announced that the company is looking for the agency of a car which will not conflict with the Chandler, a car selling for less than $1,000 factory.

Repairs Worn Shoes—The Lockstitch Double Tread Tire Co., 1840 E. 13th street, Cleveland, O., is repairing worn and unserviceable shoes. The process consists of the combining of two used casings into one thoroughly serviceable casing. Blow-outs and puncture holes, also small breaks, are first repaired. One casing is then lockstitched on top of the other by means of a double or triple row of stitching around the entire circumference.

Milwaukee Co. Moves—The Schreiber-Boorse Motor Car Co., National and Chandler agent at Milwaukee, and located at 180 Fifth Street for nearly ten years, will move to the east side, into the heart of the new car and supply district that has been developed in the last 3 or 4 years. A large two-story garage building will be erected on Oneida Street near Jackson Street, at once. It will be of steel and concrete slab construction, 68 by 120 ft. in size.

New Louisville Openings—J. B. Kennedy Co. has opened a garage and repair shop at the corner of Jackson Street and Broadway, Louisville, Ky. Frazier & Miller have opened a tire and car repair shop at 601 E. Broadway. The company also carries a complete line of accessories. The Southern Motors Co., 615 South Third Street, which handles the Dodge, Hudson and Packard pleasure cars and the Detroit electric, has opened its electric garage department. It is equipped to handle fifty cars.

Changes in Arizona Overland—An important change has been made in the Huntsman-Hotchkiss Overland Co., Arizona, distributing agents for all the Willys cars. H. H. Hotchkiss, who has heretofore managed the Tucson office of the company, has assumed charge of the office and salesroom in Phoenix. D. B. Hutchins, former manager here, has become agent for the county of Cochise, which includes the cities of Douglas and Bisbee. Northern Arizona will offer an especially attractive field for the automobile salesman next fall, according to Mr. Hutchins, who has just returned from a 1000-mile trip through that section. Heavy summer rains have fallen and abundant range feed is assured. This means that the cattlemen and sheepmen will have plenty of money. In the course of his northern trip Hutchins appointed sub-agencies as follows: Williams, Davenport & Kirkpatrick; Flagstaff, Flagstaff Overland Company; Winslow, Winslow Overland Co.; Holbrook, Smith Overland Co.

Hercules Sales Co. Moves.—The Hercules Sales Co., Louisville, Ky., which controls the selling rights for the Hercules car, has moved its offices from the Starks Building to the plant of the Kentucky Wagon Manufacturing Co., where the Hercules is now being manufactured. The output at present is ten cars a day. A. B. Challinor has been appointed sales manager of the Hercules Sales Co., Louisville, Ky. For many years he was connected with the General Motors Co., in charge of the sales in the Southern district.

New Arizona and New Mexico Chevrolet Distributor—The Babbitt-Polson Co., Williams, Ariz., has been appointed distributing agent for the Chevrolet car in Arizona and New Mexico. Sub-agencies are being established in all the principal cities and towns of the two States. Carroll Davis is to handle Chevrolets in Prescott and Yavapai counties, Arizona. His partner, Charles Carrow, has left Prescott and gone to Phoenix, where he has associated himself with Louis Garesche for the purpose of introducing the Chevrolet in Maricopa County.

Recent Ford Agency Changes—Davenport, Iowa, has been awarded one of the eighteen factory branches now being established by the Ford Motor Co. H. D. Rue, late of the Chicago branch, will be placed in charge. Two will be allotted to Iowa, Fort Dodge securing the other. The Davenport plant will be in part an assembling plant and will furnish parts and supplies to all agents and patrons in eastern Iowa. A building is now being sought for the Davenport agency. A. H. Cain of Roodhouse, has secured the Ford agency in Greene County, Ill., succeding Morrow Bros. of Athensville. The Bloomington Motor Co., organized a year ago by J. C. Blair of Toledo, Ohio, to handle the Ford car in McLean County, Ill., with Bloomington as the distributing point, has been succeeded by the Lockwood, Mandel & Schwarzman Motor Co., with Oscar Mandel president; A. Schwarzman, vice-president, and J. E. Lockwood, secretary and general manager. The new company will erect a new garage building to cost $25,000. The territory is to be enlarged to include Woodford County. McLean County has the distinction of being the leading distributor of Ford cars in Illinois outside of Chicago.

Automobile Agencies Recently Established

PASSENGER VEHICLES

Alabama

Anniston	King	Anniston Motor Car Co.
Florence	King	B. A. Rogers & Bros.

Alberta

Gleichen	King	John Boxty
Granum	King	W. P Byer
High River	King	F. Pepper Garage
Langdon	King	Roy Gowan
Okotoks	King	Okotoks Garage
Red Deer	King	Mechanical Garage
Stettler	King	Bentley & Son

California

Anaheim	Reo	W. P. Quarton
Marysville	King	Yuba Machine Works
Pasadena	Reo	Floyd Purdy
Santa Ana	KisselKar	Chas. B. Perry
Ventura	Reo	N. P. Seeley

Colorado

Denver	Oakland	J. S. Morrison Auto Co.
Denver	White	Perry A. Mead
Fort Collins	Oldsmobile	Casson & Hopper
Fort Morgan	Oldsmobile	J. H. Croft
Trinidad	Paige	D. J. Penno
Trinidad	Studebaker	D. J. Penno

Florida

Pensacola	Moon	Pensacola Auto Supply Co.
Tampa	Scripps-Booth	Beckwith-Wilson Co.

Georgia

Atlanta	Pullman	Pullman Southern Distributors
Macon	Hupmobile	Littlejohn Sales Co.

Illinois

Carlock	Moline-Knight	Donat Widmer
Chattanooga	Moon	Thrasher Automobile Co.
Chicago	Moon	E. D. Knowles
Clinton	Moon	L. DeBoise
Danville	Moon	Raymond D. Smith
Flanagan	Pullman	T. B. Bennett & Co.
Galatia	Oldsmobile	H. W. Butler
Geneseo	Moon	E. G. Orr
Streator	Franklin	Central Garage

Indiana

Attica	Oldsmobile	Harmon Auto Co.
Darlington	Hupmobile	Petersen & La Follette
Greencastle	Oldsmobile	J. G. Campbell
Hartford City	Oldsmobile	Hartford Sales Co.
Marion	Oldsmobile	John V. Shugart & Son
Muncie	Hupmobile	D. C. Williston
South Bend	Moline-Knight	Oscar Lippman
South Bend	Scripps-Booth	William DeVall
Vincennes	Scripps-Booth	D. D. Aldrich

Iowa

Ames	King	Jacobson Automobile Co.
Canova	Overland	J. A. Wick
Central City	Apperson	H. S. Butters
Coon Rapids	Oakland	Crow-Ribbal
Des Moines	Moline-Knight	Stewart & Schooler
Des Moines	Princess	The Hawkeye Motor Sales Co.
Des Moines	Pullman	Pegau Auto Co.
Glidden	Oakland	E O Potter
Greenfield	King	Wilson Bros.
Hancock	Oakland	Wiese & Nicolai
Jefferson	Moline-Knight	L. E. Jefferis
Marion	Moline-Knight	C. C. Carpenter
Maquoketa	Moline-Knight	F. R. Rozak
Menlo	King	Wilson Bros.
Monmouth	Moline-Knight	H. R. Miller
Neola	Oldsmobile	Neola Auto Co.
Northwood	Apperson	Butter Auto Co.
Oskaloosa	Apperson	Zerring & Johnson
Perry	King	King Automobile Co.
Red Oak	Moon	Benard Peterson
Sioux City	Apperson	Pioneer Auto Co.

Kansas

Atchison	Oldsmobile	A.B. Campbell
Eldorado	Overland	Eldorado Overland Co.
Hutchinson	King	C. A. Livingston Auto Co.
Hutchinson	Regal	Regal Motor Sales Co.
Lewis	Empire	J. H. Wolcott
Osawatomie	Allen	E. G. Cresse
Osborne	Reo	Gilbert & Sons
Sabetha	Oldsmobile	G. E. Fletchell
Topeka	Paige	Palace Auto Co.
Waldron	Moline-Knight	A. Grasser
Wichita	Pullman	Pullman Motor Co.
Winfield	Buick	Collison Auto Co.

Massachusetts

Boston	MacFarlan Six	F. P. Anthony
Boston	Scripps-Booth	Scripps-Booth Motor Car Co.
Salem	Oldsmobile	Oldsmobile Co. of Salem
Springfield	Scripps-Booth	Lyndon I. Philbrook
Springfield	Studebaker	Corson-Berry Co.
West Dennis	Oldsmobile	H. W. Nickerson
Worcester	Grant	Jernberg-Wheeler Co.

Michigan

Ann Arbor	Oldsmobile	Lucas & Schoettle Co.
Bad Axe	Chevrolet	McDonald Garage Co.
Battle Creek	King	E. E. Doty
Benton Harbor	Oakland	A. F. Messner
Birmingham	Republic Truck	Cruze-Crawford Mfg. Co.
Breckenbridge	Oakland	Fred Stevens
Breedsville	King	Bert Lee
Clare	Dodge	Clare Hardware & Implement Co.
Coral	Dodge	Thomas Kain
Grand Rapids	Auburn	Reid Auto Co.
Grand Rapids	Hupmobile	Geo. S. Thwing Co.
Holland	Dodge	Venhuizen & Kooyers
Houghton	Hupmobile	Earl Opal
Ionia	Oakland	Miller & Ashe
Jackson	Regal	Hazen Abbey
Laurium	Studebaker	Mort Getchell
Ludington	Oldsmobile	Harry V. Huston
New Baltimore	Ford, Overland	Vosson & Son
Niles	Oakland	Stoll Bros.
Shepherd	Regal	D. A. Kennedy
South Haven	Oakland	Jake Neffeneggar
Standish	Maxwell	A. Hanses
Three Oaks	Oakland	Lopp & Hellenger
Wyandotte	Hupmobile	Clark & Wm. Bigler

Minnesota

Duluth	King	Zenith Auto Co.
Duluth	Willys-Overland	Mutual Auto Co.
Ellendale	King	Laken & Berg
Elmore	King	W. O. Dustin & Co.
Hastings	Oldsmobile	Lovejoy & Johnson
Glenveill	Oldsmobile	Lang & Lukes
Lamberton	King	A. P. Hill
Lewiston	King	F. Eusterman & Co.
Minneapolis	Indiana	George Cromwell
Minneapolis	Pullman	A. M. Choate Auto Co.
Minneapolis	Sphinx	Santweier-Finley Co.
Owatonna	Oldsmobile	Sander Bros.
Spring Valley	Oldsmobile	Geo. H. Harris
St. Paul	Denby Truck	Arend Bros.
St. Paul	KisselKar	J. F. Lynch

Missouri

Joplin	Koehler Truck	J. W. Gorsuch
Neosho	Studebaker	Neosho Auto Co.
Sedalia	Koehler Truck	LeGrande Garage
St. Louis	Regal	Trenton Motor Car Co.

Mississippi

Okolona	Pullman	W. L. Tyson

Nebraska

Avoca	Metz	Eugene Stutt
Bellevue	Metz	E. F. Stepp
Elm Creek	Monitor	Fred Pflaum
Fremont	Maxwell	Hall & Steele
Ord	Grant	Frank Beren
Gordon	Moline-Knight	J. M. McGraw
Hampton	Oakland	Will Van Housen
Hastings	Koehler Truck	Stephen Schulz
Howells	Oldsmobile	Sindelar & Hanzel
Millard	Oakland	VanDohren Bros.
Ord	Davis	Frank Beren
Schuyler	Oakland	Boll & Zeaman
Scribner	Apperson	Henry Tonjes
Springfield	Maxwell	Albert Compte
Stamford	Davis	David Elder
Stamford	Grant	David Elder
Brock	Studebaker	F. J. Schmidt

New Hampshire

Nashua	Auburn	H. C. Dunn

New Jersey

Asbury Park	Oldsmobile	H.R. Ingalls
Jersey City	Oldsmobile	J. Jacob Wacker

New York

Amsterdam	Pullman	Shutts & Co.
Auburn	Scripps-Booth	Charles A. Hadselle
Batavia	King	N. L. Hawks
Binghamton	Scripps-Booth	Charles H. Worden
Catskill	Oldsmobile	H. W. Lasher
Chaffee	King	R. R. Allen
Hempstead, L. I.	KisselKar	National Gaerag
New Rochelle	Oldsmobile	W. M. Bantel
Norristown	KisselKar	C. R. Hendricks
Rochester	Pullman	Ball-Washburne Motor Co.
Suffern	KisselKar	Peiper-Blanchard Garage
West New Brighton, S. I.	Oldsmobile	Short & Wisely
Utica	Scripps-Booth	George A. MacCracken

Nevada

Elko	Franklin	The Simcox Garage

North Dakota

Hazelton	Partin-Palmer	Anderson, Hanawalt & Sneeberg
New Rockford	King	J. R. MacKenzie

Ohio

Arcanum	Pullman	Arcanum Garage
Athens	Regal	McCarter Garage & Machine Shop
Bucyrus	Hupmobile	H. A. Smith
Canton	Hupmobile	Canton Hupmobile Sales Co.
Canton	Regal	Quality Motor Car Co.
Cincinnati	Pullman	Pullman Motor Car Co.
Cleveland	Regal	H. & G. Motor Co.
East Liverpool	Hupmobile	C. C. Kennedy
Findlay	Hupmobile	Harry Ramsey
Lancaster	Hupmobile	John A. Houston
Middletown	Hupmobile	Wm. Cork & Sons
Newark	Regal	Wiylarch & Beck
Sandusky	Auburn	Welby C. Waterfield
Toledo	King	Landman-Griffith Co.
Troy	Oldsmobile	Smith & Densmore
Warren	Oldsmobile	Miller & Troxel
West Liberty	Oldsmobile	John Hite
Weston	Hupmobile	Pugh & Jones
Youngstown	Hupmobile	E. C. Keller

Ontario

Brantford	King	Dr. F. G. Pearson
Orangeville	King	J. F. Atkinson

Pennsylvania

Bloomsburg	Scripps-Booth	Housenick & Seiler
Harrisburg	Pullman	Bentz-Landis Auto Co
Hughsville	Pullman	Shipman & Bartlow
Pittsburgh	Pullman	Pullman Sales Co.
Spring Mills	Pullman	E. P. Shook
Tamaqua	King	J. M. Knepper
Williamsport	Pullman	Ralph B. Harlacker

Montana

Circle	King	Ed. Storm
Jordan	King	M. A. Bogie
Miles City	King	E. Devaul
Rosebud	King	Fred Bills

South Dakota

Aberdeen	Moline-Knight	K. O. Lee
Bonesteel	Metz	Ben Turgeon
Bruce	Hupmobile	V. G. Goodfellow

Tennessee

Chattanooga	King	Wallace Buggy Co.
Jellico	Hupmobile	H. M. Jones
Knoxville	Moon	City Garage & Transfer Co.
Memphis	Oldsmobile	The Oldsmobile Sales Co.

Texas

El Paso	Franklin	Franklin Motor Car Co. Leo J. Trost, Prop.
Houston	King	L. W. Worsham
Schulenberg	King	Dr. I. E. Clark
Yorktown	King	Gus Zedler

Utah

Salt Lake City	Franklin	The Franklin Motor Car Co.

Vermont

Proctorsville	Pullman	Proctorsville Garage

Washington

Colfax	Moon	A. J. Davis
Spokane	Scripps-Booth	Signal Truck Co.

Wisconsin

Grand Rapids	Moline-Knight	C. L. Duncan
Manitowoc	Moline-Knight	H. C. Schuette
Milwaukee	Crow-Elkhart	John Tellier Auto Co.
Milwaukee	Velie	Velie Motor Car Co.
Richland Center	King	E. L. Downs
Viola	King	Romer Kinder

West Virginia

Huntington	Regal	Apperson & Regal Sales Co.
New Cumberland	Regal	Scott Bros.

Wyoming

Pinedale	Oldsmobile	J. F. Paterson
Rawlins	Chalmers	Michael M. Rubne
Shoshoni	Oldsmobile	Stuchell & Junco

VOL. XXXIII NEW YORK—THURSDAY, SEPTEMBER 2, 1915—CHICAGO NO. 10

The AUTOMOBILE

Improving the Steering

A Part Often Neglected in Design — Common Failings in General Layout of This Important Part

By A. Ludlow Clayden

IF an ordinary motorist ever has the opportunity of driving a good racing car the thing which impresses him most strongly is commonly the wonderful ease of the steering. The best racing cars can be steered at a good speed literally with two fingers. By contrast, the average automobile needs careful handling at high speed and often the operation of the steering in turning a right-angle corner calls for a distinct effort and a strong grip if one hand is to suffice.

There is no magic about racing car steering, it is not especially costly nor is it of peculiar design, but it is designed as carefully as the motor because *it has to be.* On an ordinary car a steering that is very stiff as compared with racing practice is good enough so the engineer has been prone to leave it alone and it remains no better than it was in the dark ages of automobilism when a driver had to be something of an athlete. Yet a man who once has handled an easy-steering car will never be satisfied with any other, for the difference it makes to the physical condition after a long day on the road is remarkable and has to be experienced to be believed.

Fundamental Imperfections

Practically every automobile has the same type of steering so far as system is concerned, the inventor of the conventional front axle with swivel heads at each end bearing the name Ackerman. With Ackerman steering it is generally assumed that the tie rod arms projecting from the swivels should meet at the middle point of the rear axle if their center lines are produced. Now, when on a curve the two rear wheels run along two circular paths of different radius, and each wheel makes a tangent to its rolling circle, as viewed in plan. The front wheels meanwhile roll on separate circles of their own and the ideal steering gear is such that each of the four wheels should make a tangent to the circle along which it is rolling.

This true rolling can occur at three positions only: One is the straight position when the car is turning neither to right nor left, and the other two are at some definite angle of lock to right and left respectively. The effect for all other positions is that three wheels may roll perfectly but the fourth must do some skidding or perhaps two roll and the other two divide the skid between them.

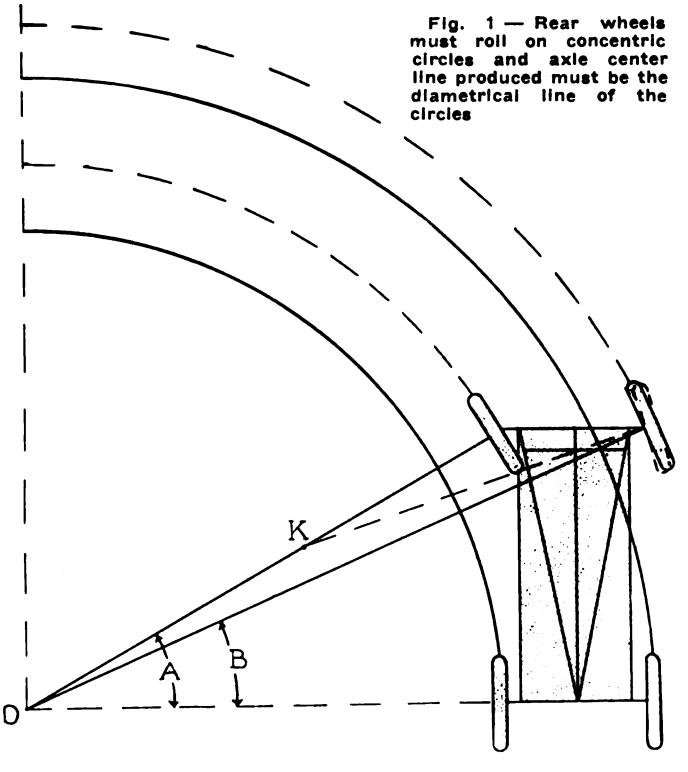
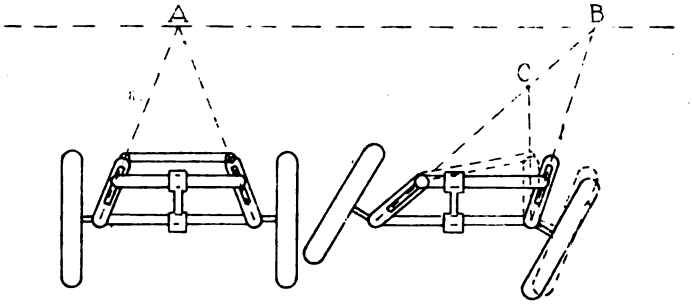


Fig. 1 — Rear wheels must roll on concentric circles and axle center line produced must be the diametrical line of the circles

From Fig. 1, it is obvious that the rear wheels must both roll on concentric circles and that the rear axle center line produced must be the diametrical line of the circles. Thus neither one of the rear wheels can skid unless both do. Suppose the point about which the car is turning is *O*, then the center lines of both the front wheel spindles must meet at *O* if every wheel rolls perfectly, without skidding. It is obvious that by turning the steering wheel we can bring one of the front wheels into such a position that the spindle center line passes through *O*, but the second front wheel will then take up a position depending upon the length of the tie rod and the layout of the tie rod arms. If the tie rod slid in guides attached to the front axle and



Left—Fig. 2—Ideal steering design, the tie rods sliding in guides attached to the front axle and the pins at its ends moving in slots cut in the tie rod arms. Right—Fig. 3—Ideal design illustrated in Fig. 2 with the conventional type steering dotted over it. In both views the right arm is supposed to be in the correct position and the left arm is correct as shown in the full line. The dotted lines show the inaccuracy of the conventional system

the pins at its ends moved in slots cut in the tie rod arms as sketched in Fig. 2 there would be no steering error whatever and the second front wheel would always be a tangent to its rolling circle, but such a construction is mechanically impractical. In Fig. 3, the ideal design of Fig. 2 is shown with the steering of the conventional type dotted in over it. In both views the right arm is supposed to be in the correct position and the left arm is correct as shown in full lines. The dotted lines show the inaccuracy of the conventional Ackerman systems.

This is exaggerated a little, but turning back to Fig. 1, assuming that the inner front wheel is at a correct angle, the tie rod may easily draw the outer wheel into a position as indicated in dotted lines. When this happens the rear end of the car is endeavoring to turn on a circle with center at *O* while the front end is trying to turn about *K* Fig. 1. Obviously this is impossible, and so the true turning point will depend upon which of the wheels skid.

Another thing shown by Fig. 1 is that the two front wheels must never be parallel except when in the straight position, as the angles *A* and *B* must always be different. It is possible to calculate the angular movement of the outer wheel spindle to correspond to any given angle of lock of the inner wheel, so that the center lines of the spindles may intersect at *O* and all wheels roll properly, but the equations are cumbersome and there is no need to quote them.

In Fig. 4 is shown the layout of a front axle and steering. The angles shown by full lines on the right circle are the angles which correspond to those on the left circle, if we are to have perfect rolling. For this example the wheelbase of the car is taken as 108 in. and the distance between the steering swivels *OQ* as 50 in. Now assume that we use a length of tie rod arm of 10 in. and choose any angle θ between the tie rod arm and the center line of the chassis. Then, when the left wheel moves to angles 10, 20, 30 and 40 deg. the right wheel ought to move to the positions shown in full lines, but the inaccuracy caused by the tie rod causes the actual positions to be as shown in dotted line. Now, the angle of error *E* is shown by the difference between the full and dotted lines on the right hand side as marked at *E* and the amount of this angle depends upon the length of the tie rod arms *OA*, *OB* and the angle θ which the tie rod arms make with the center line of the car.

It has become a habit to make this angle such that the tie rod arms produced would meet at the center of the rear axle, but this does *not* give the nearest approach to accuracy, by any means necessarily. With the proportions chosen for the diagram of wheelbase 108 in., distance *OQ*, 50 in. and lengths *OA* and *OB*, 10 in., the average of error is much lower when θ is chosen of such a value that the produced tie rod arms would meet much nearer to the middle of the car than to the middle of the rear axle.

Striking the Mean

There is no need to go into the mathematics of the layout, for they are quite simple and individual cases can be worked out by anyone, but a few conclusions are worth comment. It can be shown either graphically or by calculation that:

1—Where the tie rod is in front of the axle the inaccuracy is *in*creased by increasing the length of the tie rod arms.

2—Where the tie rod is behind the axle the inaccuracy is *de*creased by increasing the length of the tie rod arms.

Thus suggesting that there is advantage in the use of long arms as a rule, but there is something else to be considered. In Fig. 4 a front axle and tie rod are shown as they lie when the steering is locked over and it is obvious that we must not allow the angle ϕ, ever to become too large, for the greater it grows the less is the leverage which the tie rod exerts over the wheel.

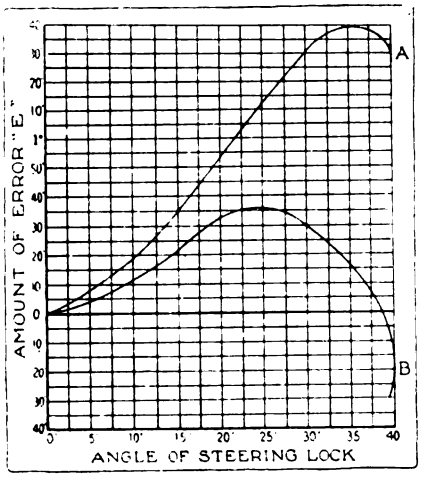
It is easy to see that there is a limiting position when the angle ϕ would become nothing and then the steering could not be moved back again to the straight position. Unfortunately for the engineer this angle varies inversely as the error. That is to say:

1—With the tie rod in front the angle ϕ is increased by *shortening* the arms.

2—With the tie rod behind the angle ϕ is increased by *lengthening* the arms.

Probably with the usual weight of car the angle ϕ ought never to be less than 150 deg., so all we can do is to make the tie rod arms of a length to suit this condition and they will then be as nearly accurate in action as we may hope to get them, if we choose the best value for θ.

The only way in which to determine the best proportions of tie rod layout is to calculate the correct angular proportions and then to try different values of tie rod arm length till the happiest mean is struck. Fig. 5 may be of interest as showing the plotted errors for the proportions of chassis



Left—Fig. 5—Showing the plotted errors for the proportions of tie rod layout in chassis chosen for Fig. 4. In upper curve error E is plotted for a value of θ such that the tie rod arms would meet in the rear axle center. Below—Effect of increasing θ to 15

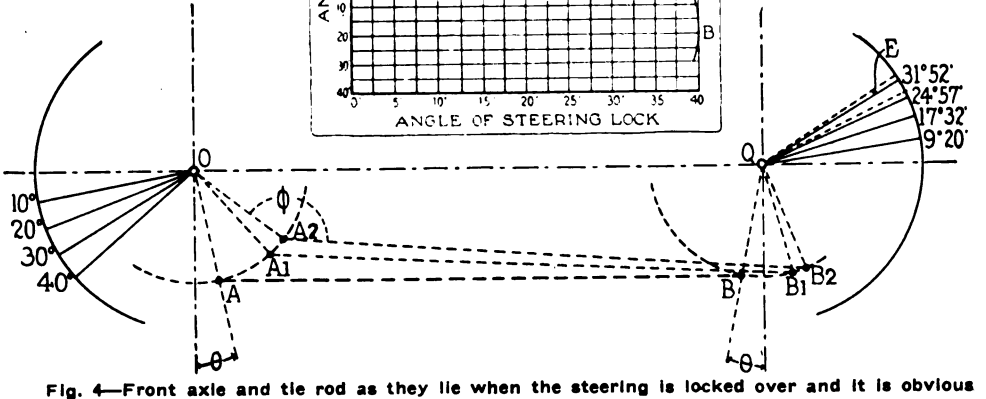


Fig. 4—Front axle and tie rod as they lie when the steering is locked over and it is obvious that the angle Φ must never become too large, for the greater it grows the less is the leverage of the tie rod over the wheel

chosen for Fig. 4. In the upper curve the value of the error E is plotted for a value of θ such that the tie rod arms would meet in the rear axle center. The far better curve below shows the effect of increasing θ to 15.

Another useful point which may be brought out by drawing a series of diagrams for different cases is that an increase in wheelbase increases the accuracy of the steering, but it is not necessary to use space here to show it for it can be easily worked out by anyone.

Errors Cause Large Forces

What then is the effect of manufacturing axles in quantity and using the same axle set for cars of differing wheelbase, as actually happens? The answer is that it is a matter of pure luck whether the steering is fairly good or fairly bad. The reader may think that, as the angular errors are only a degree or two at most, this accuracy is hardly worth troubling about, but there is one way of stating the case which brings home the forces at work.

Suppose that the road is dry and that all four tires hold on well, then in rounding a curve it might be possible for the two front wheels to roll truly without skidding (on center K Fig. 1.) If this happened the two back wheels would be forced to skid together and outwards, in an effort to counteract the steering effect of turning the wheel. In other words the driver is applying a heavy push to the inner end of the rear axle and is forcing the rear wheels to skid sideways by a quite large amount. Even if the distance is small it is obvious that the lead is considerable, and quite sufficient to make the steering heavy or inaccurate in direction. During a turn on a dry road the amount of power wasted in rubbing the tires which take the skidding action may easily exceed a tenth of a horsepower which does not sound a very large amount but is quite sufficient to be worth considering.

An Unconsidered Power Loss

Now comes a still more curios fallacy which is the idea that it is an advantage to cant the front wheels by tilting the spindles relative to the swivel centers, or *vice versa*. In Fig. 6 is shown the normal constructions, of splaying the wheels so that the tires are nearer together on the ground line than they are at the top.

Consider one of the wheels. It leans over sideways, yet the ground may be assumed to be flat. Thus the tire bears more heavily on one side of the tread than upon the other. Produce the axis of the wheel till it cuts the ground and it is at once clear that a little section of the tire has become part of the surface of a cone with its center at O and its side resting on the ground. This makes the wheel with its tire into what is virtually a bevel blank with a very large angle.

Now if we rest a bevel blank on the ground on edge as in Fig. 7, and then push it in the direction of the arrow, it will not run straight forward, but will run in a circle with a center at the natural cone center. So with the wheel and tire in Fig. 6. Its natural tendency, by virtue of the tilting, is to run in a circle also, and we prevent it from doing so, because the opposite wheel is also trying to run in a corresponding, opposing circle and the two pull against each other. The effect is that the tire tread is worn unevenly and the extra amount of power used up in wearing down the outside edge of the tread is pure waste. Again the amount is small and the effect is not great in any way, but little is gained by the splayed wheel and something is lost.

Castor Swivels

It is necessary to say something here about the various so-called castor systems of steering, of which some are good, and some have advantages existing mainly in the imaginations of their originators. To grasp the subject, first consider the forces at work on the wheel, which are the driving force of the car, the weight carried by the wheel and the resistance of any object which the wheel encounters on the road. The driving force and weight together must have a resultant equal and opposite to the resistance.

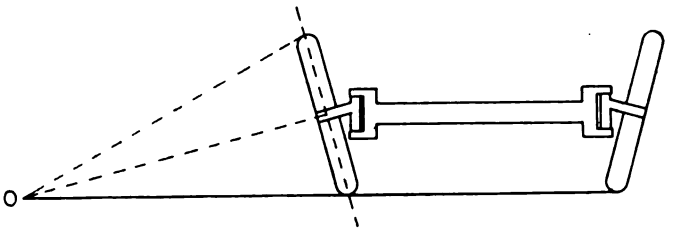
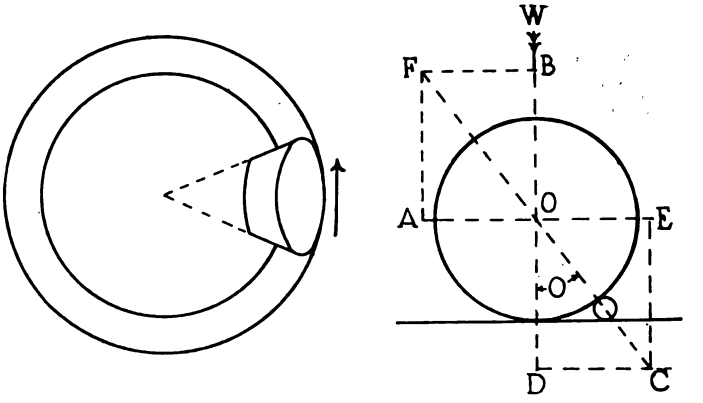
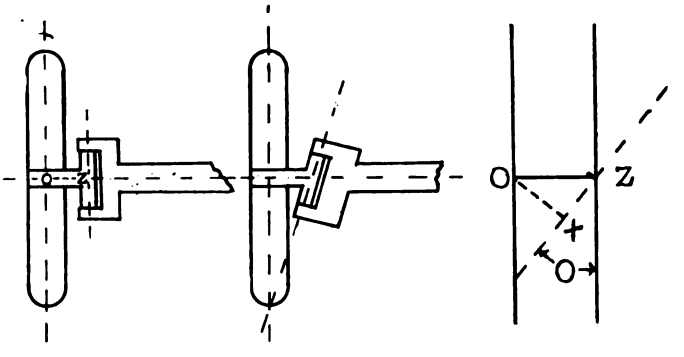


Fig. 6—Normal wheel construction, the wheels being splayed so that the tires are nearer together on the ground line than at the top



Left—Fig. 7—If a bevel blank is rested on the ground on edge and is pushed in the direction of the arrow it will not run straight forward but in a circle with the center at the natural cone center. Right—Fig. 8—Diagram of forces as the wheel strikes an obstacle. Graphically resolved there are the weight BO and the driving force AO. The resistance of the obstacle on the road must act along the line CO, thus if CO is made equal to the force the resultant FO of AO and BO must be equal and opposite to CO



Left—Fig. 9—If the plane of the wheel is vertical and the distance from the plane to the vertical axle of the steering swivel is OZ then the couple tending to turn the wheel about its swivel pin is OZ.W tan θ. Center—Fig. 10—A design where the swivel is tilted sideways so that its axle produced meets the ground at the same point as the tire. Right—Fig. 11—Another analysis of the forces, showing that the couple tending to turn the swivel is not zero, but merely reduced to OZ . cos Φ .W tan θ

Striking an Obstacle

First to take the case of the ordinary vertical pivot, assume the wheel to be striking an obstacle as shown in Fig. 8. Resolving the forces graphically we have the weight BO and driving force AO. The resistance of the object on the road must act along the line CO. Thus if we make CO equal to the force, the resultant FO of AO and BO must be equal and opposite to CO.

But CO itself can be resolved to match the other diagram of forces, into DO and EO, whence EO equals W tan θ.

Turning now to Fig. 9, if the plane of the wheel is vertical and the distance from the plane to the vertical axis

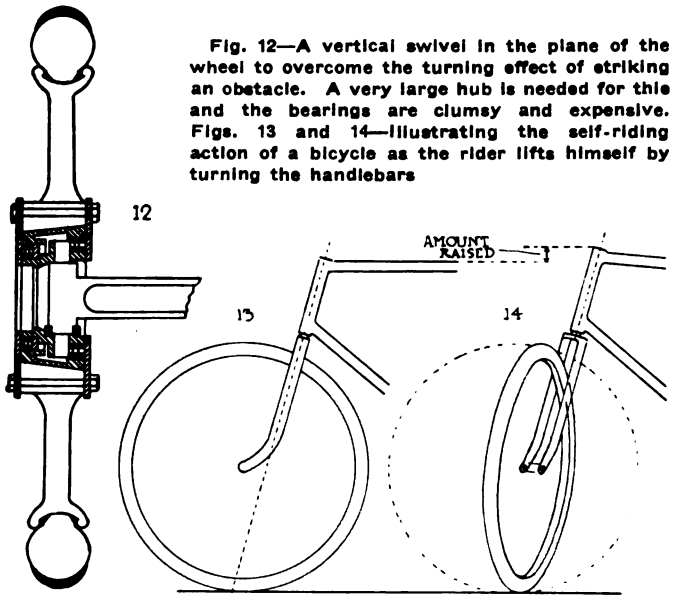


Fig. 12—A vertical swivel in the plane of the wheel to overcome the turning effect of striking an obstacle. A very large hub is needed for this and the bearings are clumsy and expensive. Figs. 13 and 14—Illustrating the self-riding action of a bicycle as the rider lifts himself by turning the handlebars

of the steering swivel is OZ, then the couple tending to turn the wheel about its swivel pin is

$$OZ . W \tan \theta$$

Now, by virtue of our original diagram of forces Fig. 8, it follows that the force $W \tan \theta$ always acts at the center of the wheel in the plane of the wheel. In other words it acts at O, whether the steering swivel be vertical or not.

In Fig. 10 is shown a design where the swivel is so tilted sideways that its axis produced meets the ground at the same point as the tire, the idea being that the resistance to shock is *horizontal* and not at an angle depending on the height of the obstacle, as has been proved to be the case by the analysis of forces in Fig. 8. The notion is that as the point of contact of tire with road is vertically beneath the swivel axis there is no turning moment on the swivel.

But let us analyse the forces once more. In Fig. 11, let OZ be the horizontal distance from the center line of the swivel pin to the central plane of the wheel. Draw OX at right angles to the swivel pin. From Fig. 8 we know that the reactionary force due to the obstacle is $W \tan \theta$. Resolving the diagram of the tilted pivot Fig. 11, it follows that the force $W \tan \theta$ acts on the swivel at a leverage OX instead of a leverage OZ as in the vertical pivot. Now OX equals $OZ \cos \phi$ where ϕ is the angle between the pivot and the vertical, so the couple tending to turn the swivel is not zero, but is merely reduced from OZ, $W \tan \theta$. to $OZ . \cos \phi . W \tan \theta$.

Similarly the converse of the tilted pivot has been suggested, the wheel being dished till the point of contact of tire with road is directly under the swivel as Fig. 6. Here the turning moment on the swivel is lessened slightly more than with the tilted swivel, but it still remains a substantial force.

There is one way only of overcoming the turning effect of striking an obstacle, and that is to use a vertical swivel *in the plane of the wheel.* This system has been used with conspicuous success on some foreign omnibuses and is perfect from a geometrical viewpoint. The system is sketched in Fig. 12, but its drawback is that a very large hub is needed and the bearings become clumsy and expensive.

The true meaning of caster action is that the steering wheels shall return to the straight position when the wheel is released after making a turn, and to get this action we require to utilize part of the weight of the car to provide a restoring force. In other words we must lift some part of the car a trifle when the steering wheel is turned to right or left. The reason that a bicycle has a self-righting action is that the rider lifts himself by turning the handle bars. The wheel is touching the ground at a point behind the point where the produced steering swivel would strike it as shown in Fig. 13. This being the case, turning the front forks around lifts the whole front end, Fig. 14.

Just the same effect can be obtained by inclining the steering swivels of an automobile by a degree or two, so giving them a little rake, and in this connection it may be mentioned that when a car steers badly and has a tendency to wabble at high speed, it is often possible to effect a complete cure by slacking off the front axle clips and driving in tapered wedges of hard wood so as to give the swivels a backward tilt. Such rake is more effective with central swivel steering as Fig. 12, but it is a real advantage with the usual sort of axle.

The Cure for Flapping

Another point that is not fully appreciated is the cause of "flapping." Often it may be noticed that a car running over a rough road has its front wheels in a state of oscillation from side to side, even when the steering wheel is held rigidly central. To understand this Fig. 15 shows a drag link and its connections. If the steering wheel is held rigidly A is a fixed point and if the axle rises and falls relatively to the frame the drag link must swing about A as a center. This means that the front end of the link B, will move along the arc of a circle with radius AB. Let C be the point nearest to the frame which B can reach as the car takes a bump. Then when B is raised to coincide with C it is not only lifted but is drawn back by an amount DC equal to the difference between the circular path of B and the true vertical. Similarly, on the rebound the same sort of action occurs, and running over a bump is the equivalent of giving the steering wheel movement enough to steer the car by pulling the drag link a distance DC.

Obviously the longer the drag link the smaller the effect of this action, as the length of the link is the radius of the circle, also by choosing the most suitable relative positions for A and B when there is no shock to disturb things, we can make the arc BC correspond fairly closely to the vertical line. Usually it is found that the best compromise is obtained by raising the front end of the link a good deal, so that the amount DC is divided fore and aft of the vertical as shown dotted in Fig. 15, for with this layout the deflection caused by the rebound will be opposite in direction to that caused by the compression of the spring.

So much for layout considerations. The forces concerned are small, the inaccuracies slight, but time spent on determining the best compromises is amply repaid by the ability to steer accurately to an inch, which is lacking as a rule. Some cars which steer well do so because the connections were proportioned correctly by accident, but if this happens with one model it does not follow that it will do so again with the next unless the layout of the good car is analysed and the reason for the accuracy discovered.

Quite apart from layout is the question of detail design of steering gear parts, and this is just as important in the pursuit of good acting steering. This phase of the subject the writer intends to take up shortly in THE AUTOMOBILE.

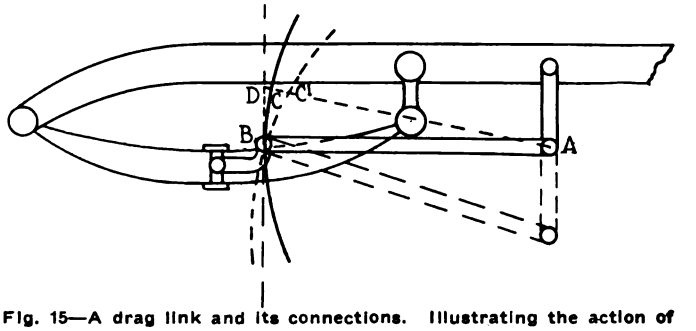


Fig. 15—A drag link and its connections. Illustrating the action of the forces set up in running over a bump

Register Trade Marks in Latin America

Often Unscrupulous Persons Register the Trade Marks of Well Known Foreign Manufacturers and Thus Control All Right To Sell Goods Under Those Marks

By Our United Export Bureau*

UNLESS a manufacturer has protected himself it is possible for any one in Latin America to register his trade mark and stop him selling his products in these republics. In some countries goods become the property of the person or persons controlling the trade mark on them, for this reason merchants in those countries only purchase goods from those controlling the trade mark.

Some unscrupulous people make it their business to register well-known foreign trade marks, thus compelling a manufacturer to either purchase his trade mark or lose the advantage of a well-known brand, which has been developed at a large expenditure of time and money. Hardly a week goes by that a case of this character is not brought to our attention.

The Spanish law on which the Latin American trade mark law is based was created by the Crown of Spain for the protection of tobacco in all its forms, and was drawn up with only this in view, the king taking the attitude that those who did not protect their trade mark were not entitled to any consideration, the party first registering the trade mark having everything in his favor.

Register Your Trade Mark

As the attached table of costs for obtaining the registration of trade marks shows, the operation is not an expensive one when your goods are known and sold on the brand they bear, and we cannot too strongly advise the registration before selling goods in any of these countries.

At the present time there is a movement on foot which only lacks the approval of three nations to make the trade mark law in the western hemisphere a uniform one.

Under present conditions, a manufacturer to obtain his trade mark in these countries, must grant a full power of attorney to the person making the application to represent him in all negotiations to obtain the registration of his trade mark. Also another point of interest is that if you purchase a trade mark and do not record the transfer in the Government office for this purpose within 60 days, the sale becomes null and void and the trade mark remains the property of the person who previously had title.

In some of the countries the enforcing of the trade mark law and its interpretation is controlled by an organization similar to our local chambers of commerce, or commercial clubs and combined with the heads of the offices of patents and trade marks. Another form is seen in Costa Rica, where police authorities enforce the trade mark law, and in some cases have even forced a man to place a trade mark upon his goods.

It is interesting to note the broad view of what constitutes a trade mark—for example, names of manufacturers and business firms, their seals, stamps, engravings, vignettes, monograms, mottoes, legends or any other distinctive sign whatsoever, serving to identify the products of a manufacturer or the articles constituting the trade of commercial houses.

The offense of infringing on a trade mark is a penal one, besides the confiscation of the goods.

Nicaragua has the shortest trade mark law and appears in its penal code in articles 314 and 319, making a total of eight lines, but in this small space they accomplish a great deal. For example, he who forges a seal, stamp or mark of any party whatsoever, private, industrial or commercial, bank or individual, or makes use of forged seals, stamps or marks will be liable to imprisonment for one year and a fine of from $50 to $500. He who causes to be placed on an article of manufacture the name of a manufacturer who is not the maker thereof, or the commercial sign of a factory which is not the real factory, is liable to imprisonment of six months and a fine of from $50 to $500.

Registration Is Easy

There are a number of offices and patent and trade mark attorneys in the United States who are prepared to undertake the registration of trade marks throughout the world.

ARGENTINA.
Life—10 years; renewable.
Fees—$21.25.

BOLIVIA.
Life—Indefinite.
Tax of $1.95 per year.

BRAZIL.
Life—15 years; renewable.
Fees—$1.25 in stamps; renewal same.

CHILE.
Life—10 years; renewable.
Fees—$1.92; certificate $0.16; renewals the same.

COLOMBIA.—
Life—20 years; renewable.
Registration of trade mark $15; renewal $30.

COSTA RICA.
Life—15 years; renewable for periods of 10 years.
Fees—$7.90.

CUBA.
Life—15 years.
Fees—$12.50; renewal the same.

ECUADOR.
Life—20 years; renewable for periods of 15 years.
Fees—$19.19; renewal fees $13.34.

GUATEMALA.
Life—10 years; renewable.
Fees—$26.

HONDURAS.
Life—Indefinite.
Fees—None provided by law. Translation, publication and stamps $35 gold.

MEXICO.
Life—20 years; renewable.
Fees—5 pesos (Mexican currency is depreciating very rapidly).

NICARAGUA.—
Life—10 years; renewable.
Fees—$2.08; certificates $0.08 each.

PANAMA.
Life—10 years; renewable.
Fees—$25; renewal fee $20.

PARAGUAY.
Life—10 years; renewable.
Fees—$19.30; each extra certificate $0.13 with stamp tax $0.07 for first page and $0.15 for each additional page.

PERU.
Life—10 years; renewable.
Fees—$14.70. By applying for registration through the Peruvian Consul General a certain amount is saved in stamp fees.

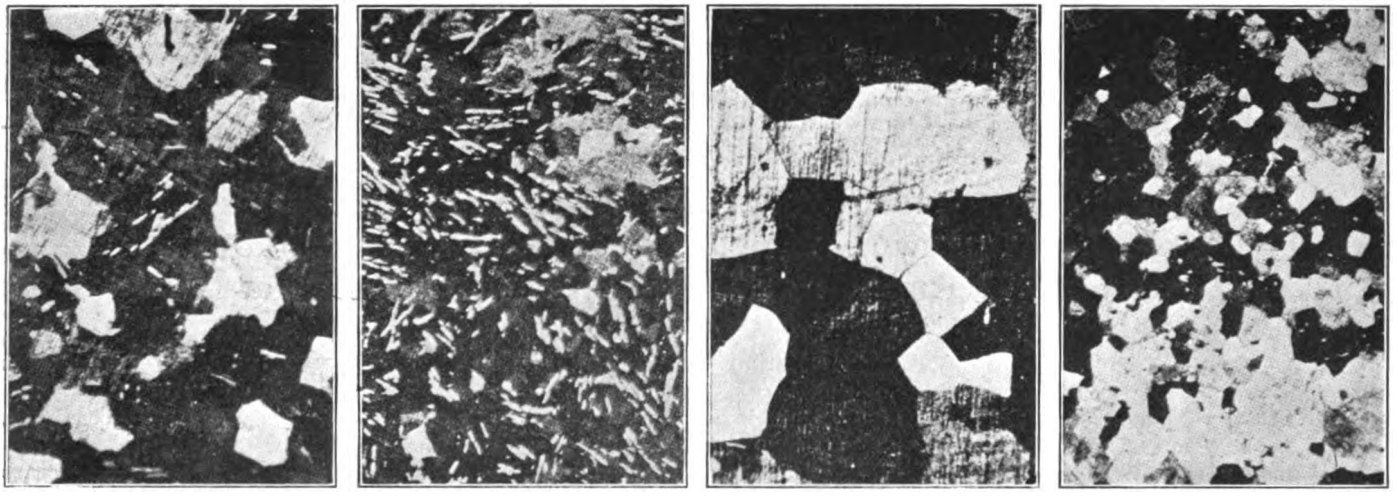
SALVADOR.
Life—20 years; renewable.
Fees—$3.63; annual tax on foreign trade marks $1.82; extra certificates $1.82; stamped paper from $0.04 to $0.10 per sheet. Ordinary paper may be used with stamps.

SANTO DOMINGO.
Life—10 to 20 years; renewable.
Fees—Registration for 10 years $5; 15 years $10; 20 years $15.

URUGUAY.
Life—10 years; renewable.
Fees—$10.34; renewal $25.85; extra certificates $2.07.

VENEZUELA.
Life—30 years; renewable.
Fees—$8.98.

*Further information can be secured from The United Export Bureau of THE AUTOMOBILE.



Bronzes of 59 per cent tin but different alloys: From left to right: 50 hrs. at 390 deg. cent., 100 hrs. at 310 deg. cent., 71 hrs. at 390 deg. and 100 hrs. at 310 deg.

Brass and Bronze—Offsprings of Copper—Part III

Alloying Substances Provide Metals Which Are Useful in Many Industrial Fields and Impart Widely Different Qualifications

By J. Edward Schipper

ALUMINUM is considered a lightening agent and yet when added to bronze in the proportion of 10 per cent to 90 per cent copper the resulting metal has a tensile strength up to 90,000 lb. to the square inch. Above this percentage of aluminum the alloy becomes brittle and no more than 11 per cent can be tolerated. It makes good small and medium castings, is readily worked, may be forged at a red heat and is quite ductile. It takes a fine polish and at one time was suggested as a good metal for U. S. coinage. One use to which it has been put is in the making of kettles for fruit preserving. It can even be made into small springs.

Nickel, in combination with copper, tin, antimony and lead, is much prized in the manufacture of the nickel-babbitts so-called, which are employed frequently for automobile motor bearings. It is a hardener and strengthener and it is put in the bearings to reduce their tendency to wear. The nickel which is added to the babbitt is the commercial grade and is generally about 98 per cent pure. It has about the same specific gravity as copper and hence does not greatly affect the weight of the given metal. Its influence on bronze is quite similar to its influence on steel in that it is a toughener. The impurities in nickel are iron, copper, silicon, sulphur, arsenic and carbon.

The metal known as white copper is a combination of copper and nickel. The United States 5-cent piece is made from a metal which contains 75 per cent copper to 25 per cent nickel. Copper, zinc and nickel go together to from German silver which has been used frequently in small parts for carbureter construction, wire in magnetos, ornaments, etc. The composition of German silver is generally copper 60, zinc 20 and nickel 20. In other words German silver is a brass when it belongs to the copper-zinc branch of the family. It has a tensile strength when cast which varies all the way from 24,000 to 46,000 lb. per sq. in. or higher. The results from thin sheets according to Kent give as high as 87,129 lb. per sq. in. The metal is known for the difficulties it presents to the foundry and rolling mill.

German silver can also be a bronze according to some authorities who give formulas which have a composition of copper, tin and nickel. According to others it is a Kalchoid, having both zinc and tin. The Chinese metal known as pakfong is made of copper, nickel and zinc and the bullet casings now in use in the European war are made from an alloy which is about 80 per cent copper to 20 per cent nickel.

Bismuth Toughens Bronze

Bismuth has a notable effect on bronze and although not used commercially to as great a degree as other alloying substances, it is recognized as a valuable toughener. It has been suggested that bismuth bronze be used for telegraph wires as these have to endure considerable stress, due to the wind. It is one of the component parts of the materials used for aluminum cooking utensils. If not carefully employed, however, and if the proportions are wrong the brittleness of the resulting metal is so great that it cannot be used commercially. When added to copper in a percentage of less 0.5 the alloy is ductile. Above that point the brittleness begins to show. One of the features of this metal is the fact that it reduces the electrical conductivity of the metals to which it is added. It has another peculiar property in that it is intensely diamagnetic, being repelled by a magnet.

Manganese is used in non-ferrous alloys where it is desirable to have castings of strength and toughness. This metal is valuable because of its strong affinity for oxygen with the result that it takes up the oxygen in castings and combines with it preventing it from forming bubbles of danger. It makes a casting homogenous, strong and ductile. Manganese bronze is one of the most useful non-ferrous metals in practical work but strange to say it is not a bronze at all, but a brass since it has as its root a composition of copper and zinc.

In appearance manganese bronze is similar to phosphor-bronze. It was invented by P. M. Parsons and was named by him white bronze. It is prepared by combining ferro-manganese in various proportions to copper and zinc alloys.

The ferro-manganese is first refined with particular care to have all the silicon removed and the iron content carefully regulated. In action the manganese bronze is similar to mild steel, having a tensile strength of about 60,000 to 90,000 lb. per sq. in. and an elongation in 2 in. of 20 per cent. This metal finds its great use in the manufacture of propellers for steam vessels. The great strength permits the blades to be made thin, and therefore efficiency of the propeller is not sacrificed. Besides this they do not corrode and are practically indestructible. While they cost about double the price of a steel propeller, the latter will have to be renewed about every three years, whereas the bronze propeller will be as good at the end of that time as it was at the beginning.

Manganese bronzes, of which there are many different grades are used also for resistance wire bearings, valves, piston rings and gun metal. When used for any purpose under water such as for pumps and for propeller blades it has to be carefully fitted so that galvanic action is not set up.

Silicon Bronze for Telegraph Wire

Silicon has its principal value when considered as an alloying substance in the manufacture of silicon bronze wire for telegraph purposes. It is about as strong as phosphor bronze but whereas phosphor bronze has a conductivity of only 26 per cent that of pure copper, the silicon bronze has a conductivity of 96 per cent that of copper, when specially prepared with a view of obtaining maximum conductivity. In ordinary practice for telephone wires the conductivity of the silicon bronze is about 70 per cent that of copper. The wire has great tenacity and is a resister of corrosion. It is practically as strong as steel which has been used for the purpose and need only be approximately one-half the diameter to carry the same amount of current as the ordinary steel telephone wire of 0.08 in. diameter can be replaced by silicon bronze wires of 0.04-in. diameter. The tensile strength of silicon wire, 3 per cent silicon and 97 per cent copper is about 55,000 lb. per sq. in. cast. With that strength a wire 0.08 in. diameter would be able to sustain its own weight to a length of 13.8 miles. A bar of steel of 90,000 lb. per sq. in. tensile strength having a sectional area of 1 sq. in. can sustain its own weight for a length of approximately ½ mile.

Iron enters into the brass and bronze alloys at times but is of little value as compared to other substances. In fact it is an impurity in most instances. It is found in manganese bronze because the manganese is added in the form of ferro-manganese. It is found in the gear bronzes at times when iron is added up to as high as 4 per cent, to act in the nature of a hardener. In this respect it gives good results and is accepted as standard practice.

While the alloying substances mentioned are those most frequently used in the arts and sciences, there are several others which are used in secret formulas and for special purposes which are not general enough in their nature to be discussed here. The alloying substances themselves are combined quite frequently, the mother metal copper in these cases being omitted.

Many manufacturers of metal have adopted a pet formula which they have kept secret and these metals are generally sold under a trade name. This is true of casting and forging metals for such purposes as propellers, bearing liners and other specific purposes. Indefinite compositions also have been given names which are generally used. Some of these are tobin bronze, bell metal, admiralty metal, Muntz metal, high brass, cartridge brass, German silver, gun metal, art bronze, gold bronze, delta metal, and many others.

Many Family Branches

These are the main branches upon which are hung the offshoots of the non-ferrous family tree. Like a tree with copper as the trunk and two main branches called brass and bronze, there are offshoots from these branches which are quite separate from the trunk as far as physical qualities and uses are concerned. The complexities of the inter-relationship of the different metals which compose the family are so vast that the study of centuries has not yet evolved the situation to one where practice is standard. In fact the newer art of iron and steel alloying has far surpassed the older one of brass and bronze as far as the standardization of practice is concerned.

The reason for this is not far to seek. It lies in the fact that the heat treatment of iron and steel can be depended upon to give a definite result, provided the materials are put into the mixture in the desired proportions. In bronze work for example, there are several well-known instances where the order of placing the materials into the crucible has such an effect upon the resulting metal that the qualities of two metals mixed in different ways are entirely at variance with each other. Heat treatment cannot be called to the help of the mixer of brasses and bronzes to anything like the degree to which it is in steel work. While it is true that heat treatment will never make a good steel out of a poor mixture, it is a fact that a good mixture can be brought to its state of best usefulness by skillful manipulation of the furnace.

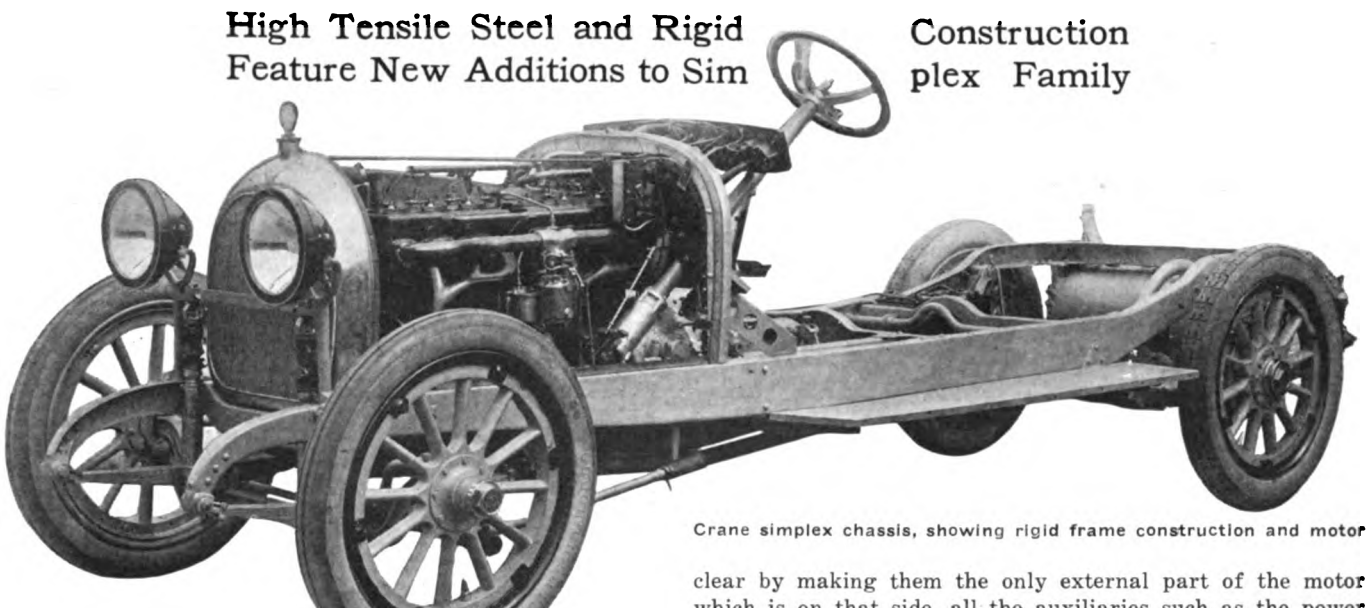
The End.

Some of the Cars of the American Ambulance Corps in France

Lined up before the hospital building which cares for the several hundred wounded brought in every week from the front by the cars. From a photograph contributed by Eliot Norton, Esq., New York City

Crane-Simplex a High Power Design

High Tensile Steel and Rigid Construction Feature New Additions to Simplex Family



Crane simplex chassis, showing rigid frame construction and motor

WHEN Henry M. Crane, former president of the Crane Motor Car Co., of Bayonne, N. J., builders of what has been known as the highest-priced chassis in America joined the ranks of the Simplex company last fall, it was expected that a product of special engineering interest would be evolved, due to the fact that cost has been made a secondary consideration throughout for the best possible in material and design. The Crane model Simplex is now being actively marketed and its chassis price of $5,000 indicates that it is designed to meet the tastes of those who prefer practically custom made cars.

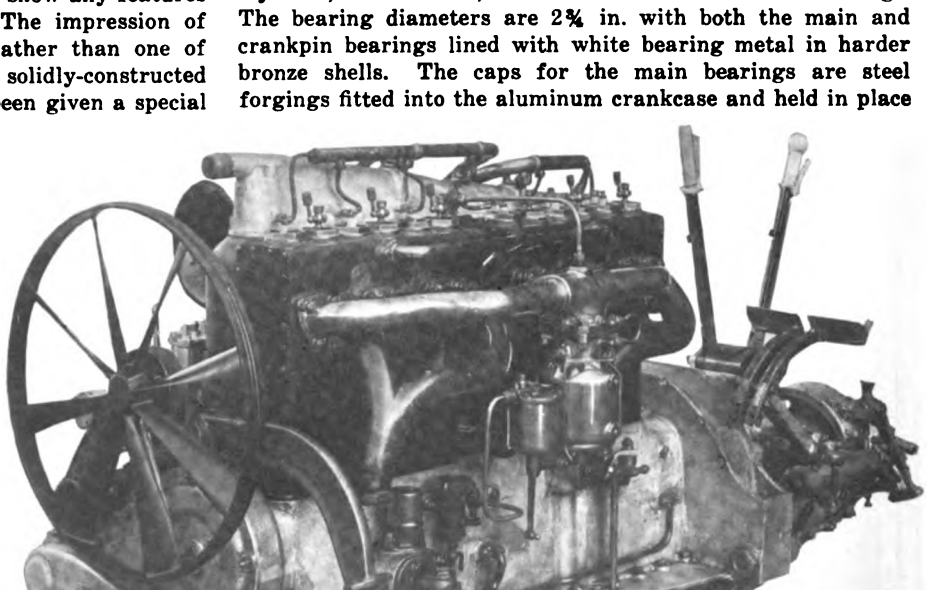
A general survey of the chassis does not show any features of design which can be called radical. The impression of great sturdiness and strength is given rather than one of freakish design. In a word, it is a large, solidly-constructed car, in which the subject of material has been given a special amount of attention and in which the details have been worked out carefully from the viewpoint of long life and accessibility. One of the features of the sales end of the car, is that it is guaranteed for life so long as it remains in the hands of the original purchaser.

The specifications of the standard chassis include a wheelbase of 143½ in. with 36 by 4½ front and 37 by 5 rear tires, and a standard tread of 56½ in. The power plant is a combined unit of six cylinders, disk clutch and four-speed gearset mounted with three-point suspension. The flywheel housing has two of the supports in a unit with it, and a third point is at the center of the cross member at the front of the radiator. The cylinders are cast in two blocks of three, with the head integral and with both the exhaust and intake on the left side. In fact, it has been made a special point to keep the valves free and clear by making them the only external part of the motor which is on that side, all the auxiliaries such as the power tire pump, generator, magneto and starting motor being on the right side. The carbureter is on the left.

100 Hp. at 1800 R.p.m.

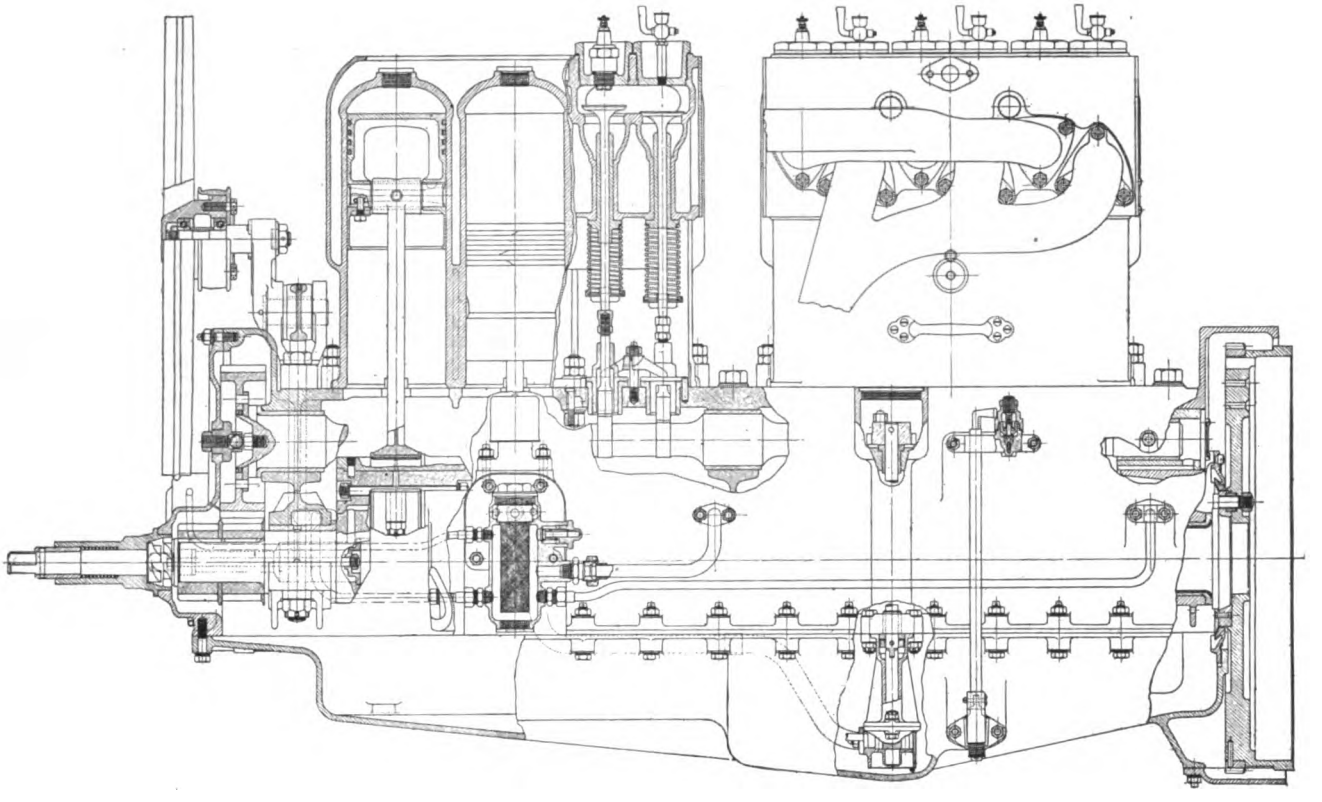
With a bore of 4⅜ and a stroke of 6¼ in. the motor develops in excess of 100 hp. at a speed of from 1800 to 2000 r.p.m. The valves are 1¾ in. diameter, in the clear and the design throughout is not one which would imply an extremely high-speed motor but rather one of medium speeds. The gear reduction at the rear axle on the standard models is 3 to 1 and the motor has been found powerful enough to handle cars weighing in the neighborhood of 5000 lb. on all ordinary grades and in all ordinary country at this ratio.

The crankshaft is very rigid. It is of electric furnace alloy steel, oil hardened, and is carried on three main bearings. The bearing diameters are 2¾ in. with both the main and crankpin bearings lined with white bearing metal in harder bronze shells. The caps for the main bearings are steel forgings fitted into the aluminum crankcase and held in place

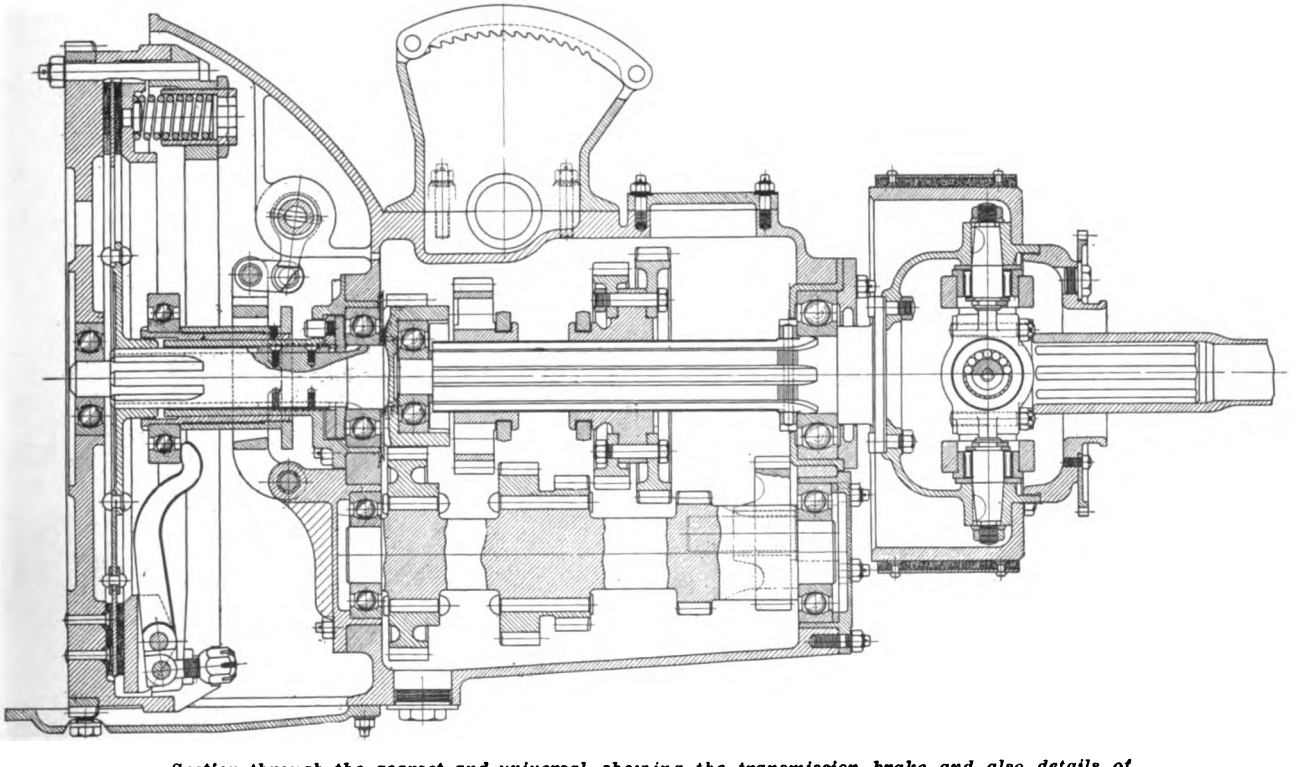


Left side of motor used in Crane-Simplex

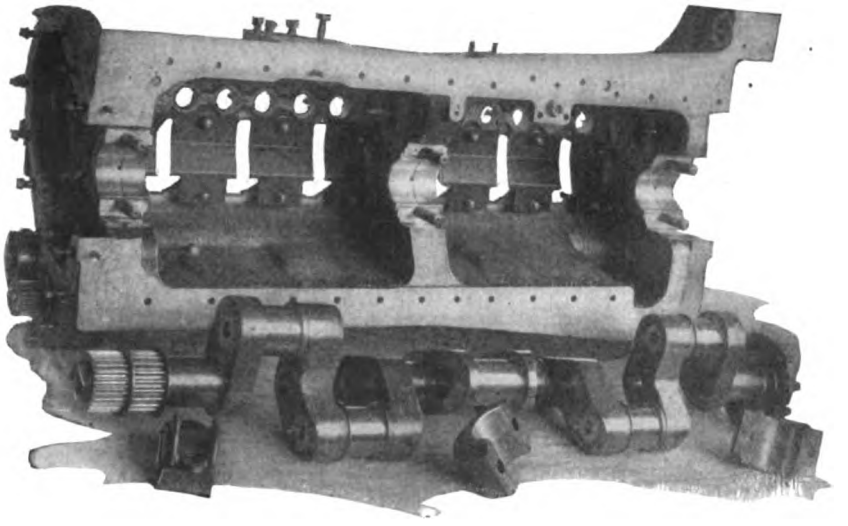
Sections of Crane-Simplex Motor and Gearset



Part section of Crane-Simplex six-cylinder motor, showing details of cylinder, piston and valve construction and bringing out the arrangement of waterjacketing and manifold details



Section through the gearset and universal, showing the transmission brake and also details of the clutch mechanism. As will be noted, the clutch has a single driving disk between two fabric-faced plates. The gearset is full ball bearing mounted and the universal is housed within the brake drum



Crankcase and crankshaft of the Crane-Simplex six-cylinder motor

by heavy bolts which pass entirely through the crankcase. I-beam connecting-rods which are machined on all sides for lightness are employed, the machining not only taking off the excess material but forming an excellent method for detecting poor forgings. The connecting-rods are not only balanced as regards weight, but the centers of gravity of each are determined carefully and precautions taken to have the centers of each set of connecting-rods at an equal distance from the crankpin axis.

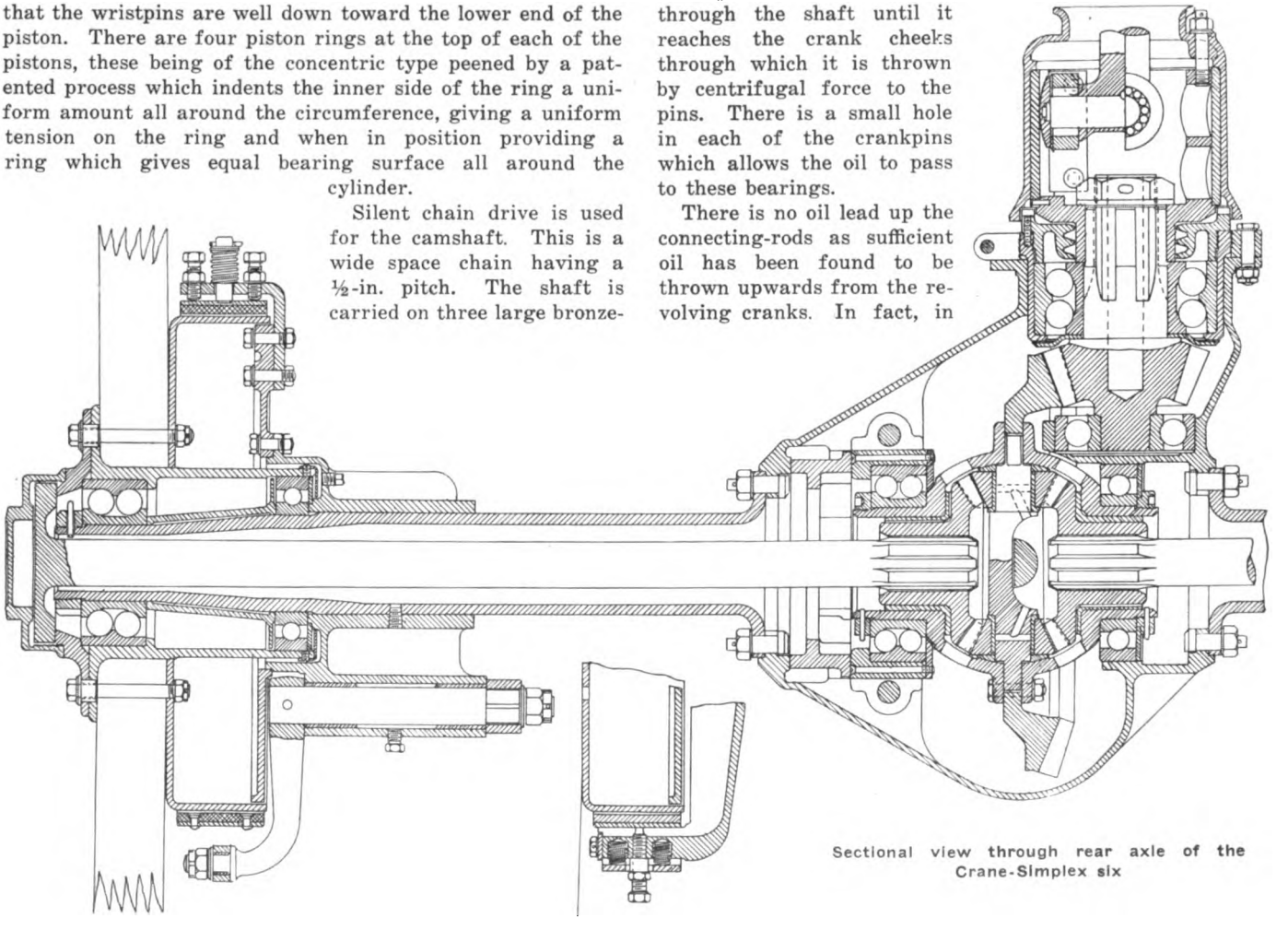
Pistons 6 1/16-In. Long.

A feature of the motor is the length of the pistons. These measure 6 1/16 in. and it will be noted in the motor section that the wristpins are well down toward the lower end of the piston. There are four piston rings at the top of each of the pistons, these being of the concentric type peened by a patented process which indents the inner side of the ring a uniform amount all around the circumference, giving a uniform tension on the ring and when in position providing a ring which gives equal bearing surface all around the cylinder.

Silent chain drive is used for the camshaft. This is a wide space chain having a ½-in. pitch. The shaft is carried on three large bronze-lined bearings which are so arranged as to allow the removal of the camshaft through the front of the case. The cams, which are integral with the shaft, are of the tangent type and work against followers which are of a special design so arranged that they provide the equivalent of a 4-in. roller follower, although they are solid. These lifters combine the advantages of the solid lifter with that of the roller type and allow a steep cam which at the same time is not unduly noisy.

Oiling is by pressure feed and the lubricant is carried positively from a gear pump operated by special drive from the camshaft from the oil reservoir in the lower half of the crankcase to a distributer housing mounted in an accessible position on the left side of the crankcase. This distributer has a large strainer through which the oil first passes, and an overflow valve which acts as a by-pass pressure regulator keeping about 10 lb. pressure on the system at all but low engine speeds. There are three leads from the distributer, each one going to a main bearing and carrying the oil directly to these under pressure. In addition to these three leads there is a smaller one which carries oil to the silent chain camshaft drive. In order that the driver shall be at all times aware of the condition of the oiling system there is an independent lead which passes to the cowl board and operates a pressure gage. From the main bearing, the oil passes through a hollow crankshaft, the oil entering from the main bearing to four large holes drilled into the shaft. The pressure on the oil is ample to overcome the centrifugal force at the exterior of the shaft and from this point the oil passes through the shaft until it reaches the crank cheeks through which it is thrown by centrifugal force to the pins. There is a small hole in each of the crankpins which allows the oil to pass to these bearings.

There is no oil lead up the connecting-rods as sufficient oil has been found to be thrown upwards from the revolving cranks. In fact, in



Sectional view through rear axle of the Crane-Simplex six

order to prevent an excessive supply of oil, baffle plates have been introduced between the cylinders and the crankcase which allow the connecting-rods to work only through comparatively narrow slots. After the oil has been forced through the system, it drains back into the crankcase and thence back to the reservoir of the lower half whence it is again pumped into the system after being drained.

Twin Exhaust System

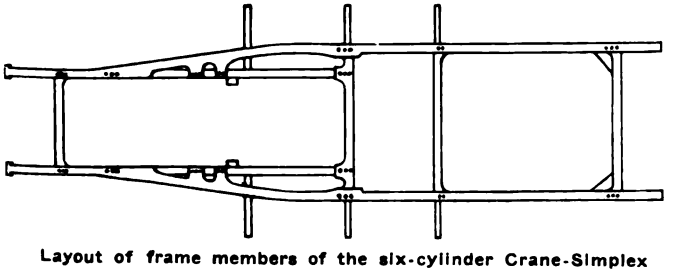
In order to cut down any possibility of back pressure, due to overlapping explosions, a twin exhaust system is used, each block of three cylinders exhausting into a separate manifold. The pipes are carried down at the front end of each block and then curved back and carried straight to the muffler. This gives a compact manifold design which is so arranged as to get the hot gases away from the motor as quickly as possible. The intake is quite compact and both the pipe itself and the carbureter, which is a Newcomb modified slightly to conform with Crane requirements, are waterjacketed. These manifolds and the valves are the only things carried on the left side of the motor. On the right side are the auxiliaries and below the manifolds on the left, are the removable cover plates which permit of easy and accessible valve adjustment.

One saw steel disk is used in the clutch which is built into the flywheel casting. This steel disk is carried on a splined shaft leading to the gearbox and is mounted between two Multi-bestos rings, one of which is riveted to the flywheel and the other to a heavy ring which forms the driven member and which is pressed against the steel disk by means of twelve spiral springs. Since the clutch is continually kept in an oily condition it is necessary, in order to maintain a positive drive without slip, to have unusually strong springs and to accommodate these and at the same time render it easy for the driver to remove the clutch, care is taken to provide a strong leverage in the pedal arrangement.

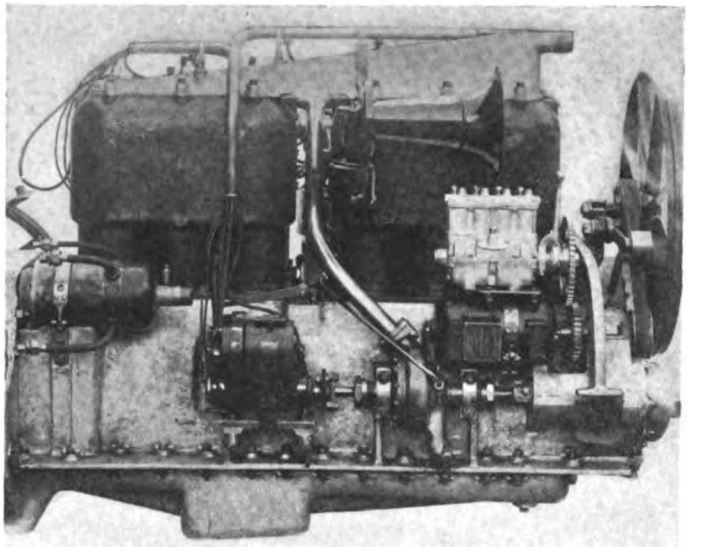
Four-Speed Gearset

Extending back from the rear of the motor is a bell-shaped extension, which forms a housing for the flywheel and clutch and also the forward end of the gearbox. The latter contains a gearset which provides four forward speeds. The countershaft is below the main shaft and both are mounted on annular ball bearings. The reverse idler is fitted with a bronze bushing and runs on a stationary shaft of large diameter. The materials used in the gears and shaft are electric furnace products of great strength and durability. Center control is used and to provide the utmost simplicity the gearshifter gate is mounted directly upon the gearcase, bringing the shifter lever and the emergency brake lever in the center of the car. Heavy oil is used in the gearbox and there is an oilproof housing between the gearset and the clutch to prevent any leakage of oil from the gearset into the clutch.

Hotchkiss final drive is employed in connection with a floating axle in which special attention has been given to securing a wide bearing spread for rigidity while at the same time all the load is borne on the axle tubes. The shafts are high-tensile alloy steel and the tubes are nickel steel bolted to a central cast-steel housing. This has an exceptionally large removable cover which renders accessible the rear axle driving gears which can be removed through this opening. The driving gears are of electric furnace alloy steel of spiral



Layout of frame members of the six-cylinder Crane-Simplex



Right side of motor showing starter, magneto, generator and power tire pump mountings

bevel form and are carried on a double row ball-bearing in front of the pinion and a single row behind. The large gear is mounted on the differential which is a four-pinion design carried on annular ball bearings. The bearing arrangements at the outside ends of the axle tubes are so arranged by turning the hub inward that the axle is considerably shortened, giving a saving of weight and also an increase in rigidity. The wheel is carried on a double row ball-bearing mounted directly on the center line of the hub and a single ball is located at the inner side.

Service Brake on Driveshaft

The service brake is carried on the driveshaft and the hand brake on the rear wheels. The drum diameter of the hand brake is 14 in. and the face width, 2½. Adjustment on these brakes is provided by a nut at each wheel. The service brake which is mounted on the propeller shaft just back of the gearbox is a contracting band design lined with Multibestos having a drum diameter of 10½ in. and a face width of 4 in.

An I-beam section front axle, which is so arranged at the knuckles that the wheels pivot at the point of contact between the tire and the road, is employed. Since the axle and knuckles are of electric furnace alloy steel they can be made of comparatively light section. The knuckle pin is fitted in bronze bushings and the load is carried on hardened washers bearing against the bushings. The hubs are forged steel and are equipped with roller bearings supplied with grease plugs which can be removed by refilling the hub caps. The spring clips are of alloy steel and the steering rod connections are ball and socket type with extra large bearing surface. All the moving parts of this linkage are packed in grease and covered with leather boots.

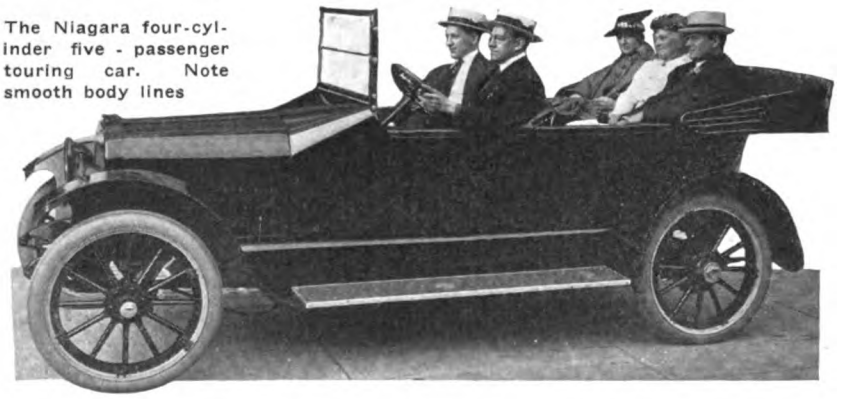
Narrow Turning Radius

Heat-treated alloy steel is used in the construction of the frame, which is of interest. The frame is but 30 in. wide in front, the width increasing back of the motor to 44 in. This permits of a very narrow turning radius. The great width of the frame under the body allows a light construction, but the arrangement of the subframe in front makes the structure particularly rigid for half the length of the frame. Beyond this point it is braced by double cross members. The depth of the flange of the side members is 6½ in. and the running boards are attached directly to the lower flange of the channel side members. This avoids the use of splash

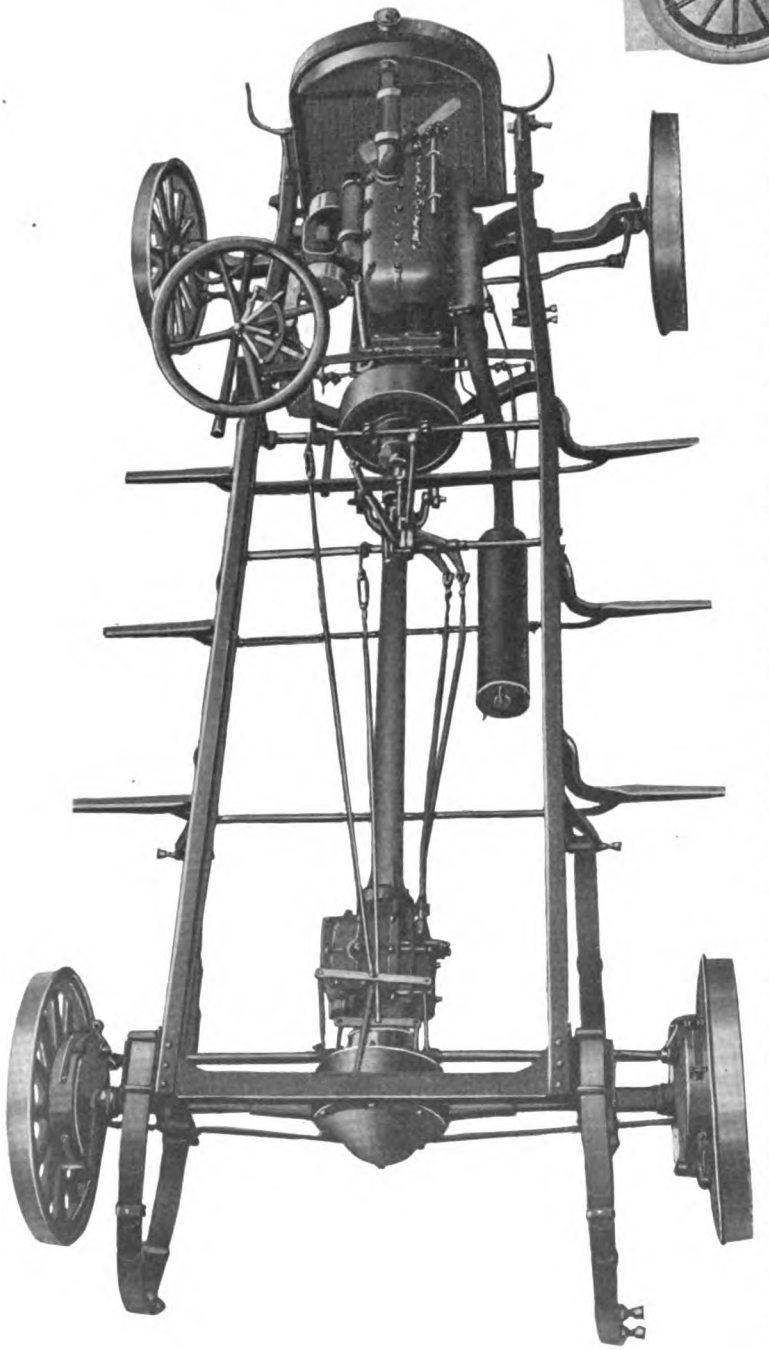
(*Continued on page* 419)

European Touches in Niagara Four

High-Speed 3½ by 5 Block Motor—Detachable Cylinder Head—Ample Bearings and Rigid Assembly—Sells for $740



The Niagara four-cylinder five-passenger touring car. Note smooth body lines



Chassis layout of the Niagara four-cylinder car, showing left drive and center control and mounting of the gearbox at the rear axle

DETAILS of the Niagara Four, which, as was announced in THE AUTOMOBILE for August 26, is to be built by the Niagara Automobile Co., Buffalo, N. Y., bring to light the fact that the design follows European tendencies in a great many respects. The power plant, which has a nominal rating of 36 hp. is of the high-efficiency, high-speed type with the four cylinders cast in a single block. The bore and stroke are 3½ by 5, and in exterior appearance everything has been done to maintain up-to-date cleanness of design. The valve chambers are entirely waterjacketed, and below the jacketing the valves are inclosed.

Detachable Cylinder Head

In accordance with what is rapidly becoming universal practice, the cylinders and heads are cast separately, allowing for good casting work and permitting the manufacturers to use large valves and to assure themselves of good core setting in the casting. The cylinder heads are held in place by heat-treated nickel-steel bolts which give a tight fit to the head and allow the copper-asbestos gasket between the cylinder and head castings to be tightly compressed, thereby preventing any leakage.

Three-ring pistons are employed and care is taken in the piston and connecting-rod assembly to maintain as near perfect as possible reciprocating and rotary balance. The centers of gravity of the individual pieces are carefully located as well as every assembly. In construction the upper end of the connecting-rod is fitted with bronze bushings. The rods themselves are drop-forged and are of the conventional I-beam design.

Three bearings are used for the crankshaft. These bearings are of sufficient length to guard against whipping tendencies, and the flywheel is rigidly bolted directly to the crankshaft by means of a flange on the rear end. The material of the crankshaft is carbon steel, heat-treated for rigidity and with ample diameter, bearing space and physical characteristics makes up a solid unit.

Lubrication is practically self-contained in the aluminum crankcase, the upper half of which forms the engine bed, and the lower half containing the oil pan and lubrication system. The method of circulating the oil is a plunger pump operated from an eccentric on the camshaft. This pump forces the oil through direct leads to the bearing surfaces in the crankcase, and by its action maintains a series of troughs full of oil below the connecting-rods. On the bottoms of the connecting-rods there are oil scoops which complete the circulation system for the lubricant. The excess oil drains back to the oil pan where it is strained and again passes through the system.

Cooling is through a honeycomb oval radiator and carburetion is effected by a Zenith instrument which is supplied with gasoline by a gravity tank located in the cowl.

The Electrical System

From an electrical standpoint the car is fully equipped, having a Disco motor-generator system for lighting and starting, operating through a positive drive silent chain which is completely inclosed. For ignition, there is a Remy distributer system which is operated from the Willard storage battery that is constantly kept charged by the generator. The starter is operated by a push button on the toeboard and is capable of spinning the engine under normal conditions at 125 r.p.m.

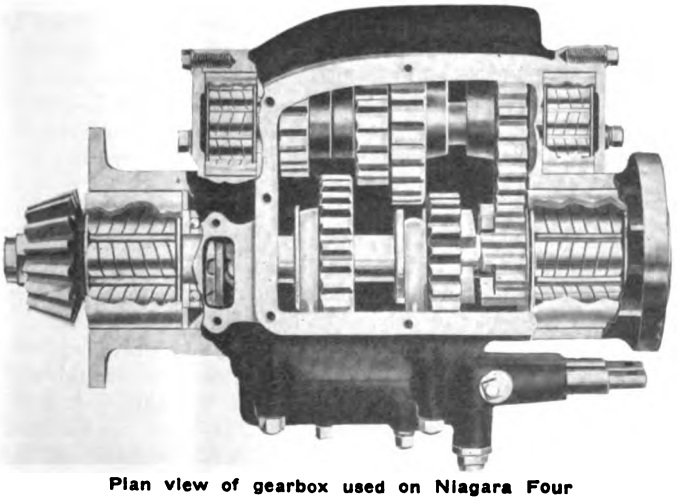
A multiple disk clutch is used in conjunction with a three-speed selective gearset integral with the rear axle. All the gears are made from chrome nickel steel and are carried on Hyatt high-duty roller bearings. The rear axle is floating and is contained in a 2¼-in. steel housing. The driveshafts which take only the propulsion torque are 1⅛ chrome nickel steel. The gears are the product of the Brown-Lipe Co., the bevel drive pinion and ring gear being 3½ per cent nickel steel. The axles are supported by a truss rod.

Drop forged I-beams are used for the front axles, the steering knuckles being Elliott type and the bearings cup and cone ball design. Artillery type wheels equipped with 32 by 3½ tires with twelve oval 1½-in. spokes and demountable rims with an extra rim comprise the wheel equipment. The springs are semi-elliptic front and three-quarter elliptic rear, the lower half of the latter being 44 in. in length with the upper or scroll part 20 in. long, measured from the center of the spring shackle to the point of support. The springs transmit the drive and in order to provide sufficient material to take this strain the width of 1¾ in. is used with a rear shackle and a fixed front support.

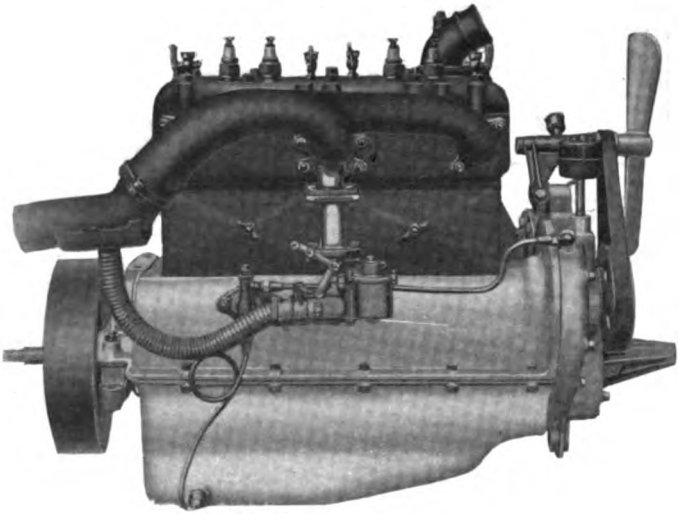
Brakes Are Double

The brakes are double with contracting service and expanding emergency on rear axle drum. Drum diameter is 11 in. The frame is pressed steel channel section 4 by 1½ by 5/32 in. with three cross members tapered from 32 in. at rear to 28 in. front. The wheelbase is 112 in. and the road clearance 11 in. Standard tread of 56 in. is employed.

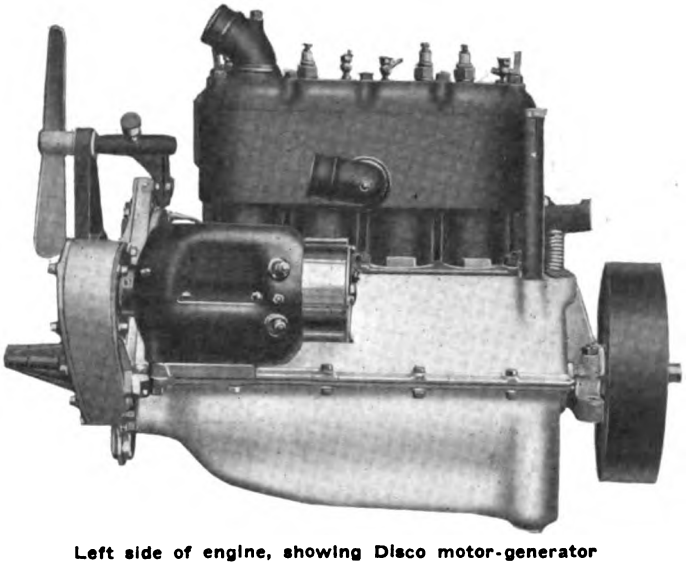
In the way of body work, the Niagara provides a yacht-line five-passenger body which is up to date in protective upholstering and coach work. The door hinges are invisible, instruments mounted on the cowl board and the storage battery carried beneath the front seat. The framework of the body is of first grade white ash with all joints mortised, screwed and glued. The steel coverings are of 18 gage polished nickel steel sheeting. Complete equipment is sold with the car, which markets for $740 f.o.b. Buffalo, N. Y.



Plan view of gearbox used on Niagara Four



Manifold side of motor used in Niagara car



Left side of engine, showing Disco motor-generator

Crane-Simplex a High-Power Design

(*Continued from page* 417)

guards and goes to make up a quiet assembly. For the engine support, there is a sub-frame made up of two deep channel members which are fitted to side members at the front end, and to a cross member at the rear. Suspension is by semi-elliptic springs all around, the rear being 62 in. in length and forming a unit of the Hotchkiss drive, taking both torque and drive. The rear spring support is by ball and socket connection, giving an exceptional flexibility at this point.

Steering is by worm and full gear, both the worm and gear being hardened steel and the wormshaft being fitted with thrust bearings. The gears are inclosed and operate in heavy oil.

In the fitting and equipment of the chassis, everything has been done to promote reliability and long life. Throughout, wherever possible, bushings take the wear to avoid the possibility of having to purchase expensive parts when a bushing replacement will do. Starting and lighting is by the Rushmore system and for ignition a high-tension dual outfit is supplied. The radiator is a cellular patented design carried on a cross member over the front axle. It is cooled by a 21-in. aluminum fan. The lines of the radiator are carried to the hood and cowl and hood clamps which provide against the possibility of rattle ever developing are fitted. Yale locks are supplied on each side of the hood and the cowl board is fastened to the dash and is independent of the body and cowl. The instruments on the cowl board are complete.

The Engineers' Forum

Thinks Aluminum Piston Will Never Prove Success in Truly High-Duty Motor—Weight and Endurance —Believes Aluminum Is Not Stronger Than Cast Iron

By Finley Robertson Porter,
Finley Robertson Porter Co., Inc.

PORT JEFFERSON STATION, L. I., Editor THE AUTOMOBILE:—I have read with a great deal of interest the exceptions taken to my remarks last week in reference to the universal use of aluminum in the automobile by both A. L. Clayden of THE AUTOMOBILE and J. E. Diamond, of the Aluminum Castings Co. Mr. Clayden's remarks in reference to crankcases and gearboxes is absolutely correct, and in my former article I should have mentioned the fact perhaps that these two units are, as Mr. Clayden explained, a case where rigidity is the main object and aluminum is to my mind the most acceptable material to be employed.

Inasmuch as this practice has become so general, it did not occur to me that these points were at issue and I based my remarks on other essential parts, feeling that the question of these two units was never involved.

In view of the discussion becoming as broad as it has I will concede that aluminum is without doubt the best material to be employed in these two cases.

Taking up the matter of pistons, however, I still feel that an aluminum piston will never prove a success in a truly high-duty motor. I mean by this, one that will develop at least a horsepower for every 2 cu. in. of displacement. I feel most certain that the motor of 1917 that will be recognized as a standard in the better class of automobiles, will have to prove sufficient for five- and seven-passenger touring cars, with a displacement not to exceed 200 cu. in. To attain this efficiency it means that a greater percentage of the heat generated will have to be dissipated by energy produced at the driving wheel rather than through a waterjacket or whatever cooling medium is employed.

Heat Conductivity Value

My contention in reference to the aluminum piston is that its great heat conductivity is of no real value because of the fact that the piston clearance and film of oil so thoroughly insulates the transmission of heat to the waterjacket that it becomes only a question of transferring the heat from the head of the piston to the side walls quickly enough to allow it to flow through the wall contact at the best possible rate. I believe it is conceded that cooling by radiation from the inside of the piston is a very negligible quantity since there has been no way as yet devised that permits of introducing air enough at this point to become a factor.

If this theory is correct, we can eliminate the conductivity of aluminum as a factor in its favor and confine ourselves principally to the question of weight and endurance. In view of the conditions mentioned, the temperature of a piston in a motor of this type must necessarily be very high when working under a full load, which we must remember is only a small percentage of the time, but in view of the fact that these extreme conditions do exist, they must be cared for in design with the result that an aluminum piston can be figured at scarcely more than 8000 or 10,000 lb. to the inch, inasmuch as these extreme temperatures may reach as high as 800 to 900 deg., which means that aluminum at that point has very little resistance, while in the case of cast iron we can assume a safe working stress of at least 25,000 lb. to the inch at these temperatures, and in the case of steel this factor can be safely considered as high as 60,000 lb. for cast steel and up to 175,000 lb. when the higher grade of forged steel is employed.

Inasmuch as the future motor will without doubt be confined to bores not to exceed 3 in., the question of section needed to conduct the heat away from the head of the piston comes to a point where steel can easily be employed, based almost entirely on the question of strength.

High Expansion Coefficient

My great difficulty, however, with aluminum pistons has been the high coefficient of expansion. Coming back again to the extreme heat conditions that prevail in a motor at times, it necessitates clearance enough to take care of this, which means that about 80 per cent of the time the motor is working with very loose pistons, which not only produces a piston slap but has a great tendency to break rings and produces a great deal of wear in the ring grooves which in a very short time becomes a source of trouble.

Referring to Mr. Diamond's remarks, I concede that aluminum is not one-third lighter than steel or cast iron but is rather one-third its weight. This is purely an error on my part and I stand corrected.

I do not concede, however, his statement that aluminum is stronger than ordinary cast iron, and I believe his assumption of 20,000 lb., tensile strength for aluminum is very low. It surely is, if it is supposed to surpass cast iron in strength. I have no difficulty in getting cast iron to run as high as 38,000 lb. tensile and have never heard of any aluminum concern claiming more than 32,000 or 33,000 tensile strength for aluminum. At the same time admitting that it is very far from uniform, so that a safe working factor must be accepted far below this figure.

280,000 Tensile for Steel

His statement also in reference to the strength of steel is far below what I would consider correct. The steel that I am using in motors for such parts as crankshafts, camshafts, bolts and nuts we are getting as high as 280,000 tensile.

Mr. Diamond's contention that my granting an improvement in the case of a low-priced automobile should also apply to a high-priced one I believe is a mistake, and in the matter of two designers being given free hand, one confined to aluminum and iron and mild steel and the other to the use of steels, is no doubt occasioned by my omitting to men-

tion that for crankcases and gearcases I felt that aluminum was so generally accepted that it would not be under discussion.

In the matter of the difference of expansion between aluminum, iron and steel as being prohibitive to the employment of inserted sleeves, I still differ with Mr. Diamond, but careful consideration of my view on this point as expressed in your last issue, will disclose the fact that I modified my statement in reference to this type of construction to the extent that I conceded the method possible, but was under the impression that it would require considerable experimenting to determine its feasibility.

All discussion in reference to this subject could be made much more valuable and instructive if we could first determine just what is considered a commercial job.

My impression of the matter is that it simply means the elimination of useless expenditures for material and methods not consistent with the results obtained. I do not believe the question as to whether an automobile costs $1,000 or whether it costs $3,000 should enter into the argument because of the fact that an engineering problem I believe should be based entirely on results obtained and not on any one intermediate condition that might be adopted by the different manufacturers. I believe we should consider the best possible results leaving the question of price out of it.—FINLEY R. PORTER, Finley Robertson Porter, Inc.

Predicts Adoption of Aluminum Pistons as Standard by Majority of Cars—System of Ribbing Strengthens Dome

By Walker M. Levett,
Walker M. Levett Co.

NEW YORK CITY—Editor THE AUTOMOBILE:—I have followed with deep interest your symposium on the use of aluminum alloys in automobile construction. Inasmuch as our company was the first in the aluminum piston field and has been manufacturing aluminum alloy pistons of very many varied types for upward of four years, in the automobile, marine and aeroplane fields, having been concerned with the designing of some and having cast all the magnesium-aluminum alloy pistons used in the well known racing cars of the last three years, in addition to having cast numerous other magnalium and aluminum alloy parts for automobiles, I have been particularly interested in that part of the discussion relating to engine design and piston. In replying to some of the comments that have been made, my attitude is simply that of one offering the benefits of observation accrued through experience as an aid or guide for some of those who have not had the same interesting opportunities that have arisen in what is, so far as I know, the greatest and undoubtedly the most diversified experience in casting aluminum alloy pistons.

A Mistaken Attitude

F. R. Porter's contribution in particular proved interesting to me as he portrayed a situation which we are now meeting almost daily, in view of the rapidly growing interest in aluminum and its alloys for engine requirements. With all due deference to Mr. Porter and his unquestionable attainments, there is not the slightest doubt in my mind that he "rushed into print" on the matter of aluminum alloy pistons, without having given them the thorough work-out which the ultimate benefits derived by those who have done so would warrant. Mr. Porter's attitude unfortunately is one that may be found among a good many clever automobile engineers. That it is a mistaken stand is best proved by the fact that aluminum pistons are being used with a remarkable degree of success for standard production in some of the best known cars for 1916 with the likelihood of their being adopted as standard by a vast majority of cars in the following year.

It is solely with the motive of aiding other engineers who, against their own conviction possibly, realize that the day of the aluminum piston has arrived, and that of the iron piston is on the wane, that I am taking this opportunity of stating a few concrete facts, both as to successes and failures in experimental work with aluminum pistons and aluminum cylinders.

The distinct impression gained after some years' experience along these lines is that each engine offers an individual problem as to clearance and prevention of slap. The engineering rules relating to coefficient of expansion seem to strike a snag when applied to two pistons of the same dimensions used in different type of engines, owing to the differing cooling properties of each type. I could give off-hand a number of rules for clearances that are proving perfectly satisfactory in different types of engines and ranging all the way on the skirt from 0.00125 in. per in. of piston diameter to 0.00275 in. per in. of diameter and without the slightest indications of slap or undue wear in either case. On the other hand, I have known of experimental work where the ordinarily safe rule of doubling the clearance usually allowed for cast iron pistons failed to operate and permitted a very appreciable slap. The manufacturer in whose engine this occurred persisted, however, until he arrived at a satisfactory clearance and has adapted our Magnalite pistons for his standard production.

With regard to the slap which is noticed when the engine is cold and too much clearance has been permitted, there have been numerous methods devised to overcome this usually objectionable feature and with evident satisfaction. Offsetting the wristpin 1/32 in. seems to have satisfactorily solved the slap problem for one manufacturer. Adding ¾ in. to the length of the skirt is a solution by another. A four segment split in the skirt of the piston and machining the skirt to an almost exact fit with the cylinder wall has also prevented any play and consequent slap for another manufacturer. Numerous counter-balancing weight distributien methods also have been employed with success.

Experience with Magnalite Pistons

The matter of the initial slap where objectionable is therefore adequately taken care of by methods that were gained solely through experience. The matter of clearance is one which warrants a little experimental work for each engine in which Magnalite pistons are to be used and the results fully justify the effort. Space limitations prevent my giving full details of numerous interesting experiences with Magnalite pistons that have come with long association with this metal. I will state for Mr. Porter's benefit, however, that we recently shipped abroad pistons on an order from one of the best known concerns, who apparently has been in the fortunate position of being able to disregard costs. This concern formerly had employed pistons which were machined from solid steel billets. Their instructions to us were practically *carte blanche*—to produce a lighter-than-steel piston, which would stand up under the heavy stresses of their high-speed motor.

(*Continued on page* 447)

Sham Warfare Motor Equipment Test

Right—Part of the military instruction camp at Plattsburg pitched in a sheltering wood

Left—Mack 3½-ton truck pulling field gun and limber on way to Plattsburg camp

By J. Edward Schipper

MILITARY Instruction Camp, Plattsburg, N. Y., Aug. 29—What an automobile machine gun corps can do in time of action was clearly demonstrated today in an engagement which took place here between the red and blue armies made up of units from the military instruction camp. The machine gun corps which is attached to the red, or invading army, and is under the command of Captain Smedburg, machine gun expert of the U. S. Army, in connection with the second U. S. Cavalry, succeeded in capturing the entire Thirtieth U. S. Infantry, one of the principal units of the blue defending army and one of the crack organizations of the regular army.

The action centered about the Coopersville, N. Y., bridge over the Big Chazy River. Late Saturday night the blue army scouts captured this bridge. Reinforcements arrived and were ordered to hold the bridge against any attacking force. Captain Root of the Thirtieth U. S. Infantry marched on the bridge early this morning and found it in possession of the blue scouts with its reinforcements. Although the red army scouts reported that other than the force holding the bridge the field was clear, a host of blues was concealed in the brush and shrubs nearby awaiting the order to surprise the crack regiment of reds. Everything had been arranged for a successful ambush of the unsuspecting blues. About a mile to the north of the bridge the machine gun troop, in its armored cars, was waiting on the State road ready to rush to the support of the attacking reds, and when everything was ready the reds hopped up from every side, completely surrounding the regiment of blues, who tried in vain to re-form their line to resist the attack.

Armored Cars in Action

The final stroke was delivered when the whole battery of armored machine gun cars dashed down the State road into the very midst of the trapped blue regiment and the umpires ruled that the entire organization was captured; or rather, that its survivors were. The machine gun troop has shown that it has justified every claim for mobility. Dashing down the road at 30 m.p.h. with machine guns cracking and the gun crews busily engaged in feeding ammunition to the Benet Merciers and Colts it makes a business-like spectacle, and is not incapable of being concealed behind stone walls, etc., in the neighboring fields.

Watch Motor Equipment

MILITARY INSTRUCTION CAMP, PLATTSBURG, N. Y., Aug. 29—Keen eyes are focused on the work in progress at this camp. Alert brains are studying the results here accomplished. The prinicples involved amount to far more than the possible 1200 graduates from the school of military instruction, because the men are not the only features of interest to the military authorities of the country.

The war in Europe has brought out the necessity for an adequate supply of material of all kinds. The work of the motor equipment in Europe has opened the eyes of officials in this country as to what the possibilities of its use are

Autocar machine gun express with its crew

when it comes to problems involving quick mobility. In former years the 25-mile-a-day march was considered sufficient for any need under ordinary circumstances. To-day 100 miles a day is not considered too much when it becomes necessary to transport large bodies of men from one point of operation to another. The use of machine guns in Europe has now reached a scale never dreamed of in former wars. It was at one time sufficient to have three machine guns to a regiment of 1000 men; from twenty-five to thirty guns are now considered necessary. The machine guns and the motor vehicles go hand in hand. They are two prominent landmarks in the military history of the past two years.

Both machine guns and motor vehicles are parts of the plan of quick mobility. For this reason, the presence of a machine gun troop fully equipped with motor vehicles at this camp is attracting the attention of army experts to a notable degree. There are fifteen motor vehicles in the camp and fourteen of these are with the machine gun troop.

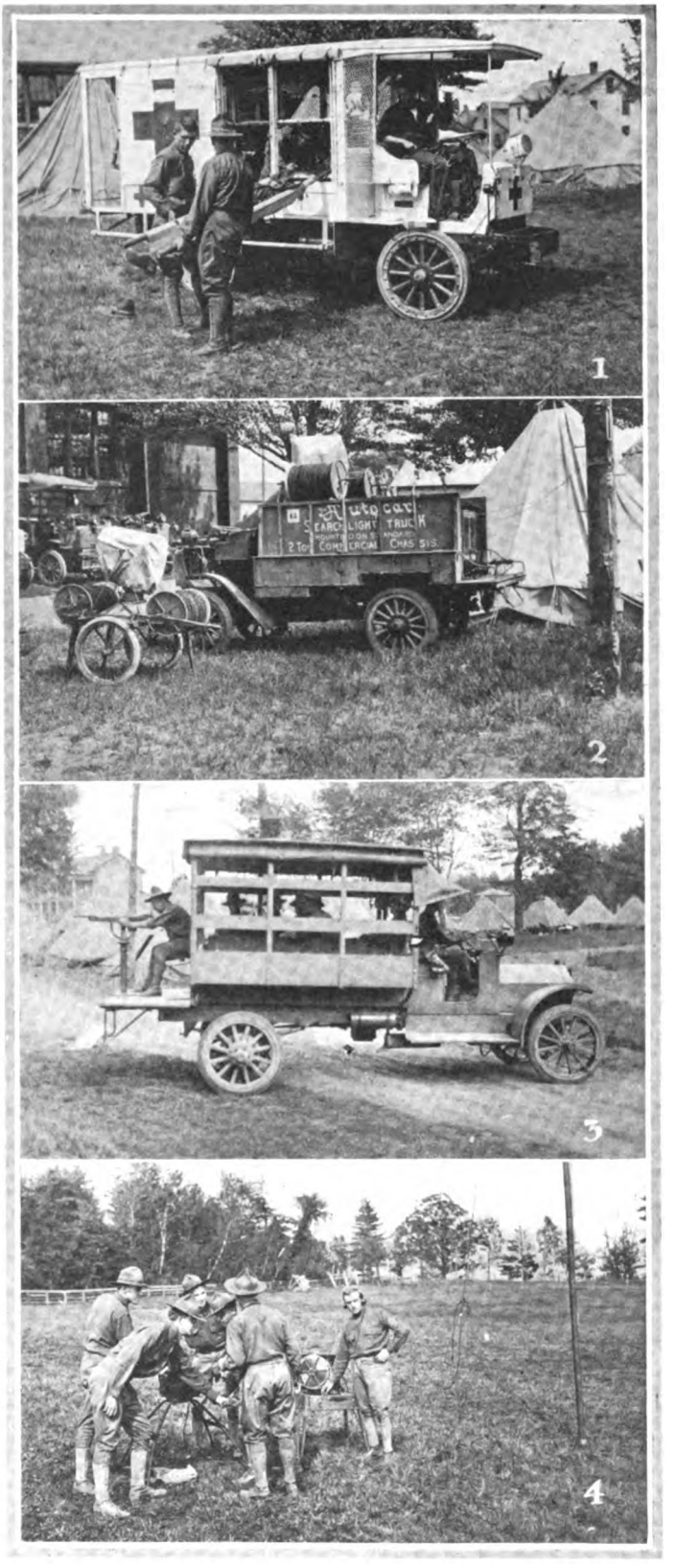
This is the first experiment in motor-transported machine gun units which has ever been conducted by the U. S. Army or the National Guard, because, hitherto, no funds or opportunities for such an experiment have been provided. Private capital has supplied the money for this organization in connection with the military instruction camp and from the experiments here conducted, it is purposed to learn exactly what kinds of cars and trucks are suited for the purpose, how many guns and men can be transported to advantage upon one truck, the speed at which they can be operated, the sort of country they can be used in effectively, and other data which at the present time are merely guess work.

Seventy Men in Machine-Gun Troop

In this troop there are about seventy men, lawyers, bankers, and business men from all over the country. They are graduates from Harvard, Yale, Princeton and other leading universities. With the troop there are twenty machine guns and two 1-pounders. The machine gun expert of the U. S. Army, Captain Wm. Smedberg, is with the troop to instruct the men in the operation of the guns and to keep a watchful eye on the performance of the equipment. Capt. Raynal C. Bolling, general solicitor of the U. S. Steel Corp., who has been instrumental in organizing the troop, is in command. The necessary funds for the experiment have been contributed by Judge Gary, chairman of the board of the U. S. Steel Corp., Geo. W. Perkins, J. P. Morgan, Brown Bros., Potter, Choate & Prentice and White, Weld & Co. In addition, vehicles have been supplied by the Autocar Co., International Motor Co., the Cadillac company, Garford, Simplex, Mitchell, Buick and Hendee Mfg. Co. A privately-owned Ford and a Locomobile are also present. In addition, the Carnegie Steel Co. has supplied armor, the Hay-Buddon Mfg. Co. has provided a field repair shop anvil and the Vought and Williams Co., a forge and vise. The U. S. Tire Co. supplied a number of extra casings for the cars.

With this equipment, there is a sufficient variety for accurate line to be drawn on the possibilities on each type of car. So far, the experiments show that two main factors govern the utility of the vehicle under consideration. They are, the speed and the body. This fact became evident even on the march from New York to Plattsburg, a distance of 400 miles accomplished in four days. Capt. Bolling immediately divided the cars in three classes; slow, medium and high speeds, and laid out the work of each accordingly. Regarding the body, the fact which stands pre-eminent at the present time is that it must be so designed as to be suitable for all around purposes. A special type of body which can only be used occasionally fails to have the general utility necessary in campaign work. This fact will become evident as a detailed study of the equipment at the camp is made.

The Garford truck is of 1½-ton capacity, and on the chassis is mounted an all-around utility body which can

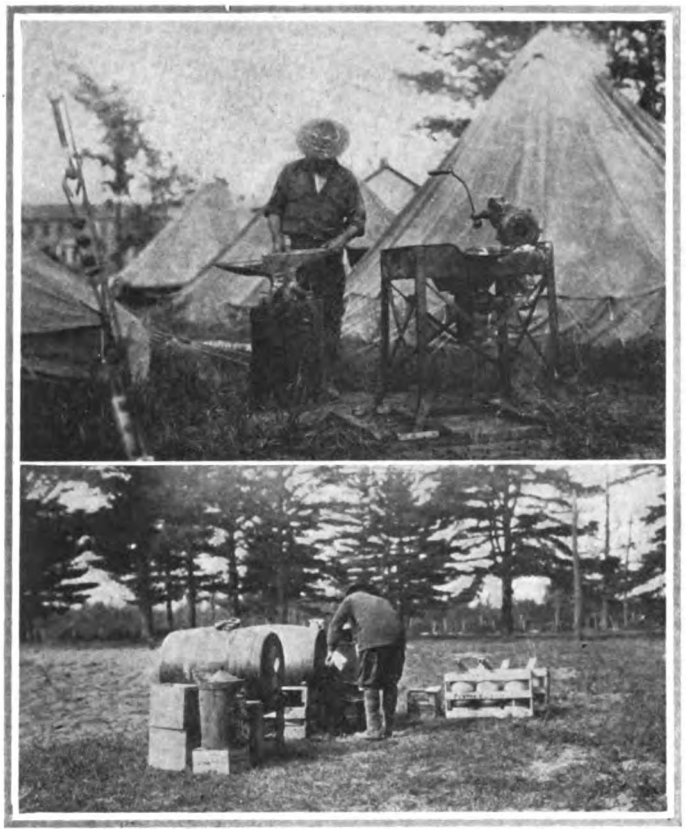


1—Autocar ambulance in action. Wounded man being handled on stretcher carried with car

2—Autocar searchlight truck with detachable searchlight reel, which can be wheeled 1-4 mile from truck, which is the source of power. This apparatus was also employed at Fishkill Landing

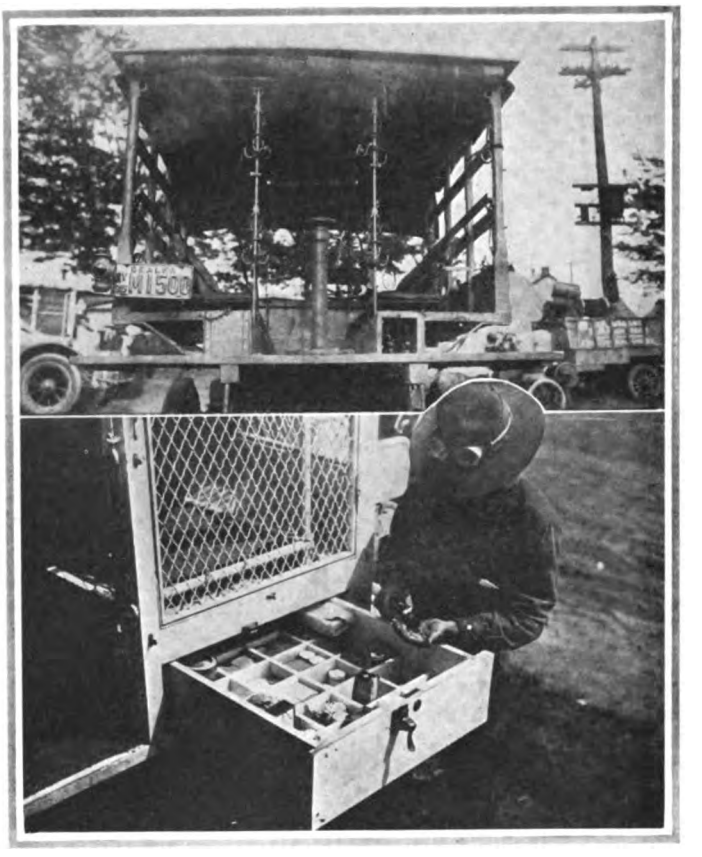
3—Garford 1 1-2-ton truck with machine gun mounting. This is an all-around useful body which can be used for transport and machine gun work, or the machine gun can be dismounted and the body used for ambulance purposes

4—Field wireless crew with apparatus which can be carried on motor vehicles



Field repair equipment carried to the permanent encampments for work on the motor trucks

Field gasoline station used at the Plattsburg camp—here is a feature which could be improved for permanent encampments



Rear view of the body mounted on the 1 1-2-ton Garford truck, which is an example of all-around use

Drawer in the side of the autocar ambulance body containing enough surgical equipment to perform a minor operation

either be used as an ambulance or a transport and machine gun car.

Body as an Ambulance

When used as an ambulance, the machine gun is, of course, removed to bring the car under the protection of the Red Cross. At that time the car can go right to the front and pick up wounded men as far as battle conditions will permit. It has a capacity of six stretchers which can be carried on racks supported within the car on uprights, as will be noted in the illustration on this page. The body, however, is more of a transport and machine-gun outfit than an ambulance. With the machine gun mounted on the rear platform, and with the side seats for the crew, a speed of 35 m.p.h. can be secured. If desired, the seats can be removed and the men crowded together to the utmost capacity of the vehicle. When not near the firing line the machine gun is removed and placed in a bag which is carried in a space provided for it beneath the side seat. The stretchers fold up, the stretcher racks are out of the way and, in a word, all-around utility is the chief asset of this type of body. It can be a field ambulance, a motor transport wagon, an offensive machine gun unit, a rear guard unit, a reconnoitering car, or fulfill any duty of ordinary military usage.

On the Buick chassis, which is of 1500-lb. capacity, there is mounted a type of body which has been found of great use on the battlefields of France when it becomes necessary to transport quickly ten or a dozen men from one part of the scene of operation to another. It is a sort of open express design which can be provided with armor plate if necessary and carries on the rear platform a machine gun mounting for either offensive or defensive work. A car of this class can dash about from one place to another at a speed of from 35 to 40 m.p.h. and with the crew of the machine gun could withstand a considerable attack while the men are performing the work assigned. In other words, a car of this type could be sent on an expedition such as the blowing up of a small bridge, and while the men in the wagon were setting the explosive and arranging the fuse the machine gun could be utilized to hold off the enemy for a sufficient length of time to accomplish the work.

Armored Cadillac in Camp

The Cadillac cars are the military hospital and armored cars which have been described before. They belong to the North Western Military Academy of Highland Park, Ill., and are part of the contingent which recently completed a tour to San Francisco. The armored car can attain a speed of 40 m.p.h. and is equipped with a revolving gun turret. The present car is equipped with pneumatic tires with the spare tire exposed at the side. In time of service these would no doubt be replaced by solid tires. The military field hospital in its present condition has a machine gun mounting on the rear which of course would have to be removed if the car were used for ambulance work. One of the points of this car's equipment are the roller stretchers. These take up so much room that they could not be used to advantage were there wounded men in any quantity.

Submitted for test by the International Motor Co. are two Macks, a 1-ton and a 3½-ton. One of the surprises of the camp has been the performance of the 3½-tonner. This is equipped with demountable armor plated sides and has mounted on its body two machine guns and a 1-lb. rapid fire gun. It acts almost as a land gun boat. On the march to the camp, 400 miles from New York, this truck with its equipment which weighed up to 8 or 9 tons was speeded to 35 m.p.h. In addition to its own load consisting of more than thirty men, the three guns, 15,000 rounds of machine gun ammunition, 12,000 rounds of 1-lb. shells, 800 rounds of 3-in. shrapnel for the field piece, two independent searchlight

systems, one of gas and the other of electric, two independent gasoline systems, and the armor plating, this truck towed a limber and a 3-in. field piece of the latest design capable of firing 9000 yd. or over 3½ miles with accuracy.

The other Mack, of 1-ton capacity, is equipped with pneumatic front and solid rear tires and a platform body upon which are removable sides and tail piece covered with Harveyized steel armor. This is capable of resisting rifle fire at 500 yd. Just for an experiment, the plates were removed and the men opened fire with the machine guns at 200 yd. The hail of bullets failed to penetrate the plate, simply splashing off, but the plates themselves rapidly became crystallized under the vibration set up by being struck blows equivalent to the falling of several ton weights at the rate of over 300 per minute. The result was they soon cracked and fell apart, although at no time did a bullet penetrate through the steel. The steel is guaranteed against rifle fire, however, at 500 yd. with the latest steel bullets. The truck is equipped to carry a Maxim rapid fire gun and a Colt machine gun with full crews for each of these and 15,000 rounds of ammunition. Both the armor plate and guns can be removed on short notice to be set up in a field position. The bodies on both these Macks have been designed by Alfred F. Masury, chief engineer of the International Motor Co., who spent 3 months making a study of European military motor equipment in Europe. A feature is the tubular centrifugal radiator behind the motor in a steel bullet-proof frame.

Simplex Machine Gun Express

On the Simplex 100 hp. is a body which may be called a machine gun express. This body carries a driver for the car and has just sufficient room for a machine gun and crew. It is capable of speeds in excess of 60 m.p.h. and can be used to dash into the enemy's line, operate the machine gun for a short time and then before it can be reached by artillery, make a hasty retreat. It is such vehicles as this that have been of great use on the other side for making quick reconnoissances.

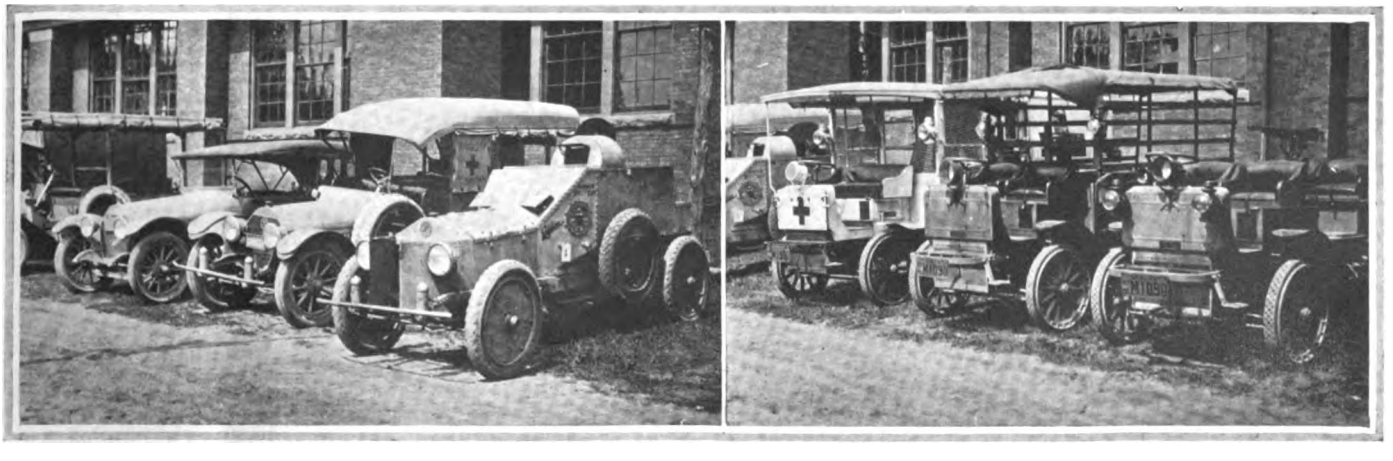
The four Autocars have all special bodies which are similar to those now in actual use on the European battlefields. These are all on the standard Autocar 2-ton chassis. The officers' reconnoissance car can carry a group of officers on a tour of inspection of the lines or for any service at all where it is necessary to take three or four men quickly along the lines. It fills the place of the officers' horses, doing the work much more rapidly wherever it is possible to remain on the road. The searchlight car is the same as that recently concerned in the manoeuvers at Fishkill Landing, N. Y. The searchlight wagon attached to the car can be wheeled a quarter mile away from the truck which contains the generator for the electric current. In this way the searchlight can be taken to the brow of the hill while the power plant remains concealed in the valley below. The motor ambulance is the same as that attached to the Canadian contingent now fighting in Flanders and the military transport is a body intended to convey men to and from headquarters or about different parts of the line. Any of these wagons can be used for transport wagons, the ambulance having carried twenty-eight at Fishkill Plains, besides having had some actual ambulance experience in working over two drowning men who were caught in a stream which was thought to be fordable. This ambulance has traveled up to 40 m.p.h. It has a water tank underneath with a tap on the rear with room for six prone and eight sitting-up besides the crew and on the side of the body there is a drawer containing enough surgical apparatus to perform a minor field operation.

Mitchell Touring Car for Officers

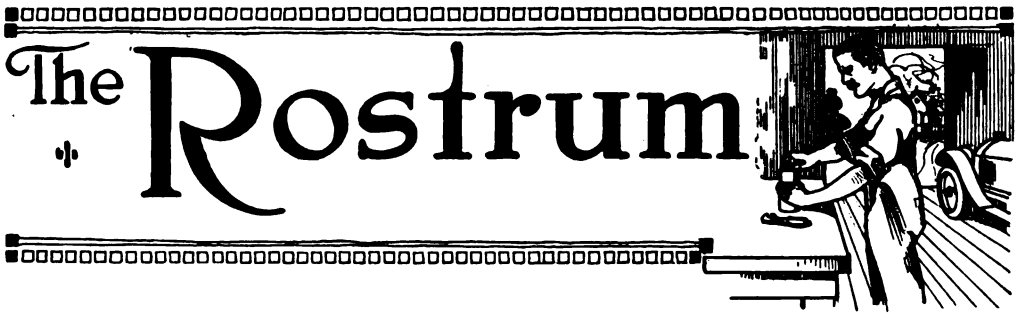
For an officers' utility car there is a Mitchell 6-16, which has a speed of 60 m.p.h. It is a standard seven-passenger touring model. There is also a Locomobile touring chassis and a Ford chassis, each capable of acting as machine gun express cars. The remaining piece of motor apparatus with the machine gun and artillery corps is a Gallaudet tractor bi-plane with a 100-hp. Gnome engine for scout work.

One other piece of motor apparatus is at the camp; this is a wireless truck mounted on a White 1½-ton chassis equipped with a special body to take care of this work. This apparatus can be set up for action in 12 min. and it can send messages 800 miles. The vehicle carries an entire crew and has a generator and complete outfit for sending and receiving wireless messages on the truck. It has a mast for the wireless antennae which are of the umbrella type. The mast is in nine sections and is 85 ft. high. This apparatus belongs to the United States regular army signal corps and has been in use for a little over a year.

Out of the preliminary chaos, however, certain definite facts regarding the uses and requirement of military equipment are beginning to stand forth. The best all-around weight capacity is not above 1½ tons except under special circumstances. Military transport cars must not be merely converted furniture vans or milk wagons, but on the other hand must have special bodies which render them of actual use other than mere vehicles upon which a body of men can pile themselves in traveling across country. With machine gun mounting, many of these vehicles can be made to serve as valuable offensive units. Trucks can be used for towing artillery; with adequate motor-driven apparatus, 100 miles per day is not too much of a journey. The machine gun squad of Plattsburg traveled 100 miles per day for 4 successive days with twenty machine guns, a 3-in. gun and caisson with limbers for each full equipment for the men, cooking outfit, provisions, and all the paraphernalia necessary. Special body design on sturdy, fast chassis will answer the requirements of all-around service far better than miscellaneous trucks picked up here and there.



Views of the motor vehicles kept ready for action at the military instruction camp in Plattsburg



Has Trouble with Gasoline Feed

EDITOR THE AUTOMOBILE:—I have a Winton six-cylinder car. The gasoline tank is on the rear end of the car and the gasoline is forced up to an auxiliary tank on the dash. It then flows down to the carbureter. I also have a four-cylinder Rambler and the gasoline tank is under the front seat and the gasoline flows from there to the carbureter. When running very slowly for 20 min. in hot weather, the gasoline will stop flowing to the carbureter and the car stops. If I wait 5 min. the gasoline will begin to flow again and everything will work properly. Both cars work exactly alike in this respect. Can you give me some advice as to the cause of this?

Riverton, N. J. H. C.

—The fact that two cars act the same renders this a very mysterious state of affairs but there are two explanations which may fit the case. The first explanation is that there are air locks in the piping. It very often happens that in installing the gasoline line, large vertical bends are allowed to occur in the piping. When this happens, there are certain times when the gasoline will be drawn away and what corresponds to a large bubble in the pipe will form in the bend. The result is that the gasoline is choked and cannot flow until this bubble is broken, which occurs due to the weight of the gasoline after a few moments' wait. When the gasoline is again drawn through the piping, another bubble is apt to form and the same occurrence happens again.

The second explanation for your trouble is that, instead of the gasoline ceasing to flow, the condition of running on a rich mixture for 20 min. results in flooded engine which will not again operate until sufficient gasoline has evaporated to bring the mixture down to the range of explosiveness. Above and below this range, a mixture of air and gasoline will not explode. With the ordinary carbureter, the auxiliary air valve will remain closed at very low speeds with the result that practically all of the suction of the motor falls upon the jet and nothing but raw gasoline is drawn into the manifold. After running a short time in this condition, with more gasoline being drawn into the manifold than is being used, the motor is choked and stops. When you wait for 5 min. as you state, the accumulated gasoline evaporates with that result that an explosive mixture is again formed and the car will run properly until the same condition is again set up.

The remedy for the trouble is either to make a lighter adjustment on the air valve, or to install some device admitting extra air to the manifold. A number of these are on the market and can be attached by simply tapping into the intake manifold and by installing a control system, such as a Bowden wire, to the steering column or some convenient position in the car. Whenever the mixture becomes super-rich, so that it is necessary to dilute it with an extra supply of air this can be done from the driver's seat. Such an installation not only guards against the trouble which you mentioned, but also permits a reduction in your gasoline bills by making a leaner mixture for higher speeds at which the car is practically continuously run during a tour through the country.

It would be well for you before making any such installation, however, to go over the piping to see if your trouble is not due to the readily cured air locks due to vertical bends. Referring to the illustration, Fig. 1, the difference between the bent piping which is apt to have air locks and the straight piping in which they are avoided, is shown.

A Metal Lighter Than Aluminum

Editor THE AUTOMOBILE:—I have been very much interested in the articles appearing in THE AUTOMOBILE on the possibility of using aluminum in gasoline engine construction, and am appending a clipping which will speak for itself.

Both the pistons and the cylinders are made of this metal and the writer had the chance to examine the engine lately and found both the piston and cylinders in splendid shape. The length of the cylinders covered by the ring travel, seemed to have even a higher polish than cast iron, and there were no scars on either member and no wear which could be noticed, although it is said that the engine has seen considerable service.

It is possible that Krause has made a discovery which will become very valuable to engine designers.

St. Louis, Mo. C. E. B.

—The clipping inclosed by C. E. B. states in part: "To take a piece of fire clay out of the earth and from it make a metal lighter than aluminum and as tensile as steel, and then take this metal and make of it a 75-hp. motor weighing 175 lb. you are capable of driving a polyplane aircraft 2 m.p.m. is an achievement that bids fair to place its achiever among the great inventors of the world. This is what G. A. Krause claims to have done. It is said that the U. S.

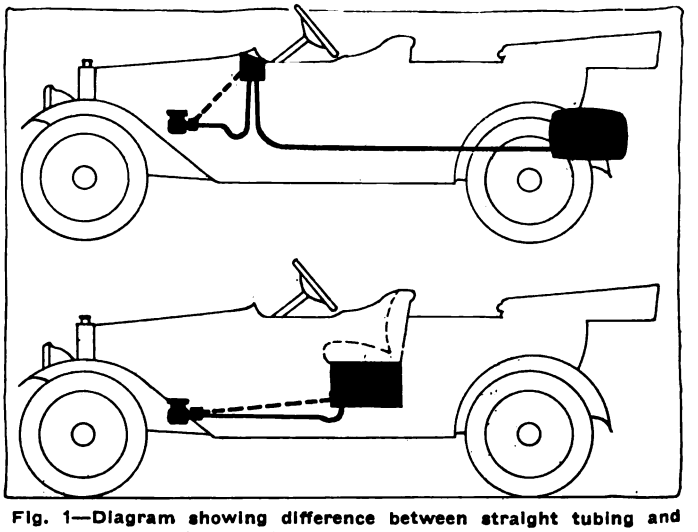


Fig. 1—Diagram showing difference between straight tubing and curved tubing which causes air locks in gasoline line

Government is figuring on a contract calling for 2500 of Krause's motors at $1,600 each or $4,000,000 gross. Naval officers have been in St. Louis a week testing the metal and motor. Speaking of his metal, Krause said, "It is a fire clay product with a specific gravity of from 1.76 to 2.16 and a tensile strength ranging from 21,000 to 35,000 lb. per square inch."

In all probabilities the alloy referred to is a mixture of aluminum and magnesium, although the specific gravity of the well-known aluminum magnesium alloys is generally a little higher than the figure given in the quotation. Magnalium for instance, has a specific gravity of about 2.5. Its tensile strength cast is from 18,000 to 21,300 lb. per square inch, and in annealed plates, runs as high as 42,200 lb. per square inch which is higher than that given above. The reason that the magnesium alloys are lower in specific gravity, is that magnesium itself is very low in specific gravity, this figure varying from 1.69 to 1.75, while the specific gravity of aluminum is 2.6 to 2.7.

With careful working, magnesium-aluminum alloys can be so made that a tensile strength of approximately 53,000 lb. per square inch with a 3.7 per cent reduction in area can be readily secured.

Weakened Magnets Need Recharging

Editor THE AUTOMOBILE:—I have a Velie racer which is equipped with a Mea Magneto from which the machine is started by hand crank and it will not fire at low speed when turned by hand. I suppose the magnets are weak.

This is a foreign magneto and will be glad if you can advise me who handles this apparatus in this country.

Saltville, Va. P. S.

—The reason you give for your magneto failing at low speeds is probably the correct one. This magneto has magnets which are differently shaped, as compared with those manufactured in this country, which as a rule have the standard horseshoe type.

The shape of these magnets is brought out in the illustration, Fig. 2. The magneto is handled by Marburg Bros., 1790 Broadway, New York City.

Grease Will Not Retard Layshaft

Editor THE AUTOMOBILE:—In THE AUTOMOBILE for Aug. 5, page 224, under the heading, Has Difficulty in Changing Gears, would state that I have recently seen in the instruction for another car the request to use heavy cylinder oil in the gearbox. This makes me think that it is quite possible that too stiff a grease might noticeably retard the layshaft. Is not this true?

Boston, Mass. W. G. R.

—It is hardly possible that heavy grease would continuously slow up the shaft although it might do so, for a considerable time after it was introduced into the gearbox. After a short time, however, the rotation of the shaft and gears would cut a path through the grease and the resistance for turning would become so small that there would not be sufficient retardation of the shaft to make gear changing difficult. The slowing of the shaft must be due to something which binds and hence will probably be found in the bearings.

Carrying Capacities and Tire Pressures

Editor THE AUTOMOBILE:—According to statistics recently compiled by THE AUTOMOBILE, the number of automobiles in this country has now passed the 2,000,000 mark. This indicates a tire output of 12,000,000 for this year. An estimate of $16 per tire, which is conservative, will give a valuation of $192,000,000 which will represent this year's output. It has been shown that 30 per cent. of this enormous sum is being wasted by ill-advised loading of tires. In other words, $57,600,000 will be wasted this year through failure to observe proper loading precautions.

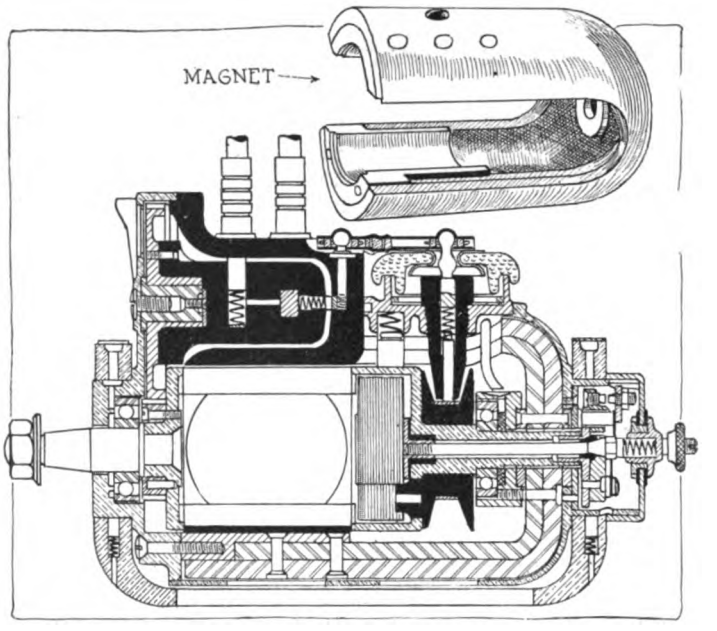


Fig. 2—Section of Mea magneto and sketch of Mea magnet

The load properly assigned to a tire should be the actual load on the tire with the car fully loaded. The actual load on each tire can be ascertained by weighing first the front of the fully loaded car, then the rear, dividing each figure by two to get the load per tire. It can then be inflated to the proper pressure for that particular weight as indicated by the scale of carrying capacities and inflation pressures. A certain tolerance in pressure should be allowed for leakage but before the pressure drops 20 per cent the tire should be pumped up again.

Realizing, of course, that every consumer has a right to his own ideas as to what constitutes good service, and that no practical inflation schedule will cover all possible conditions of service, the following schedule is offered and recommended by the Goodyear Tire & Rubber Co., as a guide under normal conditions:

Gross Carrying Capacity, Pounds Per Tire, Including Passengers and Complete Equipment

	Tire Section Diameter						
Inf. Press.	3-in.	3½-in.	4-in.	4½-in.	5-in.	5½-in.	6-in.
30	250						
35	290	360					
40	335	410	500				
45	375	460	560	675			
50	415	515	625	750	875	1000	1140
55	460	565	690	825	960	1100	1255
60	500	615	750	900	1050	1200	1370
65		670	815	975	1135	1300	1480
70		720	875	1050	1225	1400	1595
75			940	1125	1310	1500	1710
80			1000	1200	1400	1600	1925
85				1275	1485	1700	1940
90				1350	1570	1800	2050
95					1660	1900	2165
100						2000	2280

Akron, Ohio. H. S. QUINE.

Why Speed Increases Fuel Consumption

Editor THE AUTOMOBILE:—Would there be any difference in the amount of gasoline consumed in a car going 40 miles, at the rate of 40 m.p.h. and the same car on the same trip going 10 m.p.h.?

New Westminster, B. C. L. W.

—There would be a difference in the gasoline consumed going at these two different rates of speed and the probabilities are that there would be less consumed for traveling the distance at 10 m.p.h. than there would at 40 m.p.h. The reason for this is in the wind resistance. In traveling at 10 m.p.h. the wind resistance for each square foot of projected area against a vertical transverse plane would be .492 lb. At 40 m.p.h. this resistance has increased to 7.873 lb. There-

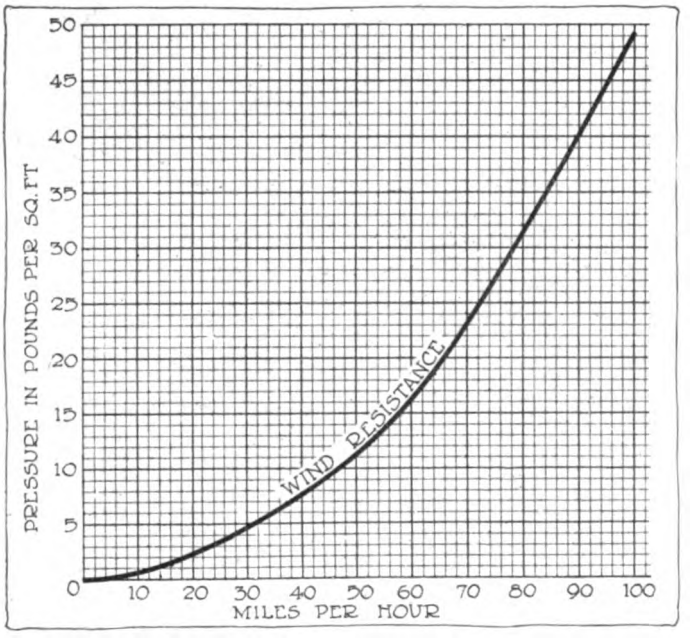


Fig. 3—Curve of wind resistance at different speeds

fore, if the projected area is 25 sq. ft. this pressure amounts to a considerable quantity at a rate of 40 m.p.h. The power required to overcome wind resistance can be figured approximately by a formula which is given as follows:

$$H.\ P. = .96\ P\ A\ M$$

In this formula *H. P.* is the horsepower required to overcome the wind resistance, *P* the pressure of the wind in pounds per square foot and *M* is the speed of the car in m.p.h., thus, assuming a car with a front area of 10 sq. ft. and a speed of 60 m.p.h. the power required to overcome the wind resistance alone, will be 20.8. A curve of wind resistances for different speeds is given in Fig. 3.

Wants Conventional Piston Defined

Editor THE AUTOMOBILE:—Do you know of any books, in either English, French or German which take up the design of motor vehicles from an engineering standpoint? If so, give price and tell whether you can furnish them.

2—How can I secure a copy of the S. A. E. handbook?

3—How can one secure junior or student membership in the S. A. E.?

4—Can you furnish indexes to articles published in past issues of THE AUTOMOBILE and if so, do you furnish back numbers of the magazine?

5—Do you know of any list of allowable unit working stresses used for the different materials entering into the make-up of an automobile?

6—What is the conventional piston design? Is there a similar design for the other parts of an engine and if so, where can I find them?

Chillicothe, Ohio. N. S. A.

—There are a large number of books covering this subject published in all three languages and it would be impossible in the space available here to give a full list of these together with their authors and publishers. It is suggested that you communicate directly with different publishing houses for their list of books covering the subject you outline, in the different languages.

2—Copies of the Society of Automobile Engineers' handbook can be purchased from the offices of the Society at 29 West Thirty-ninth Street, New York City. The book is sold in loose-leaf form with leather binder. It is in two volumes.

3—A junior or student membership in the Society of Automobile Engineers can be secured by filling out the form of application blank provided by the Society whose address is given above. It is only necessary to address the secretary of the Society who will be glad to furnish you with application blank on the back of which are printed the requirements for membership in any grade. The Council of the Society, when acting upon the application blanks, determines the grade of membership to which an applicant is most suited.

4—Indexes to the back issues of THE AUTOMOBILE are published semi-annually in the last issue in December and in June. Back numbers of the periodical are furnished whenever they are had in stock.

5—So far as THE AUTOMOBILE has any record, there is no published list of allowable unit working stresses used for the different materials entering into the make-up of an automobile.

6—There is no definite conventional piston design as a piston might be made in several different ways as regards the number, position and kind of rings and yet still be conventional. The only parts of an automobile which may be said to be strictly conventional in every way are those which follow the standards laid down by the Standards Committee of the S. A. E. Such things as I-beam connecting-rods, I-beam front axles, channel frame members, horizontally split crankcases and a large number of other details found in every car are what might be called conventional although no two are exactly alike.

Tire Size Affects Speedometer Reading

Editor THE AUTOMOBILE:—The speedometer on my car is made for a 36 by 4½ tire, and by using a 37 by 5 tire, what is the difference in per cent on the mileage?

If the speedometer registers 20 m.p.h. how fast is the car really going and how is it figured up?

Montreal, Ont. W. O. G.

—The fact that you have changed your tire size to 37 in. diameter and kept the 36-in. gear for your speedometer drive will make the speedometer register a lower speed than you are really going. The reading on the speedometer for a definite sized gear will vary inversely as the diameter of the tire. Therefore, the speed shown on the speedometer will only be 36/37 of your actual rate of travel or, in other words, only 97.3 per cent of your actual speed. To secure the proper speed reading, you will have to take the speed shown on your meter and multiply it by 1.027. The accompanying illustration, Fig. 64 shows the problem diagrammatically since the speedometer really measures to the speed of which the wheel is revolving. It will take a larger wheel a less number of revolutions to go the same distance than a small wheel, because the circumference of the larger diameter wheel is greater.

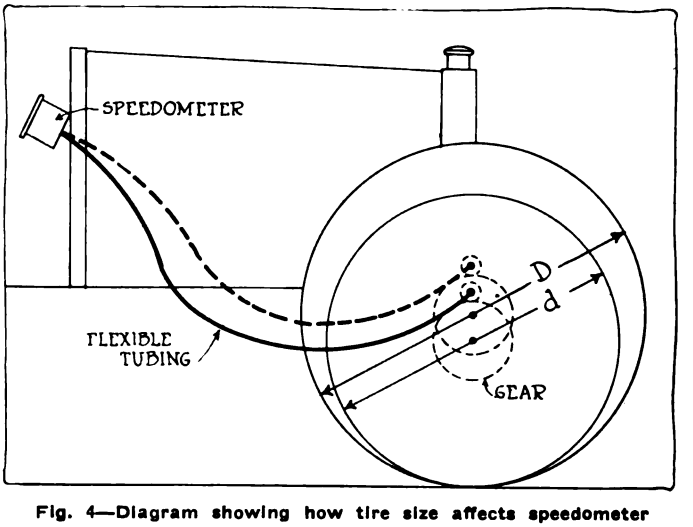


Fig. 4—Diagram showing how tire size affects speedometer reduction

The Car That Stays Young

By M. C. K.

When prices are forced down by competition and values drop more than the prices the first cause is always the public's inability to distinguish between genuine and imitation values. Nobody really prefers what is shoddy or prefers to make it. This being the case, what could be more logical than to cultivate insight in values? The following article, in connection with the responses it may call forth and continued work with details, is an experiment in this direction. It may fall short of its aim, but the classification it introduces cannot help proving useful in some degree.

COMPLETE competence to form and explain a first-hand conception of The Car That Stays Young is divided among hundreds of persons and therefore does not practically exist. Little bits of special technical knowledge relating to paints and rust, leather and imitations of leather, upholstery materials and trimmings, seat springs and brass tacks, colors and dyes, surface qualities and ductility of skelp, rigidity and elasticity of rods and wires etc., must be combined with a large and discriminating driving experience as well as with engineering insight and good sense for the fitness of things, in order to round off a detailed mental image of The Car That Stays Young with a minimum of maintenance and in which nevertheless a smart and creditable appearance is not sacrificed from the start to offset in advance the inroads of wear and tear.

All have piecemeal ideas on this subject, as the ambition to produce or own The Car That Stays Young is universal. Only a few nowadays measure their satisfaction by the amount of painstaking care needed to keep their vehicle trim and resplendent; this particular form of vanity from the horse-and-carriage days having almost disappeared even where most of the labor involved falls to the lot of a hired chauffeur. But the universal desire for a car that will continue to look fit, robust and up-to-date when past middle age usually finds a negative expression. The "cheap" car which nobody wants but which multitudes buy unknowingly is the opposite and the negative of The Car That Stays Young; it may be high-priced or medium-priced or low-priced, but if it gets the reputation of being "cheap"—with some other popular adjectives in reserve for emphasis, if needed—it is mainly because it turns out that it always ages prematurely, in efficiency, in looks, in sounds, in style. Rarely does the word refer only to an inharmonious crudity in lines and proportions; for of this shortcoming many an owner can remain happily unconscious, while to others, though they did not notice it at first, it gradually becomes a more and more aggravating source of mortification; it "gets on their nerves" and prompts them to get rid of the car.

Hundreds of errors can be committed in the design and production of an automobile, and it takes only three or four serious ones to place upon it the stigma of cheapness. There is no end to the combinations of mistakes which will result in this lapse from grace, and no single conception of the "cheap" car can therefore be set up. The word, implying only a denunciation and negation, suggests no useful arrangement of the ideas which it conceals. Yet the general avoidance of all the faults for which this commonly employed word may stand would mean a remarkable sort of progress of great economical and esthetic or educational value —with the usual commercial rewards for those accomplishing it in marked degree or in the most judicious manner. At this point the conception of The Car That Stays Young, being positive and comprehensive, suggests itself as one that can be cultivated and built up till it stands almost as clearly before the constructive mind as the actual Panhard-Levassor car did in 1895 or the Mercedes in 1901. The Car That Stays Young also represents a group of facts and ideas which can be followed up independently of routine work at factories and independently of other descriptive or test-recording work in the press. The conception is in itself a classification of important facts relating to the future value and usefulness of a car; facts which are usually snubbed in comparison with the careful attention given to all factors of the present day and hour, which always automatically assert their importance. Such a classification developed into a living and growing thing, to whose completeness automobile owners, repairmen and members of allied industries may contribute greatly from their experience, might eventually become a standard and highly specialized work of reference on Durability, which is the property on which data are most difficult to secure.

In view of so many chances for contributing a mite to progress by starting inquiries and the collection of data under a new and promising caption, the writer will try to give an outline of the leading ideas and questions which arise when one attempts to draw a mental picture of The Car That Stays Young. Having no special competence to answer the majority of the questions, he must leave them open, supplying only a framework to be covered and dressed gradually with the assistance of those who possess exact knowledge on the point involved in each instance.

Some very general considerations on design and style present themselves first.

Fancies Seldom Durable

The Car That Stays Young is meant to be used for a number of years. It can have no conspicuous design feature which is liable to be generally abandoned in later cars. A powerful conservative factor hides in this self-evident rule. It acted strongly against the introduction of 6-cylinder cars with long motor hoods, as the guarantee of the permanence of the type was vague; much less strongly against the V-eight and the twin-six which are shorter, and most of all in favor of the simple four which is standard. It forbids excessive rake of steering post and very low seats, huge fenders, bath-tub and boat bodies, fancy curves and garish colors. Any new style feature for which no substantial utilitarian reason can be advanced comes under the ban, but also the most promising engineering innovations are excluded so long as they remain subjects for discussion. Very knotty questions, can of course, come up in choosing between motors of thoroughly established durability on one side and 40-speed (2,400 r.p.m.) or 50-speed (3,000 r.p.m.) motors of more advanced design or Knight motors, on the other side; in choosing between silent or roller chain gears and spur or miter gears, between ignition by magneto or by some of the devices which have followed the wide adoption of electric lighting and starting. Among starter systems the choice is as yet difficult. Even a highly sagacious judgment coupled with the greatest care in examining the product, to see whether innovation has been undertaken lightly or with thorough revision of all the construction features which it may affect, can scarcely give the full assurance that comes with Time and Reputation—speaking of time and reputation relating specifically to the design feature under debate in each case and not merely to the manufacturer's methods and standing in general; all make mistakes at one time or another.

The ambition to assist in testing out new principles in motor engineering by investing in the "last cry" and the desire for acquiring The Car That Stays Young are not fully or safely compatible. But on the other hand one who buys The Car That Stays Young has a long time to wait until he can do so again. Progress has time to mature fully before he needs to go into the market once more. Science becomes safely industrialized while he is slowly wearing out his first purchase. To display a fine dash in selecting a car in which the most advanced ideas are embodied must always be a luxury and a risk, since scarcely any important idea reaches practical maturity till it has been on trial for 3 years with the manufacturer and for 3 years more with the public. "Art is long and life is short" holds good for the art of building cars and for the lives of the users. If the object is to crowd sensations and technical automobile experience into the short span of years during which motoring for the sake of motoring remains interesting to any one individual, the Car That Stays Young is not in all respects the ideal, but among the general public probably not more than one in a hundred will deliberately buy experience if he knows how to buy satisfaction. If style and lasting utility with few troubles can be combined, he will prefer such a combination to a flash of pride in a car that is marvelous today and doubtful next year.

Large Progress Matures Slowly

The number of years required for the thorough *mise au point* of important engineering ideas can be realized from examples. The ups and downs of alloy steels have not come to rest yet. Riveting is not yet a perfected process for frames, but frequently gives way in trucks where loads are heavy and vibration is pronounced, yet no form of welding takes its place entirely. Patience forsook nearly all who tried to subdue the promising air-cooled motors, but it survives in a single important instance among automobiles as well as for one class of aeroplane motors and now bids fair to come to new life in twin fours, sixes and nines. The gradual increase of stroke length and piston speed, with the accompanying lightening of parts, is still seeking its best limits in European cars and corresponding but different limitations suitable for American conditions and fuel prices. No spring system departing from the standard has yet been accepted as finally superior. The two-cycle motor is still stubbornly advocated and represented in Europe, though little used. The motor bus is still in its infancy in the matter of general design and weight. Every step toward the best has its pitfalls and stumbling blocks and is contested by the fairly good whose shortcomings are known but endurable.

Where the influence of these more fundamental features in motor vehicle construction are concerned the question of cost of production is in the background for determining whether the vehicle will be one that Stays Young or otherwise, while technical ability, experience, system and capital of the concern undertaking an innovation of this order must be accepted as factors greatly reducing the risk for the purchaser. For example, if a firm known to have all facilities for conducting tests and a large reputation at stake announces that electric castings have replaced drop forgings in its new car, it is fair to assume that it has found a reliable technical advantage in the change—say one depending on a stronger alloy and simpler heat treatment—but if a firm with fewer safeguards against error were to switch from forgings to stampings the change could not be accepted with the same assurance, and were it to adopt castings there would be room for a suspicion that they were chosen for being cheaper in small quantities. Though the industrial history teems with examples of technical slips committed by large firms and resulting in reducing the durability and reliability of its cars for a season or two, it abounds in far greater degree in examples of minor concerns which have gone to the wall for daring to take a technical lead prematurely.

If The Car That Stays Young is to have advanced technical features at all comprehensive or vital in character, it is therefore necessary to conclude—as most purchasers indeed do conclude—that it should at least be the production of a concern having much to lose by an error. There is scarcely any room for patronage of the admirable strugglers in the industry unless they stick closely to the established data in all important engineering features and surpass their big competitors in attention to the taste and durability of details and appearances.

Where Judgment Presides

With regard to these details and appearances the requirements for The Car That Stays Young fluctuate of course somewhat in conformity with the progress that is accomplished from year to year or from day to day, but the sins which are committed to meet the price question or for lack of knowledge of the "unmechanical" materials are usually definite and avoidable; somebody knows how the most favorable proportion between cost and value could have been maintained, while in the case of one of the larger technical questions nobody knows the final equation for sure or has means for proving his knowledge. The simplest observations in the streets, roads and repair shop disclose a number of details which make a car old in looks or action or both, and many which suggest inquiries.

Vulnerable Fenders

Crumpled, buckled and rusty mud fenders are common and very disfiguring. The means for obviating this trouble are found not only in careful driving, but in the use of crowned shapes which are much stronger than the flat ones against all impacts and resume their shape after a slight buckling, and in avoiding to have the edges of the fenders extending so far in any direction that they will be sure to receive accidental bruises in the traffic or the careless entering of a garage. The manufacturer is not always supposed to have anything to do with the careful driving which protects fenders, but it is readily realized that in reality the responsiveness of clutch, carbureter, steering gear and brakes and even the change-gear ratio, the shapes and locations of levers, pedals and throttle-control have great influence to facilitate just those minor swerves in emergencies by which the caroming with other vehicles is avoided. From this point of view the protection of the fenders becomes a deeply technical problem. The use of crowned shapes is simpler and, while the best of these, which have no flat portions, cost more than flat ones, they can be narrower than the latter with the same clearance for spring action and the same protecting capacity, since they envelop the wheel more closely. They are therefor naturally less exposed as well as stronger and prettier. No doubt, there are some advantages to be gained for the ordinary flat fender by studying the material, the shapes and the points of attachment of the brackets which support it. Elastic yielding may be encouraged, perhaps. Data may be in existence on these particulars, but an obviously safe precaution lies in having some more robust part project farther than the edge of the fender. The value of a prominent hub cap and of a running-board a little broader than the fenders with which it connects, is probably well worth looking into. An outward flare is an old expedient, which may afford some protection by allowing the fender to yield elastically to an impact which would injure it if received squarely edgewise. A close study of the smallest possible dimensions of the fenders consistent with their purpose leads to the crowned type eventually, but would reduce many flat fenders to safer proportions where price is important. The flat but edged fender is the compromise solution. The front fender which turns with the wheel may be susceptible of improvement, but here barely requires mention, as it represents no established practice. With regard to a finish

for fenders other than paint or baked enamel and materials other than sheet iron and aluminum, every practical possibility is as yet to be classed among innovations and therefore not yet of interest for building up a conception of The Car That Stays Young.

Other points, each of which also branches into a network of questions, are such as the following:

Radiators, to keep them from leaking or having cooling fins crumpled.

Rusty mufflers and exhaust pipes.

Dented motor hoods; rusty streaks at joints with radiator and dash.

Running-boards; with or without an apron.

Foot-board finish; pedals and pedal slots.

Motor finish and noises; mounting of motor and drip pan.

Wire and wood wheels; demountable wheels; demountable rims.

Steering linkage; joints, buffer springs, noises, finish.

Front seats and their upholstering.

Doors and hinges.

Paint and varnish, composition and colors.

Leather and its substitutes; cloths; seat springs.

Lines of wear on bodies; exposed portions in general.

After commenting upon each of these points in the next instalment, an effort will be made to sound specialists in the automobile industry or its allied industries for definite data on the features with which they are most familiar.

(To Be Continued)

Eisemann Device Starts Heavy Motor When Cranked Slowly by Hand

WHAT is termed an impulse starter has been developed by the Eisemann Magneto Co., Brooklyn, N. Y.; it is a device which causes a standard magneto to produce a hot spark, regardless of how slowly the motor is cranked. It is intended especially for heavy motors used on trucks, tractors, etc., though it may be employed on passenger cars as well.

The production of a hot spark regardless of cranking speed is produced by automatically compressing and releasing two springs which are part of the driving mechanism and which give the armature a sharp twist and thus cause the spark to occur at the proper moment. At speeds above 120 r.p.m. the device is automatically drawn out of action. The device can be attached to any model Eisemann magneto.

Fig. 1 shows the device when the motor is running, when it merely acts as a coupling between the drive shaft and the armature.. Fig. 2 shows it just before the trigger lets go and the armature is snapped forward, producing the spark.

The member *A* is driven from the timing gear; *B* is the part that drives the armature; *C* is a trigger which transmits the drive from *A* to *B* when the motor is running, and drops in the notch in the cross bar by the action of gravity when the crank is slowly turned.

The impulse springs are placed between the two blocks *D* which are fastened to the driven member *B* and the

Eisemann impulse starter and coupling mounted on magneto

pins *E* which are part of the driving member *A*. Turning *A* in the direction of the arrow compresses the springs.

When the crank is turned the trigger is moved around so that it drops into the notch in the cross bar by gravity, and thus holds the driven member *B* temporarily against rotation. Further movement of the crank handle compresses the springs, and when the compression is complete the cam on the trigger comes into contact with the driving member *A* and pulls the trigger away from the notch in the cross bar thus releasing the driven member and allowing it to fly in a clockwise direction; rotating the armature and producing the spark.

The trigger is heavily weighted on its upper half, and as soon as it is rotated it tends to move inward still further so that when the driven member snaps in a clockwise direction the trigger drops into the notch *F* in the driving member, Fig. 1. This feature allows the drive to be positively transmitted and removes the load from the springs. This connection is maintained until the speed drops below the minimum operating speed of the motor, at which time gravity becomes stronger than centrifugal force and allows the trigger point to come into contact with the notch again.

All parts are fully inclosed and operate in grease. The device also incorporates, on its driving side, a standard Eisemann coupling which not only gives flexibility, but also allows the magneto to be removed by lifting directly upward.

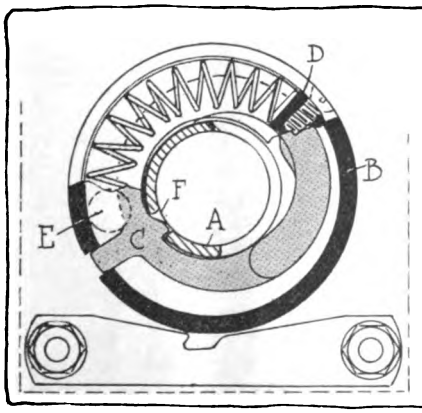


Fig. 1—Impulse starter in position for motor running

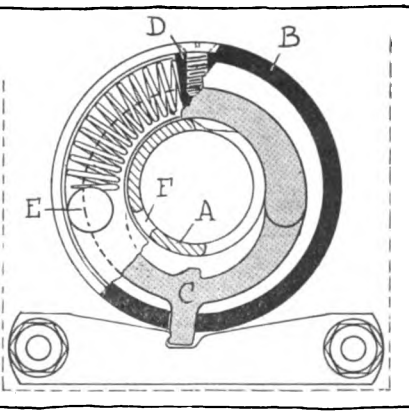


Fig. 2—Impulse starter just before armature is released

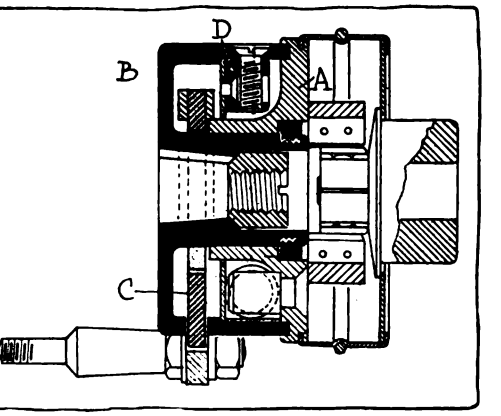


Fig. 3—Section through starter and coupling. Trigger is shown at C

ACCESSORIES

Pagel Oil Indicator

AN oil feed indicator which will stop the motor instantly should the lubricating oil become exhausted in the crankcase, the strainer clogged or the pipes leaky, has been brought out under the name of the Pagel oil feed indicator. This indicator also checks excessive speeds of the motor. It is mounted on the cowl board in the customary manner. The oil register fits in a 2-in. hole and has a ⅛-in. standard pipe thread connection either internal or external. The automatic motor stop is made either for the pressure or non-pressure feed system and is so arranged that by attaching the ground wire from the magneto it will stop the motor automatically should the oiling system fail. It is a plunger device, as shown in the accompanying illustration, being so arranged that when the oil ceases passing through the feed, the plunger is seated and grounds the magneto.

The oil enters the opening of the oil feed indicator at the left and on its way forces its piston backward. This piston operates in a tapered cylinder. The oil flows past the piston and out again through the opening at the right. The movement of the piston causes the hand control to rotate, the dial being insulated, and when the oil ceases to pass through, the indicator rests on the motor stop pin, thereby short-circuiting the magneto and stopping the car. The speed pin can be set at any desired rate and when the motor speed is sufficient to carry the indicator to the pin, it short-circuits. This does not stop the motor but prevents it from going faster. The oil feed indicator sells for $2.25 f.o.b. Sycamore, Ill. The Pagel oil register may be obtained for $1, as may be the Pagel automatic motor stop.—Turner Brass Works, Sycamore, Ill.

Goodrich Gasoline Hose

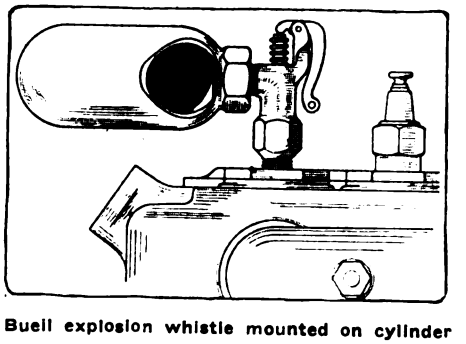
The inside rubber tube of the Goodrich gasoline hose is protected from the action of the gasoline by a fine fabric especially treated which is held in place by a steel wire. Thus, no matter how much disintegration takes place no particles of rubber, no matter how small can possibly get into the gasoline and thus cause trouble in the carbureter or motor. The wire is a flat steel spiral covering approximately two-fifths of the fabric surface and it prevents the hose from kinking. The hose is made in two styles, the Commander and the Goodrich. The latter has a smooth surface and the protecting wire in its interior is wider than that of the Commander variety which has a corrugated surface.—B. F. Goodrich Co., Akron, Ohio.

Buell Explosion Whistle

A novel idea in warning signals has been brought out under the name of the Buell explosion whistle. It comprises a whistle type of signaling device mounted in the valve cap of one cylinder where a portion of exploded gas which attains a pressure of from 250 to 300 lb. is used to blow it. The mounting usually employed with the whistle is shown in the accompanying diagram, the device screwing into a special plug by means of a standard spark plug thread.

The device is quite simple, consisting of a small poppet valve and a high pressure whistle controlled by a 1/16-in. cable located on the steering column. The valve is very sensitive so that a slight touch is all that is necessary to blow the whistle, and one of the great advantages of the signal is that the gas is clean, therefore not choking up the whistle with carbon and soot after it has been in use for a short time. The whistles come in two models, a single tone and a chime, both being 2 in. in diameter, and are of compact design. The chime is produced by three different tones, one of which is quite low and designed to give a pleasing tone to the whistle. With this arrangement, an easy musical signal is given when time is not pressing, but in case of emergency, an abrupt and powerful warning can be produced.

The special plug is useful on Ford cars and other cars where it is not possible to mount the whistle in a valve cap. The price of the three-tone chimes supplied in any spark plug thread size is $6, and a single-tone whistle with valve, $4.25. The special spark plugs for Ford cars, etc., are $1.25.—U. L. Mfg. Co., Chicago, Ill.



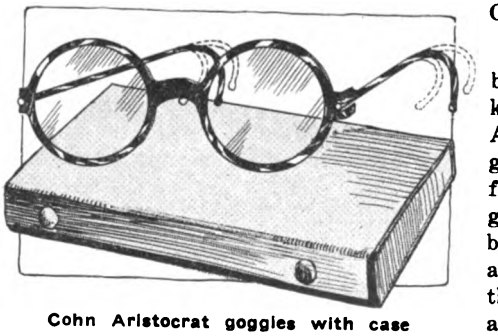
Buell explosion whistle mounted on cylinder

J-M Narco Tire-Cut Filler

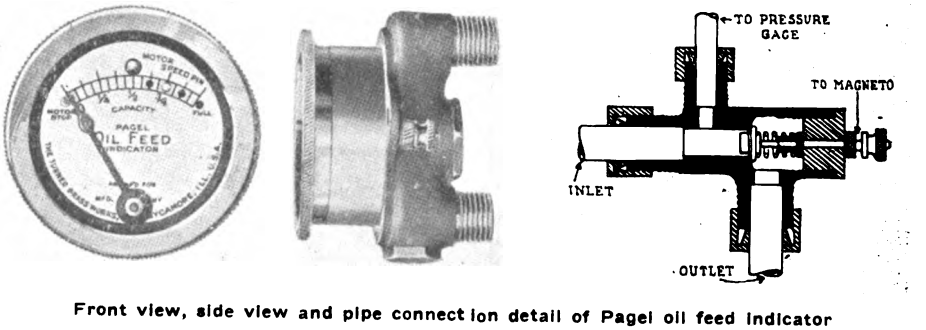
This tire-cut filler is designed for sealing up little cuts and scratches in the casings of tires which would otherwise be enlarged by sand and stone particles and it is claimed to greatly prolong the life of casings treated in this manner. The filler welds itself to the walls of the cut and the loosened tread and solidifies quickly, becoming an integral part of the tire without in any way impairing its resiliency. The filler comes in small tubes at 50 cents and in larger ones at $1.00. Tapering spouts on the tubes permit of quick and easy application.—H. W. Johns-Mansville Co., New York City.

Cohn Motor Goggles

A complete line of goggles for automobile use is incorporated in the five brands known as the Turtle, Peerless, Tourist, Aristocrat and Elite. The Turtle is the goggle with round eyepieces and patent frames and temples. The feature of the glass is the fact that the temples can be bent to any desired size or shape, as they are unbreakable. Folding side sheets of the same material, known as Zylonite, are supplied if desired. Peerless is a



Cohn Aristocrat goggles with case



Front view, side view and pipe connection detail of Pagel oil feed indicator

slightly different shape goggle and also has the Zylonite frames and unbreakable adjustable temples. Side guards can also be furnished with these. The Tourist is a flat, straight frame goggle with horizontal bridge so designed that it can be worn over the regular eyeglass. Like all the other goggles in the line, it has the unbreakable adjustable temple. The Aristocrat is a curved bridge goggle with a round eye, 2¼ in. in diameter. The Elite goggle is designed to fold and has collapsible temples which are also composed of the non-breakable Zylonite. These are wide, rectangular lenses with a hinged frame, the eyepieces being 3 in. long by 1⅞ in. high. Prices vary with the designs and the lens sizes.—Max G. Cohn & Co., Inc., New York City.

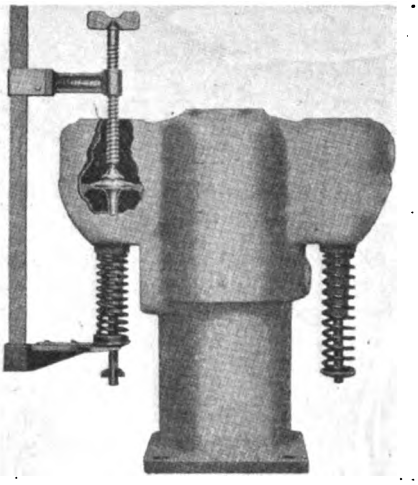
Mertz Valve Spring Release

A valve spring release for the purpose of taking out the spring seat retainer and otherwise working with a valve against the valve spring, has been brought out under the name of the Mertz valve spring release. It consists of a vertical bar at the lower end of which there is a projection fitting beneath the valve spring seat and at the upper end has a clamp which can be screwed down directly on the valve itself. In order to have the correct height for the arm containing the clamp which screws down upon the valve, there is a sliding arm which locks in any position on the vertical bar.

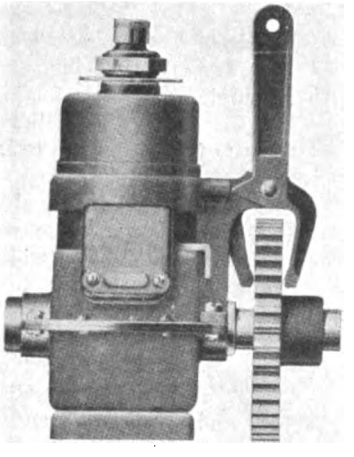
The correct length of the instrument is given on removing the first valve. At the bottom there is also an adjustable gage to fit the valve spring washer and the correct height of the instrument is fixed by locking the clamp holder in the correct position. The operation of the instrument can be readily grasped from the accompanying illustration. The pitch of the screw thread on the clamp is such that the strongest valve spring in use can be compressed by merely tightening on the thumb screw with the thumb and forefinger. The price of the release is $2.—H. B. Mertz Co., Pittsburgh. Pa.

Advance-Toledo Power Tire Pump

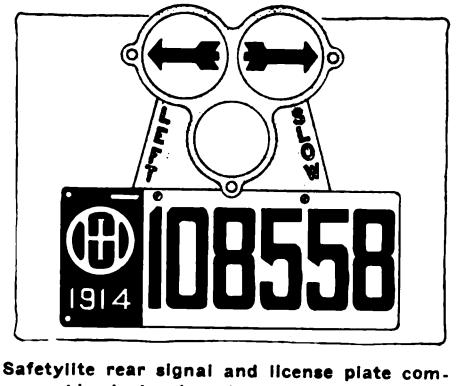
This is a pressed steel tire pump which can be fitted to used cars as well as to new. The cylinder and upper half of crankcase is a steel stamping, and the cylinder itself is reamed and burnished. The lower half of the crankcase is also a steel stamping, giving a two-piece body, both steel stampings, and giving the advantages of strength and lightness expected from this construction. The piston is of cast iron with soft steel rings. The pump crankshaft is a drop forging, and the bearings are nickel-babbitt die cast in the body. The pump is provided with a gear shift so designed that the sliding gear on the pump crankshaft is assembled with the hub on the outside.



Mertz valve spring release



Advance-Toledo power tire pump



Safetylite rear signal and license plate combined showing direction arrows

Warren motor restaurant for five

The advantage is that when the gears are put into engagement with the drive the stresses are all close to the pump bearings.

The intake port is covered with a protector which prevents dirt or sand from entering the pump, and the hose connection at the pump end is a special design, giving a large opening into the hose and a large substantial thread at the hose end. The pump sells for $15 with all fittings.—Advance Machinery Co., Toledo, Ohio.

Premo Accessories for Ford

Under the name of Premo two new accessories have recently been put on the market, one a constant tension fan belt adjustment for Ford cars and the other a gas and spark control for Fords. The constant tension fan belt adjustment consists of a coil spring attachment which clips to the fan belt pulley shaft holder and holds the belt perpetually under the proper degree of tension.

The gas and spark control is supposed to take the place of that originally on the car by slipping the polished brass collars over the teeth of the old quadrant and clamping the friction device to the levers. The makers claim a gain in appearance and durability. The price of the fan belt adjustment is 50 cents and of the spark and throttle control $1.—New York Motor Device Co., New York City.

Safetylite Rear Signal

The Safetylite is the name of a rear signal recently put on the market which indicates the direction in which a car is going to turn as shown in the accompanying illustration by means of arrows. The device consists of an aluminum casing containing electric bulbs controlled from the dash or steering wheel. The light from the bulbs brightens either the right or the left arrow so as to render it clearly visible to a driver in the rear. The signal is fitted with a standard license-plate bracket and sells for $15.—Automatic Signal Appliance Co., Cleveland, Ohio.

Warren Motor Restaurants

The Warren line of motor restaurants is comprehensive, embracing every style and size, but the one which appears most popular is naturally the five-person type illustrated herewith. It is made in style like a suit case, a wood box being covered with black enameled duck and lined with black and white striped enameled cloth. The case contains two nickel-plated food cases, each 8¾ by 5¾ by 4¼ in., knives, forks, spoons, cups and plates for five persons, two glass jars and a place for a vacuum quart bottle—which is not included. The case is 19½ in. long, 14 in. wide and 6 in. deep. The set sells for $17.—Warren Leather Goods Co., Worcester, Mass.

America's First Concrete Speedway

Twin City Oval Ready for 500-Mile Derby

THE Twin City concrete speedway on which the first annual World's 500-mile Derby is to be run on Saturday, Sept. 4, is America's only concrete speedway, and is regarded by F. H. Wheeler, of Indianapolis, Ind., its chief promoter, as the greatest in the world. It is a 2-mile track, laid inside a high wooden fence over 3 miles long. It is just south of the Minneapolis city limits and is only a short distance across the Mississippi and Minnesota rivers from St. Paul. It is decidedly a Twin City affair. To date the investment has been $870,000, which will be raised to near $1,000,000 when the grounds are landscaped next Spring.

The track is 80 ft. wide for 1577 ft. in front of the judge's stand, and on the turns and backstretch is 60 ft. The straightaway is 285 ft. long, practically flat, with an angle of only 1 ft.

From the ends of the two stretches are easement curves of 800 ft. entering into the high circle or leaving it, at 8 ft. height. These four easements allow the drivers to rise gradually into the total angle of 14.98 ft., or extreme height at the outside from the ground at each end of the oval, and to drop down again into the stretches. The change from the end of the easements into the high curve is a 1 per cent grade.

40-Ft. Safety Zone

The safety zone in front of the stands is 40 feet and inside the parking boxes are set back a similar distance. The retaining wall on both sides of the track is of concrete, 2 ft. 6 in., or 2 ft. above ground. This wall is 12 in. at the bottom and 9 in. across the top. The tire protection in front of the stands is 10 ft. netting strung on iron posts set in the retaining wall. The radius of the cement circles from the two end major axes is 1350 ft. The height of the outside of the track on the curves is 14.98 ft.

The track, which is expected to develop above 100 m.p.h., was built as follows: A sand water-settled base was slushed in, ranging from 18 in. to 8 ft. thick. This was rolled in layers of a foot by a 12-ton roller. Above this was laid a concrete base reinforced with flat expanded metal 6 in. thick, a 1-2-4 mixture of cement, sand and stone. This was covered with an inch of 1 to 1 trowel finish of cement and sand.

The forty pits are each 8 by 15 ft. abutting the 30-in. track retaining wall, separated by 2 by 4 wood partition with wood backs, equipped only with a bench seat at the rear and sand floor.

71,616 Is Seating Capacity

Total seating capacity provided is 71,616. Four grandstands are in front of the pits on the front stretch; a fifth is at the end of the backstretch and another at the second curve top. Bleachers are on the backstretch. The total frontage of the grandstands is 3672 ft. and of the bleachers 912 ft. In all there are 1840 boxes seating 11,016 persons. The grandstands seat 48,796 and the bleachers more than 10,000. The stands are frame, covered, set on wood towers of 8 by 8 timbers and 2 by 6-in. crossbeams, fully braced in both directions with a carrying capacity of live load of 150 lb. to the square foot.

The boxes are 6 by 8 ft. with rise of 8 in. in each case and 24 in. for the last tier. Between the tiers are 6 ft. walks. In each box are six armchairs. The grandstand seats have iron hand rails and small opera backs. Thirty-six official garages are in a frame building, each 12 by 16 ft. with folding front door, back of the main grandstand.

Automobiles gain entrance to the grounds at six points and to the oval by three subways. Back of the main grandstand is free parking space for 15,000 cars, in the oval are 2000 reserved parking spaces, and reserved room for 20,000 more. The subways are reinforced concrete, 60 ft. long and 60 ft. wide with 12, 14, and 16 ft. headway, respectively, decreasing to 9 ft. under the track. For pedestrians from the street railway lines at the backstretch is an additional subway 12 ft. wide.

Exact cost of the track and equipment cannot be known until an audit is made, but President F. H. Wheeler gives estimates as follows: Land, about 342½ acres, $175,000; grading, $100,000; track, $250,000; stands, $150,000; fences, $100,000; tunnels, $70,000; buildings, $25,000.

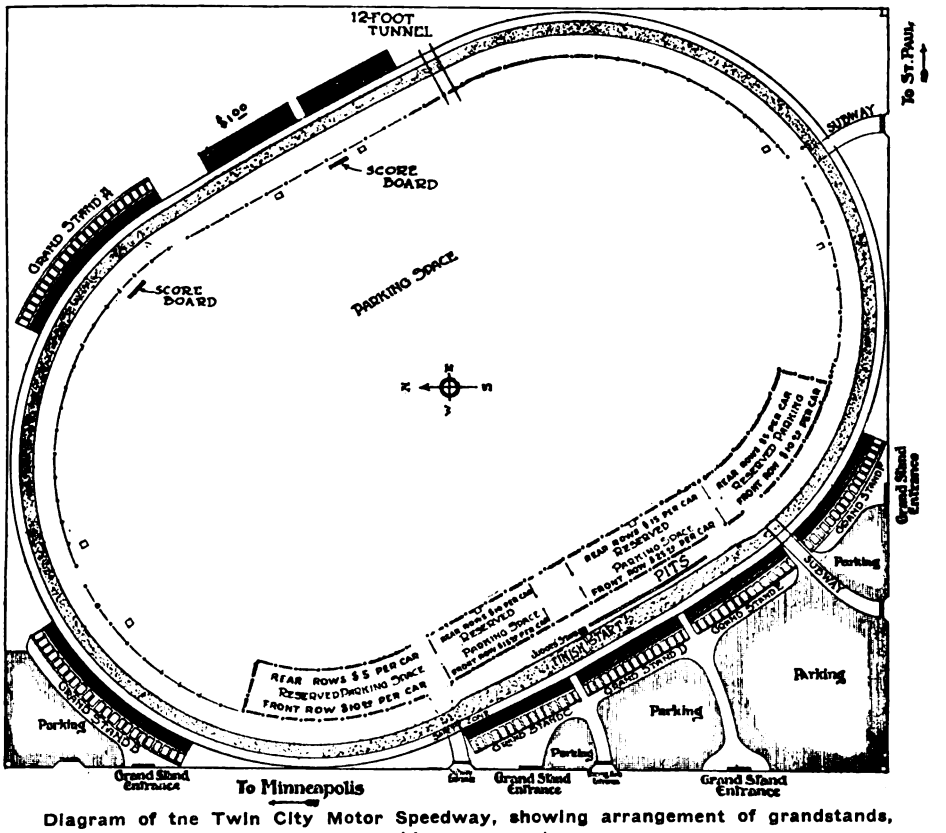


Diagram of tne Twin City Motor Speedway, showing arrangement of grandstands, parking spaces, etc.

The Automobile

PUBLISHED WEEKLY

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Vol. XXXIII Thursday, September 2, 1915 No. 10

THE CLASS JOURNAL COMPANY

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Making Meetings Pay

THE Society of Automobile Engineers is to be congratulated that it has so active an offspring of the main body as the Detroit Section, which has just formally announced its occupancy of permanent quarters with a paid secretary.

One year ago this section was struggling along as best it could with a more or less apathetic interest shown. To those who had the society's doings at heart it seemed deplorable that a section so advantageously situated as the Detroit branch was, in the very center of the industry, should not be commanding of greater interest and enthusiasm. The regulars put their heads together and thought over the matter. They realized that the bait must be better papers and more of them by some of the foremost engineers, a goodly number of them residing in Detroit. So they set about righting matters.

A prominent engineer was asked to give a paper on a pertinent subject. There was a surprising jump in attendance and interest. Engineers began to watch for the meetings, and to enter into the discussions. It was the beginning of a new era for the Detroit Section.

Since then the movement for a home of its own was started and successfully carried to a conclusion, thanks to the aid of some of the representative manufacturers in the industry. This but serves as a lesson for other branches of the Society.

Progress in Radiators

A CHANGE in automobile construction that has passed with little comment is the coming of the pressed-steel shell, now used on very many cars. Whether a radiator is of the honeycomb type or of the more common tubular pattern, it is equally a delicate, cellular structure containing a large number of joints and not possessed of any great mechanical strength. In fact the thinner and lighter its construction, the better will it operate as a radiator of superfluous heat.

With the pressed-steel shell this delicate bit of apparatus is suspended inside a stiff casing which protects it from weaving strains, and can be struck or pushed without injury to the radiator proper. In the old pattern, where the external portion also contained water and was made of thin sheet metal, accidental injury was easy, and the task of supporting the cooler so that frame weave could not affect it has taxed the ingenuity of most automobile engineers.

The new idea appears to be both better and cheaper, a rare combination of qualities; and thus the new style radiator ought to be written down as one of the conspicuous mechanical advances of the year.

Saving Costly Parts

WHAT is a problem of considerable importance in medium and low-priced cars is vital in vehicles selling for amounts which place them in the class of high-priced design. It might not be a matter of great importance to renew parts which are made from mild structural steels that are produced in great quantities and of uniform specifications, but when it becomes necessary to replace a part made from some high-grade electric furnace steel or some material which has cost hours of labor and taken the combined skill of metallurgists and shop workers it becomes necessary to use some means of lessening the cost to the owner of repair parts.

The ideal car would doubtless be one in which all the high-priced parts were guarded against wear by intermediate buffers of lower price and lower grade materials which were sufficiently soft to absorb the wear while the higher-priced and harder materials went unscathed. It is a fact that in spite of the average price of cars falling year by year the life of the more important and expensive parts is increasing, due to these safeguards.

Battery Exchange

THE great delay in getting the battery charged has always been one of the inconveniences which the electric car owner has been desirous of removing. With the necessity of waiting several hours while a battery is being charged under the old system, it seems hardly possible that the new idea of battery exchange, which is in reality but putting into practice what has long been foreseen. has come to pass.

S. A. E. Adopts Reports of 7 Divisions

Final Count on Letter Ballot for Standards Shows Every Suggestion Adopted

NEW YORK CITY, Sept. 1—Final count on the letter ballot for standards recommendations of the Society of Automobile Engineers has now been completed and the results show that all the suggestions as to new and revised standards which were approved at the last meeting of the Society in June were adopted by a large majority in the letter ballot. The balloting was closed on Aug. 16.

Voting members of the Society were urged to vote on all questions on which they felt technically qualified to express an opinion. Prior to adoption by letter ballot all of the recommendations in question had been approved by the respective divisions of the Standards Committee having the work in hand, by the Standards Committee as a whole, by the Council and by the entire Society at the June meeting. The vote showed that the total number of ballots cast was 154. Of these fifteen were defective for various reasons. The full report as to the detailed vote on each of the standards follows and shows that an overwhelming majority was in favor of every suggestion. The highest number of negative votes polled against any recommendation is noted as against the elimination of the gray iron casting specification. The votes counted against this numbered only seven with eighty-seven in favor of the elimination. The detail report follows:

SIXTH REPORT OF CARBURETER FITTINGS DIVISION

	Yes	No
Flanges for ½ in. and ⅝ in. carbureters	87	0
Flanges for 2½ in., 3 in. and 3½ in. carbureters	83	2
Carbureter air heater	78	8

SEVENTH REPORT OF ELECTRICAL EQUIPMENT DIVISION

	Yes	No
Bulb bases, sockets and connector plugs	85	3

SECOND REPORT OF ELECTRIC VEHICLE DIVISION

	Yes	No
Motor voltage	55	5
Motor name-plates	60	2
Number of cells in standard battery equipment	56	4

SEVENTH REPORT OF IRON AND STEEL DIVISION

	Yes	No
Revised vanadium steel specifiations	90	2
Specification 3330—nickel chromium steel (new)	91	1
Revised steel castings specification	88	2
Elimination of gray iron casting specification	87	7
Revised notes and instructions on steels, etc	92	1

SIXTH REPORT OF MISCELLANEOUS DIVISION

	Yes	No
Flat fan belt and pulley widths	95	1
Cotter pin sizes	101	1
Brake lining sizes	85	5

FOURTH REPORT OF SPRINGS DIVISION

	Yes	No
Nomenclature of cantilever springs	89	3
Tests for parallelism of eyes and master leaf	88	2
Eye bushing and bolt tolerances	86	2
Wrapped eyes	87	1
Width of spring ends	87	3
Frame brackets	84	4
Offset of center-bolts	86	1
Nuts for spring clips	85	4
Center-bolts	84	1
Center-bolt nuts	83	2
Spring widths	82	4

REPORT ON BELL HOUSINGS

	Yes	No
Number of bolts	73	4
Flange widths	75	2
Bolt hole circle	73	2

October Standards Committee Meeting at Chicago Athletic Club

NEW YORK CITY, Sept. 1—Meeting dates and places for the October Standards Committee meeting and the meeting of the entire organization for the 1916 winter session are announced by the Society of Automobile Engineers. The headquarters of the Standards Committee meeting to be held in Chicago on Oct. 14 will be the Chicago Automobile Club. In all probability there will be an afternoon as well as a morning session, the opening being at 9 a. m. Reports will be made by several divisions of the Society and the meeting will probably be attended by many members.

The divisions which will in all probability have progress reports to make are those dealing with electric vehicles, the miscellaneous division, truck standards and foreign co-operation.

The electric vehicle division will, in all likelihood, report again on speed and mileage ratings and on specifications involved in the assembly and operation of battery-propelled cars.

The miscellaneous division has still to report upon a number of subjects, including universal license plates, position of motor numbers, expression of car weight, air pump bases, water hose and hose clamp dimensions.

The truck standards division and the foreign co-operation division which was formerly known as the International Standards Division will, according to the present schedule, submit some important matter with regard to solid tire equipment in this country and abroad. These divisions will hold a joint meeting at the office of the Society in New York on Sept. 7 for the purpose of considering data relating to industrial truck standards, smaller than 36-in. diameter tire, branding of millimeter equivalent dimensions on solid tires, universal standards for truck tires and wheels, actual deviation from nominal tire tread diameter, carrying capacity table, ½-in. felloe band thickness for 6-in. dual tires and trailer hitch.

Small Waverly Truck Coming

INDIANAPOLIS, IND., Aug. 27—It is stated on good authority here that the Waverley Co. of this city will in the future announce a new electric commercial model of light capacity at a lower price than heretofore Waverley vehicles have been offered.

S. T. Davis, Locomobile Head, Dies

Connected with Industry Since 1899—Had Been Locomobile President Since 1902

BRIDGEPORT, CONN., Sept. 1—S. T. Davis, Jr., president of the Locomobile Co. of America, died here at 2 o'clock last night from hemorrhage of the brain. Mr. Davis was taken ill on Saturday with what appeared to be acute indigestion but a hemorrhage occurred on Monday and his condition became rapidly worse.

Mr. Davis, who had been connected with the automobile industry since June 13, 1899, the date on which he used his first car, was born in Washington, D. C., Feb. 8, 1873. He entered Columbia College preparatory school and took the degree of civil engineer from the Rensselaer Polytechnic Institute, Troy, N. Y.

In 1900 he started as treasurer of the Locomobile Co. of America, under A. L. Barber, a position which he held for 2 years, after which he became president, an office which he held up to his death. Mr. Davis was one of the organizers of the National Association of Automobile Manufacturers in 1900 and was its first president. Since that time he was on the directorate of this organization and its successors, the National Automobile Board of Trade and the National Automobile Chamber of Commerce, Inc.

Mr. Davis had a number of interests outside the automobile industry, being a director in several companies and being interested in real estate and banking to a considerable extent.

He was a member of the following clubs: New York Yacht; Automobile Club of America; Ardsley Club; Brooklawn Country Club; Automobile Club of Bridgeport; Algonquin; Seaside; Bridgeport Yacht Club; the University Club in Bridgeport, and the University Club in New York.

New Olds Model at $1,162.50 for Southern States

LANSING, MICH., Aug. 30—The Olds Motor Works are now supplying dealers in the Southern States and in other parts of the country with a special model wide tread four-cylinder Oldsmobile 43, the price of which is $1,162.50 for either the roadster or touring car. This model is fitted with specially constructed wire wheels finished in red light enamel and by the use of an extra wide tread on the wheels it is not necessary to lengthen the axle shafts.

Heinze Co. Enters Starter Field

To Open Plant in Springfield, O.—Begins Work in 60 Days

SPRINGFIELD, OHIO, Aug. 30—The John O. Heinze Co., recently formed to make electric self-starters in this city at the Shuey factories' building, is preparing to employ a force of 300 men, it is reported. Associated with Mr. Heinze is William Pflum, who was formerly vice-president and general manager of the National Cash Register Co.

Mr. Heinze is vice-president and chief engineer of the company. Before coming to Springfield, Mr. Heinze was chief engineer of the Northway Motor Co., Detroit.

The company has taken out patents on an electric starter, for lighting and ignition apparatus. The company will manufacture these apparatuses in large quantities. The company expects to begin the manufacture of its products within sixty days.

The company has brought a number of men from Detroit and other cities. Among these are: Paul Arthur, former assistant engineer of the Continental Motor Co., Detroit; Gordon Reid, formerly assistant to chief engineer Dunham of the Chalmers Motor Co., and John Boone, electrical engineer of Detroit. Mr. Arthur is head of the designing department and Mr. Reid is in the efficiency department. Mr. Boone is electrical engineer and chief of the laboratory. William Pflum is president and general manager.

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S. A. E. Sections Active in September

NEW YORK CITY, Sept. 1—The month of September starts the activities of the Society of Automobile Engineers. The Detroit, Indiana and Metropolitan sections have all announced their meeting topics and the dates and places have also been decided. Another section activity which may soon take place in connection with the meeting of the Standards Committee at Chicago in October is the inauguration of a Chicago section.

The Metropolitan Section will hold its meeting at the Automobile Club of America, New York City, on Sept. 16. Leon Goldmerstein, a member of the Aeronautical Society and associate editor of the Journal of the American Society of Mechanical Engineers, will present a paper on the aeroplane. In addition H. G. McComb, chairman of the Research Committee of the section on governors will submit the final report of this body for discussion.

On the same night as the Metropolitan Section meeting the Detroit section will open its program at the Ponchartrain Hotel with a paper by J. G. Vincent entitled "A Discussion of the Twin Six Motor." The entire technical section will be devoted to the reading and discussion of this paper.

On Sept. 24 the Indiana section will also hear a paper by Mr. Vincent and in addition James E. Diamond will talk on aluminum pistons. The meeting will be held in the rooms of the Hoosier Motor Club at the Claypool Hotel.

Winter Meeting in Show Time

The 1916 winter meeting of the Society of Automobile Engineers will be held in New York in the first week of next year, during the automobile show. It is the intention of the Meetings Committee and the Council that the coming national sessions shall be fewer in number than heretofore and be the occasion of the presentation and discussion of papers of marked interest and value to automobile engineers. Features of the technical program, which will include consideration of reports of various Divisions of the Standards Committee, are now being arranged. The members are requested to express their views as soon as possible as to what subjects it is desirable to have treated at the coming meeting. It is requested that in sending suggestions rather full outlines of the proposed papers be given, including the naming of preferred authors.

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To Make Four-Wheel-Drive Automobile Chassis

ST. PAUL, MINN., Aug. 30—The Twin City Four-Wheel Drive Co., recently incorporated with a capital of $500,000, to manufacture four-wheel drive trucks, will also make a chassis for automobiles on the four-wheel-drive principle. The company has opened temporary offices at 2334 University Avenue, S. E., Minneapolis. Announcement of the formation of the company and its factory plans was made in THE AUTOMOBILE for Aug. 26.

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Maxwell Ships 250 Cars Daily

DETROIT, MICH., Aug. 31—The Maxwell Motor Co., Inc., is shipping daily from its Detroit plants 250 cars of the 1916 model, a marked increase over previous production records.

"Reports from our dealers throughout the country," said sales manager C. E. Stebbins of the Maxwell company, "indicate that our estimates as to our 1916 output is already about 10,000 cars under what it should be. In other words, to date our dealers have asked for nearly 10,000 more cars than their contracts call for."

New Madison Six Is on Market

Has Rutenber Motor—Seven-Passenger at $1,085—Five, $985

ANDERSON, IND., Sept. 1—*Special Telegram*—A new six-cylinder model has been brought out by the Madison Motors Co., this city. It uses a Rutenber six-cylinder block motor, 3 x 5 in., with Remy starting and ignition system, the ignition being the Remy magneto type distributer. Motor and gearsets are unit with the flywheel entirely inclosed with 120-in. wheelbase and 34 by 4-in. tires. The car sells as a seven-passenger touring car at $1,685 and either a five-passenger touring car or two-passenger roadster at $985. Axles are made by the American Gear & Mfg. Co. and clutch and gearset by Detroit Gear & Mfg. Co. Steering is by Warner reversible and full gear. Stewart vacuum gasoline system is used and equipment is complete.

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Daniels to Build Eight

READING, PA., Sept. 1—*Special Telegram*—A new eight-cylinder car will shortly be brought out under the name of the Daniels eight from a factory in this city by Geo. E. Daniels, formerly vice-president and general manager of the Oakland Motor Co., Pontiac, Mich. It is expected that the new car will use a Herschell-Spillman motor, and will be virtually a custom-made job, the streamline body being made in five- and seven-passenger models and in the touring design with center cowl as well as inclosed types. The wheelbase is given as 127 in., and the price will be in the neighborhood of $2,350.

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Polhamus Resigns from Bowser

SOUTH BEND, IND., Aug. 28.—A. Z. Polhamus, chairman of the executive board of the S. F. Bowser Oil Tank & Pump Co., Fort Wayne, has resigned from that position after serving the company in various capacities for 25 years. He started with the firm in 1890 as superintendent of salesmen, later becoming assistant manger. He was a stockholder, a director and secretary-treasurer of the firm when it was incorporated in 1898. In 1904 he was chosen general manager and held that position until 1914, when he was made chairman of the executive board. His health during the past few years has demanded open-air activities and he became interested in horticulture. As the affairs of the concern are in good condition at the present time, he has decided to retire. He will retain his financial interest in the company.

Trade Review of the Week

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Detroit Factories Struggle to Keep Up with Demand—Dealers Optimistic

DETROIT, MICH., Aug. 31—Last week the Detroit automobile industry still continued to exert every influence that would aid in the production of the maximum number of cars. Everywhere the demand has remained as stiff as ever, and in some instances it is claimed that dealers could take more cars than they have contracted for. It is evident that many estimates of certain dealers' allotments of cars should have been larger to take care of the trade, but it is almost impossible for the majority to increase the number contracted for, since the factories' schedules have been based upon dealer contracts, and with a place for every machine it looks now like a forlorn hope for any of them to expect to get more vehicles than their contracts stipulate.

Healthy Production Conditions

As an indication of how things are going with some of the big factories, Dodge Bros. is now in about as healthy a production condition as it has been so far since beginning the making of a car under the Dodge name. The daily output is between 235 and 250 cars. Last week Packard announced that it is carrying the largest payroll in its history—about 8200 men. The factory is practically ready for the quantity production of the new car, and motors and various parts are now coming through rapidly. Customers' cars will start to come along in about two weeks. Maxwell reports unprecedented demand from dealers and is making 250 cars a day.

Another Cable Order

The Scripps-Booth Co. last week received another cable order from England, this for 500 more cars, it is said. As the concern has already shipped some 400 to this dealer, the foreign business is assuming large proportions.

Chalmers is also breaking records, the Six-40 model receiving a good reception, especially through the East. Last week two trainloads of Chalmers cars were shipped to the New York branch, as an indication of the quantity trend of the business.

Foreign Trade Grows

There can be no doubt that foreign business is outstripping all expectations of a few months ago. Those concerns who already have good foreign representation are doing their utmost to deliver cars to these agents, principally in England, and others are contracting for this invasion of the hitherto small market abroad. Many of the well-known London dealers have come over to make the best connections they can. One of the most prominent of the Detroit makers, who up to this time has had no English sale, has closed with a prominent Britisher for a considerable number of vehicles.

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Aug. Sales for N. Y. Break All Records

NEW YORK CITY, Aug. 31—The month of August has closed with record sales for the local automobile dealers. Never before in the history of the dealers has the automobile-buying public been so urgent in its demand for cars. August has in former years been considered a slack month, and the dealers had to wait usually until the middle of September or the beginning of October before trade picked up. This year, however, August sales have been on a par with those of March, April, and May.

Business for September and October is expected to break records. Just at present the dealers are beginning to catch up on their deliveries and in a majority of cases, especially in the small car field, shipments are coming in regularly. The buying public consists of farmers from Long Island and New Jersey, and hundreds of people who already own cars, but who either want small or large cars for their separate uses.

Last week the dealers were busy getting in their closed cars and to anticipate inquiries for these cars, the majority of them had new catalogs on their tables describing the new models in winter cars. A large sale is already reported in closed bodies.

The small cars in August made very good sales. The Maxwell company sold ninety-one cars during the month. The Saxon company reports one of the best retail months, having sold sixty cars retail. Many inquiries are being made on its coupes and sedans. The agency expects a rush business until December.

The Hupp agency is just beginning to make deliveries. Sales in August amounted to twenty-eight. It is 123 cars behind in orders. It expects a 100-per cent increase in business in September.

Demand for Closed Cars

The Chandler company reports the largest month it ever had, having sold 109 cars to date, which is about 70 per cent better than last year's sales for that month. The agency expects a big demand for closed cars and at present, in anticipation of this demand, has several special closed bodies on its floor.

Cadillac sales were much above normal, almost doubling last year's mark. Sales during August were equal to the best months since January. The company is doing a large business in closed cars.

Shipments are coming in regularly for the Franklin agency, which is now getting two carloads a week. Sales last month were between thirty and forty.

Sales in the National and Jeffery cars were about 200 per cent better than those in the same month last year. The agency reports the same complaint of a number of the other dealers, a scarcity of cars.

The Ford service station in Long Island City delivered 1200 cars last month. Shipments, however, were small and as a consequence the station was approximately 1600 cars behind in deliveries.

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Rains Hurt St. Louis Sales—Repairmen Reap Harvest

ST. LOUIS, MO., Aug. 28—The solid week of record-breaking rain and the resultant floods from which St. Louis in particular and the greater parts of western Illinois and eastern Missouri in general are just recovering had a strong but diverse effect upon the automobile industry in this district—it hurt the automobile dealer and benefited the repair and accessory man. In fact, for the time being, it almost ruined the business of the former and yet it boosted almost beyond estimation the prosperity of the latter.

The situation from the dealer's standpoint was well summarized by George Weber, president of the Weber Implement & Automobile Co., who happened to be touring the stricken district when the storm came.

He said: "There are no roads left at all in some districts. The washing away of bridges has completed the demoralization of vehicle traffic and many days will pass before conditions are normal. Where the torrent has not obliterated roads it has washed out the surface and this will necessitate extensive repairs.

"We could bear all these troubles with equanimity, however, if the crops were not seriously affected by the rains and floods, but early reports indicate heavy damage has been done. In many cases, wheat, which had been cut and was lying in the field awaiting threshing, was washed away."

The repair and garagemen, on the other hand, have been busy day and night ever since the water began to recede in pulling mired and submerged machines to town and overhauling them. The accessory men have been working day and night selling new parts to car owners whose machines were caught in the deluge.

Lansing Factories to Double Output

Reo and Olds Cos.' Schedule 40,000 Cars—Export Trade Grows

LANSING, MICH., Aug. 28—The two big local automobile manufacturing plants, the Reo Motor Car Co. and the Olds Motor Works, are scheduling an output of about 40,000 passenger cars for the season 1916. This is double the 1915 output.

During the business season just ended, the Reo Motor Car Co. sold 17,500 cars. For 1916 the production schedule calls for at least 25,000 cars. According to assistant sales manager Harry Lee, dealers have thus far contracted for more Reo cars that the total number sold the past season.

The Olds Motor Works are planning to make from 12,000 to 14,000 cars for the next season. During the 1915 season between 4000 and 5000 Oldsmobiles were sold, according to assistant sales manager N. W. Barton.

The export business of the Olds works is expected to become an important part of the general business from now on. During the past few days orders have been received from Australia, South Africa and England. The order from the latter country is for 600 passenger cars.

Refined Walker Electrics $615 Lower in Price

CHICAGO, ILL., Aug. 27—In its line of 1916 electrics the Walker Vehicle Co., this city, is listing four models, three of which sell for $1,985, as compared with $2,600, a reduction of $615 over a year ago. These models embrace a wide choice of body and are all built on 96-in. wheelbase chassis. The fourth model is on a 104-in. chassis and lists at $2,150 as compared with $2,800, a reduction of $650. This is a five-passenger limousine which is roomy in dimensions.

Refinements have been made in the body work on all models, principally in the use of more aluminum in the weather-exposed parts, sashless windows, mechanical window raisers of the lever type and a number of detail improvements in fittings and equipment.

Baker Wheels and Rims Succeed in R. A. C. Tests

LONDON, ENGLAND, Aug. 19—Certificates have just been issued by the Royal Automobile Club, concerning tests which have been made on the Rebak rims manufactured by the Baker Rim Co., Stourbridge. The tests were first on the road and then in the shop to determine the solidity of the rim of the wheel and the time required for removing and replacing it. A distance of 1000 miles on the road was covered and the average speed 20 m.p.h. The car weight was 4095 lb. with a load of 1.674 lb. on the front axle and 2421 on the rear.

The size of the tires was 820 by 120 mm. (32 by 4.7 in.) and the inflation was about 60 lb. to the square inch. No security bolts were used. On examination at the conclusion of the trial, according to the report, the rims were found to be firmly fixed upon the wheels and there was no sign of movement having taken place. The rims with the tire in place were then removed and replaced upon the wheels, with the time taken for the operation. These times are given as follows:

Wheel	Removal	Replacement
Left rear	10 sec.	11 sec.
Right rear	12½ sec.	13½ sec.
Left front	10 sec.	11 sec.
Right front	15 sec.	9¾ sec.

Subsequently the tire was removed from the rim which had been upon the left rear wheel and the time was 11½ sec. Four new tires were then placed upon the rim and the time for fitting and removal was as follows:

Make of Tire	Fitting	Removal
Dunlop	1 min. 20 sec.	14 sec.
Michelin	0 min. 58 sec.	7½ sec.
Palmer	2 min. 28 sec.	15 sec.
Clincher	1 min. 35 sec.	10 sec.

After the trials the rims were found to be in good condition and had not rusted and the water had not entered beneath the beads. There was no sign of creeping either of the tire upon the rims nor of the rims upon the wheels.

The Rebak detachable wheel also made by the Baker Rim Co. was made the subject of R. A. C. tests the route covered being 1000 miles with a Ford car. This car on the scales showed a weight of 1688 lb. with the average running weight throughout the trials of 1860 lb. During the last 31 miles of the trial the retaining nuts and lock nuts were intentionally loosened on all four wheels and tightened with the fingers. At the conclusion the retaining nut was tight with the lock nut loose on the left rear, both nuts tight with wheel loose on the right rear, retaining nut type lock nut loose on left front, both nuts tight but wheel loose on right front.

Duplex Power Car Co. Elects

CHARLOTTE, MICH., Aug. 27—At a meeting of the stockholders of the Duplex Power Car Co. the following board of directors was elected: James H. Brown, W. H. Cooley, Horton H. Bryan, M. J. Lamson, A. M. White, Frank T. Town, Frank L. King. Executive officers will be elected Sept. 8. It was announced that an order for 200 trucks from Denmark had been received but had to be declined as the orders on hand would not permit this order being completed within four weeks as specified.

Drummond to Make 4 and 6

Omaha Co. Will Assemble Cars in Its Present Plant—Ollier Promoted

OMAHA, NEB., Sept. 1—*Special Telegram*—The Drummond Motor Car Co. has been organized in this city to manufacture the Drummond four- and six-cylinder car. The Drummond Co. has been in existence for twenty years, and will assemble cars in its present plant.

Ollier a Studebaker Vice-President and Director

NEW YORK CITY, Sept. 1—At a special meeting of the Studebaker Corp., held last Friday, L. J. Ollier was elected a vice-president and director. His present promotion takes him from the position of sales manager to a vice-presidency that carries the duties of sales director.

H. R. Benson has resigned as vice-president and a director of the corporation to become distributor of Studebaker cars for the State of Maine and a part of New Hampshire. He will make his headquarters in Portland, Me.

Watson Is Haynes Sales Manager

KOKOMO, IND., Aug. 6—D. L. Watson has been appointed general sales manager of the Haynes Automobile Co. to succeed R. Crawford, who has resigned. Mr. Watson was formerly assistant sales manager and has been associated with the company for 14 years.

Coghlan Leaves Klaxon for Moon

NEW YORK CITY, Aug. 30—R. G. Coghlan, eastern sales manager of the Lovell-McConnell, Mfg. Co., has resigned his position to become associated with the Moon Motor Car Co. of New York, in the capacity of district manager.

Pennsylvania Tire Prices Reduced

NEW YORK CITY, Sept. 1—The Pennsylvania Rubber Co. has reduced the prices of its smaller sized vacuum cup tires, effective to-day. The following list gives a few of the new prices: 28 x 3, $12.65; 28 x 3½, $15.40; 30 x 3½, $16.20; 30 x 4, $19.55, and 31 x 3½, $16.90.

Pullman Opens New York Branch

NEW YORK CITY, Aug. 31—The Pullman Motor Car Co., York, Pa., has opened a factory branch at 1892 Broadway, this city. A full line of the latest models will always be on exhibition as well as a complete stock of repair parts for all models. Henry Drouet, formerly with the Pullman Sales Co., this city, will be in charge of the branch.

Sell Electrics Without Batteries

Walker Co. To Deduct $270 When Batteries Are Omitted —Movement Grows

CHICAGO, ILL., Aug. 31—*Special Telegram*—The Walker Vehicle Co. will sell its 1916 Chicago electric passenger cars with or without batteries, deducting $270 when sold minus the batteries. Arrangements are being made to rent batteries in this city at $20 per month the first year and $16 per month the following years. The concern renting batteries agrees to keep them in repair and if the battery capacity falls below 80 per cent, it will renew the parts free.

A National Movement

NEW YORK CITY, Aug. 31—That the electric vehicle business in this country, both as regards passenger and commercial cars, is on the threshold of a change, is the opinion of many in the industry. What changes are expected to take place are directly traceable to the practice which is rapidly coming into vogue of renting battery service. This, in turn, has made it possible for dealers to sell electric cars without battery equipment and naturally enables them to quote prices all the way from $200 to $900 less per vehicle, depending on the style and size. What the reduction in price will enable the electric car dealer to accomplish and what the battery rental service will do in the way of making electric cars more desirable both for pleasure and commercial use are at the present time sources of considerable speculation among those engaged in this business throughout the country.

Demand Growing

It has been the experience with practically all dealers in electric cars that lately there has been a growing demand for cars without the batteries. This has been especially true in certain New England centers and in the Middle West, although in New York no appreciable demand for cars without this equipment has made itself felt. In Hartford, Conn., about 3 years ago, the practice of renting battery service was inaugurated by several of the charging stations and has proven itself to be a success.

Opens Manufacturers' Eyes

The idea worked out by the General Vehicle Co. and Electric Storage Battery Co. in and around Boston, whereby electric truck users may purchase vehicles without batteries and buy battery service at a fixed charge through the interchangeable battery scheme has opened the eyes of manufacturers to at least some of the possibilities of reciprocal arrangements. This interchangeable idea has also been carried out in San Francisco, Spokane, Baltimore, Worcester and other centers and seemed in all cases to work out excellently. The result has been that the fever has spread throughout the field and many have gone so far as to predict that the battery proposition will work itself out on the same basis practically as the Prest-O-Lite tank arrangement, whereby the owner of one of these tanks is able to secure renewals at a nominal cost. The only difference between the two ideas seems to be that the battery will not have to be purchased, but rather a fixed charge made for the service.

Universal Renting System

While as yet it is impossible to indicate a concrete and fixed idea on how the interchangeable battery renting scheme is going to work out on vehicles which are so difficult to standardize, there are many in the industry who, although they do not desire to be directly quoted, are extremely optimistic as to the eventual outcome. It is said that a Chicago man who has taken out a series of patents on different methods of effecting the battery exchange system has secured the co-operation of several New York agents who have gathered together and worked out what may turn out to be a feasible universal battery renting system. This system and its working plans, it is stated, will be all ready for public announcement within 2 or 3 weeks. The most optimistic of those who have studied the plan state that they would not be surprised if some of the gasoline car manufacturers, especially in the truck business, would go into the business of building electric chassis for commercial use with standard battery mountings.

Mileage and Price Limitations

According to the views of the believers in the battery rental system, the only factors working against the development of the electric vehicle industry are the mileage limitation and price. With the battery rental system giving all the mileage desired and the practice of selling the car without the battery giving the reduction in price the idea is that these two factors will be largely overcome. One of the other advantages claimed is that a car in commercial service or even in touring use need only carry a battery of sufficient size for its desired trip mileage, thus a car on a 100-mile trip will take a 100-mile battery while on a 25-mile trip. When asked regarding the demand for cars minus battery in New York City the representatives of the electric car interests here all stated that while there has been no appreciable demand here, in other parts of the territory there is an indication that the practice of battery rental is growing.

Glide to Concentrate on Six

Five-Passenger Design with 3 by 5 Block Motor Has Modern Equipment

PEORIA, ILL., Aug. 30—One of the concerns to join the ranks of six-cylinder builders for the 1916 season is the Bartholomew Co., maker of the Glide car. This concern has dropped the Glide 30 of 1915 and will concentrate on the 1916 Six-40. The new car is a five-passenger design selling for $1,095, and is an assembled design, having a Rutenber 3 by 5 motor with the cylinders cast in a block. Other specifications of the car include positive water circulation by centrifugal pump, Westinghouse electric lighting, starting and ignition, disk clutch, three-speed gearset and Hotchkiss drive. The rear axle is floating with a pressed steel housing and the driving gears are carried in a cast steel carrier. Both brakes are on the rear wheels with 14 by 2 in. drums. Steering is by screw and nut with an 18-in. wheel.

Up-to-date equipment is used throughout. The gasoline feed is by the Stewart-Warner vacuum system, the wheels are provided with Goodyear demountable rims and 34 by 4 in. tires, the top is a one-person design with Jiffy curtains and the instrument board is fully equipped, including a Stewart-Warner magnetic speedometer driven from the propeller shaft, an ammeter and a dash lamp.

There is a detachable sedan top, which gives an all-year-round equipment if so desired. The Glide sedan top is constructed with a frame of hard wood, ironed and braced against squeaks and rattles. It is upholstered in Bedford cord and has double strength glass in the doors and windows. There is an electric dome light in the top. This body can be removed or attached by two men in an hour. The touring body to which this may be fitted is a full streamline design with the modern yacht-like sweep from the headlights to the rear of the body. The upholstery is enamel leather over curled hair and oil-tempered springs. The wheebase is 119 in.

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Proposed Denver Special-Tax Ordinances Favor Garages

DENVER, COL., Aug. 28—Two special-tax ordinances affecting the automobile business in Denver have been introduced in the City Council this week, and both are expected to pass when they come up for final action at the next meeting of the Council.

One provides for a $25 yearly license fee for all public garages, and the other

requires an annual license fee of $25 additional for each curb pump.

Through the efforts of the Automobile Trades Association of Colorado, the license fee for garages was reduced from $50, which the original bill provided. This organization was also instrumental in securing the introduction of the bill permitting curb pumps within specified districts. These curb pumps will be allowed throughout the residence portion of the city, but will be barred from the main part of the business district on account of congested traffic conditions.

There are now approximately sixty-five regular garages in Denver coming under the license requirements.

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Injunction Against Splitdorf Denied

TRENTON, N. J., Aug. 27—The injunction sought by Sidney S. Meyers, a stockholder of the Splitdorf Electrical Co., Newark, against that company to restrain it from paying $1,000,000 for a patent on a high-tension magneto to the Sumter Electrical Co., Sumter, S. C., has been denied by Vice-Chancellor Backes in the Chancery Court, to-day. Mr. Meyers, who thought the payment too large, will make an appeal. In connection with the purchase of the Sumter company's patent the Splitdorf company planned to acquire the Southern concern.

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Dimming Ordinance in Kansas City

KANSAS CITY, MO., Aug. 28—The council has passed a new dimming ordinance, providing that the main shaft of light shall be confined to a minimum spread and that the uppermost rays shall not be more than 6 ft. above the surface at a point of 100 ft. ahead, and the shaft shall be directly ahead of the vehicle. The penalty is $1 to $100 fine, or five to sixty days in jail, or both. Thirty arrests were made under a previous dimming ordinance, but the persons were released and not tried because of defects in the ordinance.

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N. Y. Taxicab Co. Upheld

NEW YORK CITY, Aug. 6—An injunction has been granted by Justice Callaghan in favor of the Haverty Taxicab, Inc., which will restrain the police from arresting the chauffeurs employed by the company who operate their machines without meters.

The justice held that until the question is finally passed on by the higher courts the company should be allowed to use machines, with or without meters, as it sees fit, without interference on the part of the police. The company operates taxicabs without meters upon call from private garages, and holds that its cars do not have to be licensed under the public hack ordinance as in the case of motor vehicles soliciting patronage on the street.

Michelin French Plant Rushed

Produces 6000 Tires a Day—Other Activities—Trouble with Solids in Field

CHICAGO, ILL., Aug. 28.—American automobile business men returning from Europe give many interesting sidelights on the situation so far as automobiles in the war are concerned. F. V. Springer, head of the export department of the Republic Rubber Co., states that at the Michelin tire factory in France 6000 pneumatic tires are being produced daily, this company not manufacturing any solids. In the valve plant of the factory 500 high explosive shells are being produced daily, and 8000 fuses. In addition, the company is producing artillery wheels and is taking up the manufacture of aeroplanes.

Last year the Michelin company made a check extending over a period of 2 months on all of the cars operating in France and Italy, the result of which shows that 80 per cent of all the cars in France last year were fitted with Michelin tires and 70 per cent of those in Italy also. Fully 80 per cent of the tires used in France have steel-studded treads, the French car owner not yet being convinced of the merits of the different types of anti-skid rubber treads used by Americans.

In northern France considerable difficulty has been experienced in the solid tire field by tires on military trucks separating between the tire and the base. This is largely due to the heavy loads carried and the high speeds, it being quite common for trucks overloaded to be driven 140 to 150 miles a day. This means higher speeds than heretofore necessary in truck use, and has proved disastrous to tires. Tire makers at the present time are trying to cope with the situation. In Italy factories are exceptionally busy, Fiat devoting the majority of its time to the production of motor trucks, which is at the rate of 40 per day at present.

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Traffic Mgrs. to Consider Extra Demurrage

NEW YORK CITY, Aug. 31—At the meeting of factory traffic managers and members' representatives to be held in Detroit, Sept. 14, at the Detroit Board of Commerce, as announced in THE AUTOMOBILE of Aug. 29, such matters as extra demurrage, or storage charges on automobiles held in freight cars at destination, will be considered. Another important point that will be brought before the meeting will be whether batteries can reasonably be considered a component part of engine starters and subject to the same rates; also, damage to automobiles by sparks and cinders entering cracks around doors of freight cars. The effect on automobile shipments of the ruling by express companies that carload rates do not include wagon service and that such shipments are subject to extra switching charges will be considered. Advertising matter on freight cars, and recommendations to be made to the Uniform Classification Committee regarding the classification of various items will also be looked into.

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Pennsylvania Has $138,406,000 in Cars

HARRISBURG, PA., Aug. 30—At the rate of $1,000 per car, there is $138,406,000 invested in motor vehicles in Pennsylvania. The registration to date is 138,406, and the number of trucks is 7453. The registration of cars thus far this year runs as follows: Under 20 hp., 14,543, against 11,107 last year; between 20 and 35 hp., 112,703, against 75,709; between 35 and 50 hp., 10,655 against 9759; cars over 50 hp., 639 compared with 585 last year.

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Detroit Body Pays $111,000

DETROIT, MICH., Aug. 28—The Security Trust Co., trustee for the Detroit Body Co., has been allowed to pay secured claims totaling about $111,000. Of this amount a mortgage of $75,000 will be paid to the First and Old Detroit National Bank and a mortgage of $36,000 to the Detroit Trust Co.

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No Glare for Washington

WASHINGTON, D. C., Aug. 28—The district commissioners have adopted an amendment to the police regulations granting permission to use electric or acetylene headlights or sidelights on automobiles and motorcycles. The lights are to be allowed, however, only on condition that they are equipped with anti-dazzling devices approved by the chief of police.

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Indianapolis Co. to Make Carbureter

INDIANAPOLIS, IND., Aug. 27—Papers of incorporation have been filed by the VanBriggle Motor Device Co. with $150,000 capital to manufacture a new carbureter invented by L. H. VanBriggle. The incorporators are: L. H. VanBriggle, H. S. Rominger, Z. F. Harshbarger, U. Z. Wiley, Frank Bivens, R. E. Hosea and E. O. Null.

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Flaum Shock Absorber Assigns

NEW YORK CITY, Aug. 30—The Flaum Shock Absorber Corp., manufacturer of shock absorbers, at 1876 Broadway, has made an assignment to H. I. Barnett. The company was incorporated on Jan. 8, 1915, with a capital of $20,000. S. M. Halper is president, and C. A. Most treasurer.

United Kingdom Continues to Lead in Car Imports from United States

Takes 2246 Cars Worth $4,413,387 in June as Compared with Only 240 Cars Worth $239,274 in June, 1914— France Takes 969, or 826 More Than Last Year

WASHINGTON, D. C., Aug. 28—The tremendous gains made in our export trade in automobiles, cars and parts during the last fiscal year are vividly shown in detailed figures issued this week by the Department of Commerce. The gross figures were published exclusively in THE AUTOMOBILE for Aug. 12.

The United Kingdom holds first rank in the volume of its imports of cars from this country. During June last the number shipped to that country was 2246, valued at $4,413,387, while in June a year ago the number was only 240 and the value $239,274. During the twelve months ended June, the number of cars exported to the United Kingdom increased from 7222, valued at $5,853,127, in 1914, to 13,934 cars, valued at $21,149,552.

The shipments to France in June last amounted to 969 cars valued at $2,634,338, as against 143 cars, valued at $88,874, exported in June, 1914. During the fiscal year these exports rose from 1429 cars, valued at $924,130, in 1914, to 5441 cars, valued at $13,776,752, in 1915.

Italy's Imports Decrease

Italy's imports of cars from this country show a sharp decline from seventeen cars, valued at $13,801, in June a year ago, to four, valued at $2,893 in June last. Even more marked was the decrease during the fiscal year, 343 cars, valued at $242,695, being shipped there in 1914, while in 1915 the number was 115 and the value $78,265.

There were no shipments of cars from this country to Germany in June last, while in June a year ago forty-four cars, valued at $56,249, were exported. During the fiscal year the number of cars exported there decreased from 1435, valued at $1,059,249, in 1914, to twenty, valued at $20,164, in 1915.

Under the heading "other Europe" large increases are to be noted. In June last the number exported to European countries not already mentioned was 1432, valued at $2,952,440, while in June, 1914, the number was 242 and the value $203,816. During the twelve months' period the number increased from 2928, valued at $2,337,733, in 1914, to 4249, valued at $10,720,541, in 1915.

Eight hundred and twenty-seven cars were shipped to Canada in June last, the value being $631,609, while in June a year ago the number was 513 and the value $642,024. During the fiscal year the number shipped there decreased from 4624 cars, valued at $5,919,776, in 1914, to 4433 cars, valued at $4,428,338, in 1915.

Mexican Trade Poor

Our export trade in automobiles with war-ridden Mexico is not very flourish-

Exports and Imports of Automobiles and Parts for June and Eleven Preceding Months

EXPORTS

Automobiles

	June 1914 Number	June 1914 Value	June 1915 Number	June 1915 Value	Twelve months ending June 1914 Number	Twelve months ending June 1914 Value	Twelve months ending June 1915 Number	Twelve months ending June 1915 Value
Commercial	90	$120,257	2,990	$8,578 802	784	$1,181,611	13,996	$39,140,682
Passenger	1,982	$1,870,882	4,418	4,785,998	28,306	25,392,963	23,880	21,113,953
Total	2,072	$1,991,139	7,408	$13,364,800	29,090	$26,574,574	37,876	$60,254,635
Parts of (not including engines and tires)	.....	$473,968	.....	$1,139,182	.....	$6,624,232	.....	$7,853,183

EXPORTS BY COUNTRIES

Automobiles

France	143	$88,874	969	$2,634,338	1,429	$924,130	5,441	$13,776,752
Germany	44	56,249	.....	.....	1,435	1,059,249	20	20.164
Italy	17	13,801	4	2,893	343	242,695	115	78,265
United Kingdom	240	239,274	2,246	4,413,387	7,222	5,853,127	13,934	21,149,552
Other Europe	242	203,816	1,432	2,952,440	2,923	2,337,733	4,249	10,720,541
Canada	513	642,024	827	631,609	4,624	5,919,776	4,433	4,428,338
Mexico	3	4.577	11	13,255	167	256,675	78	81,322
West Indies and Bermuda	65	44,657	310	165.199	556	513,124	1,693	993,188
South America	76	50,683	193	119,044	1,985	1,939,212	1,264	702,163
British Oceania	425	369,693	459	399,134	4,244	3,695,595	3,186	2,670,483
Asia and other Oceania	147	149,121	735	1,849,630	2,140	2,076,278	2,316	4,557,634
Other countries	157	128,370	222	183,871	2,017	1,756,980	1,147	1,076,233
Total	2,072	$1,991,139	7,408	$13,364,800	29,090	$26,574,574	37,876	$60,254,635

Tires

Belgium	.....	.....	.....	.....	.....	$15,730	.....	.....
Germany	.....	$6,586	.....	.....	.....	132,181	.....	$6,090
England	.....	192 510	.....	$365,606	.....	1,503,440	.....	2,655.099
Canada	.....	168,976	.....	110,852	.....	961,937	.....	772,574
Cuba	.....	.....	.....	29,790	.....	.....	.....	106,083
Mexico	.....	2,577	.....	7,117	.....	111,948	.....	190,813
Australia	.....	.....	.....	64,519	.....	.....	.....	245,240
Philippine Islands	.....	14,040	.....	25,025	.....	141,205	.....	250,832
Other countries	.....	68,489	.....	135,953	.....	638,826	.....	736,539
Total	.....	$453,178	.....	$738,862	.....	$3,505,267	.....	$4,963,270

IMPORTS

Automobiles

Automobiles dut.	22	$31,746	22	$34,519	300	$620,493	322	$525,303
Parts of (except tires) dut.	.....	96,739	.....	81,060	.....	812,083	.....	847,109
Total automobiles, and parts of	.....	$128,485	.....	$115,579	.....	$1,432,576	.....	$1,372,412

IMPORTS BY COUNTRIES

Automobiles

France	10	$17,365	5	$6,082	134	$304,716	62	$131,936
Germany	2	2,293	.....	.....	21	45,680	6	13,606
Italy	5	5,989	4	5,385	55	79,464	111	122,446
United Kingdom	.....	.....	2	5,379	40	115.042	74	179,765
Other countries	5	6,099	11	17,673	50	75,591	69	77,550
Total	22	$31,746	22	$34,519	300	$620,493	322	$525,303

ing. In June last eleven cars, valued at $13,255, were shipped there, as against three cars, valued at $4,577, exported in June a year ago. During the twelve months' period the exports fell from 167 cars, valued at $256,675, in 1914, to seventy-eight cars, valued at $81,322, in 1915.

310 Cars to West Indies

The West Indies and Bermuda took 310 cars from this country in June last, the value being $165,199, while in June, 1914, the number was sixty-five and the value $44,657. During the fiscal year the exports increased from 556 cars, valued at $513,124, in 1914, to 1693 cars, valued at $993,188, in 1915.

Decrease to South America

Our exports of cars to South America increased from seventy-six, valued at $50,683, in June, 1914, to 193 cars, valued at $119,044 in June last, but during the fiscal year decreased from 1985 cars, valued at $1,939,212, in 1914, to 1264 cars, valued at $702,163, in 1915.

British Oceania imported 459 cars from this country in June last, the value being $399,134, while in June, 1914, the number imported was 425 and the value $369,693. During the twelve months' period these exports declined from 4244 cars, valued at $3,695,595, in 1914, to 3186 cars, valued at $2,670,483, in 1915.

Exports to Asia Gain

Our export trade in cars with Asia and other Oceania increased from 147 cars, valued at $149,121, in June a year ago to 735 cars, valued at $1,849,630, in June last, and from 2140 cars, valued at $2,076,278, in the fiscal year 1914 to 2316 cars, valued at $4,557,634, in 1915.

Under the heading "other countries" the exports amounted to 157 cars, valued at $128,370, in June, 1914, increasing to 222 cars, valued at $183,871 in June last, while during the twelve months' period the shipments declined from 2017 cars, valued at $1,756,980, in 1914, to 1147 cars, valued at $1,076,233, in 1915.

The detailed schedule of exports and imports appears on the opposite page.

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Gasoline for Export Up

NEW YORK CITY, Aug. 30—The Standard Oil Co. of New York has announced an advance of 1 cent a gallon all around in the price of gasoline for export. This brings the quotation for deliveries in 110-gal. drums f.o.b. seaboard to 18 cents a gallon. This is the first price advance in more than a year, during which time the quotation has held firmly at 17 cents a gallon. The New York company's quotations on export business are regarded as the standard, and any changes in the local company's prices are followed by the other companies doing an export trade.

$49,000,000 for Rural Delivery

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Motor Vehicles To Be Extensively Used—$2,000,000 Saving Effected

WASHINGTON, D. C., Aug. 28.—Motor car manufacturers and dealers throughout the country will find much to interest them in a statement issued by the Post Office Dept. to the effect that Postmaster General Burleson will ask Congress next December for an appropriation of about $49,000,000 to provide rural delivery during the fiscal year beginning July 1, 1916. The appropriation for the current year is $53,000,000.

$1,000,000 for New Routes

Of the $49,000,000, it is estimated that $48,000,000 will operate all the rural routes now authorized. The additional $1,000,000 will pay for new service to be established before or during the 12 months to be covered by the appropriation. The Post Office Dept., in a statement, says that the appropriation for rural delivery for the fiscal year 1913 was $47,000,000. The Postmaster General now proposes to provide a modernized and a much larger service during the fiscal year 1917 for just $2,000,000 more than the cost of the old service 4 years ago. One of the reasons why this is possible is because of the economies resulting from the introduction of the automobile in this field of postal transportation.

Automobile Service Success

The department's statement says the success of the automobile service has been fully demonstrated during the last 2 months. With one or two unimportant exceptions, in connection with which postponements of the change were asked and allowed for special reasons, the motor car has been substituted for wagon delivery, wherever ordered, smoothly and on the scheduled time. The motor service is steadily gaining in efficiency and popularity.

Many Applications

Applicants for examination for permanent places as automobile carriers average twenty to each position. In some cases as many as forty men have sought the positions, offering to supply a car, do the 50 to 60 miles a day required for 6 days a week, at the compensation offered—from $1,500 to $1,800 a year. Inasmuch as the majority of the motor car routes radiate from small communities, in which relatively few machines are available for business purposes, this showing is regarded as conclusive proof of the desirability, as well as the feasibility, where road conditions are good, of using the motor car as a carrier of rural mails. It is to be remembered, according to the department's statement, that the adoption of the motor car for this service will give a powerful stimulus to the cause of good roads and improve the facilities available to the farming population for utilizing the parcel post system.

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U. S. Rubber Imports Grow

WASHINGTON, D. C., Aug. 27—Crude rubber shipments from the principal South-American ports have shown an increase of 2,143,076 lb. for the year ending June, 1915, over the year previous, most of which surplus was imported by the United States, according to the report of George H. Pickerell, consul for the United States at Para, Brazil, to the Department of Commerce. The total rubber shipped from the three chief rubber ports of the Amazon Valley was 5,192,260 for the year ending June, 1915, as against 3,049,184 for the year previous. Of this total the United States took 3,088,114, and Europe 2,104,147. The year previous the United States took 1,035,396, and Europe 2,013,788; so that while the United States has increased its imports nearly threefold, Europe has stood practically stationary. The three ports included in these figures are Para, Manaos, and Itacaotiara. Para shipped more than two and one-half times more to the United States than to Europe; Manaos shipped the greater part of its output to Europe, and Itacaotiara shipped all of its rubber to Europe. Para ships nearly three times the amount of rubber that the other two combined do.

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S. O. Advances Gasoline Up 1 Cent in New Jersey

BAYONNE, N. J., Aug. 27—The price of gasoline in this city, where much of the supply is made by the Standard Oil Co., was raised 1 cent a gallon to the dealers yesterday and they in turn increased the price to customers. The price is now 14 cents a gallon, an increase of 3 cents within a month. It was said yesterday that there may be an increase in the prices of other oil products. Local dealers are selling Gulf gasoline at 13 cents.

Further advances have recently been announced in some of the southern States. In Alabama the price has been advanced 1 cent a gallon and in North Carolina 1 cent a gallon to 16 cents. At most Georgia points the price has been raised 1 cent a gallon to 16 cents, but in Atlanta the quotation has been advanced 1½ cents to 14 cents. In Virginia an increase of 1 cent, to 13 cents a gallon, is announced.

Packard Buys More Real Estate

Pays $75,000 for 12.8 Acres—Business Growth Necessitates Further Expansion

DETROIT, MICH., Aug. 30—Through the purchase of 12.8 acres of ground from different parties, the Packard Motor Car Co. now owns over 100 acres of real estate. The purchase price of the land was about $75,000. To what use this property will be made has not yet been definitely decided, although it may be assumed that new buildings or additions to the plant will be started ere long.

Notwithstanding the fact that the Packard company has now under construction half a dozen additions and new buildings which when completed and equipped with their machinery will represent a total expenditure of $1,500,000, the concern's business is now growing so fast that the officials found that it will be necessary to further expand in order to cope with the future.

Through this new acquisition of land the Packard company now has a strip about 1000 ft. wide and extending over one mile along the belt line railroad.

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National Adds to Plant

INDIANAPOLIS, IND., Aug. 30—The National Motor Vehicle Co., Indianapolis, is building a large addition to its Twenty-second Street plant, and the improvements include remodelling of the present offices. Pending completion of same, the general offices of the company have been removed to 426 North Capital Avenue, at which address is located its local branch.

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Pope Buyer Issues Stock

WESTFIELD, MASS., Aug. 29—The Westfield Mfg. Co., which recently bought the plant and business of the Pope Mfg. Co., in this city, has issued the following securities in payment therefor: $400,000 6 per cent serial debenture bonds; $400,000 7 per cent convertible preferred stock, and $800,000 common stock.

The company will continue the manufacture of cars and bicycles and will be under the direct management of W. C. Walker of Hartford. C. H. Tenney of Springfield, Mass., will be chairman of the board, and the other directors will be Joseph Shattuck of Springfield, O. J. Thomen of Redmond & Co., and S. C. Millett of Millett, Roe & Hagen.

Redmond & Co. underwrote the preferred stock and Millett, Roe & Hagen took the bonds, all of which have been placed with investors.

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Tin Prices Active

NEW YORK CITY, Aug. 31—The last week proved no exception to the recent tendency to establish low records in the New York market. Tuesday tin prices became active and remained so during the whole week and at the end of the week it was 45 cents above Monday's price. This was due entirely to the settlement of the Arabic incident. The copper markets were unsettled yesterday due to a sharp break in London standard warrants. Copper agencies say good sales of copper are being made on a basis of 18 cents a pound. While spot copper declined in London, there was no change in electrolytic. Lead was firm, quite a number of sales being made at $4.90 by the leading interest, while outside interests are asking an advance over the official price set by the American Smelting & Refining Co. The leading situation appears to be in full control of the producers and further advance in the price is looked for this week. The munition makers are reported to be seeking to cover up to the end of the year, but sellers are not as yet prepared to sell this far ahead. The price which was established yesterday was $4.90 per 100 lb. There being a net gain of 45 cents at the end of the week.

A slight change took place in the aluminum market with a gain of 1 cent while antimony declined 2½ cents. The rest of the metal markets made no changes. The oil and lubricants markets were weak with but one change. This change took place on Friday when gasoline rose 1 cent. The rest of the markets made no changes.

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Hurlburt Leases Mott Iron Works

NEW YORK CITY, Aug. 28—The Hurlburt Motor Truck Co. has leased the old plant of the Jordan L. Mott Iron Works, on Harlem River and Mott Haven Canal, between Third Avenue and 133d Street, this city.

The company has orders for over 1000 trucks to be used as Red Cross ambulances in the European war, and will treble its force of workmen to operate a full twenty-four hours in shifts of eight hours, employing over 300 men.

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Detroit Steel Products Adds Again

DETROIT, MICH., Aug. 30—For the third time this year the automobile springs department of the Detroit Steel Products Co. is being enlarged. The present addition will be a one-story structure which will add 15,000 sq. ft. of floor space to the department.

"Business thus far this year is fully 50 per cent ahead of 1914," said an official of the company. "August will show to have been the best month we ever had. We have 800 men on the payroll and we are working to full capacity, with three shifts."

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Velie Makes Factory Changes

MOLINE, ILL., Aug. 27—Increased production will be the result of the changes being made at the plant of the Velie Motor Vehicle Co., this city. The six-story building heretofore used for storage purposes will hold the final assembly departments and shipping rooms. With this new arrangement rough material is received at the west end of the main plant, and finds its way through the machine shop, first assembly and test, hence to the final assembly, where the bodies await installation, after which the completed cars are shipped.

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Lenox Plant Moved to Lawrence

LAWRENCE, MASS., Aug. 30—The Lenox Motor Car Co., Boston, Mass., will build a reinforced concrete factory to cost $100,000 in this city. It is stated that the company will enter the commercial vehicle field.

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St. Louis Body to Lease Plant

ST. LOUIS, MO., Aug. 27—The Commercial Auto Body Co. has closed a lease for the building at the southeast corner of Sixteenth and Pine Streets, this city, to be used as a plant for building commercial bodies. The offices and showrooms at 3003 Locust Street will be

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.33	.33	.33	.34	.34	.34	+.01
Antimony	.31	.28	.28½	.28½	.28½	.28½	—.02½
Beams & Channels, 100 lb	1.47	1.47	1.51	1.51	1.51	1.51	+.04
Bessemer Steel, ton	23.00	23.00	23.00	23.00	23.00	23.00	.....
Copper, Elec., lb	.16	.17	.17¼	.17¼	.17¼	.17¼	+.01¼
Copper, Lake, lb	.16½	.16⅞	.18½	.18½	.18½	.18½	+.02
Cottonseed Oil, bbl	5.45	5.54	5.57	5.65	5.65	5.68	+.23
Cyanide Potash, lb	.23	.23	.23	.23	.23	.23	.....
Fish Oil, Menhaden, Brown	.39	.39	.39	.39	.39	.39	.....
Gasoline, Auto, bbl	.14	.14	.14	.14	.15	.15	+.01
Lard, Oil, prime	.85	.85	.85	.85	.85	.85	.....
Lead, 100 lb	4.45	4.60	4.70	4.90	4.90	4.90	+.45
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	23.50	23.50	23.50	23.50	23.50	23.50	.....
Petroleum, bbl., Kan., crude	.75	.75	.75	.75	.75	.75	.....
Petroleum, bbl., Pa., crude	1.60	1.60	1.60	1.60	1.60	1.60	.....
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	.....
Rubber, Fine Up-River, Para	.57	.57	.57	.57	.57	.57	.....
Silk, raw, Ital	3.70	..	3.75	..	..	3.75	+.05
Silk, raw, Japan	3.55	..	3.50	..	..	3.50	—.05
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb	33.75	34.25	35.00	34.50	34.50	34.20	—.45
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

retained by the company for the present.

The new factory has four floors and a basement. About 30,000 sq. ft. of floorspace will be available. The bodies will not be assembled, but will be built from the raw material in the plant. The basement will be used for a mill room, the second floor for assembling, the third floor for trimming, and the fourth for painting and finishing.

Heretofore the company has built bodies for Ford chassis only. In the new plant custom work for all makes of chassis will be done.

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Crane Plant Sold

BAYONNE, N. J., Aug. 30—The entire plant in this city of the Crane Motor Car Co., has been purchased by the Car Lighting & Power Co. The plant will be used by the Clothel Co., the subsidiary of the Car Lighting & Power Co., which manufactures apparatus for refrigeration.

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Scripps-Booth Adds to Plant

DETROIT, MICH., Aug. 30—Its present plant being inadequate to meet its increasing business, the Scripps-Booth Co. is now having erected a three-story plant on Bellevue Avenue, across from its present location. When this plant is completed a production of 100 cars a day will be possible, and the present working force will probably be doubled.

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Dividends Declared

Packard Motor Car Co., Detroit; quarterly of 1¾ per cent on preferred; payable Sept. 15.

Securities Markets Strong

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General Motors Makes High Record After the Arabic Settlement

NEW YORK CITY, Aug. 30—Assuming frankness and sincerity in the latest German assurances, financial interests in New York regard last week's developments in connection with the destruction of the Arabic as of paramount importance to the financial situation. With better understanding between Washington and Berlin the markets once again show up strong. For the most part, stocks showed increase in tone on Saturday, when the majority of issues recorded net advances. One of the important advances was that of General Motors common which rose seventeen points, while that of the preferred rose three points. There were many other notable changes such as Willys-Overland common which rose thirteen points and Studebaker common with a rise of twelve and one-half points. Among the tire issues the largest change took place on Saturday, Kelly-Springfield common rising ten points. Firestone common rose seven points.

Few Declines

There were a few declines this week which ranged from one to five points. The heaviest decline was that of Vacuum Oil which dropped five points, while that of Goodrich preferred and Goodyear common both declined one point. In a general way closing prices were under the best. Trading was on a heavy scale, with very many shares changing hands.

The Detroit issues also picked up with the settlement of the Arabic incident, there being but three declines. The rest of the stocks showed good gains. The gains ranged from one to five points. Continental common, Packard common, and General Motors common rose five points. The bond markets were quiet with no trading.

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N. Y. Exports Amount to $233,531

NEW YORK CITY, Aug. 30—Automobiles valued at $233,531 were shipped from this city during the week ending Aug. 21. Shipments for the same period last year amounted to $336,920 in automobiles, and $1,907,798 in trucks.

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65,183 Visit Ford Plant

DETROIT, MICH., Aug. 30—During the fiscal year of the Ford Motor Co. which ended Aug. 1, the plant was visited by 65,183 persons. This is at the rate of over 210 per day for 300 working days. September, 1914, was the record month for visitors, 11,890 having been recorded during 26 working days or 457 per day.

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Boosters' Outing Sept. 22

NEW YORK CITY, Aug. 30—The Motor Club Boosters will hold an outing at Fred Wagner's farm at Smithtown, L. I., on Sept. 22. William Allen of the Allen Co., is general manager.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	110	..
Aluminum Castings pfd			100	104	..
J. I. Case pfd			70	80	..
Chalmers Motor Co. com			90½	92	+ 1½
Chalmers Motor Co. pfd			95	97	+ 1
Electric Storage Battery Co			65	68	+ 2½
Firestone Tire & Rubber Co. com			525	530	+ 7
Firestone Tire & Rubber Co. pfd			111	..	..
General Motors Co. com			219	220½	+17
General Motors Co. pfd			109½	110½	+ 3½
B. F. Goodrich Co. com			62	63	+ 7
B. F. Goodrich Co. pfd			106	108	— 1
Goodyear Tire & Rubber Co. com			270	274	— 1
Goodyear Tire & Rubber Co. pfd			108½	110	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co., com			28	30	+ 5
International Motor Co. pfd			59	60	+ 9
Kelly-Springfield Tire Co. com			185	190	+11
Kelly-Springfield Tire Co. 1st pfd			85	87	..
Kelly-Springfield Tire Co. 2d pfd			175	185	+ 1
Maxwell Motor Co. com			42	43¼	+ 2
Maxwell Motor Co. 1st pfd			90	92	+ 4
Maxwell Motor Co. 2d pfd			35	37	+ 1
Miller Rubber Co. com			190	194	..
Miller Rubber Co. pfd			107½	..	+ ½
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			117	..	+ 5
Packard Motor Car Co. pfd			100	..	+ 1
Peerless Motor Car Co. com			140	150	+10
Peerless Motor Car Co. pfd			..	..	..
Portage Rubber Co. com			46	48	+ 4
Portage Rubber Co. pfd			93	94	+ 1
*Reo Motor Truck Co			17	18¼	..
*Reo Motor Car Co			33	34½	+ ½
Splitdorf Electric Co., pfd			..	..	..
Stewart-Warner Speed. Corp. com			65	66	+ ½
Stewart-Warner Speed. Corp. pfd			105	107	..
Studebaker Corporation com			111½	112½	+12½
Studebaker Corporation pfd				103	105	+ 1
Swinehart Tire & Rubber Co				88	90	+ 3
Texas Company				150	151	..
U. S. Rubber Co. com				49	51	+ ½
U. S. Rubber Co. pfd				103	105	+ 1
Vacuum Oil Company				214	219	+ 5
White Company pfd				110	..	..
Willys-Overland Co. com				182	184	+13
Willys-Overland Co. pfd				106	106¾	+ 1

No quotations available on account of war.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	98	89½	..	..
Chalmers Motor Co. pfd	..	..	95	97	— ¼
Continental Motor Co. com	155	180	..	300	+ 5
Continental Motor Co. pfd	..	75	83	87	+ 1
General Motors Co. com	..	..	217	221	+ 5
General Motors Co. pfd	..	..	109	111	+ 2
Maxwell Motor Co. 1st pfd	..	..	89	92	+ 1
Maxwell Motor Co. 2d pfd	..	..	35½	39	+ 1
Maxwell Motor Co. com	..	..	41½	45	— 1
Packard Motor Car Co com	..	..	120	130	+ 5
Packard Motor Car Co. pfd	94	..	100	102	+ ½
*Reo Motor Car Co	19½	20½	..	33½	— ¼
*Reo Motor Truck Co	..	12¼	17⅜	18	— ⅛
Studebaker Corp. com	..	..	112	115	+ 5
Studebaker Corp. pfd	..	..	102	106	— 2

INACTIVE STOCKS

*Atlas Drop Forge Co	19	..	27	30	..
Ford Motor Co. of Canada, Ltd	..	550	..	1525	..
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	20¼	22	..
Regal Motor Car Co. pfd	23	..	..	21	..

BONDS

General Motors, notes, 6s, 1915	..	100	..	..	..
Packard Motor Car Co. 5s, 1916	..	..	99	..	+ ½

*Par value $10, all others $100 par value.

Business Tour Reaches 2,850,000

Wisconsin Run Covers Territory Containing 20 Per Cent of State's Population

MILWAUKEE, WIS., Aug. 28.—Approximately 20 per cent of the population of Wisconsin—2,850,000—were placed directly in touch with the 1916 models of the leading automobile manufacturers of America; about 50 per cent were informed of the greatest State fair ever held in Wisconsin, and 65 to 70 per cent were made acquainted in one way or another with all that has to do with good roads, motor vehicles, travel, speed, roadability, scenery and natural resources of the Badger commonwealth, by the booster tour undertaken by the Milwaukee Automobile Dealers, Inc., from Aug. 23 to 27 inclusive, over a route of more than 650 miles, covering the richest and most productive territory of Wisconsin.

The first day the tour covered 109 miles, from Milwaukee to Janesville, Wis., by way of Racine, Burlington, Delavan and Beloit. On the second day 153 miles were covered, and at noon the tourists were within 17 miles of Milwaukee. Wednesday the route measured only 101 miles, being from Madison, the State capital, to Oshkosh. The fourth day took the tour from Oshkosh to Green Bay, 114 miles, by way of the Fox River valley, one of the most fertile agricultural and manufacturing districts in the Middle West. On Friday, 131 miles were covered in the run home from Green Bay along the west shore of Lake Michigan.

Close observation of the cars participating in the tour shows that not one experienced mechanical trouble of any kind, necessitating any delay on the road, and if the tour had been run under grade 3 rules of the A. A. A., each entrant would have come back with a perfect road score.

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Used Car Pocket Edition Revised

CHICAGO, ILL., Aug. 30—The Chicago Automobile Trade Assn., has issued a revised edition of the pocket edition of its National Used Car Market Report which, like the first edition, is supplemental to the large book, but covers only Zone 7 which centers in Chicago. The book is exactly the same size as its predecessor, but despite the fact that it contains information on 154 makes of cars as against 131 listed in the first edition, it has but eighty-six pages instead of ninety-seven.

A great improvement has been made in the method of listing the data and the operation of ascertaining information on a particular car has been considerably simplified. In the first edition, information concerning the model, year, type and list price was given in "run in" form and was not as easy of access as in the new form. In the new edition complete information on each model is given on a single line reading across one page, the "run in" paragraph at the end having been eliminated.

The book contains the following concrete information compiled from the data in the main edition on Zone 7: "U. S. Average"; "As Is Sales"; "As Is Appraised"; the latter being derived from the appraisements made by the committees in Zones 1, 7 and 9.

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25 Exhibitors to Date for Michigan State Fair

DETROIT, MICH., Aug. 30—The annual Michigan State Fair opens next Monday, Sept. 7, and as in past years the automobile show will be one of the big attractions.

From the list of exhibitors given herewith it will be noticed that most of the local automobile dealers have secured space.

In addition to passenger cars and commercial vehicles there will be several motor tractors and among them, it is said, will be a Ford tractor which will give daily demonstrations.

The list of exhibitors up to to-day is as follows:

Buick Motor Car Co., Buick; Cadillac Motor Car Co., Cadillac; Cunningham Auto Co., Maxwell; Chevrolet Motor Car Co., Chevrolet and Monroe; Chalmers Motor Co., Chalmers; Dodge Bros., Dodge; Denby Motor Truck Co., Denby; Ford Motor Co., Ford; Grasser Motor Co., Hupmobile; Jackson Automobile Co., Jackson; McKenney-Devlin Co., Grant and Haynes, also Vim truck; M. A. Young, Mitchell and Reo; Hudson Motor Car Co., Hudson; Oldsmobile Co., Oldsmobile; Oakland Motor Car Co., Oakland; Overland Detroit Co., Overland; Ross Automobile Co., Ross; Thompson Auto Co., Federal and Commerce trucks; Standard Auto Co., Oakland and G. M. C.; Studebaker Corp., Studebaker; Signal Motor Truck Co., Signal; Standard Motor Truck Co., Standard truck; Kalamazoo Motor Vehicle Co., Kalamazoo truck; Gornor Oil Co., and Kleis & Clouse, Ford starters.

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Dixie Magneto on National Twelve

NEW YORK CITY, Aug. 30—In the description of the twelve-cylinder National appearing in THE AUTOMOBILE for Aug. 19 it was stated that the magneto used is a special Splitdorf. This magneto is the Dixie model for twelve-cylinder motors manufactured by the Splitdorf Electrical Co., Newark, N. J.

90 M. P. H. To Be Twin City Limit

Wavy Surface of Concrete Track Expected to Keep Winner's Speed Down

MINNEAPOLIS, MINN., Aug. 31—*Special Telegram*—The wavy concrete surface of the 2-mile Twin City Motor Speedway track is expected to hold the average speed of the winner of Saturday's 500-mile World's Derby below 90 m.p.h. Elimination trials which were to have begun Monday were postponed until Wednesday, owing to weather and track conditions. In an unofficial trial Monday, Gilbert Anderson, in his Stutz, made a lap of the track in 1:12 4/5, an average of 99 m.p.h.

Only one of the two Peugeots reported recently shipped from France, to be driven by Wilcox and Aitken, has arrived, and it will not be possible for it to reach the track in time for Saturday's race. Wilcox and Aitken are to be Stutz relief drivers. The Peugeot will be ready for the Sheepshead Bay race Oct. 2, and will probably be driven by Johnny Aitken.

H. J. Tremain of Minneapolis has bought the Duesenberg entered in the Twin City race with Henderson as driver, but has elected Ralph Mulford to pilot it on Saturday.

The track is in fine condition and good weather is promised so that the attendance should be 100,000.

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Automobile Racing for Japan

TOKIO, JAPAN, Aug. 27—Automobile racing will be inaugurated in this city when a series of track races will be held in commemoration of the anniversary of the coronation of the Emperor. American cars will be entered, among them being two Mercers, recently sold by G. R. Bentel, the Pacific Coast Mercer distributor, to F. J. Fujioka, the two cars to be driven by W. T. Watanabe and H. Sakamoto.

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De Palma Wins at Kalamazoo

KALAMAZOO, MICH., Aug. 28—Driving a most consistent race and without having the slightest hitch, Ralph De Palma, in his Stutz racer, won the 100 miles race at Recreation Park this afternoon He covered the century in 1:33; 31:40, averaging 65.32 m.p.h. Incidentally De Palma is now richer by $1,000. Bob Burman will receive $700, having finished second in the race in his Peugeot. Third money went to Billy Chandler, who drove a Deusenberg. The fourth prize went to G. F. Patrick, who was at the wheel of a Mercer, while the fifth and last prize

was won by Thomas Ball, driving a Buick.

Ideal weather prevailed and a crowd of from 12,000 to 15,000 people was present when the race started. A thousand automobiles or more were around the course.

Of the race itself there is not much to be said because it was practically a one-man race. De Palma could probably have made better time, but he drove carefully and took no chances. He did not stop once during the entire race.

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Motometers on Elgin Racers

NEW YORK CITY, Aug. 27—Boyce Motometers were on all cars in the races for the Chicago Automobile Club cup and the Elgin national trophy held at Elgin, Ill., Friday and Saturday, Aug. 20 and 21.

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Hyatt Service in San Francisco

DETROIT, MICH., Aug. 30—The Hyatt Roller Bearing Co. will open a new service branch in San Francisco. It will be located at 366 Golden Gate Avenue. This will be the ninth Hyatt service branch now in the country, the others being located in Atlanta, Boston, Detroit, Los Angeles, Minneapolis, Chicago and New York.

The local service branch of the Hyatt company has moved into larger quarters at 751 Woodward Avenue. About Nov. 1 this branch will be moved into the new office building now in course of construction.

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Iowa Dealers in Convention

DES MOINES, IOWA, Aug. 31—The first semi-annual convention of the Iowa Automobile Dealers' Association opened a two-day session here to-day. This is the first convention of its kind to be held in the United States. There are seventeen associations in all. President of the Garage Owners Association of Illinois, W. B. Taylor, and Secretary E. J. McGuirk will address the 600 Iowa dealers. Among those present will be Mayor Hanna of Des Moines, who will give the welcome address. This will be followed with an address by J. Friedman of Dyersville, vice-president of the Iowa Association. Secretary N. L. Seeman will give a report on the Iowa association, which was organized March 10 of this year.

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Grossman Holds Annual Salesmen's Convention

NEW YORK CITY, Aug. 30—The annual salesmen's convention of the Emil Grossman Mfg. Co., Inc., Brooklyn, N. Y., was held in the offices of the company, Bush Terminal, Aug. 27 and 28. Emil Grossman, president of the company, presided.

Since January, 1915, the company has added over 500 new customers. The company's increase in business for this year, over that of 1914, was over 50 per cent.

The following salesmen and other members of the company's staff attended the 2-day sessions of the convention: Emil Grossman, president; J. N. Lowe, vice-president; L. M. Schwartz, secretary; E. C. Delgado, assistant treasurer; A. A. Greene, in charge of sales to manufacturers; N. T. Gutelius, advertising manager; P. L. McIlvaine, export; S. S. Waldman, purchasing agent; M. S. Rosen, engineer; Harry G. Wedler, W. M. Farans, A. E. Rosenberg, R. R. Rosenquist, A. F. White, representative in India and the Far East; J. E. Vidal, representative in Cuba, Porto Rico, South and Central America; E. E. Gamon, factory manager; R. W. Johnson, assistant factory manager; L. G. Hartdorn, assistant factory manager; Carl Postal, assistant factory manager spark-plug department.

Friday evening the members of the convention were entertained by the company at dinner and at the theater. Saturday evening there was a banquet.

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Washington Jitneys Common Carriers

WASHINGTON, D. C., Aug. 28.—Within the next few days orders declaring jitneys common carriers, subject to rules and regulations governing this class of public utilities, will be issued by the Public Utilities Commission. The commission has decided to take this action upon the advice of Corporation Counsel Syme, who recently made an investigation of the jitney situation.

The first step of the commission will be the preparation of rules and regulations governing the jitney service. The companies, as well as individual owners, will be required to file immediate reports of all accidents. Annual reports, which will include a complete statement of their financial operations, together with a general description of their rolling stock, etc., will also be made. The question of an interchange of transfers will be decided later.

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Bosch on Austin and Mercer

NEW YORK CITY, Aug. 31—The Bosch Magneto Co. has closed contracts with the Austin Automobile Co., Grand Rapids, Mich., and the Mercer Automobile Co., Trenton, N. J., to use Bosch magnetos for the coming season.

The Engineers' Forum—Aluminum Pistons

(*Continued from page* 421)

By a system of ribbing, which we have developed ourselves and which gives the dual advantage of quickened thermal conductivity as well as adding rigidity to the dome of the piston, we were able to turn out a piston that weighed less than 12 oz. and under the directions we sent for machining, they have met every requirement, for our pistons have now been adopted for their standard production, which fact speaks for itself.

System of Ribbing

The system of ribbing under the dome which we employ adds greatly to the radiating surface and at the same time strengthens that part of the piston on which the greatest stress occurs, without adding more than a fraction to the weight. Two of the ribs are extended to reinforce the wristpin bosses, offering a solid dome construction from the stress point above the wristpin to the center of the piston head.

The advantages following a correct installation of aluminum alloy pistons are sufficiently well known among your engineering readers so that this feature of the discussion is scarcely worth mentioning here. The principal idea is to offer the foregoing suggestions gained through experience and for the guidance of those who would gain the benefits of Magnalite pistons.

As to aluminum alloy cylinders, it is only fair to state that their present development is somewhat embryonic, although we have successfully cast quantities of them for aeroplane work and unquestionably they will have a broad future in the automobile trade. Just as the problems of aluminum alloy pistons have been solved, so in time will come the full development of the aluminum cylinders, and it is my prediction that sooner than is now expected, an alloy metal will be produced, having all the advantages of light weight and with a bearing surface which will not require the use of a reinforcing iron cylinder sleeve.

Copper and iron have been known and used for fifty centuries but aluminum has been commercially known for but thirty years and the industrial possibilities yet to be developed from the manipulation of aluminum are just beginning to appear.—WALKER M. LEVETT, Walker M. Levett Co.

United Truck Extends — The United Motor Truck Co., Grand Rapids, Mich., is building additions to its plant.

Thermoid Rubber Adds — The Thermoid Rubber Co., Trenton, N. J., will build a two-story, 71 by 190 ft. addition to its plant.

Garford Truck Adds—The Garford Motor Truck Co., Lima, Ohio, is building an addition to its plant at an estimated cost of $20,000.

Pathfinder to Build—The Pathfinder Co., Indianapolis, Ind., has had plans prepared for the construction of a 60 by 400 ft. addition to its plant.

Maine Co. to Make Automobiles—The E. E. Wentworth Corp., Springvale, Me., will construct a plant for the manufacture of automobiles at a cost of $50,000.

American Steel Installs Furnace.—The American Steel Foundries, Chicago, Ill., has installed a 6-ton electric furnace of the Heroult design at its Indiana Harbor, Ind., plant for the production of automobile and other castings.

Sheldon to Treble Output.—The Sheldon Axle Co., Wilkes-Barre, Pa., is increasing its output of worm-drive truck axles by the installation of new machinery and special equipment. After the additions are completed, it expects to treble its output.

Chevrolet Buys Toronto Plant — The Chevrolet Motor Co. of Canada, Ltd., Toronto, Ont., will on Oct. 1 take possession of the plant of the Dominion Carriage Co., Ltd., West Toronto, which it has purchased. It hopes to have cars ready for delivery in three months.

Scripps-Booth New Factory — Ground has been purchased and work is now going forward as rapidly as possible on a new three-story fireproof factory which will be the home of the Scripps-Booth Co., Detroit. The new factory will have a capacity of 100 cars a day.

New Automobile Co. in Mich —The Francisco-Martin Motor Co., Newport, Mich., has been incorporated with $30,000 capital stock to manufacture automobiles. The incorporators are G. W. Francisco, L. J. Martin and F. B. Scholl. It is stated that the company will erect a factory at Newport.

Internal Gear Drive News Issued.—The Internal Gear Drive Assn., Detroit, Mich., has published the first issue of the Internal Gear Drive News, which is to cover the growth of the internal gear drive idea, as applied to motor trucks throughout the world. It will also tell of the service these axles are giving.

Sterling Wheel Erecting Plant — The Sterling Wheel Co., 245 Oregon Street, Milwaukee, manufacturer of ball-bearing resilient wheels for automobiles and motor trucks, which was recently reorganized and the name changed from T. S. Wheel & Mfg. Co., with W. M. Swift Miller, Milwaukee, as president and general manager, is building a plant at Eighth and Oklahoma Avenues.

Timken Forge Plant Progressing.—Work on the new drop forge plant of the Timken-Detroit Axle Co. is progressing. The new upright boilers are in place and the steel frame work is now being erected. The new worm-drive axle assembly plant recently finished is now in operation with a full new equipment of machinery. This plant gives the worm-drive axle plant about 100,000 additional square feet of floor space.

Crown Fender Plant in Ypsilanti—The Common Council of Ypsilanti, Mich., has made it possible for a new industry to locate there with the prospect of employing from 500 to 2500 men when fully running. This is the newly organized Michigan Crown Fender Co., which will manufacture fenders for automobiles and other metal stampings. The city purchased a site and will erect a building 400 by 80 ft. for the concern, which later expects to purchase the property. It is stated that the Ford company will use a large part of the output.

Haynes Additions to Cost $250,000.—Additions to the plant of the Haynes Automobile Co., Kokomo, Ind., will cost $250,000. A large office building is now being completed and will stand outside the old plant, the offices of which will be made a part of the space given over to the manufacture. In addition there will be erected at once three new steel and concrete structures alongside of the present factory. There will be new painting, testing, power plants and also a new building for the storage of rough and finished materials and cars.

The Automobile Calendar

Sept.	Peoria, Ill., Second Northwestern Road Congress.
Sept. 4	Twin City, Minn., 500-Mile Race; Twin City Motor Speedway Co.
Sept. 6-9	Worcester, Mass., Show, Dealers' Assn.
Sept. 6-10	Indianapolis, Ind., Show, Indiana State Fair.
Sept 6	Reading, Pa., Show, Hotel Berkshire.
Sept. 6-15	Detroit, Mich., Show, Michigan State Fair.
Sept. 8-11	Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13-17	Milwaukee, Wis., Show, Automobile Dealers' Assn.
Sept. 13-17	Oakland, Cal., Pan-American Road Congress.
Sept. 17-18	Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18	Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Sept. 18-25	Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Sept. 24	Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 26-Oct. 10	Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Oct.	Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct.	Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2	New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 2	Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9	Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 4-10	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6	Columbus, O., Garage Owners Convention.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9	Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14	Chicago, S. A. E. Standards Committee Meeting.
Oct. 16	Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 18-19	Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Nov. 1-3	Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18	Arizona 150-mile Grand Prix.
Nov. 20	Corona, Cal., Road Race.
Nov. 29-Dec. 4	Electric Prosperity Week.
Dec. 31	New York City, Show; Grand Central Palace.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Bamford Detroiter Production Manager—W. R. Bamford has been appointed production manager of the Detroiter Motor Car Co., Detroit.

Thorpe Truck-Tire Manager — G. L. Thorpe has been appointed manager of the truck-tire department of the Hood Tire Co., St. Louis, Mo.

Shaw Heads Dallas Co.—The Dallas Qualityre Co., Dallas, Tex., has been organized in Dallas with Lamonte Daniels president and L. L. Shaw vice-president. Mr. Shaw is in charge.

Conrad Sphinx Sales Manager—H. W. Conrad, formerly sales manager of the Pullman Motor Car Co., York, Pa., has been appointed sales manager of the Sphinx Motor Car Co., York.

Hitchcock Truck Dept. Head.—A. S. Hitchcock has been appointed truck department manager of the Cadillac Auto Co. of R. I., Providence. This concern handles the General Motors trucks.

Dealer

New Supply House for Ala.—The Auto Supply Co., J. R. Jones, manager, has been formed in Dothan, Ala., to handle a general line of accessories, etc.

Swan Carbureter Agency—The Los Angeles Ignition Works, which recently moved into a new building at 1007-1011 Main Street, Los Angeles, Cal., have secured the agency for the Swan carbureter for Orange and Los Angeles counties. The Swan carbureter is a San Francisco product which is working into great favor on the Pacific Coast.

Packard at Manchester.—Alvan T. Fuller, who has the agency for the Packard line at Boston, Mass., Portland, Me., and Providence, R. I., has added Manchester, N. H., to his list, having opened an agency there last week on Merrimac Street. F. B. Freeman has been placed in charge of the Manchester agency. He had the Stutz agency in Boston until a few weeks ago.

Cleveland Agencies Moving—The H. F. Neighbors Co., Cleveland agent for the Dodge, has secured a site at the corner of Chester Avenue and Twenty-second Street, upon which two structures will be erected. One has been started and the other will be started soon. The structure under way will have 18,000 sq. ft. of floor space and the other structure will contain 22,000 sq. ft. The Buick agency will be moved off of Euclid Avenue next year.

Motor Men in New Roles

Nachtrib Goes to Dallas.—E. R. Nachtrib, formerly factory representative of the Willys Overland Co., Toledo, Ohio, has been appointed assistant to Manager Taxis of the Dallas, Tex., branch.

Smith Edison's Detroit Office Mgr.—Bertram Smith, well known in the storage battery business for the past fifteen years, has been appointed manager of the Detroit office of the Edison Storage Battery Co.

Bryant Standard Welding Factory Manager—R. S. Bryant, for many years consulting engineer of the Standard Welding Co., Cleveland, Ohio, has been appointed factory manager in charge of all manufacturing.

Jones Sun Branch Mgr.—S. A. Jones has been appointed western branch manager for the Sun Motor Co. and is expected in Dallas next week to close arrangements for the opening of a branch house in this city.

Has Entire State Agency.—J. W. Gogarn, who was recently given the agency for the Mitchell line at New Haven, Conn., has been made agent for the entire State as a distributor for the Carl H. Page Motors Co. of New York.

Parrish Denby Sales Manager — The Denby Missouri Truck Co., 405 North Twenty-second Street, St. Louis, Mo., has been appointed distributer of the Denby truck in the St. Louis district. G. Y. Parrish will be sales manager of the new concern.

Gaston Cadillac Rep.—George Gaston, formerly salesman for the Munger Automobile Co., the Dallas Cadillac agency, is now district representative for the Cadillac Motor Car Co. His territory embraces Texas, Missouri, Kansas, Oklahoma, Arkansas and Louisiana.

Thackston Dallas Hupp Mgr.—E. O. Thackston will be general manager of the Dallas Hupmobile Co., Dallas, Tex., with F. N. Abbott as territorial manager. Hupmobiles will be handled exclusively in sixty-five counties of North, East and West Texas. This organization will be in the way of a factory branch. A new building at 2210-2212 Commerce Street is being erected for the company and this will be the salesrooms and parts department.

Recent King Changes.—B. R. Hayden has joined the King Motor Co. of Chicago as sales manager. G. W. Franklin has resigned from the Wetmore-Quinn Co. to join the A. A. Crumley Co., Michigan State distributor for the King car, as sales manager. Mr. Franklin was formerly sales manager for the Regal Motor Car Co. Bert Collins, late of the Studebaker Corp., has joined the King Motor Car Company as a special factory salesman. His position is a new one created for the purpose of making jumps to certain points where co-operation with dealers, old or prospective, is needed. He will have no particular territory. A. J. Smith has returned to the automobile business and is now sales manager for the Reliance Automobile Co., northern California, distributor for the King eight.

Dealer

To Distribute Danver Oiler—The Danver Sales Co., 17 Custom House Street, Providence, R. I., will distribute the Danver auxiliary oiler for Ford cars.

Pasadena Savage Tire Moves — The Savage Tire Co.'s Pasadena branch, under the managership of Frank Verbeck, former racing driver, is located in its new quarters, 43-45 East Union Street.

Recent N. Y. Trade Changes.—The Akron Tire Co. has leased a store at 1789 Broadway, New York City, and the Lyons-Atlas Co. service station at 1876 Broadway has been leased to the Lexington Motor Car Co.

Moves to New Quarters.—The Henshaw Motor Car Co. of Boston, agent for Dodge Bros. cars, has leased the building 915-921 Boylston Street that was built especially for the E. R. Thomas Co. when it opened a branch at Boston with Mr. Henshaw in charge. It was later occupied by the Garford agents, but for some months has been idle. Mr. Henshaw will utilize the entire building, but he will also continue his service station at the Motor Mart.

Indianapolis Republic Tire Distributor—The Varney Electric Supply Co. Indianapolis, Ind., has been appointed distributor for the Republic tire. The territory controlled by the Varney company includes all of Indiana (with the exception of a few counties in the northeastern part of the State), southern Illinois and the western portions of Kentucky and Tennessee. S. C. Walker, secretary and treasurer, has complete charge of tire sales and has eight district men under his jurisdiction.

Automobile Agencies Recently Established

PASSENGER VEHICLES

Alabama

Opelika	Abbott-Detroit	C. R. Summers

Arkansas

Little Rock	King	U. S. Motor Co.

California

Los Angeles	Paige	Smith Brothers
Oxnard	Dodge	Oxnard Garage
Oxnard	Hudson	Oxnard Garage
Pomona	Chandler	Potter & McCormack
Ventura	Ford	Claude C. Needham
Visalia	Dodge	Charette-Pennebaker Co
Portersville	Dodge	J. W. Stephens
Redlands	Maxwell	Hatfield & Ayres

Colorado

Akron	Saxon	M. W. Lewis
Alamosa	Overland	E. J. Best
Alamosa	Hudson	R. R. Sumner
Arvada	Dort	Arvada Motor Car Co.
Aspen	Overland	Aspen Automobile Co.
Aspen	Saxon	Gerbaz & McPhee
Berthoud	Overland	Jeffere Auto Co.
Boulder	Hudson	N. U. Wallace
Boulder	Overland	J. C. Deckelman
Boulder	Saxon	B. C. Garbarino
Byers	Overland	C. C. Shetler
Canon City	Overland	York Auto Co.
Broomfield	Reo	Walter W. Wilcox
Colorado Springs	Dort	Big Four Auto Co.
Colorado Springs	Reo	Beecher Motor Co.
Craig	Saxon	Anderson & Brokaw
Cripple Creek	Dort	E. J. Williams
Cripple Creek	Saxon	Clark Supply Co.
Cheyenne Wells	Dort	T. C. Turner
Deertrail	Dort	G. I. Williams
Denver	Chalmers	E. J. Johnson
Denver	Cole	Colorado Motor Car Co.
Denver	Dort	J. S. Morri on
Denver	Jackson	Regal Sales Co.
Denver	King	Regal Sales Co.
Denver	National	W. W. Beeson
Denver	Regal	Regal Sales Co.
Denver	Paige	L. G. Palmer
Denver	Velie	John Deere Plow Co.
Edwards	Paige	A. W. Burnison
Elbert	Buick	Theodore Neuman
Flagler	Saxon	William Seal
Fort Collins	Reo	Jackson-Ankney Merc. Co.
Fort Collins	Saxon	G. Harold D. Parker
Fort Collins	Buick	G. Harold D. Parker
Fort Collins	Paige	J. C. Hunt
Fort Morgan	Reo	A. C. Gillette
Glenwood Springs	Cole	Bart Patrini
Grand Junction	Paige	Western Colorado Motor Sales Co.
Greeley	Dort	Lee Bros.
Greeley	Reo	J. B. McCutcheon
Greeley	Buick	Weld County Garage
Hayden	Cole	Dawson Auto Co.
Holyoke	Saxon	G. W. Garland
Hugo	Saxon	Cobb & Hatton
Idaho Springs	Paige	Richard E. Staley
Lamar	Saxon	Hartman Auto Co.
Lamar	Reo	Miller Bros.
Las Animas	Reo	F. W. McCune
Leadville	Cole	O. W. Reynolds
Longmont	Saxon	Shaw & Shickle
Loveland	Reo	Anderson & Griffin
Loveland	Saxon	Stewart & McFadden
Monte Vista	Paige	Stephens & Corrington
Paonia	Paige	Joseph Carlstrom
Placerville	Dort	M. B. Stone
Pueblo	Paige	Spitzer Bros.
Steamboat Springs	Oakland	L. J. Brown
Timnath	Cole	Giddings & Carey
Trinidad	Saxon	Mack Patterson
Trinidad	Cole	Trinidad Garage Co.
Trinidad	Paige	George D. Single
Windsor	Reo	P. A. Bartz
Windsor	Paige	H. E. Hickman
Yuma	Dort	L. J. Titterington
Yuma	Saxon	Heiserman & Mouser

District of Columbia

Washington	Grant	C. L. Burrows & Co.

Florida

Lake City	King	National Highway Garage
Tallahassee	King	Brown's Garage

Georgia

Columbus	Abbott-Detroit	C. E. Porter, Jr.

Idaho

Blackfoot	Oldsmobile	Red Cross Garage

Illinois

Aurora	Oldsmobile	L. D. Krumlauf
Bloomington	Hupmobile	F. G. Oseminger
Bloomington	Reo	F. H. Cole
Cerro Cordo	Jeffery	C. W. Adams
Decatur	Hupmobile	G. W. Ehrhart
Sublette	King	Leffelman & Lauer
Welden	Reo	M. F. Shinneman

Iowa

Council Bluffs	Chandler	Kimball Tire Case Co.
Des Moines	Auburn	Iowa Motor Sales Co.
Des Moines	Westcott	Iowa Oldsmobile Co.
Earling	Chandler	F. W. Wilmerding
Lemars	Oakland	Kilburn-Rickabaugh Co.
Long Tree	Abbott-Detroit	H. U. Baker
Oakland	Oakland	F. W. Pierce
Redfield	Hupmobile	A. E. Smith
Shenandoah	Oakland	A. F. Woodard
Silver City	Oakland	F. W. Anderson
Stanton	Oakland	Stanton Auto Co.
Traer	Chandler	T. F. Cohort

Indiana

Connersville	Lexington	Inland Motor Sales Cor.
New Castle	Maxwell	Claude Stanley
Richmond	Detroiter	Geo. H. Schultz
Roann	Oldsmobile	J. E. Clingaman
South Bend	Vim	Wm. Devall

Kansas

Atchison	King	E. J. Donnelly
Dodge City	King	Howell & Rinehart Co.
Haviland	Auburn	V. B. Clements
Phillipsburg	Chandler	W. H. Champlin

Kentucky

Covington	Hupmobile	B. B. Hume
Mt. Vernon	Hupmobile	W. J. Schleicher

Maine

Dexter	Maxwell	Blainsdell Auto Co.
Greenville	Chandler	W. R. Dailey

Maryland

Hagerstown	Regal	Young Motor Car Co.
Oakland	Chandler	Ravescroft Garage

Massachusetts

Boston	Detroit Electric	E. Y. Stimpson
Boston	Detroiter	Geo. G. Reed
Boston	Pathfinder	Regal Motor Sales Co.
Boston	Velie	J. W. Bowman Co.
North Adams	Studebaker	W. J. Shaw
Webster	King	Robert V. Cassidy
Worcester	Abbott-Detroit	Mavkel Auto Co.
Worcester	Studebaker	Studebaker Corp.
Worcester	Velie	O. A. Kelley Co.

Michigan

Battle Creek	Chalmers	Jackson Garage
Battle Creek	Dort	United Motors Co.
Bay City	Detroiter	F. O. Rockwell
Bay City	Hollier	Stohl Auto Co.
Detroit	Dort	A. A. Crumley
Detroit	King	A. A. Crumley
Escanaba	Dodge	John E. Jackson
Farmington	Oakland	Wm. Goers
Fremont	Dort	Robert Southard
Fremont	Studebaker	Evans-Tinney Co.
Grand Rapids	Chalmers	C. D. Miller
Grand Rapids	Dort	Oswald Motor Car & Supply Co.
Grass Lake	Hollier	T. B. Jones
Howell	Ford	Roy Sprague
Jackson	Cadillac	John A. Bennett
Jackson	Paige	Temple Garage
Ludington	Studebaker	Peter Peterson
Manton	Overland	A. B. Bartlett
Milan	Detroiter	E. F. Bay
Niles	Dort	A. Gregg
Niles	Ford	Pinkham Bros.
Niles	Studebaker	Felix La Cosse
Oxford	Ford	Charles Howarth
Pigeon	Dort	Leipprandt Bros.
Potterville	Ford	Fhaner Bros.
Rockland	Dort	G. W. Stannard
Rochester	Oakland	W. T. Crawford
Sault Ste. Marie	Dodge	Wynn Auto Sales Co.
Sault Ste. Marie	Oakland	T. L. Linsett
Vassar	Dort	K. C. Mott

Minnesota

Duluth	Winton	I. M. Ford
Kasson	Oldsmobile	Otterness Bros.
Lewiston	Oldsmobile	F. E. Franks
Minneapolis	Kissel	Barclay Auto Co.
Minneapolis	New Era	Reilly Herz Co.
Ortonville	Hupmobile	Art Powell
Redwood	Red	Farrell & Keefe
Silver Lake	Ford	A. L. Banek
St. Paul	Kissel	T. F. Lynch
Worington	King	Ullrich Auto Co.

Missouri

Springfield	Oldsmobile	Benj. Toothman
St. Louis	King	Monarch Motor Sales Co

Montana

Butte	Franklin	The Silver Bow Automobile Co.
Ennie	Dodge Bros.	Porter Nelson
Glendive	King	J. Wieglands

Nebraska

Ainsworth	Oakland	L. F. Corbitt
Beemer	Oakland	C. J. Nellor
Benkelman	Oakland	E. A. Mathews
Broken Bow	Oakland	Carothus & Brittan
Burwell	Oakland	Meyers & Mansail
Ceresco	Oakland	Anderson & Dahlstrom
Clarkson	Oakland	Pokorney & Vrasper
Curtis	Oakland	D. O. Nelson
Dalton	Oakland	J. C. Frandsen
Dunbar	Oakland	E. E. West
Eustis	Oakland	Charles Urbele & Co.
Fremont	Oakland	Electric Garage Co.
Gibbon	Oakland	Walker & Wallace
Gordon	Oakland	A. E. Park
Grant	Oakland	W. A. Westenburg
Hampton	Oakland	Hampton Auto Co.
Holbrook	Oakland	Henry Krause
Howells	Oakland	Mestl Brothers
Julian	Oakland	S. A. Wilberger
Kenesaw	Oakland	Wm. Primm
Kilgore	Oakland	J. H. Fisher
Lincoln	Oakland	F. A. Roehl
Minden	Oakland	J. A. Slater
McCook	Oakland	M. M. Brumley
McCool Jct	Oakland	A. R. Marshall
Nebraska City	Oakland	Grassmueck Bros.
Norfolk	Oakland	Scott Auto Co.
Orleans	Oakland	Linean Hardware Co.
Ohiowa	Oakland	G. F. Spelde
Osceola	Oakland	Meridian Garage
Petersburg	Oakland	Nick Otelle & Son
Plymouth	Oakland	Nispel & Metcalf
Sargent	Oakland	R. A. George
Senceca	Oakland	Thomas McCawley
Scribner	Oakland	Boll & Zeman
Silver Creek	Oakland	Graham Bros.
Stanton	Oakland	A. V. Johnston Auto Co.
Talmage	Oakland	Charles Brehm, Jr.
Thayer	Oakland	Aug. Heidbreder & Son
Utica	Oakland	Aug. Heidbreder & Son
Valentine	Oakland	H. W. Harper Auto Co.
Wilsonville	Oakland	J. B. Andrez

New Jersey

Atlantic City	Vim	Eastern Motor Co.
Bayonne	Chandler	C. W. Beckman
Bridgeton	King	David R Mitchell
Hammonton	King	Wm. Turner
Merchantville	King	Merchantville Auto Co.
Riverton	King	Geo. M. Weimer Auto Garage
Woodstown	King	John R. Watson

New Mexico

Albuquerque	Oldsmobile	J. L. La Driere
Aztec	Dort	J. G. Black
East Las Vegas	Oakland	Vegas Auto Co.
Ft. Sumner	Oldsmobile	C. Frymire
Las Vegas	Oldsmobile	Midway Garage
Magdalena	Oakland	Magdalena Mch. & Auto Co.
Raton	Oldsmobile	E. G. Love Motor Co.
Tucumcari	Oakland	M. B. Goldenberg

New York

Bayport	Oldsmobile	Wm. L. Mantha & Co.
Buffalo	Dort	A. F. Winegar
Menands	Oldsmobile	H. R. Hill
Penn Yan	Maxwell	Joseph T. Cox
Portchester	Chandler	Reynolds Empire Garage Co.
Suffern	Kissel	Peiper-Blanchard Garage
Watertown	Dort	G. H. Baltz

North Carolina

North Wilkesboro	King	Yadkin Valley Motor Co

Ohio

Akron	Chandler	Baynon Motor Sales Co.
Archbold	Auburn	Yoder & Ehrat
Bridgeport	Pullman	The Bridgeport Auto Sales Co.
Columbus	Abbott-Detroit	Geo. W. Carroll
Columbus	Lewis	Snyder Automobile Co.
Columbus	Maxwell	C. W. Hoffritz
Columbus	Monroe	Winders Motor Sales Co.
Columbus	Scripps-Booth	Broad Oak Automobile Co.
Columbus	Winton	G. E. Thomas Co.
Democracy	Detroiter	W. H. Kunkle
Findlay	Hupmobile	G. W. Gavis & Co.
Huron	Chandler	G. E. Rhinemiller
Ironton	Saxon	Wilbur E. Jones
Lima	Oldsmobile	Cadillac Co. of Lima
Lima	Regal	Lima Regal Sales Co.
Logan	Maxwell	W. H. Nunemaker
Marion	Hollier	E. W. Owne Machine Co.
Marion	Oldsmobile	Barnhouse-Hemmerly Auto Co.
Martins Ferry	Regal	Krim Bros. & Sims
Middletown	Oldsmobile	Bevis & Shartle Machine Co.
Spratt	Dort	G. H. Gillogly
Tippecanoe City	Chandler	Theo. M. Bell
Wilmington	King	Bonta & Davis

Oklahoma

Frederick	Hupmobile	F. W. Emenhiser
Okarche	Hupmobile	E. C. Loosen

Ontario

Ottawa	King	W. C. Greig

Pennsylvania

Bloomsburg	Chandler	Zehner Bros.
Devon	King	Devon Garage
Flourtown	King	Seddon Garage
Germantown Pike	King	Moores Garage
Harrisburg	Westcott	Universal Motor Car Co
Hazleton	King	J. L. Wagner
Hazleton	Vim	John Deach
Nazareth	Abbott-Detroit	James Itterly
New Castle	Maxwell	Jas. P. Cope
Norristown	King	Norris City Garage
Philadelphia	Pathfinder	W. Snellenburg & Co.
Reading	Oldsmobile	Oldsmobile Co. of Reading
Scranton	King	D. M. Campbell
Shamokin	Vim	Erb & Zaring
Souderton	King	R. D. McIntyre

South Dakota

Centerville	Mitchell	Chas. Shidler & R. Smith
Emery	Oakland	P. H. McManus & Son
Turton	Ford	L. G. Mannie

Tennessee

Knoxville	King	Harth Automobile Co.
Knoxville	Westcott	F. A. Carpenter

Texas

El Paso	Kissel	Pioneer Motor Co. Inc.
Marshall	Chandler	L. S. Hawley
Olympia	Chandler	A. N. Daly & V. E Meyers

VOL. XXXIII NEW YORK—THURSDAY, SEPTEMBER 9, 1915—CHICAGO NO. 11

The Automobile

Die Casting vs. Machining

For Unstressed Parts Process Offers Economical Avoidance of Costly Shop Work in Car Manufacture

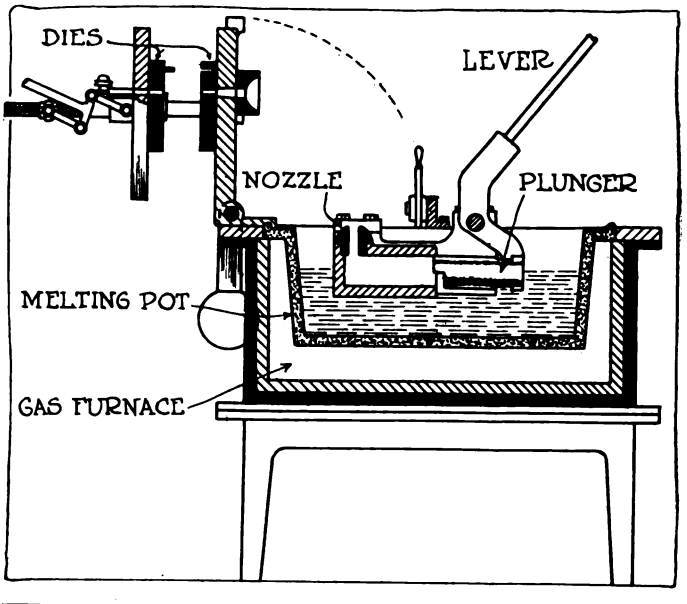
By J. Edward Schipper

PERHAPS some day the gears in the transmission system, the differential gears and a thousand and one other parts that are now the product of laborious drop forging and machine work will be die cast. It is certain that were this ever possible the cost of manufacturing automobiles would drop so far as compared to present-day practice that even the big price cuts of the last year or two would look small to the possibilities which would then be reached. To-day we cannot go this far or even nearly so great a distance in the direction of simplicity in manufacture, and what to-morrow will bring forth in the field it is only possible to conjecture; but with the improvements in materials and with the discovery of material which would act as dies for molten steels this condition may at some time be reached.

While the dream of die-cast steel may be far removed and vague, the die-cast part itself is becoming more and more an important factor in the construction of the up-to-date car. According to present-day practice, die castings are limited to parts which need not have material of more than 18,000 lb. per sq. in. in tensile strength, except where aluminum can be used. This bein a fact, the uses about the car to which this class of manufactured part may be put, are limited to those which do not carry the heavier stresses, either static or dynamic. Thus it is found that for housings and simple parts which have but little actual work to do but which, at the same time, were it not for the process, would require an amount of machine work, die castings are often the most economical to use.

Limits of Strength

With the limitations of strength and the limitations of material which, at the present time, can be used for this method of casting in permanent molds under pressure it is a matter of course that one other limitation should follow; this is the restriction on the uses to which the die-cast product can be put. These restrictions are clearly brought out in considering the parts which have been successfully made from die castings and those which, on the other hand, have failed. In other words, there is a well-defined field in which die castings can be used to advantage in the present



The above is a diagrammatic illustration of the die casting machine patented by H. H. Doehler in 1907. As will be noted there is a cast-iron pot which holds approximately 500 lb. of lead. This melting pot is fitted into the gas furnace and the pump cylinder is contained within the melting pot, being completely immersed by the molten alloy. Into this cylinder there operates a plunger controlled by a lever. This plunger which is attached to the controlling arm is withdrawn by raising the lever to its utmost height and this allows the molten liquid to flow into the cylinder. The downward movement of the lever forces the piston into the cylinder cutting off the flow of the molten metal into it and forcing the molten metal through the nozzle. The die which is divided into two parts fits firmly over the nozzle and can be swung backward on its frame, through an angle of 90 deg. There is a shut-off for the metal operated by a lever and as soon as the main lever completes a downward stroke, the cutter is operated preventing the molten metal from running backward into the pot.

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Opelika	Abbott-Detroit	C. R. Summers

Arkansas

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California

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Oxnard	Hudson	Oxnard Garage
Pomona	Chandler	Potter & McCormack
Ventura	Ford	Claude C. Needham
Visalia	Dodge	Charette-Pennebaker Co
Portersville	Dodge	J. W. Stephens
Redlands	Maxwell	Hatfield & Ayres

Colorado

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Alamosa	Overland	E. J. Best
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Berthoud	Overland	Jeffere Auto Co.
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Boulder	Overland	J. C. Deckelman
Boulder	Saxon	B. C. Garbarino
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Broomfield	Reo	Walter W. Wilcox
Colorado Springs	Dort	Big Four Auto Co.
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Denver	Cole	Colorado Motor Car Co.
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Denver	National	W. W. Beeson
Denver	Regal	Regal Sales Co.
Denver	Paige	L. G. Palmer
Denver	Velie	John Deere Plow Co.
Edwards	Paige	A. W. Burnison
Elbert	Buick	Theodore Neuman
Flagler	Saxon	William Seal
Fort Collins	Reo	Jackson-Anknev Merc. Co.
Fort Collins	Saxon	G. Harold D. Parker
Fort Collins	Buick	G. Harold D. Parker
Fort Collins	Paige	J. C. Hunt
Fort Morgan	Reo	A. C. Gillette
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Holyoke	Saxon	G. W. Garland
Hugo	Saxon	Cobb & Hatton
Idaho Springs	Paige	Richard E. Staley
Lamar	Saxon	Hartman Auto Co.
Lamar	Reo	Miller Bros.
Las Animas	Reo	F. W. McCune
Leadville	Cole	O. W. Reynolds
Longmont	Saxon	Shaw & Shickle
Loveland	Reo	Anderson & Griffin
Loveland	Saxon	Stewart & McFadden
Monte Vista	Paige	Stephens & Corrington
Paonia	Paige	Joseph Carlstrom
Placerville	Dort	M. B. Stone
Pueblo	Paige	Spitzer Bros.
Steamboat Springs	Oakland	L. I. Brown
Timnath	Cole	Giddings & Carey
Trinidad	Saxon	Mack Patterson
Trinidad	Cole	Trinidad Garage Co.
Trinidad	Paige	George D. Single
Windsor	Reo	P. A. Bartz
Windsor	Paige	H. E. Hickman
Yuma	Dort	L. J. Titterington
Yuma	Saxon	Heiserman & Mouser

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Tallahassee	King	Brown's Garage

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Decatur	Hupmobile	G. W. Ehrhart
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Welden	Reo	M. F. Shinneman

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Des Moines	Auburn	Iowa Motor Sales Co.
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Earling	Chandler	F. W. Wilmer
Lemars	Oakland	Kilburn-Ric
Long Tree	Abbott-Detroit	H. U.
Oakland	Oakland	F.
Redfield	Hupmobile	A
Shenandoah	Oakland	
Silver City	Oakland	F. W. Anderson
Stanton	Oakland	Stanton Auto Co.
Traer	Chandler	T. F. Cohort

Indiana

Connersville	Lexington	Inland Motor Sales Cor.
New Castle	Maxwell	Claude Stanley
Richmond	Detroiter	Geo. H. Schultz
Roann	Oldsmobile	J. E. Clingaman
South Bend	Vim	Wm. Devall

Kansas

Atchison	King	E. J. Donnelly
Dodge City	King	Howell & Rinehart Co.
Haviland	Auburn	V. B. Clements
Phillipsburg	Chandler	W. H. Champlin

Kentucky

Covington	Hupmobile	B. B. Hume
Mt. Vernon	Hupmobile	W. J. Schleicher

Maine

Dexter	Maxwell	Blainsdell Auto Co.
Greenville	Chandler	W. R. Dailey

Maryland

Hagerstown	Regal	Young Motor Car Co.
Oakland	Chandler	Ravescroft Garage

Massachusetts

Boston	Detroit Electric	E. Y. Stimpson
Boston	Detroiter	Geo. G. Reed
Boston	Pathfinder	Regal Motor Sales Co.
Boston	Velie	J. W. Bowman Co.
North Adams	Studebaker	W. J. Shaw
Webster	King	Robert V. Cassidy
Worcester	Abbott-Detroit	Mavkel Auto Co.
Worcester	Studebaker	Studebaker Corp.
Worcester	Velie	O. A. Kelley Co.

Michigan

Battle Creek	Chalmers	Jackson Garage
Battle Creek	Dort	United Motors Co.
Bay City	Detroiter	F. O. Rockwell
Bay City	Hollier	Stohl Auto Co.
Detroit	Dort	A. A. Crumley
Detroit	King	A. A. Crumley
Escanaba	Dodge	John E. Jacks
Farmington	Oakland	Wm. Goers
Fremont	Dort	Robert Sout
Fremont	Studebaker	Evans-Tinn
Grand Rapids	Chalmers	C. D. Mill
Grand Rapids	Dort	Oswald Supply
Grass Lake	Hollier	T. B.
Howell	Ford	Roy S
Jackson	Cadillac	John
Jackson	Paige	Tem
Ludington	Studebaker	Pet
Manton	Overland	A.
Milan	Detroiter	E.
Niles	Dort	
Niles	Ford	
Niles	Studebaker	
Oxford	Ford	
Pigeon	Dort	
Potterville	Ford	
Rockland	Dort	
Rochester	Oakland	
Sault Ste. Marie	Dodge	
Sault Ste. Marie	Oaklan	
Vassar	Dort	

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Kasson		
Lewiston		
Minneapolis		
Minneapolis		
Ortonville		
Redwood		
Silver Lake		
St. Paul		
Worington		
Springfield		
St. Louis		
Butte		
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Glendi		
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McCool Jct	Oakland	
Nebraska City	Oakland	
Norfolk	Oakland	
Orleans	Oakland	
Ohiowa	Oakland	
Osceola	Oakland	
Petersburg	Oakland	
Plymouth	Oaklan	
Sargent	Oakla	
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Scribner	Oak	
Silver Creek	Oa	
Stanton	Oa	
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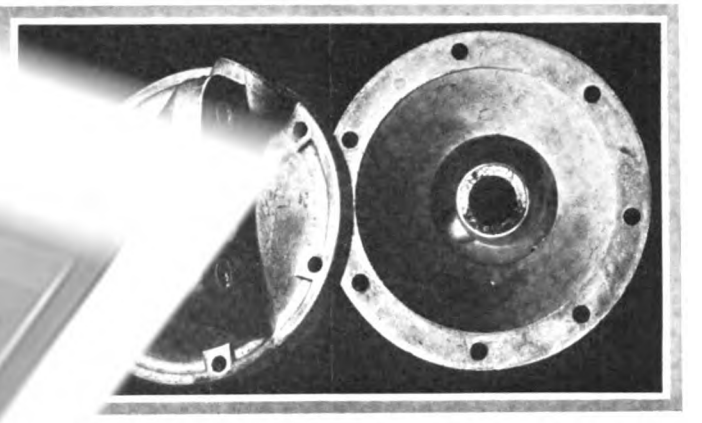

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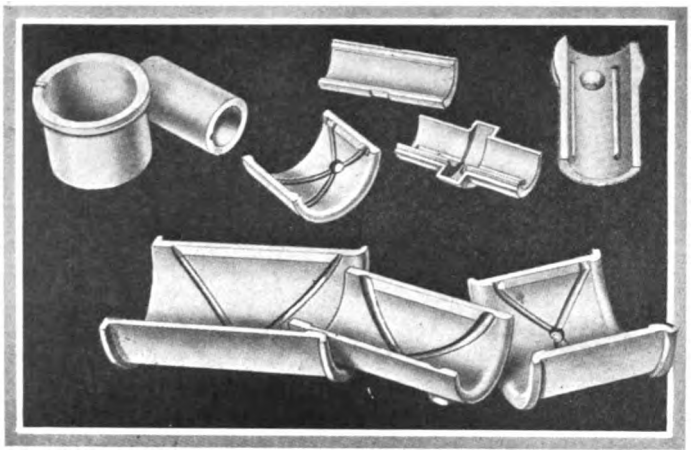


Die cast bearings of various types made by the H. H. Franklin Mfg. Co.

state of the art, and in this range of possibilities it would pay the manufacturer to investigate and determine if many of the small parts which now not only occupy the time of his employees in machine work, but which also occupy floor space for machinery which could be with better economy turned toward other uses. It is necessary to determine whether a die casting would or would not be better than another part made perhaps by forging or stamping and then finished by an amount of machine work determined by the number and directions of holes to be drilled, for instance, or the milling, grinding and other machine work necessary.

Good examples of where die castings have been employed to advantage for automobile use will give an idea of what engineers in general have come to believe is the proper field of work for this type of part. Electrical apparatus, which is necessarily not under great demands as regards strength, but which on the other hand must have parts made within limitations of perhaps 0.001 in. is an instance. We find it quite common in this field for the magneto housings, switch locks, switch handles, base and cover plates to be made of die castings. With the starting units and generators it is the same. In pumps for housings and bodies, ball-bearing cages, speedometers, ring nuts, spark and throttle levers and steering-wheel gears, the die casting has been believed by many to be far better economically than any other class of part. On the other hand, die castings which have been used in parts which have failed through either direct stress or corrosion have shown that for uses wherein either of these destructive agents may exert its influence, they may be bad practice.

Automobile Industry Demands Castings

That the demand for the die casting in the automobile industry is a strong one, and that in spite of the fact that the die casting is limited at the present time as regards its strength, there is a well-defined field for it, is clearly brought out by the fact that one of the largest companies in the die-casting business, the Doehler Die Casting Co. of Brooklyn, N. Y., is at the present time casting 1,000,000 lb. per month, probably 95 per cent of which goes to different automobile manufacturers.

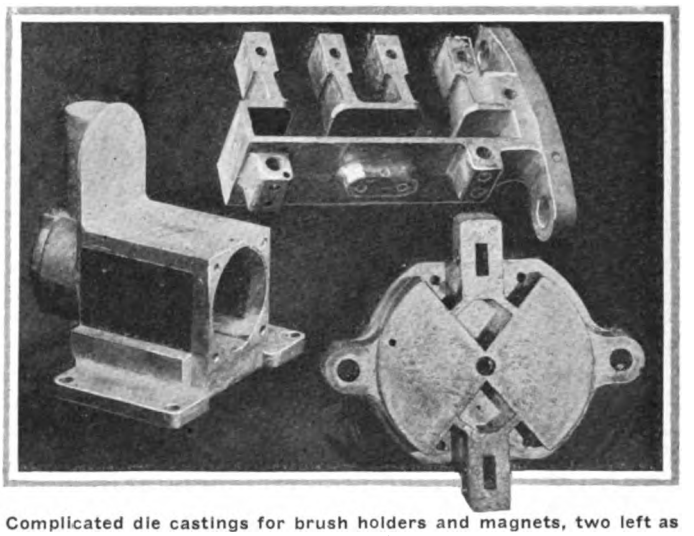
In the automobile industry at the present time four classes of die castings, each with a well-defined field, are in use. They may be classified according to their basis, or, in other words, according to the metal which forms the major part of the alloy. These bases are zinc, tin, lead and aluminum.

With these four classes in mind and with the field for each pointed out, some of the features to be considered in the selection of a proper metal for a die casting will be brought out. It may be said at the start that although probably 85 per cent of the die castings made in the world are with a zinc base, it is in this very class that some of the failures which have been noted in the automobile industry have been reported. A good example of this is in pump-jacket practice.

It is a fact zinc base castings are corroded by aqueous liquids. That this is not alone confined to liquids which have water as a base is shown by the fact that even gasoline which theoretically should not have the slightest influence on metal will cause a certain amount of corrosion due to the impurities—mainly sulphuric acid—which it contains in its commercial state. These castings are often plated with nickel, copper and brass, and in such a case will resist a much longer time the inroads of moisture. It may be buffed to take a beautiful polish, but this does not endure for any appreciable time due to the moisture which is contained in the atmosphere. If a permanent polish is desired it must be electro-plated with nickel or some other alloy.

Zinc Base Alloys Corrode

In spite of the fact that these zinc base alloys corrode they have been used for pump jackets on account of their cheapness and the fact that they can be made accurately in that way. The result is that while the pump housing may last four or five years, sooner or later it is bound to give way and fail. There are those who condemn this practice, stating that the material should not be used for this purpose, but on the other hand a tin base alloy hardened with copper and antimony would be proper. On account of the high price of tin and the other ingredients this metal has been in many cases of prohibitive cost and the zinc base alloy substituted. It is but fair to state, however, that the zinc base alloy can be made of such thickness and can be so thoroughly bushed with brass at vital points that it will last over a period of many years despite the positive corrosion. At the end of this time the cost of renewal of the parts is so small that aside from the temporary inconvenience it can be practically neglected. However, there is no reason why a zinc alloy die-cast pump body should not last the life of a car, if properly designed.



Complicated die castings for brush holders and magnets, two left as made by Doehler company and right by Veeder Mfg. Co.

Where the zinc die casting comes into its field is in such parts as magneto housings, etc., where they are not only not in contact with moisture but are even guarded against the inroads of air by a coating of black copper sulphide.

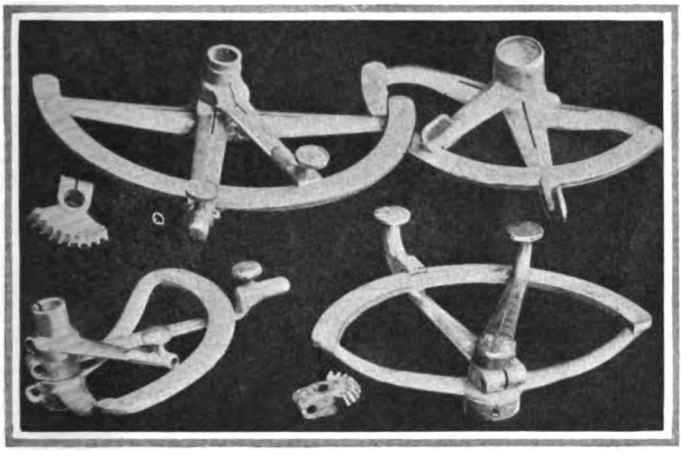
It must be remembered in assembling parts made of die castings that they should fit and not be drawn together by force, thereby exposing parts of these materials to greater strains than they are able to endure. The die casting is not as strong as the yellow brasses and bronzes, and great care has to be used and very often special designing becomes necessary, such as reinforcing and general strengthening to equalize the natural inferior strength of the zinc-base die-

cast alloy. In other words it is not possible for the engineering department of an automobile concern to take the drawings for a part which has been made of brass or bronze and have that same part made in a die casting in such instances where the brass or bronze parts were stressed up to some point near the ultimate.

Strength Equal to Cast Iron

The content of the zinc base alloy generally runs from 70 to 90 per cent zinc, 0 to 20 per cent tin with varying contents of copper, aluminum, antimony and lead. A typical example of an alloy for a zinc-base die casting would be about 85 per cent zinc, 9 of tin, 5 of copper and 2 aluminum. When an alloy of this kind is die cast to a proper design, in the expression of one concern in the business, "It cannot be broken except with a sledge and when cast properly of suitable alloy is about the strength of cast iron." It requires more time and more expensive alloy to make die castings as they should be made than it does to turn them out rapidly from cheap alloy.

Turning to the second class of die castings, those which have tin as a base and which are alloyed with varying proportions of lead, copper, antimony and zinc, it is found that this includes some of the most useful of the bearing metals. While the term babbitt no longer means the one definite alloy which in definite proportions was laid out by Isaac



Control quadrants of aluminum die castings have proven satisfactory to many of the leading automobile manufacturers

Babbitt and which consisted of tin, antimony and copper, or in other words, was a straight bronze, there are many of the so-called babbitt metals which are of admirable use for bearings. It has come to be practice with a great many concerns in the automobile business to die cast the babbitt, or nickel-babbitt as some have named it, into a backing of bronze. This has worked out so well that many are predicting universal adoption for the die-cast babbitt-lined bronze bearing for automobile use. Others still favor the solid babbitt bearing.

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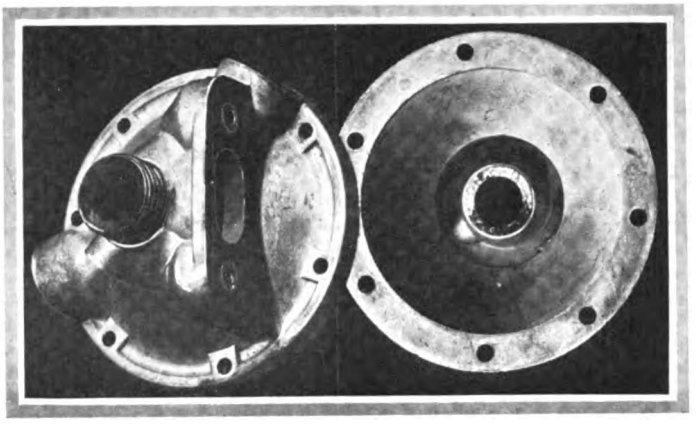

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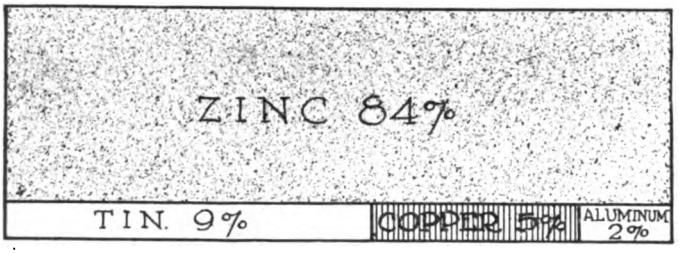


Diagram showing the composition of a zinc alloy frequently used for die casting work. Castings of this material have approximately the strength of cast iron

tin has fluctuated between 0.30 and 0.50 cent, with the price during the past 2 years something over 0.40. It can easily be seen that with this wide variation in price several thousand castings weighing from 1½ to 3½ lb. for each half such as happens in water-pump casings would make a big difference in operating expenses to a large plant.

One of the classes of metals which metallurgists have been trying to die cast for many years is the softer brasses, but so far the high temperature has defied the efforts of the die-casting industry. Brass sand castings are so cheap as compared to the present-day permanent mold castings that most parts are cheaper cast by the old method than the new. Other points given against brass casting are the great shrinkage, destruction of the molds, quick-heat conductivity of the die and slowness of manufacture.

A word should be said regarding one of the characteristics of die-cast metals which renders them of greater strength and uniformity than the plain sand-cast products. This is the closer grain of the material due to the pressure under which the metal is cast. Micro-photographs of die castings as compared to straight sand castings bring out the fact that the grain of the die-cast material is much finer in structure than the coarse grain sand casting. There have been brasses and bronzes, and are still in the bearing field, which have been successfully cast in sand in which the microstructure is a fibrous one rather than granular. These special bronzes, however, are probably the last in the list of these metals which it is aimed to die cast as the temperature of fusion is so high that the molds would be able to stand only a small quantity of castings before they cracked and had to be replaced.

It must be remembered that the cost of a die casting bears a definite relationship to the number of castings which can be made from one die. The dies are made of high speed chrome-tungsten steel. It requires the highest class of labor to make them, working carefully with microscopic accuracy, hence between the cost of the material, the cost of the die-cutting tools and the cost of high-priced labor, large numbers of castings must be made from one die to keep the unit cost a minimum.

Renault Aviation Twelve Possibly for Cars

PARIS, Aug. 28—Renault has produced a twelve-cylinder water-cooled aviation motor which, after being thoroughly tested at the national aviation motor laboratory, has been fitted to big capacity aeroplanes. The new motors are being produced in large quantities and supplement the eight-cylinder air-cooled motors in which Renault has specialized for a number of years. Renault's motor, which has a bore and stroke of practically 4 by 6, has its cylinders cast in pairs and mounted on an aluminum crankchamber. A certain amount of inspiration appears to have been obtained from the Mercedes six-cylinder aviation motor, particularly as regards the valve arrangement. There are two valves per cylinder inclined in the head, and operated by a fully inclosed camshaft running down the head of each line of cylinders. The ends of the rockers project through the housing as in the case of the Mercedes. The drive for the camshafts is obtained from the front end of the motor by means of bevel gearing and shaft, the entire mechanism being contained in a neat aluminum housing. The oil pump is placed crosswise at the foot of the two shafts giving camshaft drive.

Two Carbureters Used

Two special Zenith carbureters are used, each one being outside the cylinder group and close up to the crankchamber. In each case the intake valves are on the outside and the piping is reduced to a minimum. Magneto and water pump are carried across the front of the motor. No flywheel is used. Compared with the engines used on aeroplanes up to the present, the Renault production is remarkably clean-cut and accessible. Many modern car engines are not superior in this respect. The only visible moving parts are the valve stems and the ends of the rocker arms.

Although the motor has been specially designed for aeroplane service, an external examination gives the impression that the designer has been more anxious to get the neat, clean-cut appearance demanded by automobile users than to save weight. There has been no attempt at weight paring by the use of copper jackets or even plates for the water-jackets. Many of the fitments are Renault stock design, and although the design is a decided departure from anything produced in this French factory, the origin of the motor is obvious without the name plate.

Break from Rotary Design

The production of this motor is of more than ordinary importance by reason of it being on the part of the French the first important break from the rotary air-cooled aviation motor. This design is fully applicable to automobile service, and there is every reason to believe that the end of the war will see the adaption to automobiles of the Renault twelve-cylinder aviation motor built to smaller dimensions. It is significant too, that in the last army aeroplane contracts no rotary aeroplane motors were ordered and one water-cooled radiating cylinder motor was struck off the lists. Renault and Sunbeam twelve-cylinder water-cooled engines predominated in these contracts.

French to Relax Automobile Restrictions

PARIS, Aug. 28—With the month of September the state of siege will cease to exist in what is known as the interior of France. At the same time the regulations governing the use of automobiles outside the army zone will be considerably simplified. Instead of it being necessary to make application for a separate pass for each journey undertaken, this pass carrying the photograph and signature of every person in the car, it is now possible to obtain a monthly pass available for the whole of the interior of France and for any number of journeys. This pass is issued to either the owner or driver of the car, and must bear that person's portrait and signature. Any persons can be taken as passengers, providing they are provided with official papers proving their identity.

The new regulations do not affect Paris and neighborhood, where it is still necessary to secure a fortnightly pass available only for the Seine and Seine and Oise districts, and stating the number of passengers carried. There is no change either as regards the war district and the big stretch of territory behind the battle line considered to be of military importance.

Stutz Wins First and Second Places at Twin Cities

Double Victory by Cooper and Anderson on New 2-Mile Cement Speedway—Old Rivals Vanquished —Pace 86.35 M.P.H.—Track Rough in Spots

Twin City Speedway Results

Car	Driver	M.P.H.
Stutz	Cooper	86.35
Stutz	Anderson	86.35
Duesenberg	O'Donnell	78.86
Ogren	Alley	77.94
Sebring	Haibe	75.33
Duesenberg	Haupt	74.02
Duesenberg	Chandler	Flagged at sunset
Delage	Oldfield	Flagged "

FORT SNELLING, MINN., Sept. 4—The great Northwest, that territory served by the twin cities, Minneapolis and St. Paul, had its first taste of a home speedway to-day when the new 2-mile cement speedway located midway between the two cities, was opened this afternoon, the christening performance being a 500-mile race for a purse of $50,000, measuring up with the classical Indianapolis event in both distance and prize money.

Under a cloudless sky and with all that the weather-man could provide, 40,000 spectators watched the Stutz team, made up of Earl Cooper and Gilbert Anderson, win the most signal honors that it has been the lot of any entrant to carry off in a speedway event. Not content with taking first place, the Stutz team to-day won positions one and two, thereby carrying off $30,000 of the total prize money.

Relentless Warfare

From the drop of the flag in the flying start the two Stutz cars began a relentless warfare against De Palma and Resta, who had vanquished them at two other 500-mile events, Indianapolis and Chicago. But Peugeot steel and Mercedes design were not equal to Stutz stamina to-day, and the veterans Cooper and Anderson wore down every rival in the first 100 miles and then made a most interesting team race for the remaining 400 miles and finished in one of the closest finishes ever seen on a speedway, Cooper leading by less than ¼ sec. and little more than half the length of the car.

The pace was 86.35 m.p.h., slower than the pace of 89.84 which De Palma set at Indianapolis last May and considerably under the pace of 97.58 set by Resta when he carried off first honors at the Chicago 500-mile event on the new board track in June. To-day's pace would have been considerably faster if the Stutz twins had had any cars to push them. During the first 100 miles the pace was over 90 m.p.h., but that immediately wore out Resta's Peugeot and the Stutz team dropped nearly 3 m.p.h. in the average from that point.

Cement Track Rough

The new cement track was rough. It had been built too hurriedly. The pouring of cement was started July 9. Constant rains held the work back and later rains delayed it. The fillings had not time enough to settle before the cement surface was laid. There could be only one result, undulations in the surface and high spots where the expansion strips are placed between the blocks of cement. For days before the start of the race stone chippers with chisels in hand were squatted around the track busily engaged in chipping off the high spots that threw all four wheels of the cars into the air. Time was lacking and when the race was staged many high spots remained and the cars suffered severely.

Downs Erstwhile Victors

The Stutz alone seemed able to withstand the vibration of the track and yet maintain high speeds. But it was Stutz day. Stutz was seeking revenge for past failures to win the coveted honor of a 500-mile classic since three years ago when the Stutz made its debut as a car on the Hoosier speedway and immortalized itself in racing fame by carrying off fourth place as a newcomer. Nineteen hundred and thirteen saw Stutz win third; in 1914 it was fourth, leading all other American cars; this year it was third and fourth again, being beaten only by foreign machines; at the Chicago speedway it finished fourth and sixth; but to-day it was not only first but first and second, and the vanquished were the cars that defeated it in 1913, 1914 and 1915. Peugeot, Mercedes and Delage are names that have been nightmares to American builders of racing cars for the last three years, but their reputations were tarnished to-day and for the first time an American car has won a 500-mile classic since the National victory of 1912.

Resta had the inside position in the first row at the start and he set out to get the lead and hold it. He took it in the first lap and held it in the second and third when Burman in another Peugeot headed him out, with the Stutz team trailing a few lengths back and with De Palma's Mercedes in the group. Burman took the lead in the fourth lap and led for 30 miles until he went out with a broken connecting-rod. He was setting a metal-breaking pace, hotly pursued by Resta, De Palma and the two white Stutz machines, lying back 100 to 200 yd. These four were ½ mile ahead of the others in a couple of laps. At 10 miles Burman started drawing away from the field; at 15 miles he was the length of the homestretch ahead of Resta and the others; lap by lap he continued to gain and by 20 miles he had a gain of nearly a mile. So it continued to 30 miles, then came the end. On the thirty-second mile he limped in, stopped at the pits and withdrew.

In the meantime matters had been changing back of Burman. For 10 miles Resta pursued the fleeing Burman in another Peugeot but at 16 miles Cooper had pushed the Stutz up and had Resta two lengths back of him with Anderson in the other Stutz scarcely four lengths back. De Palma had already stopped to change a plug and was nearly two laps or 4 miles back. Here started the grinding process on Resta. From 20 miles to 60 miles he was held between the two, no jockeying, but Cooper leading a fast clip of over 90 m.p.h. Resta was never over 50 ft. back of him and little further back came Anderson.

Peugeot Takes Lead

At 60 miles Resta crept up and took the lead, the two passing the tape side by side. But Resta's honors were short. He held leadership but a lap before Cooper had wrested it

from him. A lap later and Resta again led by a length. For four circles of the oval he held the lead, all three so close together that a blanket would almost cover them. It was at 74 miles that Anderson showed in front to the cheers of the grandstands and in a lap he was over 150 yd. ahead of Resta with Cooper trailing about 50 yd. back of the Peugeot. Two laps more and Resta was again in front. He held the lead for nearly 10 miles but troubles overtook him, the pace had told on his Peugeot. Trouble symptoms showed up at 94 miles when he lost premiership to the two Stutz cars. Resta slowed up on the backstretch and stopped at the pits. He continued a lap or so more and was out. Just at this crisis Cooper's pace had told on tires and he pulled in to change a left front leaving Anderson away in the lead when he finished the first century in 67:09, a pace of 90.91 m.p.h.

The Duel Ends

Thus ended the race that promised to be the grandest duel of the year between Stutz and Peugeot and Stutz and Mercedes. At this point De Palma was nearly three laps or 6 miles back. He had lost 1.45 in changing a plug and was losing in the pace the leaders had set.

Up to this time the first group of cars had been the magnet of all grandstands, but here the attention turned to the second group of cars led by Mulford in a Duesenberg, who was second at the 100 miles, due to Cooper's tire change. He was only 43 sec. back of Anderson. Close back of him was O'Donnell, his team-mate who was leading De Palma by the narrow margin of 2 sec. The Ogren, driven by Alley, was ½ min. back of O'Donnell. The last group, containing Sebring, Chandler's Duesenberg and Haupt's Duesenberg, were from 15 to 25 min. back of the leaders.

From 100 miles the Stutz team gradually drew away from the field. At 140 miles they were minutes up on O'Donnell who was solid in third place; at 200 miles the lead was 4 min.; at 240 it was 6 min.; at 300 it was 10 min.; at 360 it was 11 min.; at 400 it had jumped to 13; at 440 it was 26 min.; and at 500 miles it was nearly 33 min. It was a steady gain made possible by speed ability.

Back of Alley there were interesting brushes at times for positions. Haupt's Duesenberg and Oldfield's Delage were rivals at times but the constant tire troubles of Oldfield made it impossible to maintain a position that would insure his finishing before sundown, the limit set by the referee in which the race had to be finished. Barney had twenty stops chalked up against him, nine alone being for tire repairs, three for changing spark plugs and the others for fuel, water, changing driver or mechanic and sundry other troubles. He broke a steering knuckle coming into the homestretch and borrowed a steering arm from Burman, making the improvised repair and continuing. It was the only case of a broken steering knuckle in speedway racing for some time.

Mulford, who was a strong contender for third honors from the start, was eliminated at 120 miles when in fifth place due to a broken side member in the frame.

Our First Cement Track

To-day's race was the first one ever run on a cement speedway in this country, although the classical Brooklands in England is a cement speedway that has been in existence for many years. The speedway here is scarcely banked enough for the highest speeds and within a year the track will unquestionably be improved. The banking is not straight as in the Chicago board speedway but a cross section is a parabola, the same as used on the new board speedway being built in New York. Yesterday and during practice it looked as if the new cement course would be too dusty for safety. Sweeping it off each day and washing, as the management did, failed to lay the dust. The final solution was a coating of light oil, 39 gravity, which was readily absorbed into the cement and dried in less than an hour.

Instead of starting the race at 10 o'clock, the proverbial hour for starting 500-mile events, it was delayed until noon, in order to let the business men attend. This caused several entrants to ask if it would be called off at sunset, not a few entrants realizing that it meant fast pace to finish all cars by 6.44, the official sundown. A compromise was effected in which those cars still running at sundown were given additional mileage on a pro rata basis, according to the speed they had averaged and in this way two cars, Chandler's and Oldfield's running at the finish, were given seventh and eighth position. Twelve cash prizes were awarded but only eight of these captured, the remaining four going back to the speedway treasury.

Early Eliminations

To-day's race is the only one of the now classical 500-mile events in which every car that was eliminated fell out before the race was one-half over. Fourteen cars started the race, six finished the 500 miles, two were running when it was called off and six had withdrawn. They went out at 30, 70, 100, 120 and 180 miles. Never before have cars gone out so early in a contest; generally several drop out early, but invariably some hold out until near the end. To-day's race was really only a 100-mile event so far as the contest element was concerned.

Speed Tabulation Twin-City 2-Mile Cement Speedway, 500-Mile World's Derby, Sept. 4, 1915

CAR	DRIVER	Miles 20	40	80	100	140	160	200	240	280	300	340	380	400	440	460	500	M.p.h.
Stutz	Cooper	13:09	26:20	53:10	1:07:49	1:34:27	1:47:23	2:17:09	2:43:32	3:10:31	3:25:00	3:53:28	4:22:43	4:37:02	5:05:54	5:19:59	5:47:29.30	86.35
Stutz	Anderson	13:12	26:23	53:06	1:06:18	1:34:52	1:48:04	2:16:39	2:43:12	3:10:07	3:23:56	3:53:18	4:23:51	4:37:36	5:05:34	5:19:47	5:47:29.55	86.35
Duesenberg	O'Donnell	14:44	28:45	56:23	1:09:57	1:36:39	1:50:16	2:20:24	2:49:09	3:18:39	3:33:42	4:03:23	4:35:29	4:50:39	5:31:35	5:47:36	6:20:25.35	78.86
Ogren	Alley	13:56	27:45	56:10	1:10:33	1:43:50	1:58:42	2:33:05	3:02:03	3:36:29	3:51:17	4:22:40	4:54:22	5:09:18	5:40:06	5:54:57	6:24:44.55	77.94
Sebring	Haibe	15:23	30:40	1:07:59	1:23:38	1:54:56	2:10:28	2:42:19	3:15:24	3:47:08	4:02:19	4:32:47	5:06:59	5:21:33	5:51:20	6:06:20	6:38:47	75.33
Duesenberg	Haupt	16:06	34:29	1:05:12	1:25:32	1:56:00	2:11:03	2:41:04	3:13:59	3:43:51	4:01:28	4:32:36	5:03:34	5:25:33	5:55:28	6:10:34	6:45:18.55	74.02
Duesenberg	Chandler	15.23	30:42	1:10:21	1:29:06	2:02:11	2:22:13	2:54:06	3:36:17	4:11:53	4:26:47	5:00:34	5:38:32	5:53:53	6:27:56	6:43:06	Running	
Delage	Oldfield	18:18	33:17	1:02:37	1:20:20	1:52:14	2:05:24	2:42:36	3:17:18	3:52:34	4:36:55	5:05:50	6:17:19	6:36:56	Running			
Mercedes	De Palma	16:38	31:09	57:12	1:09:59	1:37:02	1:53:10	Out at	190 mile	s with oil	-flooded	magneto						
DuChesneau	Brown	23:43	42:37	1:21:10	1:59:08	3:10:44	3:37:32	Out at	186 mile	s with en	gine trou	ble						
Duesenberg	Mulford	13:51	27:24	53:27	1:07:01	Ruled o	ff at 120	miles bec	ause of cr	acked fra	me							
Peugeot	Resta	13:10	26:21	53:07	1:16:10	Out at	102 miles	with bro	ken oil p	ump								
Mercer	Henning	15:22	31:42	Out at	66 miles													
Peugeot	Burman	12:52	Out at	32 miles	with bro	ken conn	ecting-	rod										

Little Tire Trouble at Twin Cities

Right Rear Tire Main Sufferer, Due to Outside of Track Being Rougher —Unusual Mechanical Troubles Show Effect of Rough Track

FORT SNELLING, MINN., Sept. 4—There was not so much tire wear on the 500-mile race on the speedway here to-day as was anticipated, a fact largely explained by the relatively slow speed of 86.35 m.p.h., a lower pace than set on the Indianapolis brick track, and 11 m.p.h. slower than the Chicago board speedway. The day was hot and more tire troubles were expected. As at other speedways it was the outside right rear tire that suffered most, due in this case to the outer part of the track being rougher than the central strip on which the majority of the cars drove and also due to the fact that much of the car weight is thrown on this wheel.

Of the fourteen cars to start to-day six finished the 500 miles; two were running but flagged off at sunset; and six had dropped out due to mechanical troubles. Of the six cars that finished the race eighteen tires were changed, an average of three per car, or an average tire life of over 170 miles. Silvertown cords were used on the winning Stutzes.

Tire destruction wore out seven on the right rear wheels; five on the left rears; five on the right fronts; and only one on the left front. A few treads were thrown.

Cooper changed six on his Stutz, two right rears, a left rear, two right fronts and a left front; whereas Anderson, his running mate, changed but three, two right rears and a right front. As these two cars ran practically neck and neck for 500 miles it is difficult to explain just why one should have double the tire trouble of the other. Little differences in car balance, in driving and in many other matters could easily make such a difference.

Mechanical Troubles

Mechanical troubles were more or less unusual, demonstrating that rough tracks are still able to do very material damage to cars when traveling at high speeds, and in this respect the percentage of mechanical troubles was greater than at the Indianapolis or Chicago 500-mile races. Several of these troubles were due primarily to the track, whereas others were not. Mulford's Duesenberg broke a side member of a frame at 120 miles, the channel section breaking nearly in two. More serious was the breaking of a steering knuckle on Barney Oldfield's Delage when coming down the homestretch. Fortunately the car was controlled, a new steering part was borrowed from Burman's Peugeot and the race completed. Still another break apparently due to the track was on O'Donnell's Duesenberg which broke one of its diagonal radius rods when the race was three-quarters over. The mechanic held the rod from trailing on the ground for the last 100 miles. All of these eliminations were more or less directly due to vibration.

Crystallization Appears

Several other cars had mechanical troubles that came perhaps from parts crystallizing or other causes. Burman's Peugeot was the first out at 32 miles, a connecting-rod breaking. Such parts are generally made as light as possible and fatigue due to excessively high speeds is sure to show itself sooner or later. The case was perhaps similar to the part of De Palma's Mercedes that gave way in the last lap of the Indianapolis race this year. Reciprocating parts are being designed with the minimum weight for high-speed work and the breaks indicate that renewals are needed at reasonably frequent intervals.

Resta had a simple trouble, a screw cap coming off the base of the pump case of the Peugeot, making it impossible for him to pump oil. It may or may not have been due to the excessive vibration.

De Palma's troubles began 10 min. after the start when he changed a spark plug; later he made some carbureter adjustments, changed another plug and finally withdrew, due to oil getting into the magneto through the shaft coupling. The oil reached the distributer box and at high speeds missing occurred, but at low speeds the mechanism worked satisfactorily. He withdrew at 190 miles.

In addition to breaking a steering knuckle Oldfield stopped three times to change spark plugs and finished the race with all of the shock absorbers out of commission.

Good Pit Work

Particularly good pit work was done by the leading cars and had Resta and Burman with their Peugeots continued in the race to the finish there would unquestionably have been some quick pit work among the leaders. Cooper made but five stops, a total of 3.5 min. for his six tire changes and three fillings of gasoline. His first right rear was changed after 2 hr. of racing and the second right rear after 2 hr. more of running. The pace was faster the first 2 hr., being slightly over 90 m.p.h. for the first century until Resta was disposed of, Burman was out and De Palma had ceased to be a factor.

What was true of tire wear with Cooper was also true of Anderson on the right rear where he changed one after 70 min. running, another on the same wheel after 65 min. more of speed, but no more to the finish.

O'Donnell made but two tire changes, both after the race had been on for 2 hr., changing both rears as a precaution. From that until the finish he had no more changes.

De Palma changed both rears after 1.5 hr. of racing. Comparing the tire changes of all leading speed cars it is seen that about 2 hr. of fast driving was the life of the right rear tires at the middle of the day when the track was hottest and the pace fastest. After this time the pace dropped, the track cooled slightly and the drivers had fewer cars on the oval to overtake, and were better able to drive a straight course.

The total length of time spent by each car at the pits follows:

DRIVER	CAR	NO. STOPS	MIN.
Cooper	Stutz	five	3.5
Anderson	Stutz	four	4.5
O'Donnell	Duesenberg	three	4.5
Halbe	Sebring	four	4.5
Alley	Ogren	seven	15
Haupt	Duesenberg	seven	16
Chandler	Duesenberg	fourteen	25
Oldfield	Delage	twenty	72
De Palma	Mercedes	seven	24

Burman did not make a stop before he went out; the same applies to Resta and Mulford.

Nothing more could have been desired in the performance of the two Stutz cars. They ran the 500 miles without the hoods being raised, the only stops being for fuel and tire changes. The cars were both alike, being the sixteen-valve design used first at the Indianapolis race this year and later at the Chicago speedway and more recently at Elgin road races where they won first and second positions in both contests.

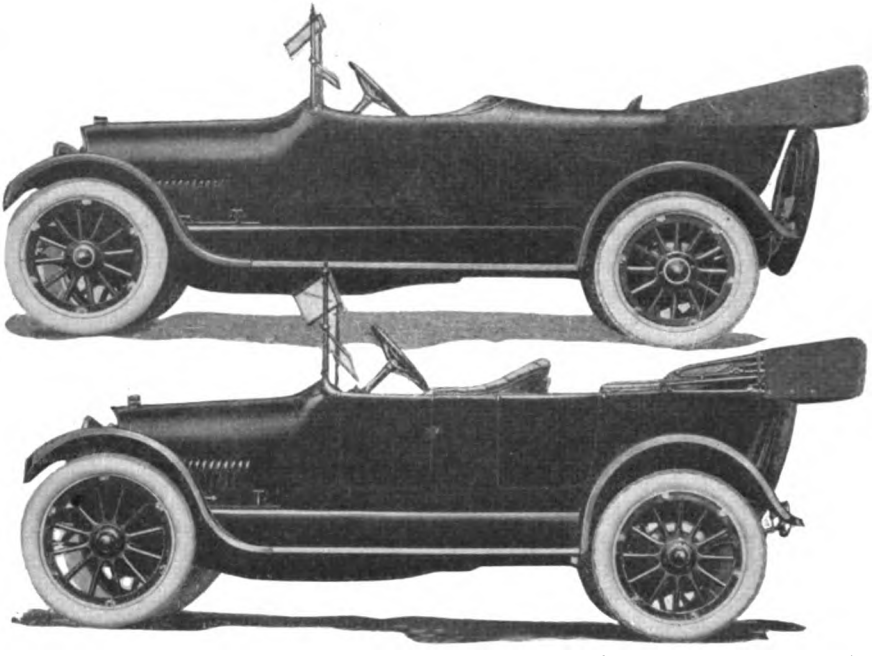
Among other details of equipment, Cooper, Anderson and O'Donnell used Oilzum for lubrication. All cars in the race used Motometers.

Many Unique Points in Reo Design

Accessibility a Marked Feature—Reo Four and Six Show Few Chassis Changes But Have Improved Bodies for 1916—Prices Substantially Lower

FOR 1916 the Reo Motor Car Co., Lansing, Mich., will produce two models, a four and a six, the general design being much the same for the two chassis. Naturally the six, being the more expensive car, has some refinements which the four does not possess, so it is proposed to describe the six-cylinder in detail and to call attention is passing to the differences between the six and the four.

There have been no great changes in the chassis, but the bodies have been improved in line and in comfort, especially that of the six-cylinder which now has divided front seats and a thoroughly handsome outline. Prices have been lowered considerably, the four now costing $875 as against $1,050 last year, and the six $1,250 as against $1,385, with five and seven-passenger touring bodies respectively.

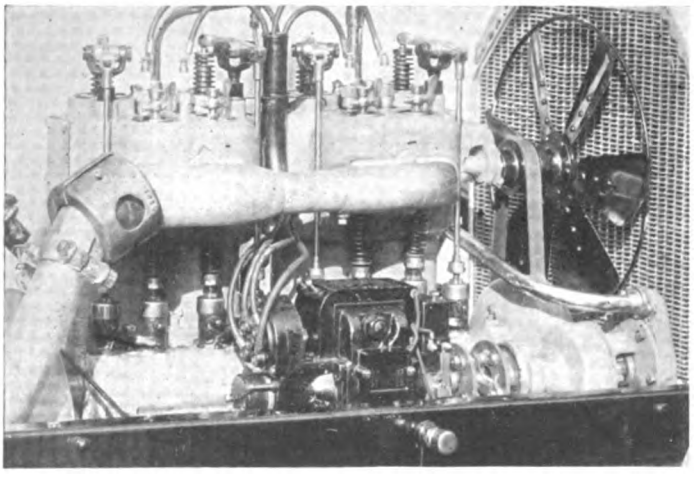


The new Reo body styles. Above—Observe the rolled top edge to the panel on the six which gives a particularly smart appearance. Below—The new four

Starter Is Simplified

In mechanical detail the most striking alteration is in the arrangement of the starter drive, and this may therefore be dealt with first of all. The Reo company is an upholder of the separate gearbox with amidship location, and this gives ample room between the engine and the gear. Advantage is taken of the space thus provided to mount the starting motor clear of either engine or gearset, cranking through the clutch shaft instead of by means of the flywheel, and there is a highly ingenious ratchet arrangement whereby every portion of the drive is released as soon as the gasoline motor has commenced to run; there is no free wheel clutch, no part whatever in motion outside of those which would be moving without any starting equipment.

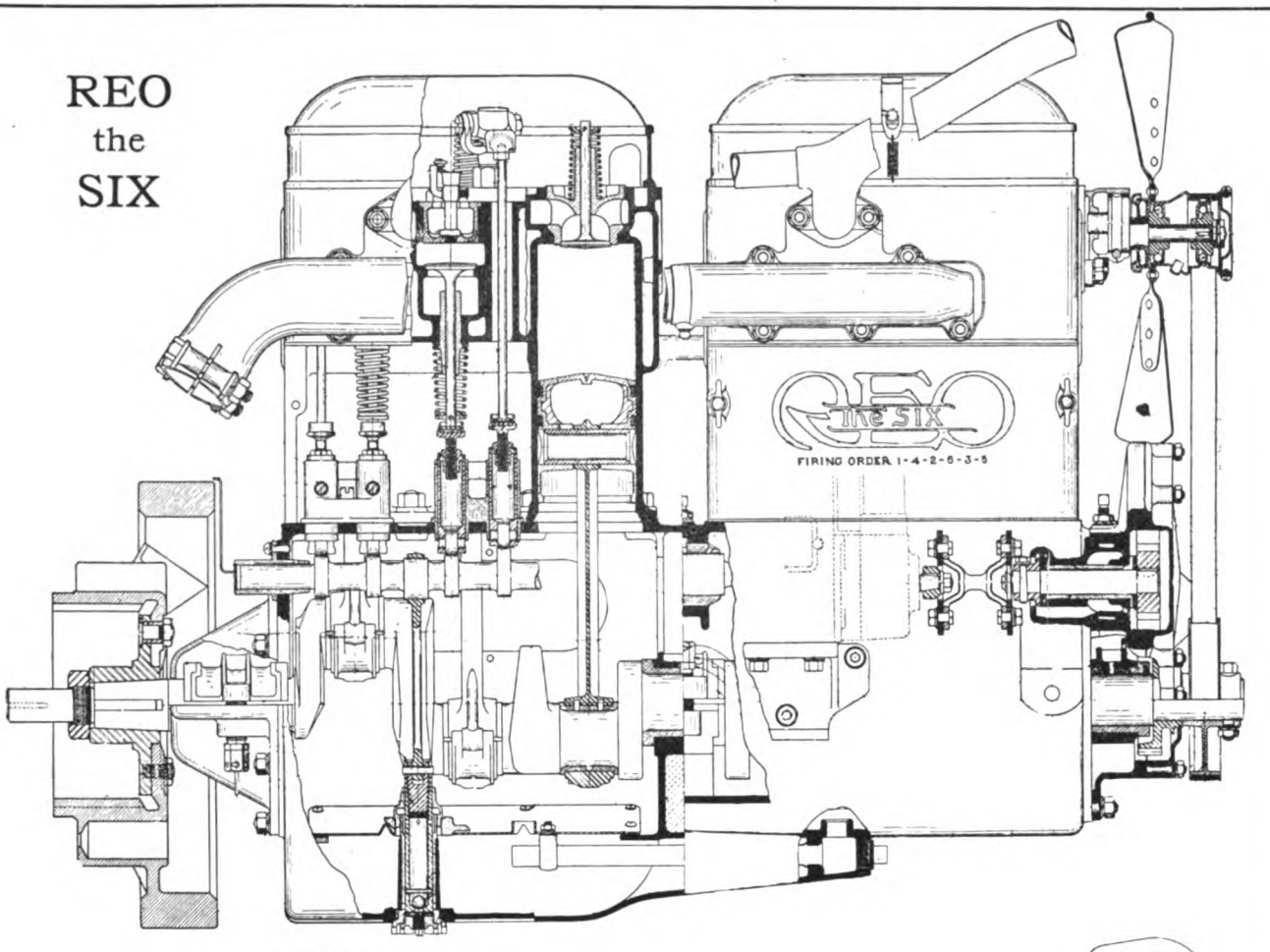
In the 1915 design the same location was used for the starting motor, but the clutch-shaft carried a worm wheel, and the cranking motor had a worm which was in permanent engagement with the worm wheel. This worm wheel was not keyed to the clutch-shaft, but could be locked to it by a ratchet pawl operating in the same way as the ratchet used on the 1916 car, but the worm and worm wheel have now been replaced by a roller chain. This simpler form of drive has a dual advantage; it is cheaper in first cost, and it needs less attention from the driver, for an occasional smear of grease suffices for lubrication, whereas the worm needed inclosure and a bath of oil. The illustration of the gearset shows the ratchet mechanism, the pawl being on the large chain sprocket which turns on a bearing on the front end of the gear case. Actually keyed to the clutchshaft is the ratchet gear, but the pawl is normally held by a spring so that it is clear of its wheel. Normally rotating with the sprocket is a sheave carrying a trip pin, and if this sheave is held stationary for an instant while the starting motor is running it trips the ratchet pawl which then takes hold of the ratchet wheel and allows the engine to be cranked. To hold the sheave for the necessary fraction of a second there is a cord hanging loosely around it, and depressing the starting switch tightens the cord just enough to trip the ratchet pawl. Immediately the starting pedal is released the pawl comes out of mesh and everything stops. The device is very simple and effective, and it is quieter in action than the flywheel gear; probably it is also a little cheaper as the total number of teeth to be cut is fairly small.

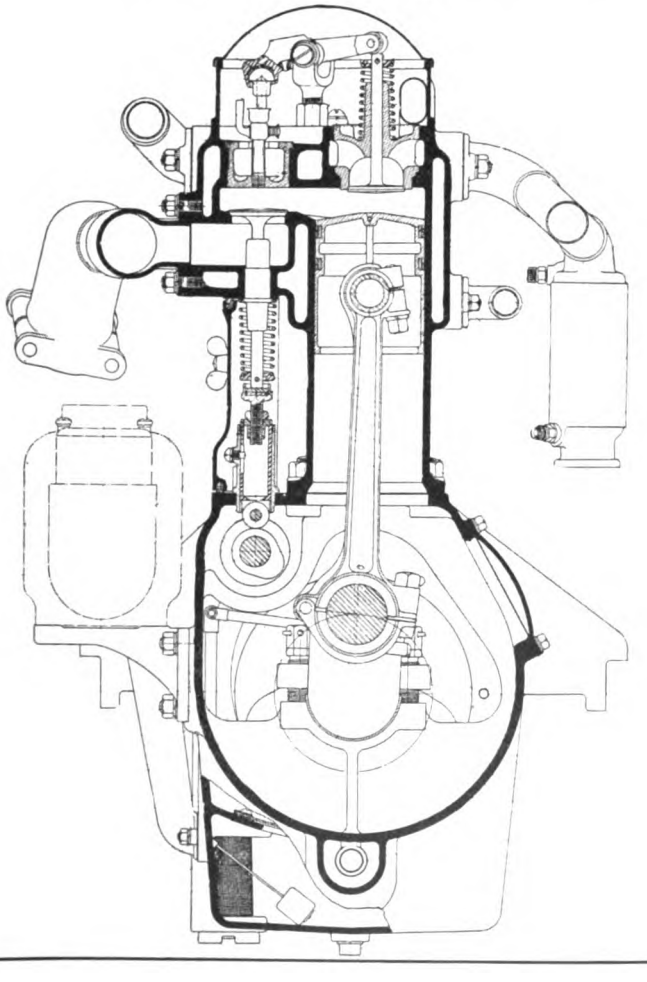


Right side of four-cylinder Reo motor, showing mounting of generator and ignition unit

Having begun with the starting arrangement it will be best to mention the rest of the electrical outfit, as this is common to both four and six. Generation and ignition are

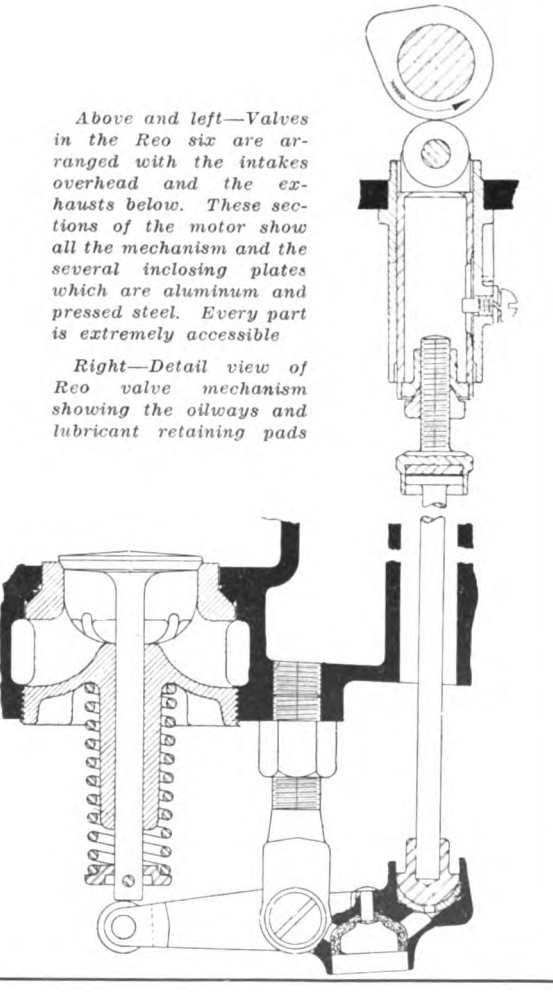
REO the SIX

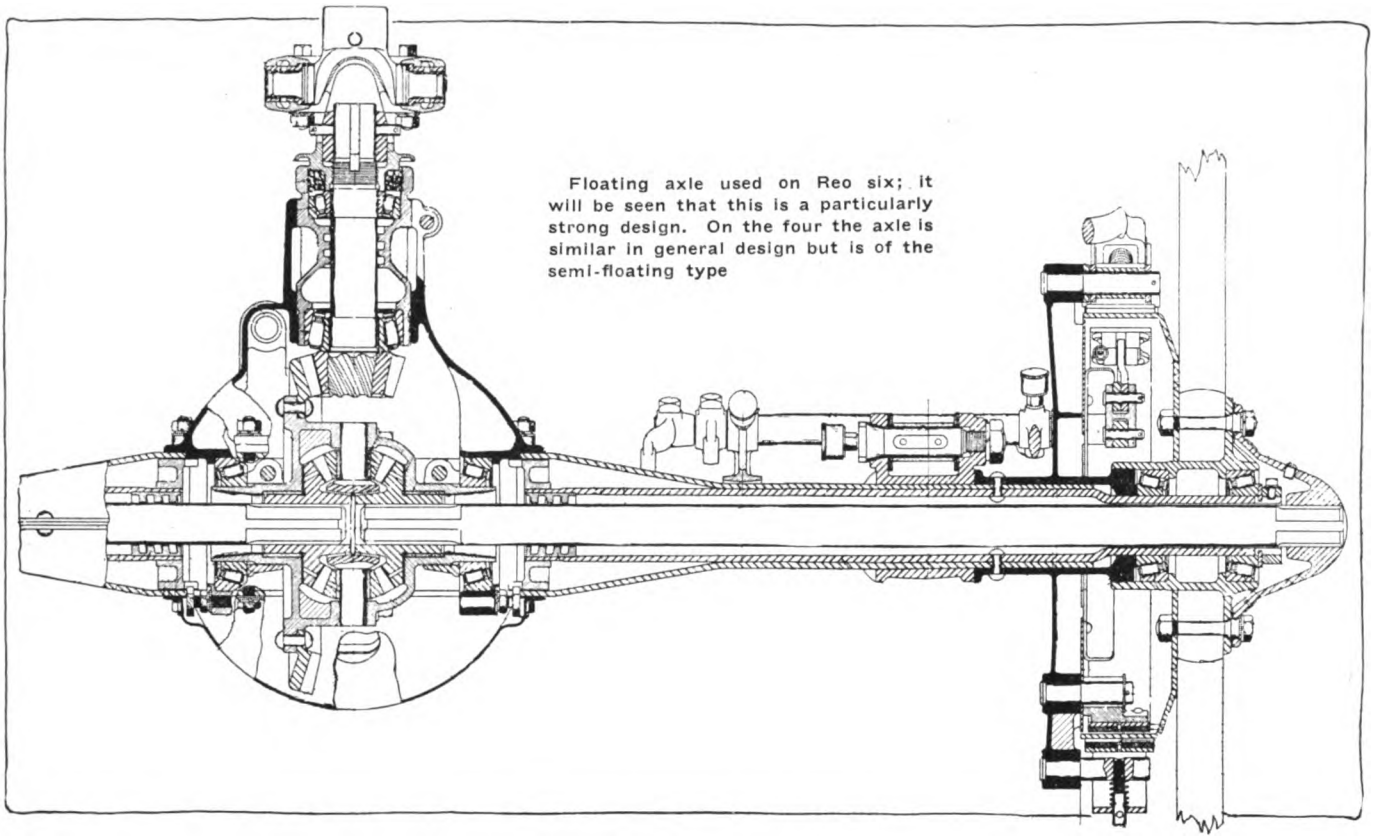




Above and left—Valves in the Reo six are arranged with the intakes overhead and the exhausts below. These sections of the motor show all the mechanism and the several inclosing plates which are aluminum and pressed steel. Every part is extremely accessible

Right—Detail view of Reo valve mechanism showing the oilways and lubricant retaining pads





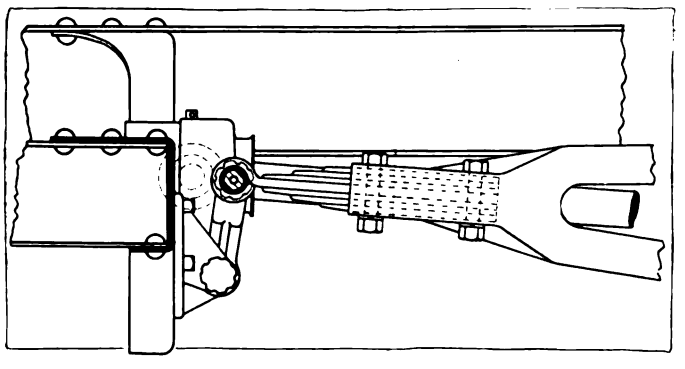
Floating axle used on Reo six; it will be seen that this is a particularly strong design. On the four the axle is similar in general design but is of the semi-floating type

both cared for by a Remy unit, mounted on the right side of the engine, and driven through a simple leather coupling from a special pinion in the timing gear case. There is nothing else on this side except the exhaust valves and the push rods for the overhead inlets, these being inclosed, and the generator is low enough to allow easy access to the valve tappets.

Motors Are Similar Design

On the opposite side of the motor is the water pump, pairing with the generator as to position, and the distribution gearing is composed of helical tooth spur gears. The generator-shaft pinion is driven from the camshaft gear, and to make connection with the water pump a large intermediate pinion is used, the pump speed being the same as that of the crankshaft.

Having thus inverted the usual order by describing detail first, we may now come back to the main dimensions and general scheme of the two motors. The four is 4⅛ in. by 4½ in. bore and stroke, 240.5 cu. in., or 27.2 hp. The six has a longer stroke proportionally, being 3 9/16 by 5⅛ in., 306.5 cu. in. or 30.5 hp. For both four and six two blocks of cylinders are used, and both have the valve arrangement which it is suggested should be called F-head. That is to say there is an overhead intake valve and an exhaust valve in the usual position. This construction has the advantage that it allows plenty of room for the valve pockets and for cooling water around the valves. Cages are used for the intake valves which are set directly over the pistons in the cylinder heads, and it is possible to scrape out carbon effectively by removing the intake valve and the compression cock plug over the exhaust valve. The spark plugs are also set upright in the cylinder head area, which is supposed to be the best place for efficiency. In the four the valve rockers are not incased, but aluminum covers are used on the six, the object being to protect the mechanism and to shut in the few small sounds that may be caused by the valves, though the operation is designed with a view to eliminating noise right at its source.



Spring front end of Reo torque rod to give flexibility with absence of rattle

Valve Operation Designed for Silence

The important points in making an overhead valve motor are to keep the weight of the push rods and rockers as low as possible and to prevent the occurrence of backlash at any joint in the mechanism. Turning to the drawing of the valve gear on page 459, it will be seen that the tappet is a light, hollow structure and the top of the adjusting screw contains a pad of soft material bearing against a mushroom foot on the long push rod. This gives sufficient area to prevent rapid wear of the cushioning substance. Coming now to the rocker, this has a large oil cup made integral with it, a felt lining being used to absorb lubricant—preferably soft grease—and to conduct it to both the pin fulcrum of the rocker and the hemispherical head of the push rod, the latter also bearing against a fiber surface. So far every point seems well cared for, but perhaps the most ingenious idea of all is the use of a fiber roller to join the valve stem and the operating extremity of the rocker. A fiber pad at this point would soon wear away because of the slight sliding action between rocker and valve during opening and closing, but the roller is offset just a sufficient fraction of an inch to cause it to turn instead of being dragged across the top of the valve stem. Actually the roller center and the center line of the valve just about coincide when the valve is fully open. This dodge provides an ever-changing surface of fiber and distributes such little wear as does take place over

the whole circumference of the roller. Finally it is noteworthy that none of the valve gear is expensive, all the small parts being very simple both to make and to assemble.

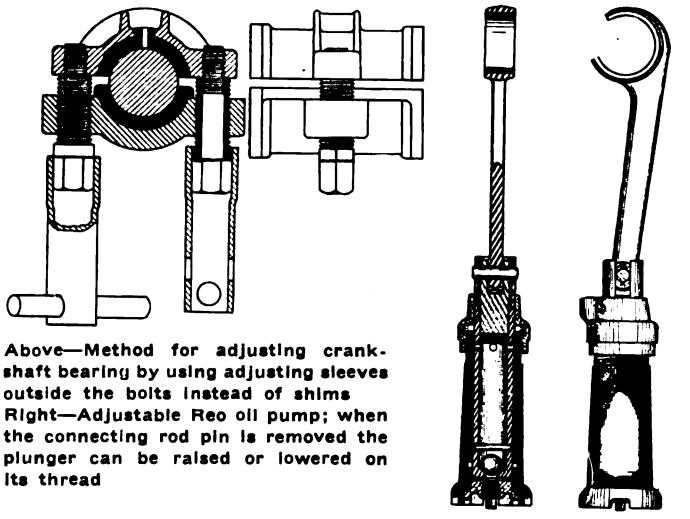
Oil Feed Is Adjustable

Lubrication is a combined pressure and splash system, the three main bearings of the crankshaft being supplied directly from the pump which also feeds the timing gears and dip troughs for the connecting-rods. The system is identical for both motors and its feature of peculiarity lies in the oil pump, which is an especially substantial job. This is a plunger type driven from the camshaft, but unlike the majority of such pumps, it is driven by an eccentric with a full strap connection to the pump plunger and no spring is used for the suction stroke. Reference to the drawing herewith shows that the oil is sucked in at the bottom of the pump cylinder as the plunger rises and is transferred to the interior of the plunger as the latter descends. Thence it passes out through holes at the top of the hollow plunger and so goes to the supply pipes.

Now, the ball valve at the bottom of the plunger will only open after the intake holes near the bottom of the cylinder are closed by the descending plunger, so the effective stroke is very short. Adjustment of the amount of the oil supply is rendered possible by this construction, because the plunger can be raised or lowered to vary the clearance between the foot of the plunger when at the bottom of its stroke, and the head of the cylinder. There is a screwed connection between the plunger and the connecting-rod which permits the adjustment to be made easily.

Unique Bearing Adjustment

An advantage of this form of pump is that it sucks in too much oil at each stroke and discharges the surplus, the effect being to alternate the direction of flow through the meshes of the screen, so tending to maintain the latter free from dirt. Another engine feature that is unique on Reo cars is the method adopted for adjusting the bearings of the crankshaft. In the detail drawing of one of the bearings, appearing on this page, it will be seen that the cap is not packed apart from the upper half by shims, but the width of the gap between the two is set by means of threaded

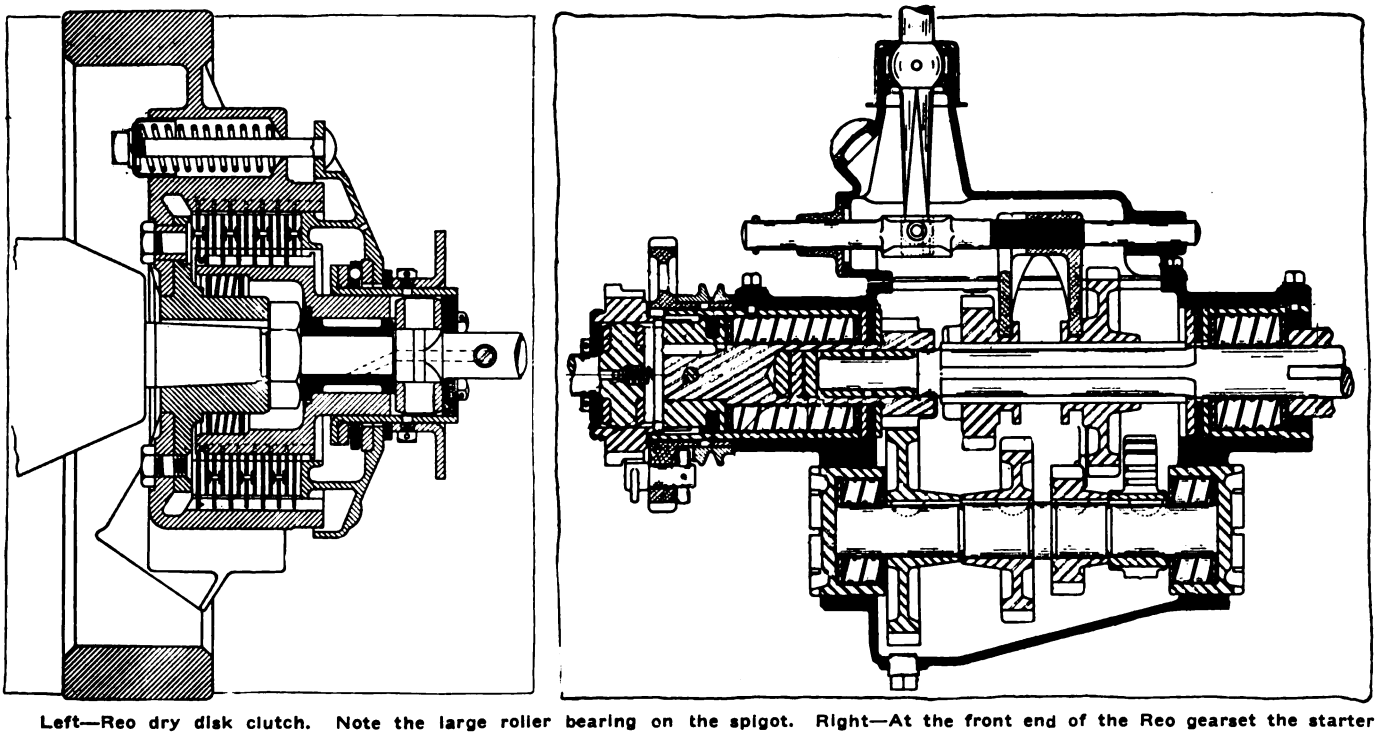


Above—Method for adjusting crankshaft bearing by using adjusting sleeves outside the bolts instead of shims
Right—Adjustable Reo oil pump; when the connecting rod pin is removed the plunger can be raised or lowered on its thread

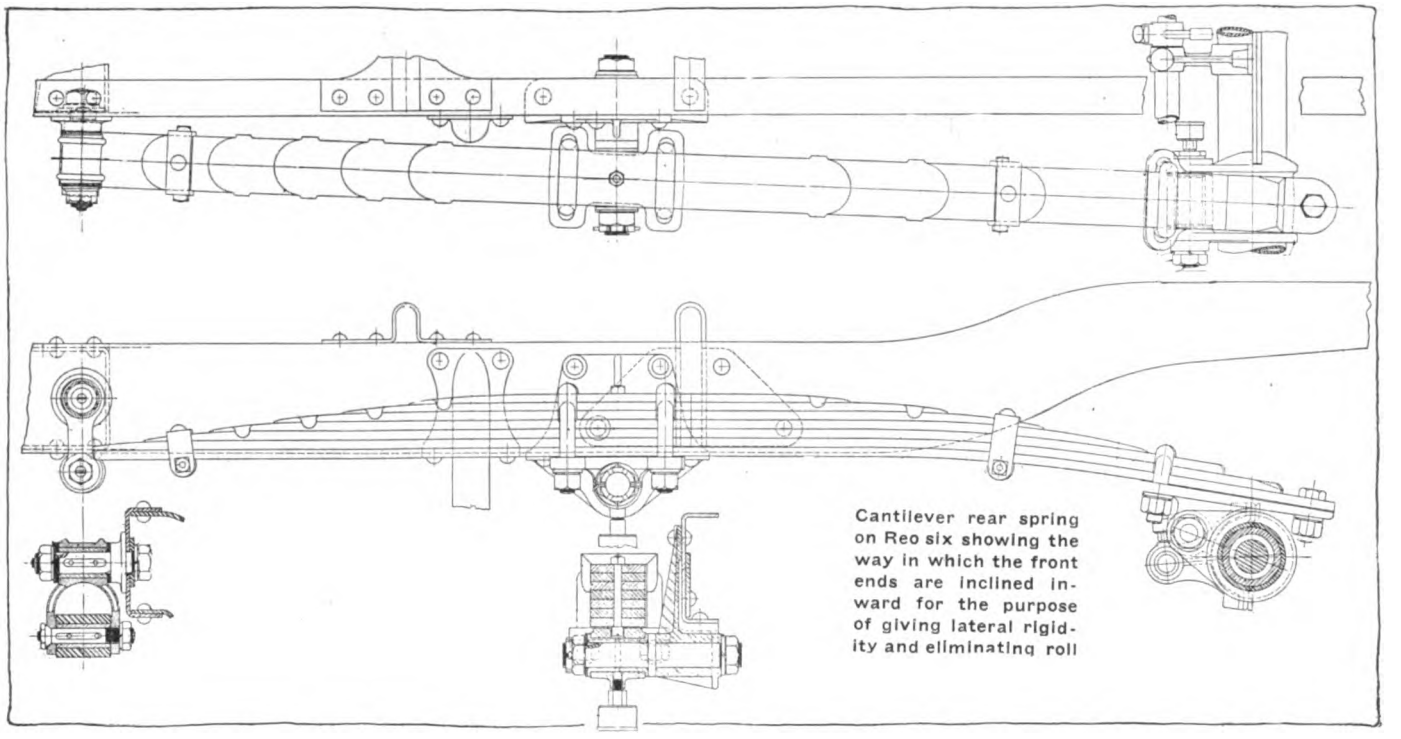
sleeves through which the actual locking bolts pass. Both sleeve and locking bolt have the same sized head and a special tube spanner is supplied which can turn either the bolt alone or both bolt and sleeve together. To adjust the bearing the spanner is first put over the bolt head only and the bolt is slacked. Then the spanner is pushed home and the sleeve unscrewed a little so as to decrease the gap, and finally the bolt is tightened again. Locking wires of an easily detachable sort serve to secure the locking bolts against turning. The bearings at the front and rear ends can be adjusted from beneath the car without dropping the oil pan, as the bolt heads are brought through the latter, and the center bearing is inverted so that the middle bearing can be set up through the hand holes in the side of the crankcase.

For the connecting-rods a hinged cap is used, and shims or liners for adjustment, but it is possible to take up a connecting-rod end through the crankcase hand holes. For the wristpin the bearing is in the piston and is, of course, non-adjustable.

The carbureter is a Johnson, which is a simple instrument with a metering pin adjustment for the nozzle. It is a type that is easy to set and easy to clean, should the necessity



Left—Reo dry disk clutch. Note the large roller bearing on the spigot. Right—At the front end of the Reo gearset the starter sprocket is shown. The grooved pulley just behind is the trip gear for the starter pawl, which can be seen in the illustration at the bottom of the sprocket



Cantilever rear spring on Reo six showing the way in which the front ends are inclined inward for the purpose of giving lateral rigidity and eliminating roll

arise. A simple Y-pipe leads the gas to the two cylinder blocks, and the vertical part of this is inclosed by a water jacket. In connection with the fuel feed the four has a gravity feed from a tank under the front seat, and the six a vacuum tank feed from a rear located container, but the four has a hand pressure pump on the cowl board that can be used when ascending exceptionally steep grades, there being a non-return valve in the filler cap that permits the tank to operate either as a gravity or pressure supply.

Clutch Frees Easily

The clutch used for both six and four is a dry plate, the faced disks being the flywheel members and the plain steel disks the inner ones. There are three springs carried on a spider after the manner that is becoming so popular with cone clutches, but in this case the spider is to the rear and the spring adjusting nuts are in front of the flywheel. The inner member revolves on a spigot which is part of the crankshaft, and it has also a large diameter roller-bearing surrounding the flywheel boss, so the inner member is given an exceptionally true support. The effect of this is to cause disengagement with very small pedal movement and, the inner part being so light, gear shifting is facilitated. Between clutch and gearbox is a short shaft with a telescopic universal joint at each end to allow for any slight disalignment and also to facilitate assembly as it allows either the clutch or the gearset to be taken down without disturbing the other. The gearset itself is mainly noteworthy by reason of the positive lock which holds rigidly whichever shifting fork is not in use. The shift lever is ball mounted on the lid of the gearbox and normally rests in the mid position. Located on either side of the gearbox lid are tubular cases containing spring-backed plungers which enter the slots in the shifting rods, so that with the gear lever in neutral neither shifting fork can move. Pressing the lever to one side or the other forces one plunger out of the slot in the shift rod and so allows the lever to move it, but meanwhile the other plunger holds the second shift rod against any accidental displacement. It is impossible to move both shift forks at once with the gear lever.

Another feature of the gearset is the large size of the Hyatt roller bearings used, especially that at the front end which carries the constant mesh pinion.

At the front end of the drive shaft is a telescopic universal and a pin pattern at the rear. In both cars the drive is through the springs but a torsion member is used, this having another Reo feature in the method of its attachment to the frame. It is sometimes raised as an objection to a torque stay that it is liable to set up a chatter or rattle when the clutch is let in, and to overcome this the Reo rod has a short leaf spring through which the actual attachment to the frame is made. This spring provides a cushioned torsional resistance and can give a little when starting or when applying the brakes. The drawing shows the details so clearly that no more description is needed. The rear axles differ slightly in design, that on the four being semi-floating and that of the six a full floating construction. Almost the same bevel pinion housing is used for both, and Timken bearings are employed for mounting both pinion and differential.

In the larger axle the road wheels run also on Timken bearings and the drive shafts are withdrawable by removing the hub caps, whereupon the whole differential can be removed. Since the wheels are carried on the drive shafts in the axle of the four the last-mentioned feature is peculiar to the six.

One other difference is that the four has a straight tooth bevel gear and the six a bevel of spiral type, the gear ratios being 4 to 1 high, 7.2 to 1 sec. and 14.8 to 1 first speed both for the four and the six.

Anti-Roll Cantilever Spring

The rear springs are again different as the four has three-quarter elliptic suspension and the six a cantilever system. The latter is especially interesting because the two springs are closer together at their front ends than at the rear extremities, and this is said to eliminate much of the roll that is sometimes a trouble with a cantilever system. The drawing shows the details of the spring layout, and it may be observed that the attachment to the axle is performed by a short plate bolted to the end of the longest leaf of the spring. The little clip which steadies the front end of the short plate is not screwed up tight enough to prevent free movement of the spring leaves. There is a full equipment, including all the usual articles and the tires are of good size, the four having 34 by 4 in., and the six 34 by 4½ in. front and rear.

The Engineers' Forum

Must Convince Production Department of Aluminum Construction Advantages—Cars Not Yet Standardized—The Heating Question

By W. B. Stout
Chief Engineer, Scripps-Booth Co.

DETROIT, MICH.—Editor THE AUTOMOBILE:—Engineers are agreed that the attainment of minimum weight in automobile construction is the next great step. This line of development is favored by engineers, production, buying and sales.

In connection with light-weight construction, the use of the newer methods of aluminum casting has been given serious publicity within the last few weeks. This construction is undoubtedly attractive to the engineer who feels that what difficulties there are easily can be overcome by systematic development, and that these are fairly few.

The Production End

The production end of the factory questions the advisability of aluminum for block cylinders, for instance, as production has never handled a proposition of this kind before, and is a department which usually contains more of the Missouri strain than any other department of the factory.

If production can be shown the advantage of block-cast aluminum engines and success in this department, much will be done toward the establishment of the new construction.

The buying end of the firm is, at the outset, opposed to the aluminum construction on account of extra cost. This item of cost in the engine itself looms up large, and is questioned. This resolves itself into a mass of figuring to determine whether the decreased weight of the engine eliminates enough cost in the rest of the chassis to pay for the change from the standpoint of the buying department.

On the Fence

The salesman and dealer is still on the fence regarding aluminum motor construction if he knows anything about it at all. The country salesman will probably oppose it on the start. If only one manufacturer takes it up, then it will be criticized by other dealer's and sales effort will be required to sell the construction irrespective of its merit, as has been the case, for instance, in air cooling. If a number of manufacturers adopt the idea, as seems very probable, then aluminum engines will have plain sailing, for there is no doubt but that the problems involved can be easily solved by the engineering department. Aluminum cylinders are being tried in aviation. Aluminum engines with aluminum pistons have been used successfully without cast iron liners in the cylinders. It is probable that cylinders will be lined however with cast iron or steel or some lining material, and that aluminum pistons will be used, but there is little doubt but that this type of engine is coming.

The first types will be sand cast. Eventually a die casting method may be developed for more accurate work which may cut the cost and better the production.

One problem is prominent in connection with aluminum cylinders for the multiple cylinder constructions. These are generally of small bore and hence have a greater amount of cooling surface per cubic inch of volume than the usual type. This means that in order to run at equally efficient temperature, more heat units per minute must be sent through the cylinder than in larger constructions, providing the cooling effort be the same. This factor has been noted in multiple cylinder motors enough so that thermo-regulation of the cooling water flow has been found advisable.

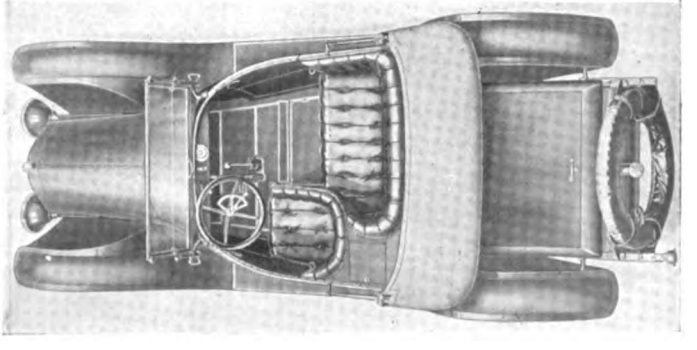
Heat Conduction Increases

With the adoption of the aluminum for cylinders, heat conduction is enormously increased so that the cooling is even greater per cubic inch of wall surface than before. This may necessitate more accurate regulation of cooling, and there is even the possibility that it may bring into prominence again the advantage of air cooling for small cylinders.

The Renault firm with cast-iron cylinders has been using blower cooling on aviation motors for years and has about the most reliable aviation motor which Europe has developed. There is a possibility that aluminum constructions may increase the popularity of this type.

Experimentation with aluminum for major castings in the automobile is but further proof that the automobile of to-day is not yet standardized. Engineers, constructors, purchasers, and advertisers must revise and revamp their ideas and methods with each new step of rational development. To date, however, the entire growth seems to focus as a point of agreement on the acquisition of lighter weight, smoother performing cars.—W. B. STOUT, Chief Engineer, Scripps-Booth Co.

Mitchell Adds Three-Passenger Car



Racine, Wis., Sept. 2—A three-passenger roadster has been added by the Mitchell-Lewis Motor Co., Racine, Wis., to its line of 1916 cars. The body is mounted on the same chassis as the Six of 16 touring design which is featured by 125-in. wheelbase, cantilever rear springs, 34 by 4-in. tires and sells for $1,250. In this design there is an individual seat for the driver set well forward of the extra wide two-passenger seat. A wide footrest is provided for the two passengers and directly back of the drivers' seat is a convenient small package receptacle.

Glide Six Replaces Four for 1916

3 by 5 Block Motor Gives 41 Hp. at 2000 R.P.M.—Detachable Sedan Body—Westinghouse Electric System

FOR 1915 the Bartholomew Co., Peoria, Ill., built one model known as the Glide 30. It was a four-cylinder car. For 1916 the one-model policy of this concern has been continued but in place of the four there is a new model known as the 1916 six-40. This concern has therefore entered the ranks of those who build nothing but six-cylinder models. The new car sells for $1,095, and is an assembled design.

Rutenber Power Plant

The power plant is a Rutenber with the six cylinders cast in block. The dimensions are 3 by 5 and a horsepower output of 41 is claimed at 2000 r.p.m. on the dynamometer. At 1000 revolutions the horsepower curve is said to show 22 brake hp., 33 brake hp. at 1500 r.p.m. and 41 at 2000 r.p.m. This motor is therefore of moderately high-speed characteristics and to take advantage of this fact it is designed to run on a direct ratio of 4.64 to 1. This ratio keeps the motor within the range of efficient speeds during ordinary cross-country driving and allows it to reach the peak of its curve on hill work, while at the same time the ratio is not so low as to prevent throttling for low speeds on high gear.

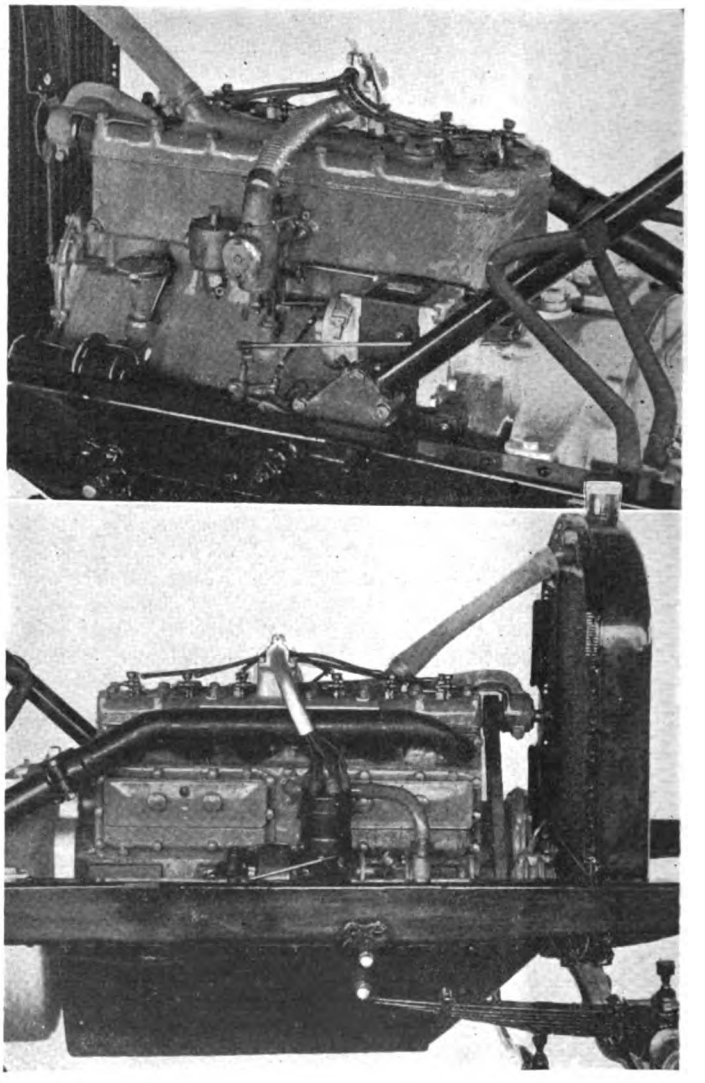
Cooling is accomplished by a centrifugal water pump which forms a positive method of circulation and the radiator is cooled in addition by a two-blade aeroplane type fan which is mounted on a bracket extended from the cylinder head casting.

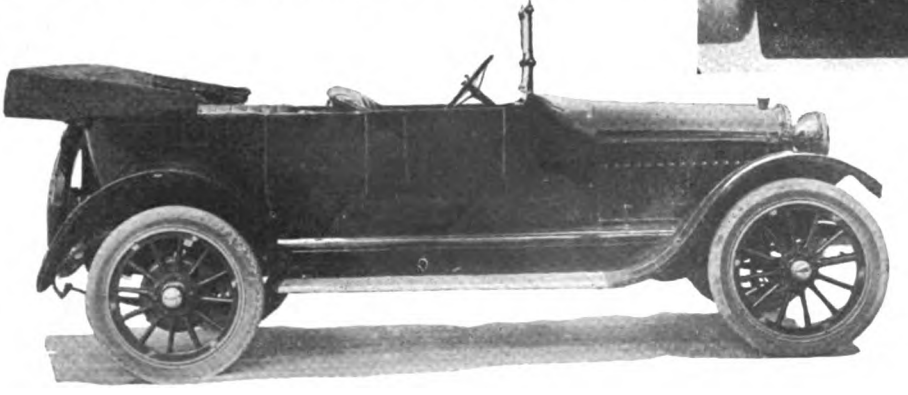
For lubrication there is a vane pump which is driven directly from the front end of the camshaft and which draws oil through a detachable filter in the base and delivers it to troughs under each connecting-rod and to the timing gears. For lubricating the main bearings there are oil ducts cast in the walls of the upper case. A large filler opening is supplied on the left side of the motor at the front end and there is an oil gauge just back of the filler opening for determining the quantity held in the reservoir.

The Electrical System

The electrical equipment is entirely Westinghouse, the starting motor being mounted on the left side of the engine and bolted to a flange which forms an integral part of the flywheel housing. The driving pinion is thrown into mesh by the Bendix gear arrangement, the starting motor being put into operation by pressure on the starting switch button. The generator is on the right side of the motor just back of the centrifugal water pump and is driven by the same shaft which operates this pump although it is separated from the pump drive by a leather coupling which allows a certain amount of flexibility in the connection. A voltage regulator is used in connection with the generator, according to the Westinghouse layout which operates to deliver a tapering charge to the battery. The charging is at a fairly high rate when the battery is exhausted but slower when the battery is practically fully charged.

For ignition the Westinghouse vertical type of the latest design is employed. The timer distributer unit, which includes an entirely independent unit consisting of interrupter,



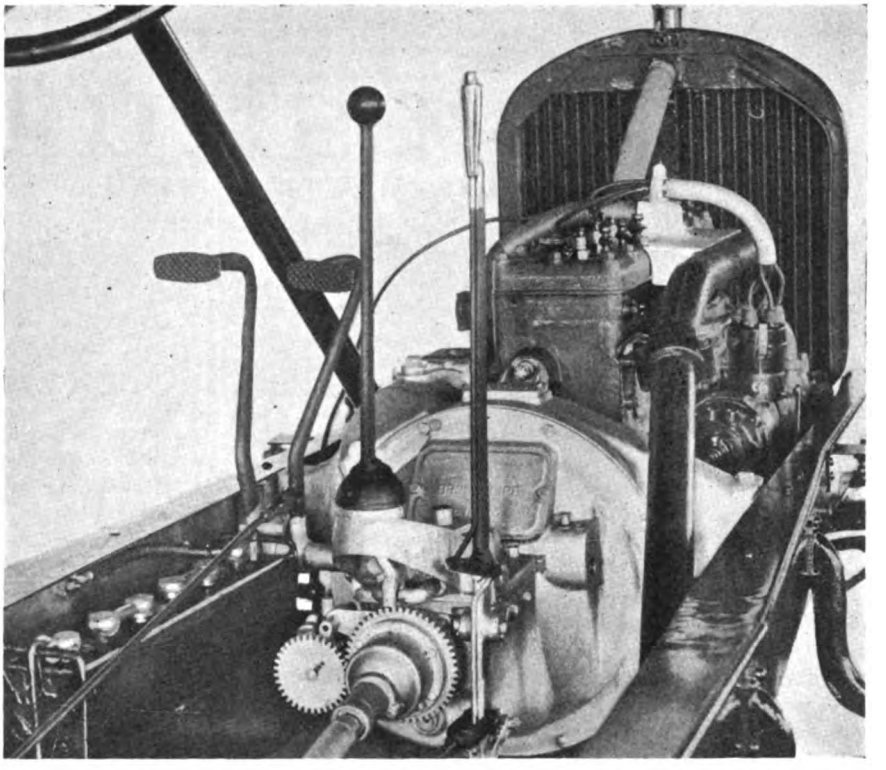


Upper—Left side of Rutenber six-cylinder 3 by 5-in. block motor used in the Glide six for 1916

Lower—Right side, showing Westinghouse ignition unit mounting

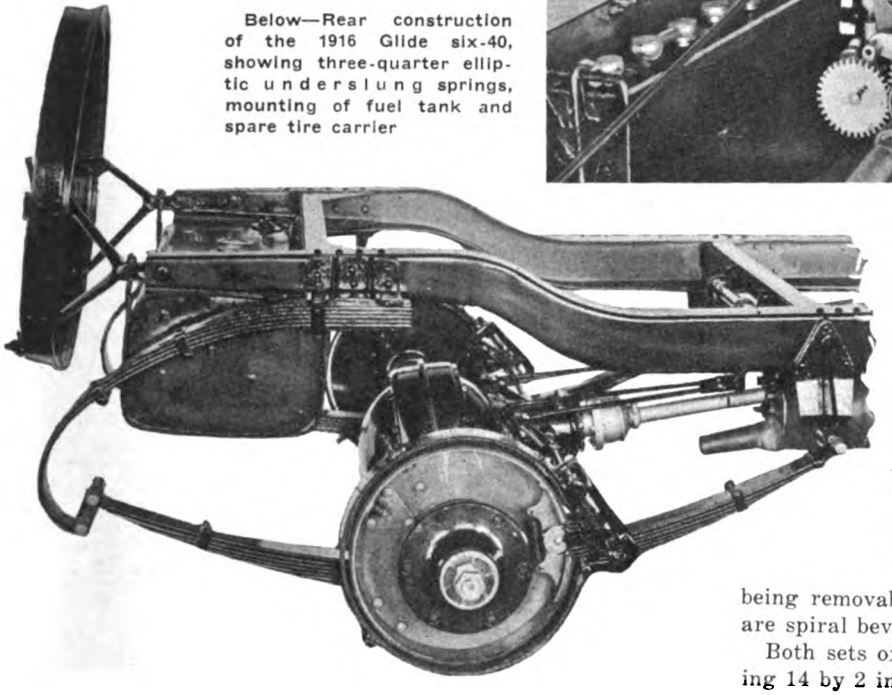
Left—The six-cylinder, five-passenger Glide touring car for 1916 which sells for $1,095

condenser, coil and distributer, is mounted on the front end of the generator and is driven from this shaft by spiral gears running in oil. The wiring system of this arrangement is simple, consisting of leads to the independent plugs and a single wire running to the switch. In order to prevent short-circuiting of the spark-plug wires there is a tube mounted on an insulated block on the cylinder head which keeps these wires free from the dangers of vibration and guards against the possibility of the insulation being burned through by the hot exhaust pipe. The battery used in connection with the electrical equipment is 6 volts and has a capacity of 80 amp.-hr. Located on the instrument board there is an ammeter which gives the car operator a key to the entire system indicating at all times the battery charging rate.



Above—Rear view of the power plant of the Glide six, showing mounting of storage battery inside the frame and the control levers on the gearbox. Note strong frame section

Below—Rear construction of the 1916 Glide six-40, showing three-quarter elliptic underslung springs, mounting of fuel tank and spare tire carrier



Power is transmitted from the motor to the gearset by a multiple dry disk clutch. This is a thirteen-disk design with alternate disks faced with Raybestos. The aim with this clutch has been to keep the surface large and the unit pressure small, thereby reducing wear on the facing. The gearset, which forms part of the unit power plant, is mounted directly in a bell housing back of the flywheel case. The gears are 3½ per cent nickel steel with the limits of backlash kept down for quietness. The drive is taken through a tubular propeller shaft and Spicer universals. The front universal is so arranged as to allow for a slight longitudinal movement of the rear axle and to take care of this there are ten splines on the forward end of the tubular propeller shaft through which the drive is transmitted. The rear universal joint is the same as the front with the exception that it is fastened firmly to the propeller shaft by a solid connection, all the longitudinal play being taken up at the forward end. To guard against dirt and grit the universals are housed to retain oil and exclude foreign matter.

Hotchkiss Drive Employed

As would be judged from the fact that allowance is made in the propeller shaft for end play, the drive is Hotchkiss, both the torque and drive being taken through the rear springs which are underslung. The rear axle is a floating design with pressed steel housing. The driving gears are mounted in a cast steel carrier which is designed to hold the gears in alignment. Accessibility is one of the features of the rear axle, the entire differential being removable through the hand hole. The driving gears are spiral bevel designs with a 4.64 to 1 ratio.

Both sets of brakes are on the rear wheels, the drums being 14 by 2 in. with the foot service brake external contracting and the hand brake internal expanding. This drum is bolted to the rear wheels which are carried on Gurney bearings. The wheels are connected to the rear axle driving shafts through large flanges bolted to the hubs. At the differential ends the axle shafts have six splines. The differential gears are large, having a 5-7 pitch.

Equipment a Feature

Up-to-date equipment is used throughout. The gasoline feed is by the Stewart-Warner vacuum system; the wheels are provided with Goodyear demountable rims and 34 by 4 in. tires; the top is a one-person design with Jiffy curtains; the headlights have a double bulb arrangement for dimming and the instrument board is fully equipped with a Stewart-Warner magnetic speedometer driven from the propeller shaft, an ammeter and a dash lamp.

With a five-passenger body this car sells for $1,095. In addition there is a detachable sedan top which gives an all-year-round equipment if so desired. This body can be removed or attached by two men in an hour. The touring body to which this may be fitted is a full streamline design with the modern yacht-like sweep from the headlights to the rear. Upholstery is enamel leather over curled hair and oil-tempered springs. The wheelbase is 119 in.

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...ng. I think this will answer many questions
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..., Minn. R. M. B.
...er to this and several corresponding requests, ...OBILE is publishing in this issue on pages 472 to ...le explaining the different types of rear axles.

...utch Brake Prevents Difficult Shifting

THE AUTOMOBILE:—Herewith is a drawing, Fig. 1, ... a clutch brake I have fitted to my car. It is merely ... block of wood or fiber, 1 in. square and 1 in. thick ... through the upper left hand wing bolt hole of the ... housing cover. The clutch when released presses ...st this either lightly or tightly according to foot pres... on the pedal, slowing the spinning of the clutch and ...king shifting of gears very simple.
New Rochelle, N. Y. W. J. G.

Remedying a Slipping Clutch

Editor THE AUTOMOBILE:—Recently I have noticed a jump in my car when I open the throttle with a load on the engine. It seems as though the clutch slipped out and in again grabbing suddenly and producing the jump. Can you advise me regarding this?
Eastvale, N. J. A. S. KURTZ.

—The diagnosis which you have made of your own case seems to fit the evidence you have given regarding the action of your car. The clutch does not slip out, however, but remains engaged, when occurrences such as you have noted take place. What actually happens is that the surface of the clutch is in such a condition that the frictional resistance is not sufficient to hold the load. If you have a leather-faced cone clutch, the chances are that the leather has become dry and after allowing the clutch to slip for a length of time in this condition, the face of the leather assumes a hard glaze which prevents it from taking hold as it should. If this trouble has gone too far, the only repair is to replace the leather facing. On the other hand, if it has just started to develop you may save the leather by thoroughly saturating it with neat's-foot or castor oil. This will soften the leather and give it the easy engagement with the firm holding power that is the natural prerogative of cone clutches.

With some cone clutches there is a tendency on account of the thinness of the material or carelessness in placing it on the cone, for the copper heads of the rivets to project through the leather. The result is that the copper bears against the cast iron flywheel and causes a slipping action since the coefficient or friction between copper and iron is not high

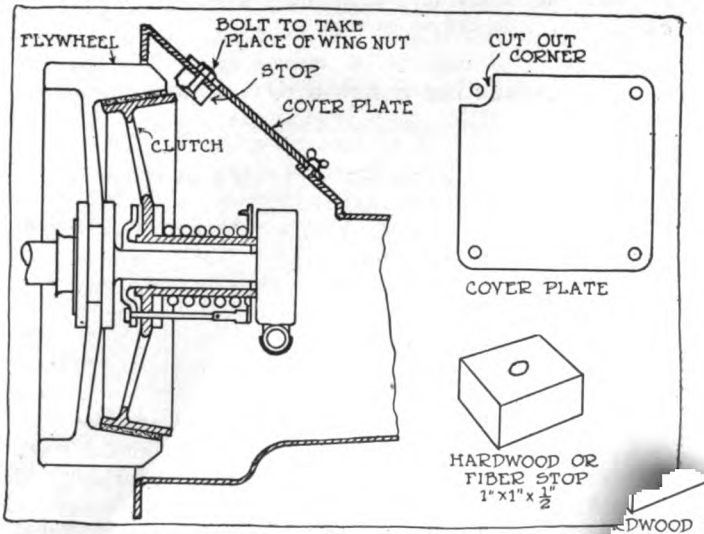

Fig. 1—Arrangement suggested by subscriber to act as a clutc

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...ving the displacement you mention,
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...his displacement or 38, 34.125 or 28.275

...ferent Types of Rear Axles

AUTOMOBILE:—Please explain through the
...t a semi-floating, three-quarter floating, and
...rear axle is and show cuts of same if possible.
...at so many automobile mechanics and salesmen
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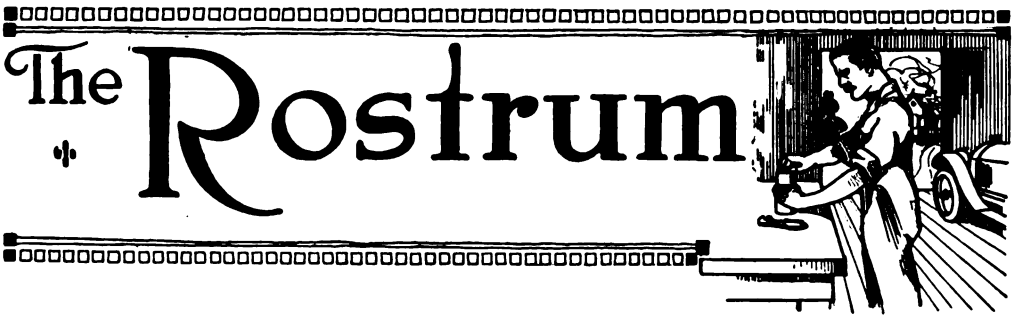


Selective Allows Choice of Speeds

EDITOR THE AUTOMOBILE:—I find a great many car owners who believe that with a selective type control it is still necessary to start your car in first speed, then progress to intermediate, and then in a few moments go into high. I have always supposed this method was perfectly proper and have always used it.

Recently in studying a book on automobiles, I find that it says that with a selective type of gearbox "it is not necessary in changing from low to high speed to pass through the intermediate speed." I take this to mean that you may start your car off in any speed you may desire, without injury to your engine and gears, providing you use the proper care in allowing the clutch to slip into engagement. Am I correct in this matter?

Brooklyn, N. Y. F. K. L.

—No doubt what the author meant to make clear is that while it is advisable in shifting gears to go progressively from one to the next it is not necessary to do so. For instance, if a car was in the lowest speed with a selective gearset the step to the highest speed could be made without ever having the intermediate gear in mesh. With the progressive gear, as the name suggests, the gears are moved through the intermediate when going from low gear to high gear. With either type of gearset, however, the acceleration of the car should proceed smoothly from the time of starting until the high gear is in mesh. It is not proper after driving to jump intermediate speeds unless under extraordinary circumstances. One set of conditions wherein it would be perfectly possible and perfectly proper to go from low speed into high is in descending a steep grade. In fact, if desired, on a very steep grade, one can start directly in high gear without violating any of the rules of good riding.

Two-Bearing Crankshaft Satisfactory

Editor THE AUTOMOBILE:—Kindly let me know as to the two-bearing crankshaft on the Regal light four. Are two bearings sufficient and how is it that only two bearings are used?

Delmont, S. D. DELMONT AUTO CO.

—The two-bearing crankshaft for a four-cylinder motor has worked out very well when the motor is block cast and of very short overall length. These bearings are carefully laid out to stand the stresses which they are called upon to endure and stand up quite well under the strain of continuous running. Where the bearings suffer on the two-bearing installation it is generally due to the action of the crankshaft, which instead of rotating throughout a circular path tends to turn in such a manner as to give an oval action to the ends of the crankshaft. This irregular motion which is due to the whipping of the shaft tends to force the bearings out of alignment more and more, and finally when the bearings fail it is due to this irregular action.

In general, where the design has been carefully worked out and the bearing size calculated as it should be, two bearings can be made to form the duties in a light four-cylinder block motor to perfect satisfaction. Where the bearings are going to be stressed to their ultimate capacities, however, for long periods a higher factor of safety is gained by using a larger number of bearings, and the whipping action of the shaft is furthermore broken up into two or more lengths.

Nearly All Have House Organs

Editor THE AUTOMOBILE:—Will you kindly furnish me with the following information:

1—What tire manufacturers issue house organs like Goodyear? Give all those who issue organs like Ford *Times* and Timken.

2—What is the S. A. E. rating in hp. of the model 80 Overland?

3—Why is the long-stroke motor better?

4—Where can I get a directory for Ford cars?

Bouton, Iowa. C. F. M.

—Practically every tire company and every automobile company in the country issues house organs of either simple or elaborate natures in accordance with the plans of the concern. In fact it would be far more simple to give a list of concerns which did not publish house organs than one which contains the names of those who do. In many of the concerns the house organs do not come out regularly, but merely from time to time, while others have regular editions which appear promptly at the schedule period.

2—The S. A. E. rating of the model 80 Overland is 27.25.

3—The long-stroke motor is generally claimed to be superior, due to the higher thermal efficiency. Another argument which is frequently advanced in favor of the long stroke motor is that for a given displacement per minute the piston speed is less. Since the piston displacement per minute is a criterion of the horsepower, the number of reversals of reciprocating motion per unit of power are less with the long-stroke motor, with the result that in general a better running machine is produced with the long-stroke design. The life of the long-stroke motor is claimed to be greater, and it is generally conceded to hold to the last ounce of power at slow speeds, such as under load in hill work, better than the short stroke snappy motor.

4—We presume by this that you mean a directory of Ford owners. THE AUTOMOBILE has no record of any such directory being published, although in most States where there is State registration it is possible to secure a directory of car owners, together with the names of the cars owned.

Mathematics of Motor Flywheel Explained

Editor THE AUTOMOBILE:—I am building an experimental single-cylinder gasoline engine 3¾ by 5¾, with valves positively balanced against cylinder pressure. The valve area is 2.75 in. clear for both inlet and outlet. Crankshaft is balanced and the reciprocating parts are light. What weight of flywheel will be best to use?

2—What should be the volume of the compression space

to give 60, 75 and 90 lb. compression? The valves will open to full area with 20 deg. movement of crank.

Port Henry, N. Y. F. E. B.

—The weight of the flywheel cannot be determined offhand in this manner. In the first place, the manner in which the weight of the flywheel is concentrated is highly important and also the weight of the crankshaft itself has a great deal to do with the necessary weight of the flywheel.

It must be remembered in designing a flywheel that the first function is to enable the gas engine to complete its cycle and the second is to keep the variation of angular velocity within well-defined limits. Any flywheel of even light weight will accomplish the first aim but to do the second, in the most efficient manner requires careful working out either by experimentation or calculation. For purposes of calculation, the mass of the flywheel is generally considered as being concentrated in the rim, and it is possible by this means to calculate exactly the weight necessary to limit the variation in angular velocity to any amount. It is a pure mathematical problem. Let V_1 be the maximum velocity in feet per second of the rim, V_2 be the minimum and V the mean. If M is the mass of the rim it will be equal the weight divided by the acceleration due to gravity 32.2, or $M = \frac{W}{32.2}$

In addition to the above values let v_1 be the maximum angular velocity of the rim in radians per second; v_2 the minimum and v the mean. Let E be the difference between the greatest amount of energy received by the flywheel rim and the mean energy in the rim. I is the moment of inertia of the flywheel rim.

Remembering the general energy formula, $\frac{WV^2}{2g}$

$$E = \frac{WV_1^2}{2g} - \frac{WV_2^2}{2g} \quad ; \text{ or, } \frac{W}{2g}(V_1^2 - V_2^2)$$

This latter expression factors to $\frac{W}{2g}(V_1 + V_2) \quad (V_1 - V_2)$

Examining this expression we see that $(V_1 + V_2)$ is equal to twice the average velocity or $2V$. And, furthermore, $V_1 - V_2$ is equal to greatest range in velocity of the rim. If we divide this by the mean velocity of the rim V, we get a co-efficient which may be called C, which represents a function of the speed variation.

Substituting the suggested values in the last equation, we have

$$E = \frac{W}{2g}(2V) \quad (CV) \quad \text{or} \frac{WV^2C}{g}.$$

Therefore, the weight of the rim necessary for a velocity change of CV ft. per second with the intermittently applied energy E is therefore:

$$W = \frac{Eg}{V^2C} \text{ lb.}$$

With this mathematical value, you can determine the weight of rim necessary for your flywheel. In general for motor of the size you mention, this will probably work out to somewhere around 60 to 75 lb.

2—With a motor having the displacement you mention, 97.5 cu. in., the compression volume necessary to give you 60, 75 and 90 lb. compression would be respectively 40, 35 and 29 per cent of this displacement or 38, 34.125 or 28.275 cu. in.

Different Types of Rear Axles

Editor THE AUTOMOBILE:—Please explain through the Rostrum what a semi-floating, three-quarter floating, and full-floating rear axle is and show cuts of same if possible. It seems that so many automobile mechanics and salesmen are unable to tell one from the other, especially three-quarter and full-floating. I think this will answer many questions along this line.

Minneapolis, Minn. R. M. B.

—In answer to this and several corresponding requests, THE AUTOMOBILE is publishing in this issue on pages 472 to 475 an article explaining the different types of rear axles.

Clutch Brake Prevents Difficult Shifting

Editor THE AUTOMOBILE:—Herewith is a drawing, Fig. 1, showing a clutch brake I have fitted to my car. It is merely a small block of wood or fiber, 1 in. square and 1 in. thick bolted through the upper left hand wing bolt hole of the clutch housing cover. The clutch when released presses against this either lightly or tightly according to foot pressure on the pedal, slowing the spinning of the clutch and making shifting of gears very simple.

New Rochelle, N. Y. W. J. G.

Remedying a Slipping Clutch

Editor THE AUTOMOBILE:—Recently I have noticed a jump in my car when I open the throttle with a load on the engine. It seems as though the clutch slipped out and in again grabbing suddenly and producing the jump. Can you advise me regarding this?

Eastvale, N. J. A. S. KURTZ.

—The diagnosis which you have made of your own case seems to fit the evidence you have given regarding the action of your car. The clutch does not slip out, however, but remains engaged, when occurrences such as you have noted take place. What actually happens is that the surface of the clutch is in such a condition that the frictional resistance is not sufficient to hold the load. If you have a leather-faced cone clutch, the chances are that the leather has become dry and after allowing the clutch to slip for a length of time in this condition, the face of the leather assumes a hard glaze which prevents it from taking hold as it should. If this trouble has gone too far, the only repair is to replace the leather facing. On the other hand, if it has just started to develop you may save the leather by thoroughly saturating it with neat's-foot or castor oil. This will soften the leather and give it the easy engagement with the firm holding power that is the natural prerogative of cone clutches.

With some cone clutches there is a tendency on account of the thinness of the material or carelessness in placing it on the cone, for the copper heads of the rivets to project through the leather. The result is that the copper bears against the cast iron flywheel and causes a slipping action since the co-efficient or friction between copper and iron is not high

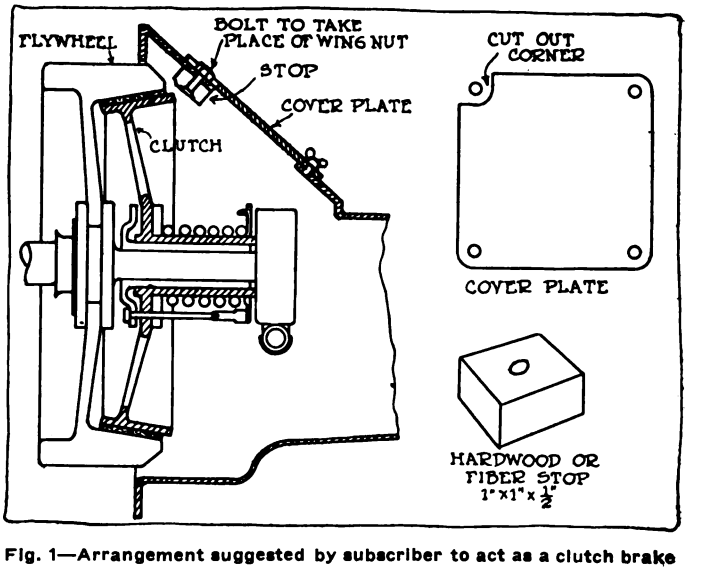


Fig. 1—Arrangement suggested by subscriber to act as a clutch brake

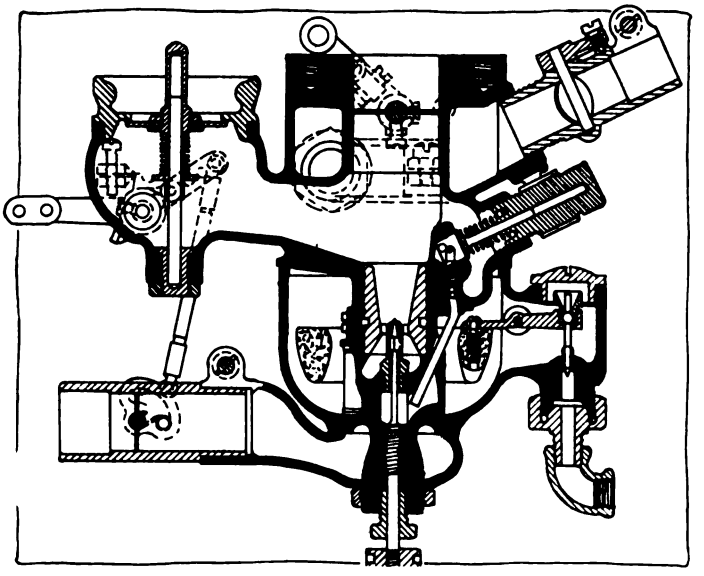


Fig. 2—Sectional view of the Schebler model O carbureter

enough to withstand the load of propulsion with only the pressure of the clutch spring to hold it engaged.

Therefore, should your clutch be a cone, it would be well to examine the surface of the leather to see first if the rivets are properly counter-sunk; secondly, to see if the surface of the leather is not glazed and dry, and third, to see that the leather is not worn out. If the latter is the case, the only remedy is to replace it.

In case the clutch is a disk design, intended to run in oil, the slipping may be due to the accumulation of grease between the plates. Even with the best of care, grease will sometimes accumulate between the clutch plates, with the result that slipping occurs. The remedy for this is naturally to employ some solvent, or something which will cut the grease from between the plates. Kerosene is the agent generally employed for this purpose. The method of applying the kerosene will depend upon how the clutch is assembled and housed. If there is an accessible cover plate, the kerosene can generally be poured down through this and the motor run a while with the gears in neutral. This will cause the grease to be washed out. When this has been done thoroughly, the kerosene is drained and the lubricant renewed.

A mistake very often made by owners of cars which have a disk clutch housed with the gearbox is in placing heavy grease in the gears, forgetting that this will work its way between the plates of the clutch. When this is done the clutch very soon begins to slip.

Adjusting Schebler O Carbureter

Editor THE AUTOMOBILE:—What is the gear ratio of the model 31 Buick?

2—What speed can be had with this type of motor?

3—Is it a high or low-speed motor?

4—Give me a diagram of how to adjust the model O Schebler carbureter for high speed.

5—What is the gear ratio of Reo the Fifth? What speed can be had from this motor?

Schleisingerville, Wis. J. SILL.

—This car is geared 3.5 to 1 on direct.

2—This car can travel up to 60 m.p.h.

3—It may be called a medium high-speed motor.

4—A diagram showing the section of the model O carbureter is given in Fig. 2. To adjust the Schebler model O carbureter, referring to Fig. 3, first see that auxiliary air valve is seating lightly; close needle valve *E* and knurl *I* by screwing to right until they have seated. Do not use any pressure on adjusting screw after it meets with resistance. Then turn needle valve *E* to the left three turns, open throttle about one-third and start motor. After the motor is warmed up, turn needle valve *E* to right slowly until motor runs smoothly with throttle nearly closed. Open throttle slowly about one-third, and if motor backfires, screw down on air-adjusting screw 25 until motor runs smoothly. Open throttle wide and if motor backfires at speed, turn knurl *I* to left until it overcomes backfiring. The second jet *I* should not come into operation until the car has attained a speed of from 18 to 25 m.p.h. or an approximate engine speed of from 700 to 1000 r.p.m.

The second jet *I* adjustment is not a delicate adjustment, and when adjusted for high engine speed will expose from one to four threads of the adjusting knurl. The volume of heat entering carbureter jacket can be governed by position of lever *X*, which can be placed open, half open and wide open. We recommend half open during summer and wide open during winter.

5—The Reo Fifth is geared 4 to 1 on direct. It can attain a speed of 50 m.p.h.

Burning or Scraping Carbon Satisfactory

Editor THE AUTOMOBILE:—I have a 1914 car which has not been overhauled in 6 months and it knocks a little on the grades. I think the cause for this is carbon. Would you advise me to have it burned out or scraped?

Chester, N. Y. C. F. J.

—Either burning or scraping the carbon is an efficient way of having it removed. Both methods remove the carbon, and the one which is most convenient to you will be satisfactory to employ.

Graphite and Oil Stop Squeak

Editor THE AUTOMOBILE:—I have a 1915 Cadillac of the seven-passenger type and have been troubled for some time by the squeaking of the service brakes whenever applied. I have tried putting oil on the brake bands which affords only temporary relief. Would graphite help this squeaking, and if not, could you advise what would?

Dexter, Me. F. A. A.

—The brake bands of this car sometimes become too dry and grip the drums suddenly, giving rise to the noise of which you speak. This can be remedied by applying a mixture of graphite and oil. Sometimes it happens that a rivet head will project through the lining.

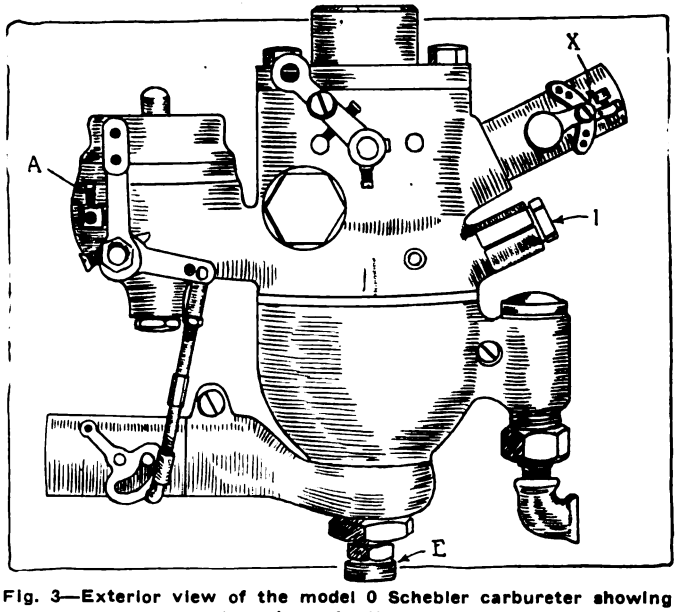
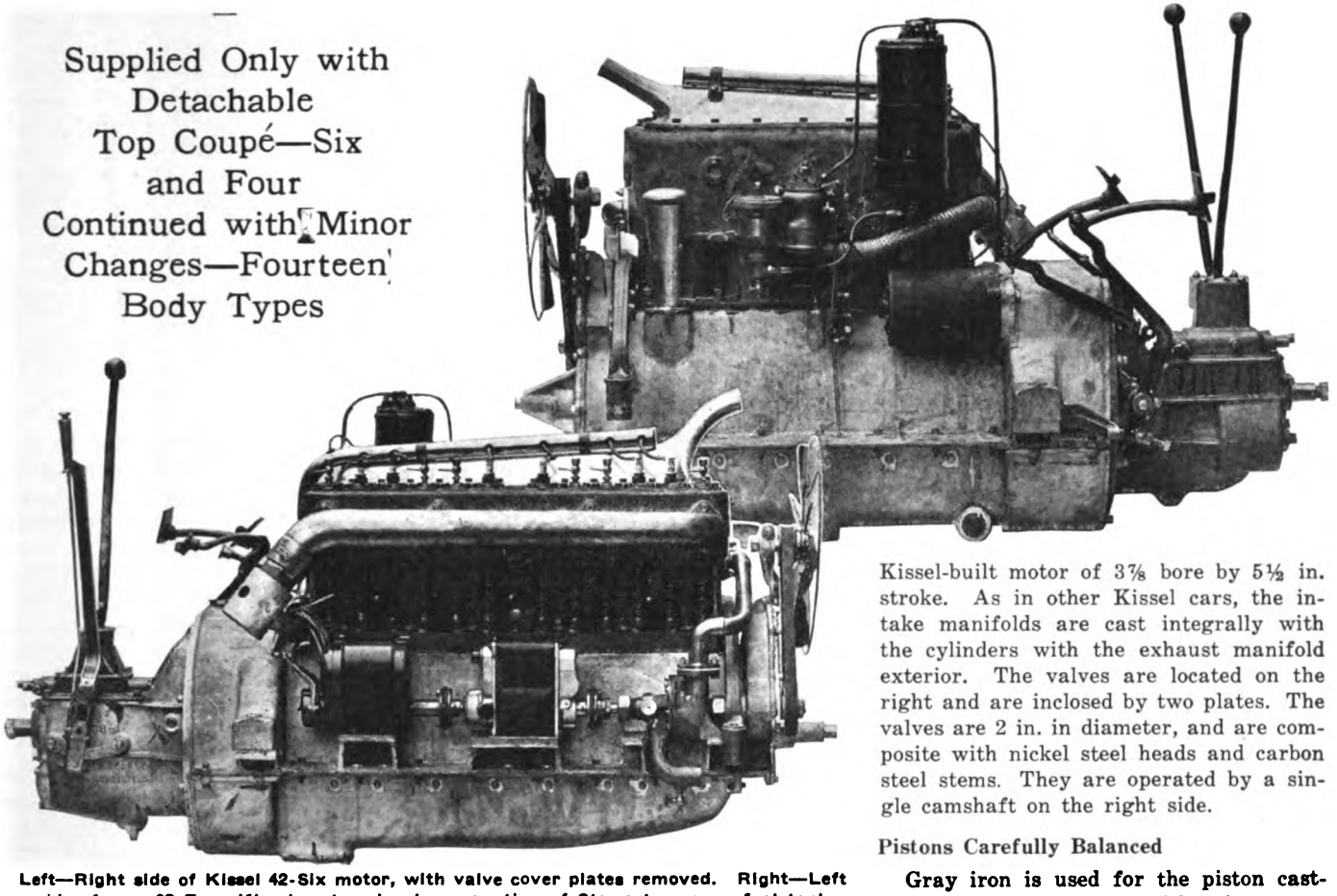


Fig. 3—Exterior view of the model O Schebler carbureter showing the points of adjustment

Kissel Adds Four-Cylinder Chassis

Supplied Only with Detachable Top Coupé—Six and Four Continued with Minor Changes—Fourteen Body Types



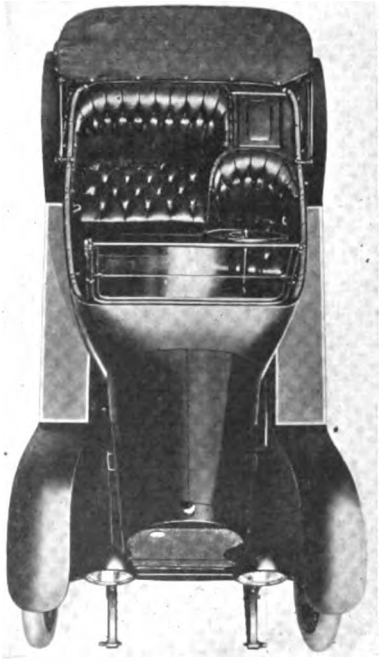
Left—Right side of Kissel 42-Six motor, with valve cover plates removed. Right—Left side of new 32-Four Kissel motor showing mounting of Stewart vacuum fuel tank

PROMINENT features of the line of the Kissel Motor Car Co., Hartford, Wis., for the 1916 season include a reduction in price in the 42-Six and 36-Four models which are continued for this season, and the addition of a new model known as the 32-Four. The all-year car which featured the line for 1915 is continued with refinements, and for 1916 combination touring and sedans or coupés may be had on any of the chassis except the new 32-Four, which is only supplied with the detachable coupé top. The prices are $1,050 for the 32-Four; $1,250 for the 36-Four, and $1,485 for the 42-Six with five-passenger touring bodies on the fours and a seven-passenger touring on the six.

The new four is entirely an added feature this season, while mechanically only slight changes have been made in the 42-Six and 36-Four models. The former has a wheelbase of 126 and a 3⅝ by 5½ motor, while the latter has 121-in. wheelbase and 4¼ by 5½ power plant dimensions.

The New Four

The new 32-Four has a wheelbase of 115 in. It is fitted with a high-speed Kissel-built motor of 3⅞ bore by 5½ in. stroke. As in other Kissel cars, the intake manifolds are cast integrally with the cylinders with the exhaust manifold exterior. The valves are located on the right and are inclosed by two plates. The valves are 2 in. in diameter, and are composite with nickel steel heads and carbon steel stems. They are operated by a single camshaft on the right side.



Kissel four-passenger, the fourth occupying a removable seat on the right. Note storage space behind driver's seat for two suitcases or other baggage or equipment to be carried

Pistons Carefully Balanced

Gray iron is used for the piston castings as for the cylinders. The pistons are required to balance within ½ oz., and the rings, three in number, are of the same grade of iron as the pistons and cylinders, although softer, so as not to wear the walls of the cylinders. The pistons are provided with 1⅛-in. wristpins, which are pressed into the pistons and secured by a set screw and nut. The wristpin bearings are Non-Gran bronze. The connecting-rods are 0.40 carbon-steel, drop forgings, of I-beam section and have their lower bearing caps secured by two 9/16-in. 0.30 carbon steel bolts and castellated nuts. Adjustments can be made at these bearings by removing shims which are placed between the caps and the connecting-rods. The bearing material used at this point is Fahrig metal, 2 in. in diameter and 2⅛ in. long.

Helical Timing Gears

For the crankshaft 0.40 carbon steel is used, the length of the shaft being 30¾ in. The front bearings are 2⅛ by 2½, the center 2⅛ by 2½, and the rear, which takes the side thrust of the starting motor, is 2⅛ by 3¾. The bearings are carried on bridges in the crankcase, which is of aluminum alloy built quite deep for rigidity. The camshaft is made integrally

with the cams finish ground, the shaft being carried on three bronze bearings and driven from a set of helical timing gears of 8¼ normal pitch mounted on a dustproof casing.

Water circulation is positive by means of a centrifugal pump, and the lubrication is carried out by a constant level circulating splash system with the oil reservoir conventionally located in the lower part of the crankcase. The carbureter is a Stromberg and the radiator a cellular Mayo.

Cranking and lighting are by electricity, the starting system being operated by closing the ignition switch and pressing the starting pedal. It is a product of the Kissel engineering force and is so arranged that when the motor is running the lamps are lit directly from the generator. At other times, the current is supplied in the usual way from the storage battery. There are two small lamps for the convenience of the driver, located under the dash, and a dimming switch is provided for the headlights.

A leather-faced cone clutch with adjusting springs under the facing is inclosed in a housing which forms an integral part in the crankcase in the rear of the motor, thus giving a unit power plant, since the gearset is contained within the same housing. The gearset is bolted directly on to the flywheel housing flange in the rear of the crankcase, completing the unit power plant. All parts run submerged in oil and transmit their drive through two Spicer universal joints and shaft to the floating rear axle. This axle is also a product of the Kissel shops. The axle is so constructed that adjustment of the pinion and driving gear can be made without disturbing any other parts. The bearings are Timken and the axle drive shaft of chrome-nickel steel with all the bearing parts running in oil.

The front axles are the same as on the other two Kissel models, being one-piece drop-forgings of I-beam section having 2½ in. depth with special steel spindles heat-treated and ground to 1-in. outside diameter and ½-in. inside diameter fitted with Timken bearings to carry the wheels. Two hardened steel bushings are pressed in each of the spindles and reamed in place to have the bearings fit on the steel knuckle bolt. The spindles are lubricated through holes drilled in the top of the steering knuckle bolts and by a grease cup near the bottom of the steering knuckles.

Both sets of brakes are carried on the rear wheels and are double external. They have 14-in. drums with 1⅞-in. face width using 2-in. lining. The wheels are artillery type with twelve spokes to a wheel. The new 32-Four has 32 by 4 demountable rims, while the larger models have 36 by 4 rims. The chassis frame is pressed steel and in the new model the sections are 4 in. deep, with 1¾ flanges and 5/32 web. The springs are semi-elliptic front and three-quarter elliptic rear.

Steering is by irreversible split-nut and worm. The nut and screw is held in a dustproof case through which grease is introduced. The control levers are mounted in the customary manner on the top of the steering wheel. The gasoline tank is in the rear of the frame, being held in place by two strongly riveted malleable iron brackets. It is of pressed steel and has a capacity of 20 gal. The feed to the carbureter is by the Stewart-Vacuum system.

New Detachable Tops

The new detachable tops are attached by bolting at ten points, at six points to the heavy steel brackets and at four points to the regular top iron of the touring car or roadster. An inverted top iron is used so that when the top is on there is no indication of the parting line between the two halves of the body. The frames of the new all-year tops are built of heavy white ash and elm with mahogany sashes. These frames are covered with sheet steel and aluminum, and the roof is three-ply white wood covered with canvas. The material and construction of the rough are such that warping is rendered practically impossible. In the outfitting these bodies are made quite luxurious, the windows and doors being French plate glass, and there are dome lights, leather trimming, etc. In finishing these bodies they are given seventeen coats and twenty-one finishing operations. The hinges are pressed steel and the lock and window fixtures are of brass.

Fourteen Body Styles

A full line of bodies with complete equipment are supplied by the Kissel company, the inclosed design being the all-year type which provides detachable coupé or sedan top, converting the touring cars to sedans or coupés, as desired. The line of bodies this year is much more complete than for 1915, as with the new model there are now fourteen body styles to choose from, whereas in 1915 nine of these were not built.

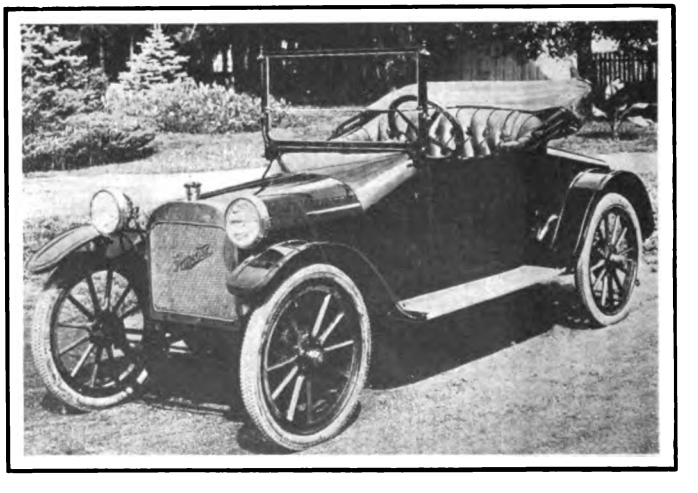
Equipment a Feature of Harvard Roadster

UNDER the name of the Harvard light car, the Pioneer Motor Car Co., Troy, N. Y., is producing the car announced in THE AUTOMOBILE for August 12 and which is illustrated herewith. The car is made with either wood or Spranger wire wheels with demountable rims for standard equipment. The motor is an L-head 2¾ by 4½ in. block with intake and exhaust manifolds cast integrally. The crankcase is aluminum. Inclosed ⅛-in. valves are employed and the carbureter is a Carter fed from a 7-gal. gasoline tank in the cowl. Ignition is by Bosch magneto.

The crankshaft is a one-piece forging carried on two bearings 1½ in. in diameter, the front one being 2 in. long and the rear 2½. The connecting-rod is an I-beam with the lower bearing Babbitt-lined 1½ by 2 in. The piston pin is ¾-in. diameter with a 1 7/16-in. bearing. Lubrication is by the splash system.

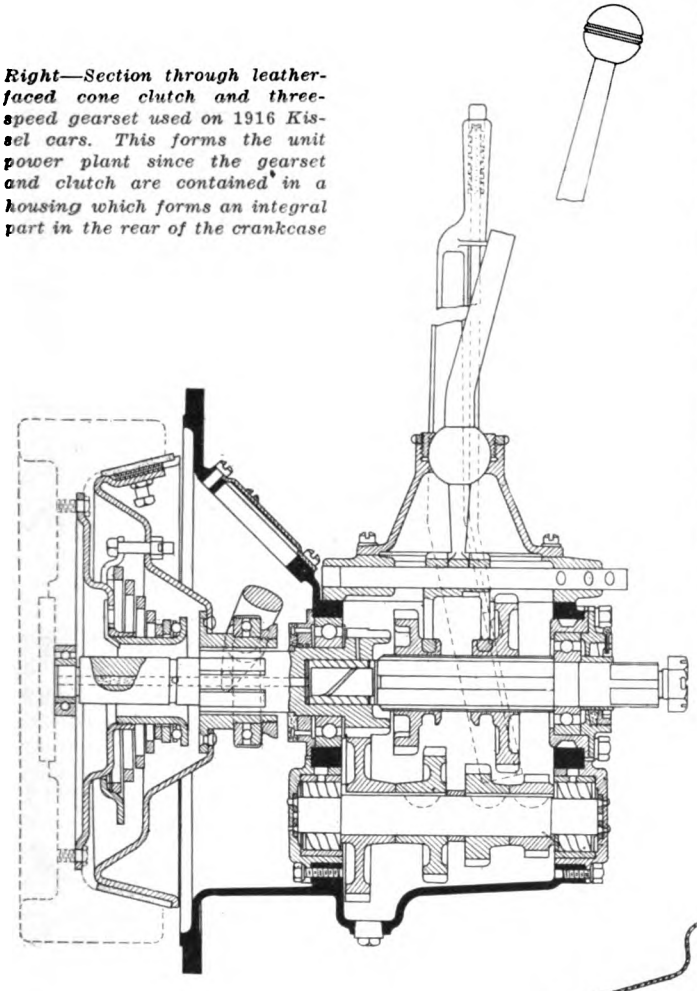
The clutch is a multiple-disk faced with Raybestos and the gearset provides three speeds. It is mounted in a unit power plant housed within the crankcase extension. From the gearset the drive is taken through a Blood Bros. universal and inclosed propeller shaft set to a roller and ball semi-floating rear axle. The springs are quarter elliptic front and rear.

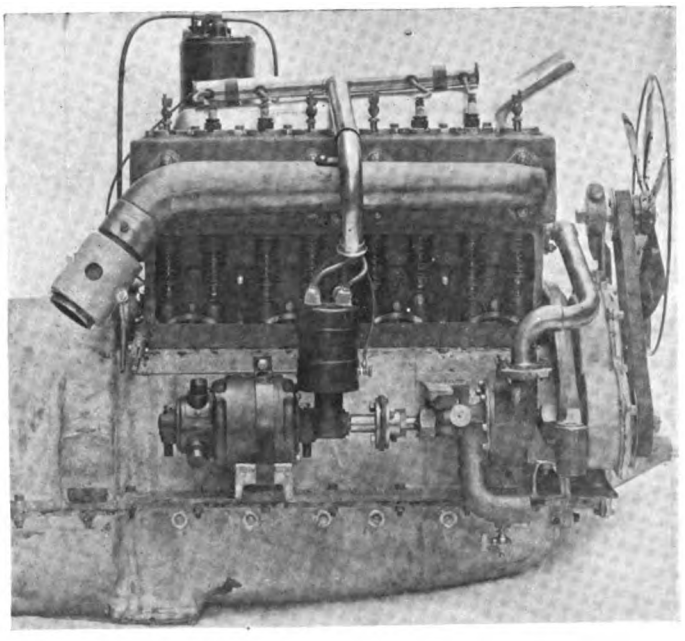
Other specifications of the car include 100-in. wheelbase, 44-in. tread, double set of brakes, sheet steel body, 28 by 3 in. wheels with clincher tires and full equipment providing electric lighting and starting, Pantasote top, Klaxet horn and a complete tool and tire equipment with speedometer, windshield, etc. The speed is given as from 4 to 40 m.p.h. and the price $750.



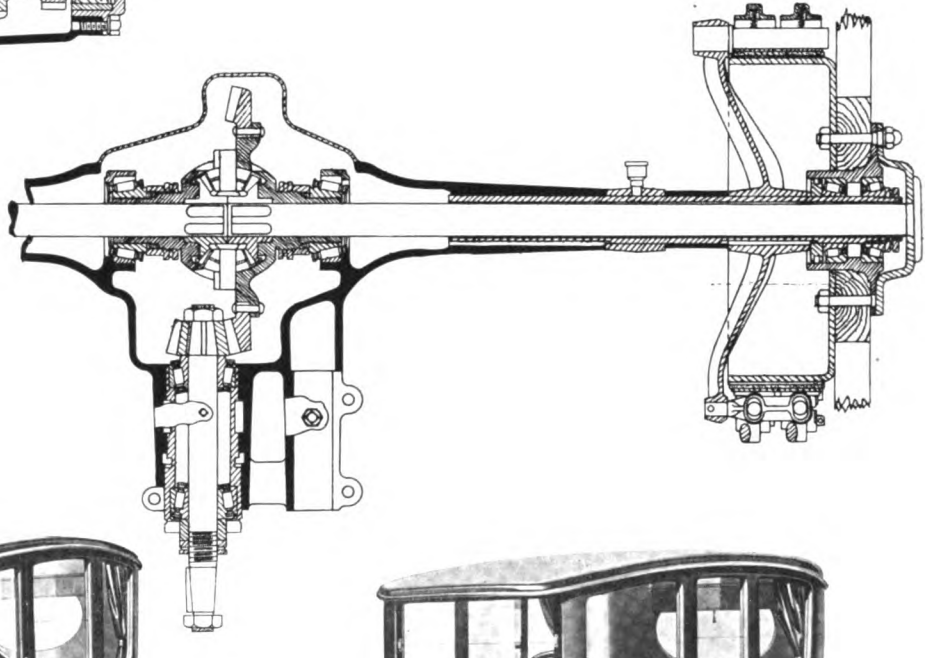
Harvard roadster which sells for $750, fully equipped

Right—Section through leather-faced cone clutch and three-speed gearset used on 1916 Kissel cars. This forms the unit power plant since the gearset and clutch are contained in a housing which forms an integral part in the rear of the crankcase





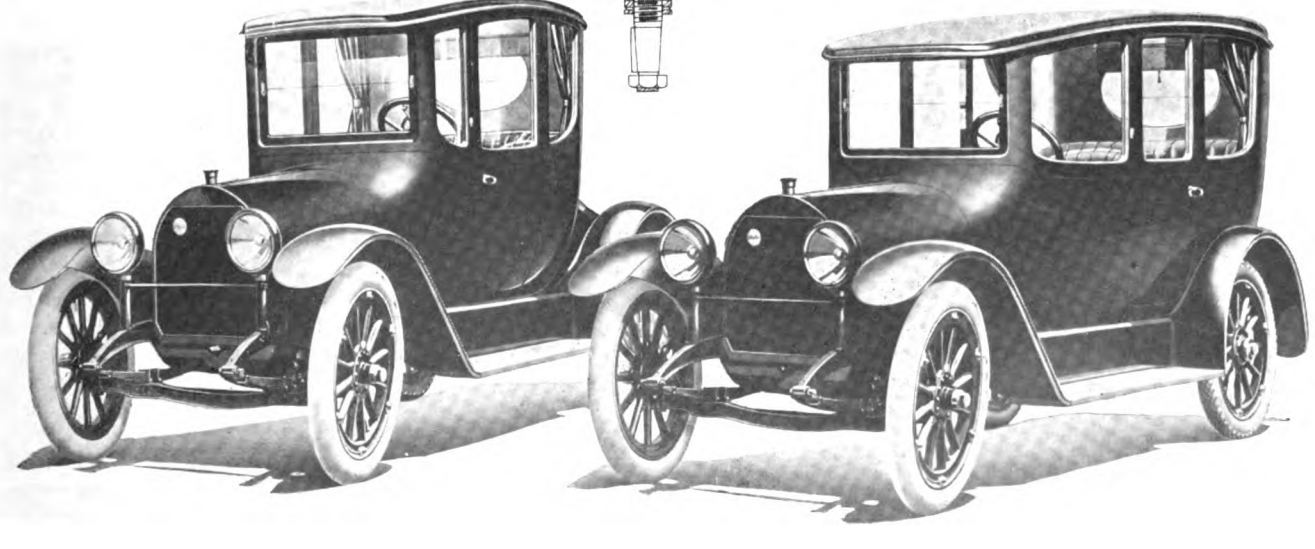
Above—Right side of new Kissel four-cylinder motor, with valve cover plates removed. Note mounting of wiring and Stewart vacuum fuel tank



Right—Section through Kissel floating rear axle. The adjustment of the pinion and driving gear can be made without disturbing any other parts

Below at left—The 36-Four roadster with detachable coupé top detached. It sells for $1,550

Below at right—Detachable top mounted on a Kissel 36-Four chassis, and listing at $1,600



Axle Design for Accessibility and Strength

Requirements of Bending Stresses, Load Carrying and Driving Torque Met by Various Bearing Arrangements —Floating and Semi-Floating the Two Basic Types

(Published in response to numerous requests for information.)

TWO important duties must be fulfilled by the rear axle of the car. First, it must sustain the weight of the rear end and, secondly, it must take the driving stresses which are developed in the propulsion of the car. These two duties are fundamental and have to do with the ability and performance of the car to such a degree that the design of the rear axle becomes of pre-eminent importance in the development of the vehicle.

Three types of axle have come to be practically universally used throughout the field of American cars during the past few years. They are known respectively as the floating, semi-floating and three-quarter floating. These axles each have inherent qualities of their own both in function and design which render them different from one another as regards their performance in the car, yet in spite of frequent explanations as regards the difference between them it is still a source of misunderstanding upon the parts of those who read the specification tables with an idea of learning something about the car which they intend to purchase.

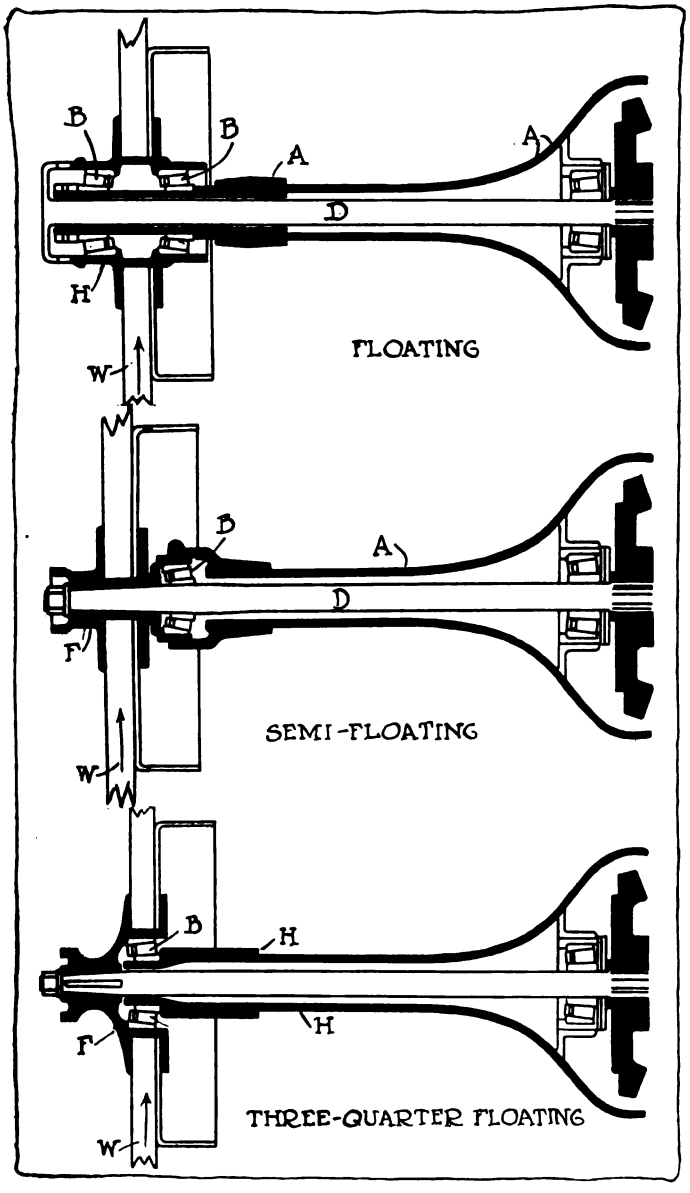


Fig. 1—Diagram showing principles of construction in Timken floating, semi-floating and three-quarter floating design

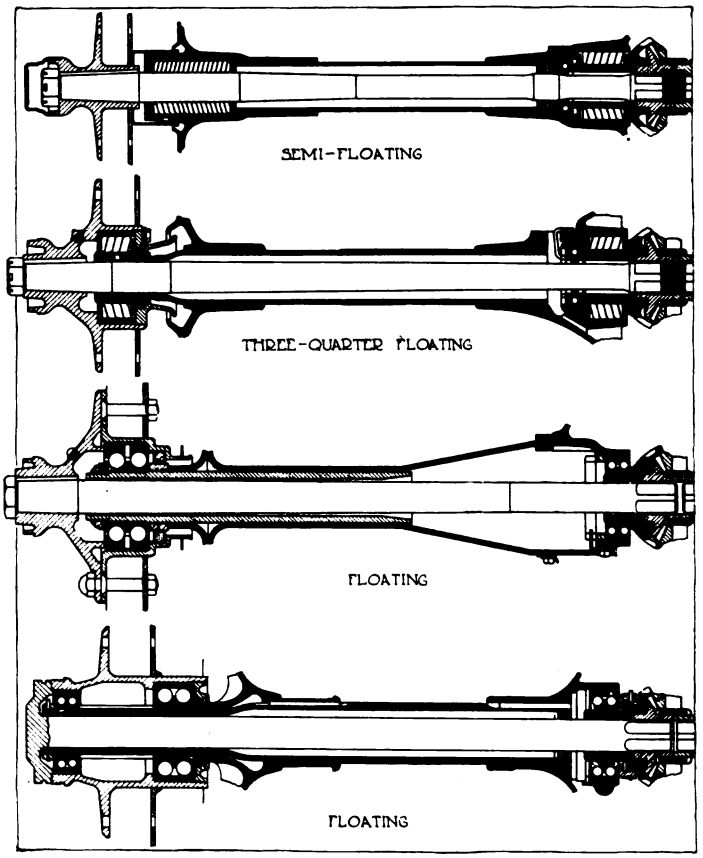


Fig. 2—Four representative types of Weston-Mott rear axles

Fundamentals of Design

In studying the fundamentals of design of the different types of axle it will be noted that the differences have been caused mainly by two desires: First, to separate the weight carrying and propulsion and bending stresses, and secondly, to make the axle accessible. Strength and accessibility have been the two main requirements and an investigation will show how they are met in each type.

The practice of naming the type of axle in the specifications of the car has often caused the non-technical owner to wonder what is really meant and also owners who, technically

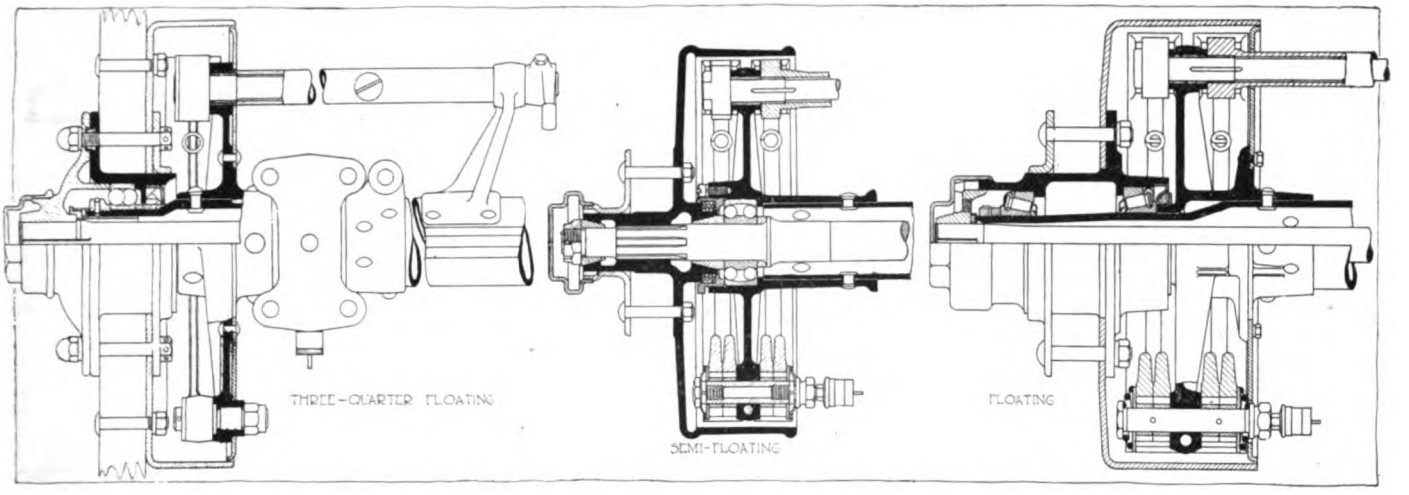


Fig. 3—American Ball Bearing Co.'s three-quarter, semi and floating rear axles showing bearing arrangements at hub

informed on other parts of the car, are not clear as to what the difference in construction really means. The Timken Axle Co. has provided diagrammatically an example of all three types from which it is very easy to see the fundamental differences. These three are shown in Fig. 1. The upper illustration being that of a floating axle or as it is sometimes called, full-floating; the center figure is a semi-floating and the lower figure is three-quarter floating.

Studying these three diagrams the differences of construction are immediately brought out and bearing in mind the statement that the axle has two important duties to perform, the reason for the existence for each may be found. Taking the floating axle first, and studying it from the standpoint of a weight carrier, it will be noted that the force *W* which represents the reaction of the ground upon the wheel in supporting the weight of the car, is transmitted through the wheel to the hub *H* and thence to the axle housing *A* through the bearings *B*. It will be seen that the driveshafts *D* do not carry any of this weight.

Observing this axle from the other standpoint, that of a driving mechanism, it will be seen that the driveshaft *D* has nothing to do but to transmit this torque to the road wheels. From this the axle secures its name floating, as it is free within the housing. When rounding a corner there is an enormous bending stress on the rear wheels and none of this stress falls upon the driveshaft but instead is transmitted through the bearings *B* to the housing *A*. In other words, every stress that the axle is called upon to endure save that of driving the wheels in propelling the car is taken by the axle housing.

The Semi-Floating Type

In the semi-floating axle a different set of conditions prevail. Here it will be noted the rear wheel in carrying the load *W* transmits this load through the flange *F* to the shaft *D* through which the load is transmitted by the bearings *B* to the axle housing *A*. A certain amount of the load carrying stress is borne by the driving shaft in this type of axle, as the portion which extends beyond the bearing *B* is fixed in the hub of the wheel and hence must receive the load. In transmitting the driving stress or torque, the driving shaft turns freely within the housing, the drive being through a connection of the shaft and the hub to which it is fixed. The

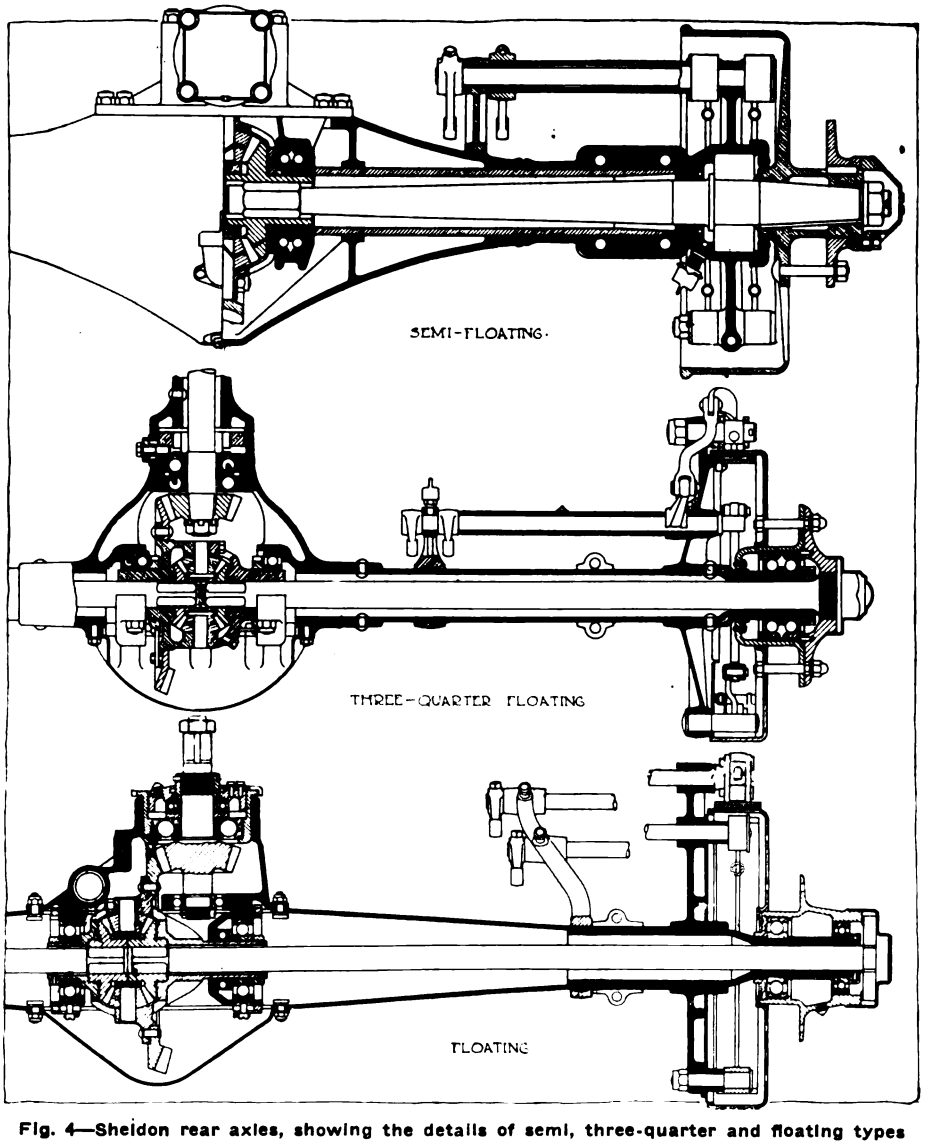


Fig. 4—Sheidon rear axles, showing the details of semi, three-quarter and floating types

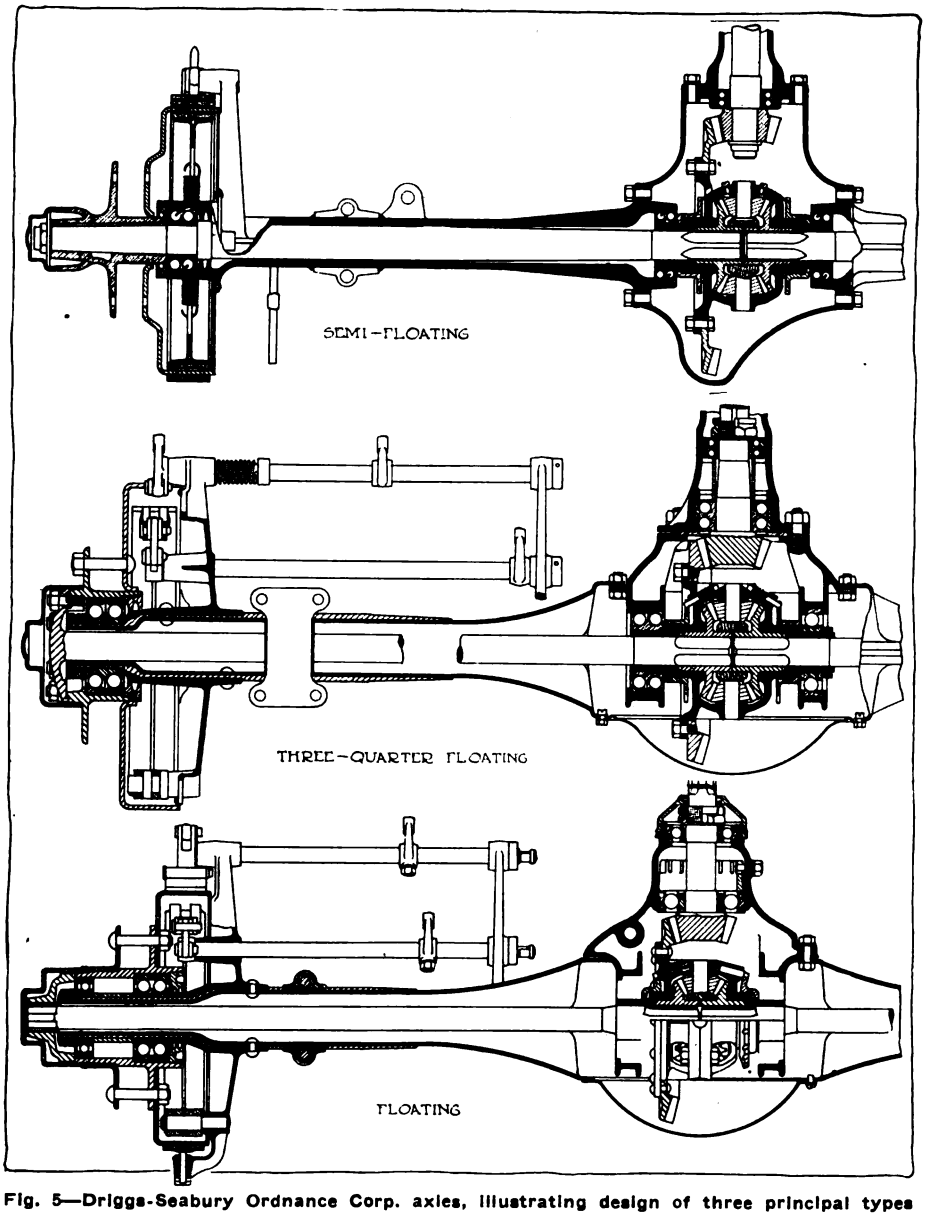


Fig. 5—Driggs-Seabury Ordnance Corp. axles, illustrating design of three principal types

bending strains are also received by the portion of the axle which projects beyond the bearing *B*.

The Three-Quarter Floating

The third type of axle, the three-quarter floating, employs the construction which is in many respects closely similar to the semi-floating. The load stress *W* is transmitted directly through the flange *F* to the bearing *B* and the housing *H*. Practically all the weight, therefore, is transmitted to that portion of the housing which extends into the hub. The bending and driving stresses are taken practically entirely by the drive shaft, some of the bending possibly being absorbed through the housing. Where a single bearing is used under the center of the wheel the disposition of the stresses becomes practically the same as in the semi-floating axle.

Advantages of Each

These are the three methods used to meet the requirements demanded of an axle and from what it has been said, the advantages of each type are quite evident. In the floating design, the shafts can be easily removed for repairs, all it is necessary to do is to withdraw them from the housing by pulling them out. Thus the claim of accessibility is that most frequently mentioned in connection with floating axles.

The claim for the semi-floating and three-quarter floating is that they can be made to accomplish the work readily although having lighter proportions. The reason for this is apparent when the wheel bending or skidding stresses are considered. The bearings which take the stress caused by rapidly rounding a corner in the floating axle are those on either side of the wheel mounted upon the housing. Since these are located in this particular position, they must be fairly close together, requiring good bearing strength to compensate for the large moment which is exerted against them.

In the other type of axle, where the bending stress is taken through the driveshaft, it will be seen that the axle shaft tends to fulcrum about the outer bearing and to rest against the inner bearing in meeting the stresses. In other words, the inner bearing is the power in a lever of the first class which fulcrums about the outer bearing for the purpose of withstanding the bending stresses. Both bearings do the work. The resistance to the load on the outer bearing is taken in the same way as a man lifting a heavy stone by means of a crowbar, resting the bar over a small rock as a pivot and pressing down on the handle. The analogy is complete if the load to be lifted is considered as the bending force on the wheel, the small stone acting as a pivot or fulcrum is the outer bearing, and the force applied on the handle of the crowbar is the same as that applied by the inner bearing on the inner end of the driveshaft.

All Types Manufactured

These are the two schools of axles which broadly cover all three types. They are all satisfactory and do their work in the manner intended, and it is found that most axle factories make all three types to suit the wishes of their customers, which are largely the factories turning out the finished cars.

To give examples of the different kinds of axle and the methods by which prominent manufacturers meet the peculiarities of design necessary with the different types of construction, details of the Weston-Mott, American Ball Bearing Co., Sheldon and Driggs-Seabury axles are illustrated.

Weston-Mott Construction

In Fig. 2 the axles made by the Weston-Mott Co., Flint, Mich., are shown. The upper view illustrates a typical semi-floating design carried on roller bearings. Below that is a three-quarter floating design with the bearing mounted in the hub as described in previous paragraphs. The upper floating design is a single bearing outfit which is similar in many respects to the three-quarter floating, having the bearing in the hub of the wheel. In other words, it forms a sort of compromise between the three-quarter floating axle illustrated above and the floating design shown below. It is claimed that this type of axle has all the advantages of the floating design with the only exception that the axle shafts help to steady the wheels in connection with the hub bearing against bending stresses. The shaft can be removed without jacking up the car.

The construction of the product of the American Ball Bearing Co., Cleveland, Ohio, is shown in Fig. 3. The three-

quarter floating is shown to the left and, as will be noted, a single bearing of the double row self-aligning type is used here. It is mounted on the axle tube which thus carries most of the weight of the car. The semi-floating is in the center and is also provided with a single double-row self-aligning bearing which in this case is mounted directly on the shaft. The floating design has the hub carried on two taper roller bearings mounted on the axle tube as far apart as possible to provide the resistance to bending stresses caused by ruts, curves or curbs.

Sheldon Axle Practice

Referring to Fig. 4, the products of the Sheldon Spring & Axle Co., Wilkes-Barre, Pa., are shown in section. The top drawing is the semi-floating axle. The driveshaft carries the load of the vehicle besides the driving and bending strains and is securely fastened to the hub, thus guarding against the development of looseness at the rear wheel which consequently shows itself in the wobble of the rear wheels. The bearings which support the axle shaft are shown. The outer bearing is not shown in section but may be noted just inside the wheel flange. The inner bearing is shown in section and is just outside the differential. The bearing spread, as will be noted, is practically half the width of the car.

The center drawing in this illustration is the Sheldon three-quarter floating. In this the driving axle not only takes the driving or torsional strains but also maintains the alignment of the wheels. Here it is seen a large bearing and a heavy shaft are used to take care of the conditions which arise with this axle. The bearing must carry all the stresses due to pressure on the rim of the wheels and therefore is of good size.

The lower drawing shows the Sheldon floating design. The outer extremity of the axle tube supports the entire weight of the car through the two annular ball bearings in each hub mounted on the tube. The bearings, as will be noted, are designed to take care of the bending stresses by being heavy although close together as in all axles of this type.

Driggs-Seabury Axles

In Fig. 5 are shown the three types of axle as manufactured by the Driggs-Seabury Ordnance Corp., Sharon, Pa. The upper view showing the semi-floating design illustrates an axle which is typical for this class. This type of axle is used on cars from the cheapest to the most expensive, the axle consisting of a shaft squared or splined at the inner end and the outer extremity mounted in a bearing at the end of the axle tube. While this type of axle is not so accessible as the floating it is easy to remove by first taking off the wheel and then the bearing retaining nut. In other designs for all priced cars as a rule, it is sometimes necessary to remove the entire axle from the car, taking the bolts out of the center housing flange, removing wheel and then disassembling the differential, etc.

According to the Driggs-Seabury Co., this type of axle will rarely give trouble if designed with a factor of safety of 8 to 10. This would provide a large diameter of shaft in the outer bearing tapering toward the inner end where the shaft fits into the differential and reduced again at the outer end to take the taper of the wheel hub.

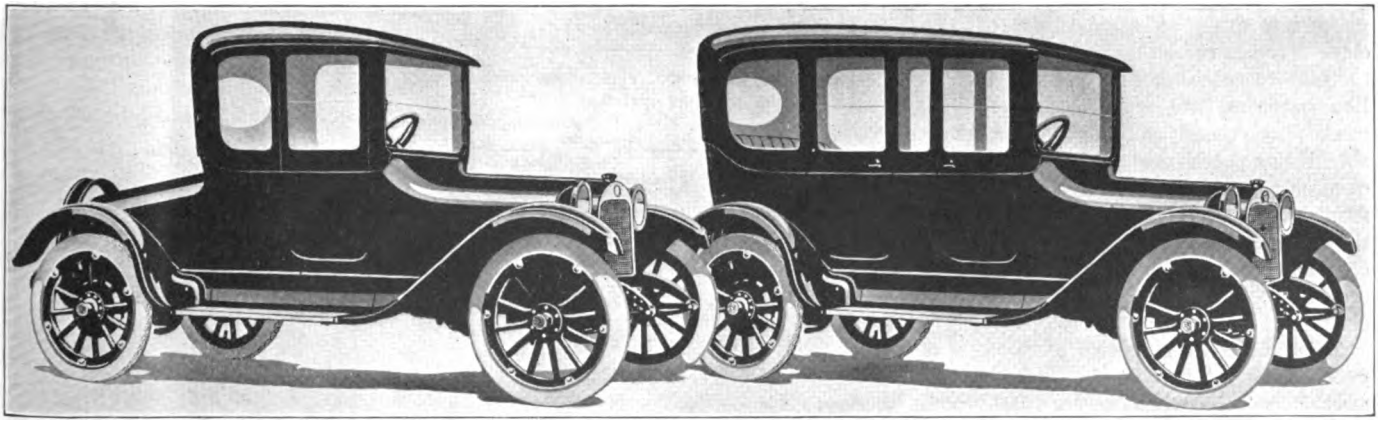
The three-quarter floating is also a typical design of its class, and with this type to remove the axle the bolts are taken from the axle flange and the axle drawn from the housing without jacking the car. The axle flange can be either forged integrally with the axle or be a separate flange, drawn up on key and taper formed on the axle.

The floating axle shown at the bottom of the illustration is mounted in the usual manner on two bearings on the axle tube. It is self-sustaining for both radial and transverse loads, with or without axle shafts in place. Hence the car could be held any distance with the axles removed. The claim of accessibility possessed by this axle is its strong point and, as may be noted, the axle shaft can be drawn directly from the housing.

The entire axle situation is one of interest as it is a part of the car which it is desirable to have as immune from breakdowns as possible, and it is one upon which a great amount of study has been put for this reason. As regards the desirability of the types there is still a difference of opinion with most engineers leaning toward that type in which the bending stresses are taken care of by a wide bearing spread.

An interesting view held by some is that there are no full-floating types of axle on the American market. According to these engineers, the average American's idea of a full-floating axle is one in which the driveshafts can be removed without the necessity of taking off the wheels. This, it is pointed out, is erroneous, as in an axle which has the driveshafts rigidly bolted to the wheels no floating is possible, whether the axle shafts are mounted in the housing or not.

Dodge Bros. Bring Out Demountable Tops for Touring Car and Roadster



DETROIT, MICH., *Sept. 4—For the winter trade Dodge Bros. are now beginning to supply their distributors and dealers with the first of the new winter cars. As far as the chassis, motor and other constructional features are concerned, there is absolutely nothing new from the current Dodge model. The novelty consists in a demountable top which is furnished in addition to the regular roadster or touring body. This top is attached to the car body and does not disturb in any way the windshield. It can be entirely removed in summer and the ordinary mohair top, which is furnished as a part of the regular equipment with the winter car, substituted. A semi-open car can be made out of the winter car by removing the window glasses, side panels, front posts, etc. Either with a roadster or touring body the winter Dodge car will be sold with the usual complete equipment at* $950.

ACCESSORIES

Heco Horn for Fords

A SPECIAL vibrator horn for the Model T Ford car is the Heco. This horn utilizes the power generated by the flywheel magneto of the Ford and the connections are made as shown in the illustration. One wire terminal connects to the magneto and the other is grounded. As no two flywheels generate exactly the same amount of current, it might be supposed that the tone of the horns will vary with the car on which each is installed. To overcome this difficulty, the Heco has been fitted with a special adjustment for equalizing the energy developed from the magnetos, and is said to produce a uniform sound volume, no matter what the current supplied.

Strong claims are made for the extreme simplicity of the horn, which consists essentially of a magnetic vibrator which strikes the sound diaphragm to produce the sound. All vibrating points are made substantially of tempered tool steel against wear.

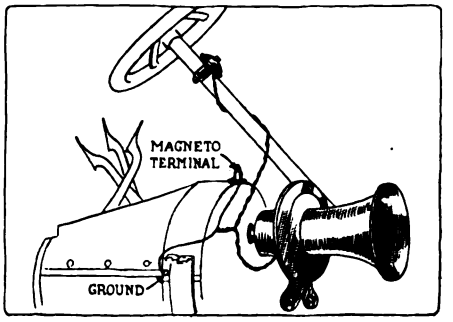
The horn is supplied complete with push button, wiring, screws and directions for attachment. Once the horn is in place it is a simple matter to adjust the tone to the desired pitch. After making the simple connections shown in the sketch, the engine is started running, and the push button held down. While doing this the milled adjusting nut on the rear of the horn is turned until the tone suits the user. The price of this horn is $3.50.—Heinze Electric Co., Lowell, Mass.; sales offices, Detroit, Mich.

Vanguard Windshields for Fords

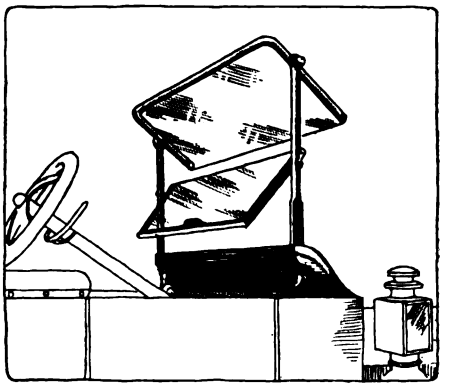
To improve the appearance of the older Ford cars with straight dash and to get away from the abrupt transition between body and hood, the Vanguard rain-vision and ventilating windshield has been designed. With it is combined a cowl shield to fit over the front of the top of the body, thus giving the appearance of a cowl dash. This combination is called the DeLuxe cowl shield for Fords and sells for $15 for either touring car or roadster.

This shield, for which patent was granted Dec. 29, 1914, is made in two sizes, one 42 in. wide for the 1913 Model T Ford, and the other 40 in. wide for the 1914 model as well as all the 1915 Fords that came equipped with the zig-zag shield. Like all rain-vision and ventilating shields, the upper half can be adjusted to any position and locks automatically, while the lower half opens inward as desired. A rubber weather strip, attached to the botom rail of the shield, makes the lower half rain and wind proof.

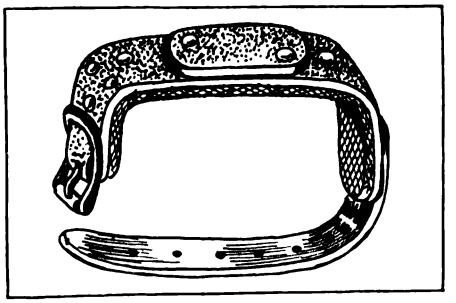
The cowl and metal parts are finished in black enamel and nickel trimmed. The attaching brackets and clips are adjustable. It is claimed that anyone can attach the device in a short time. — Vanguard Mfg. Co., Detroit, Mich.



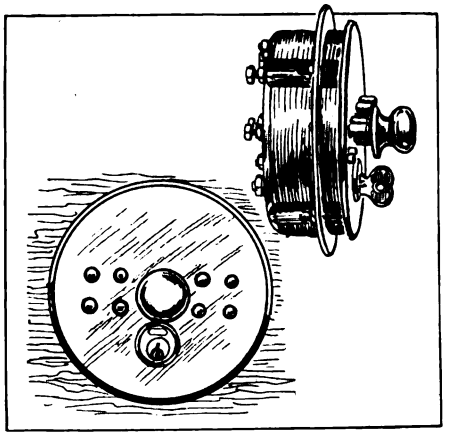
Heco magneto-driven fan for Fords, showing wiring connections



Vanguard windshield and cowl dash for Fords of the older type with straight dash



Leather Tire Goods Co. strap-and-pad oiler for leaf springs



Strap-and-Pad Spring Oiler

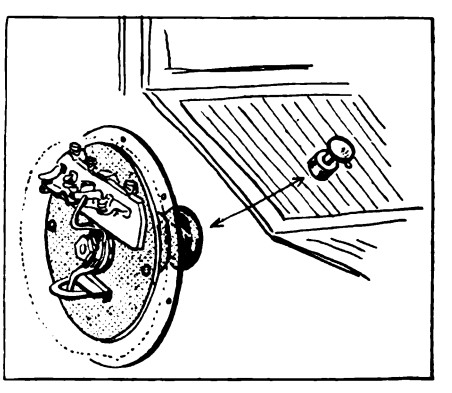
This is a leather strap passing around the leaf spring and held by an ordinary buckle, the strap being lined with a pad of wicking which retains oil and feeds it out to the interstices between the leaves. A hole in the strap is provided for inserting the oil-can spout to recharge the pad; a leather cover excludes dust and though it is stationary, the can spout is easily pushed under it. The leather is treated to prevent oil absorption. Two straps are required for each Ford spring, two for a semi-elliptic and four for a full elliptic spring. Price 25 cents each.—Leather Tire Goods Co., Niagara Falls, N. Y.

H-P-B Dimmer Switch

A dimming switch designed for installation on the dashboard so that it can be operated with the foot, obviating the necessity for taking the hands from the steering wheel is the H-P-B. The lights may be dimmed by throwing them in series or by connecting a resistance in the circuit, the switch being adapted to either arrangement. Installation is a simple matter. Price $2.—H. P. B. Electric Co., Inc., New York City.

Pittsburgh Five Searchlight

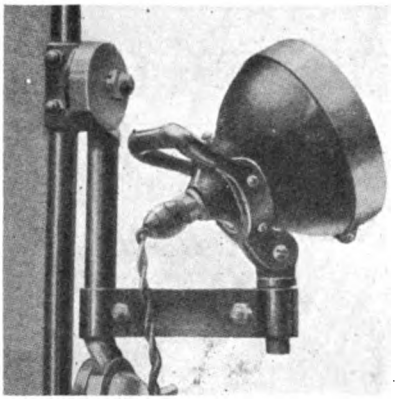
The Pittsburgh Five searchlight is provided with an outside set screw focusing adjustment, which permits the use of any style lamp, either Mazda or nitrogen, regardless of size or voltage, and makes it possible to adjust the lamp instantly for any kind of beam without disturbing it in any way or removing it from its position. Due to this accessible adjustment, the lamp may be transferred from one car to another of different



Above—H-P-B foot-operated dimming switch
Left—Two views of the H-P-B circuit lock

voltage at will. It also enables the user to select a bulb to suit his requirements and in case of accident to use any available bulb as a renewal. Should it become necessary to use the searchlight to take the place of the headlight, the width of the illuminated field can be increased as desired.

Another feature is the double curvature parabolic reflector which though only 5 in. in diameter is said to produce as much beam candlepower as any large headlight, with even distribution of light. The handle serves as a stand for holding the lamp in an upright position when detached for repairing tires, etc.—Pittsburgh Electric Specialties Co., Pittsburgh, Pa.

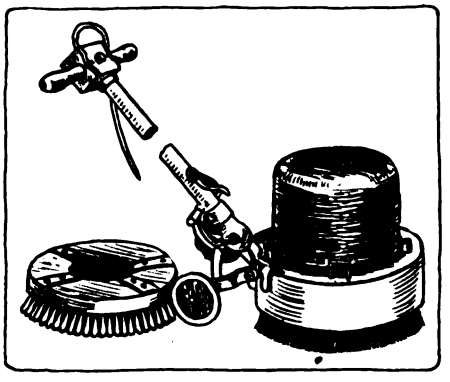


Pittsburgh Five searchlight which is easily adjustable for varying voltages

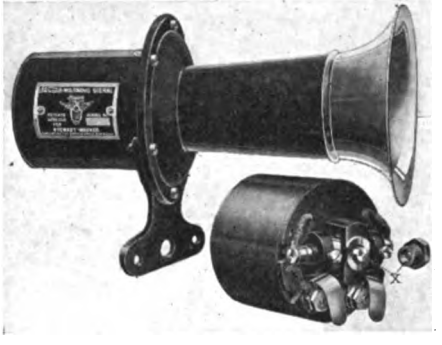
Stewart Motor-Driven Horn

A motor-driven warning signal is the latest addition to the Stewart accessory family. The motor is very simply arranged, with the ratchet rotor on the end of the armature shaft and bearing directly against a stirrup on the diaphragm. This arrangement provides a very simple and direct mechanism for producing the sound. A feature of the instrument is that the motor is completely assembled in itself and can be slipped directly into the housing of the warning signal. With this arrangement, the bearings are always in alignment and the friction and resistance are cut to a minimum. The front bearing at the rotor end is a bronze bushing while at the other end there is a ball thrust *X* as shown in the illustration. The lubrication of the instrument is taken care of by a ball oiler which provides a passage directly to the armature shaft.

Some of the advantages claimed for the instrument by the manufacturers are light weight, high speed with small amperage, water-tight winding, firm fastenings to resist centrifugal force, hard drawn copper commutator and the winding which is so arranged as to provide maximum saturation of the fields. The tone of the signal may be adjusted by a sounding button in the center of the diaphragm. The button provided with the warning signal is quite large, being mushroom like in shape and covering the entire top of the holder so that when it is desired to press it, there is no danger of merely pressing on the switch frame. Price, $7.50.—Stewart-Warner Speedometer Corp., Chicago, Ill.



Utility floor machine which is electrically operated and is especially suited to cleaning garage floors



Above—The new Stewart motor-driven horn which sells for $7.50. Below—Part section of the motor which drives it. X is a ball thrust

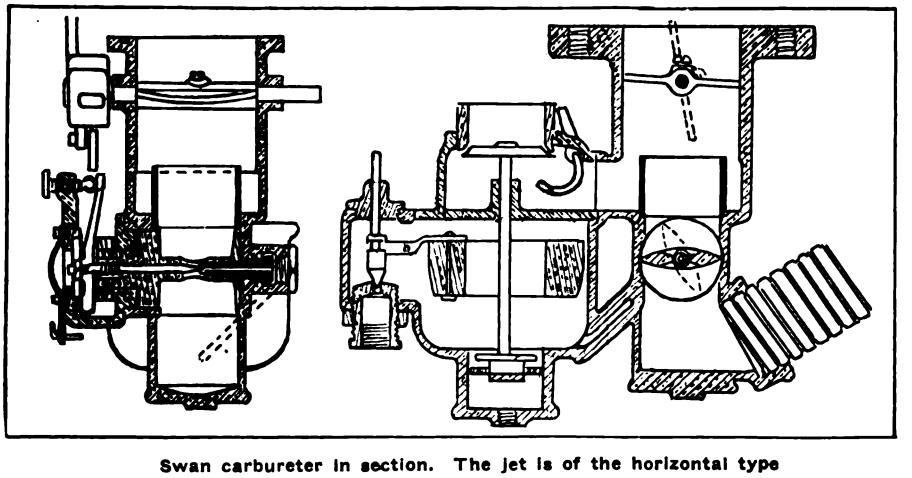
Utility Floor Machine

An electrically operated apparatus which scrubs floors at the rate of 2000 sq. ft. per hour and polishes waxed floors at 2500 sq. ft. per hour is the Utility floor machine. This will scrub, sandpaper, polish and otherwise treat floors of all kinds, being provided with a steel wire brush for rough surface floors, a palmetto brush for the smoother variety and a black tampico brush for polishing wax surfaces, with a sandpaper disk for wood and cork tile floors. The Utility machine is especially suited to garage work, as it cleans the most difficult floor surface in a thorough manner, and an ordinary porter can quickly learn to operate it.

For scrubbing, the cheapest of pure grit powders costing about 1¼ cents per pound can be used. The machine carries a 1/6-hp. motor and drives the brushes through reduction gears. Four types of motors are built, 110-volt alternating, 110-volt direct, 220-volt alternating and 220-volt direct; the alternating current motors are for 60 cycles, single phase. Control is by a flush switch in the tubular steel handle which has a toggle joint and adjustment so that the operator may vary the angle. Ball bearings are used throughout and the weight is but 45-hp. Current is obtained from any lamp socket.—Vacuna Sales Co., New York City.

Swan Carbureter

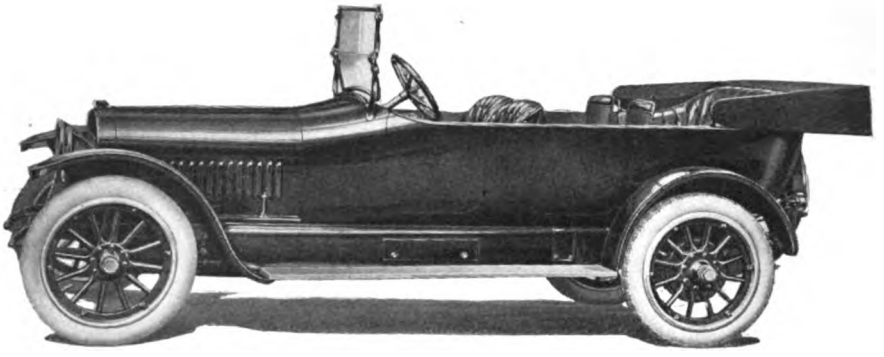
Accurate adjustability and simplicity of construction are the main feature of the Swan horizontal jet carbureter. The float chamber is offset from the mixing chamber; a single passage carries the fuel to the jet which is horizontal and opens into the middle of the mixing chamber and is controlled by a needle-valve projecting from the opposite side of the mixing chamber and interconnected with the throttle. Thus the gasoline supply is increased or diminished with the throttle opening. The air passage at the nozzle is sufficiently high to break up the gasoline. An automatic valve above the float chamber supplies auxiliary air, the auxiliary valve stem being extended downward and terminating in a piston which works in a dashpot in the bottom of the float chamber, preventing fluttering and too rapid opening and closing. The ratios of openings are adjustable and the gasoline flow can be adjusted to any throttle opening. A special model is made which is adapted for use on Ford cars.—Swan Carbureter Co., San Francisco, Cal.



Swan carbureter in section. The jet is of the horizontal type

Davis Line Is Four, Two Sixes and Twelve

New Bodies the Feature— Design of All Cars Similar — Continental Motors Used— Revised Four $70 Lower in Price



Davis six-cylinder, seven-passenger touring car which sells at $1,495

THE George W. Davis Motor Car Co., Richmond, Ind., will continue to market a line of cars made of standard units but for 1916 the bodies are entirely new on all models, and one of them, the four-cylinder, has received slight changes otherwise, and a price reduction of $70, making it $1,165. The model 6-50, which was listed at $2,150, has been discontinued. The 1916 line consists of the improved four, a five-passenger six at $1,250, a seven-passenger at $1,495 and a twelve in the same chassis at a price under $2,000, but as yet undecided.

Design of All Models Similar

All Davis cars are alike, insofar as the make and design of their component parts are concerned, the motors being Continentals, the clutches and gearsets Warner-Muncie, axles Weston-Mott, universals Hartford, steering Warner, etc. The differences lie mainly in the dimensions. The $1,250 six has a 120-in. wheelbase, 34 by 4 tires and a 3¼ by 4½ motor, while the larger six has a 3½ by 5 motor, 124-in. wheelbase and 34 by 4½ tires.

Four Has Delco System

The improvements in the four-cylinder model consist of the adoption of Delco cranking, lighting and ignition, the shifting of the fuel tank from under the seat to the rear and the fitting of a Stewart vacuum gravity gasoline feed, a new windshield and one-man top, a new type of rear axle and a new body. The wheelbase remains at 112 in. and tires 34 by 4.

It is in the Davis bodies that a departure has been made from ordinary practice. The front seats now are divided and both seats are movable, that for the driver being mounted on a track, so that the seat may be slid back and forth to meet the driver's needs and that of the other passenger is mounted on a revolving base. This makes a most convenient arrangement, for the front seat passenger may turn his seat in any direction from straight forward to backward.

Bodies are Roomier

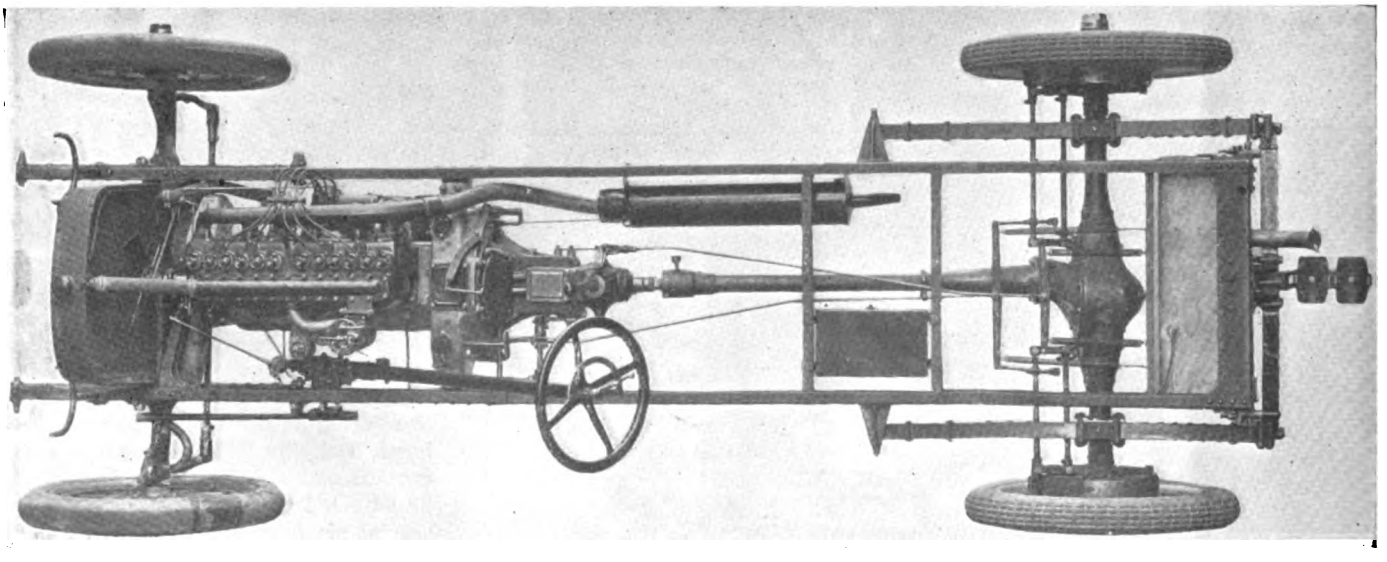
The bodies are roomier than those of 1915, have better lines and use metal molding instead of wood. The doors are flush and now are hinged at the forward end. A new Neverleek top with Handy curtains, made by the Davis company, is used.

The five-passenger six uses the new model 7W Continental motor. The motor accessories are a Stromberg model HB carbureter, Delco electrical apparatus and Stewart fuel feed. The power plant uses a cone clutch and three-speed gearset driving a shaft, with Hartford universal joints to a floating type of rear axle.

The larger six has exactly the same design of units but uses the 6N Continental motor and running gear parts of larger size and greater strength.

Twelve Like Bix Six

The twelve-cylinder model will be exactly like the large six except, of course, for the motor, which will be a Continental 3 by 4 with valves in the head. Details of this motor have not yet been made known.



Chassis of Davis six for 1916, showing mounting of the new Continental motor with Delco electrical units

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, September 9, 1915 No. 11

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

A Battery Alarm

IN not properly attending to their cars many motorists are extremely remiss, though they are much better mechanics on the average than many people would have it believed. Judging by the comments of service men, it seems that one of the most frequent lapses on the part of owners is that of forgetting the need to add water to the storage battery except at too rare intervals. It is a natural enough mistake, because the battery is commonly so well concealed that, so long as it continues to do its work, its very existence can be forgotten, and the modern storage battery will withstand an amount of ill usage which is amazing when the shortcomings of the ignition batteries of 1906 are remembered.

Since it seems that this neglect to water the battery is really somewhat serious as a service trouble, it suggests the opportunity for some ingenious inventor to devise a simple and inexpensive attachment which will automatically call the attention of the driver, as soon as the water level falls too low. It ought not to be difficult to find some fitting which would sound a buzzer intermittently, or even a purely mechanical warning should be possible in connection with some sort of float mechanism. Of course it may already have been done, but if so why has not the device become part of every electrically equipped automobile? This is a condition which should have been attained long since in this era of refinement.

A Wider Range of Bodies

ONE striking feature of the announcements of new cars is the increasing tendency toward a rounded-out line of body types. A number of instances might be cited where prominent makers who several seasons ago—in some cases not over a year ago—offered only two body types on their chassis, have for 1916 increased the body line to include inclosed types as well. Several quantity producers have even gone so far as to offer what might be termed all-year cars, with convertible touring and roadster bodies.

The average automobile buyer is not able to have two or more cars. Thus there is a large field in cars which can be opened up sufficiently to be considered as open cars for summer driving in good weather, and which can be readily changed to closed types for winter weather and for rainy days. The most noteworthy point about this convertible scheme is that the manufacturers are able to offer such models at only slight increases in price over the open models.

The movement should serve to extend the usefulness of the average man's car, making winter driving less the privilege of those who can afford limousines and other inclosed types for winter use alone. It is just another step, going hand in hand with the general reduction of prices, in the increasing of automobile democracy.

Stowing Tools

A FEATURE wherein the majority of automobiles are deficient is in the provision of storage space for tools and simple spares. Of course, tools are not needed very frequently, but this is no argument for putting them away in places where they are difficult of access. The motorist of experience usually carries some half-dozen tools which he finds are needed most constantly in the pocket on one of the doors, and the example of a few makers in fitting up a door flap to cover a regular small tool rack is very much to be commended. It costs very little and it saves hours of the driver's time in an ordinary year of use.

Tools for operating demountable rims, for changing a spark plug or for opening up a carbureter to clean it out, ought to be as handy as possible, because they are always wanted sooner or later, and when they are wanted it is usually in a hurry. The big, heavy tools like hub cap spanners and such spares as valves, which are needed very seldom, may be stowed away anywhere as long as they are prevented from rattling, but the little things which form the most important part of the kit should not be jumbled up together in an untidy heap beneath one of the seat cushions. In these days of complete equipment there is no excuse for the absence of a proper tool and spare cabinet.

Another point which might be touched upon in this connection is the lack of provision for preventing rattling of the tools. Some makers provide wooden racks for this purpose but these are usually inadequate to accommodate the additional tools which most automobilists consider necessary.

703,527 Cars Built in Past Year

665,826 Passenger Cars and 37,000 Trucks Valued at $523,463,803

NEW YORK CITY, Sept. 4.—Continued demand for automobiles and trucks in this country and abroad has brought a remarkable increase in sales, the statistics for the past year, as compiled by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, Inc., showing the production to have been 703,527 cars, valued wholesale at $523,463,803, which is an advance of 36 per cent in the number of cars and more than 10 per cent in value over the previous twelve months.

Sales of passenger cars of all types to June 30, which is the end of the year in the industry, were 665,826, for which the manufacturers received $450,941,131, while the sales of commercial vehicles of all types are estimated at 37,700, valued at $72,522,692. The figures for twelve months ending June 30, 1914, were 515,101 cars, passenger and commercial, valued at slightly more than $485,000,000.

It will be noted that while the number of cars increased 36 per cent, the value increased only 10 per cent, indicating the greater value the makers have been giving purchasers as manufacturing costs were brought down and fewer changes were made in chassis construction.

Franklin to Increase Production to 4,500 for 1916

SYRACUSE, N. Y., Sept. 7—The H. H. Franklin Mfg. Co., this city, will increase production above original estimates. The company planned at first to turn out 3800 of the 1916 cars, an increase of 35 per cent over the previous year. This production will be increased to 4500 cars, or 1700 more than last year. When additions now under way are finished the company will have a capacity of 7000 cars annually. These new buildings will give 200,000 ft. additional floorspace. Sales reports of the Franklin Atomobile Co. for July and August show an increase of 31 per cent over the same period last year.

Drummond Four, $1,095; Six, $1,275

OMAHA, NEB., Sept. 2—As reported in THE AUTOMOBILE last week, the Drummond Motor Car Co. has completed arrangements for building automobiles in this city and will hereafter push the product of its own plant. The new car will be called the Drummond and will be put out in both four- and six-cylinder types, selling for $1,095 and $1,275 respectively. The body parts of the car are touring, roadster and the standard closed types.

Late machinery necessary for the assembling of the Drummond has been installed and the first cars will be put on the salesroom floor soon.

The Drummond Motor Co. has been in the business of overhauling and rebuilding vehicles for more than twenty-five years. Its building has a floorspace of 42,000 sq. ft.

The personnel of the Drummond company directly interested in the new car is: J. W. Griffith, president; F. W. Bacon, vice-president and general manager; W. L. Griffith, secretary and treasurer, and R. W. Craig, general sales manager.

Hodgkins Studebaker Sales Manager

DETROIT, MICH., Sept. 6—R. T. Hodgkins, who was assistant sales manager of the Studebaker Corp., has been appointed sales manager, succeeding L. J. Ollier, who was made a vice-president and director some time ago.

Mr. Hodgkins, previous to joining the Studebaker organization, was for ten years with the New York naval militia, being an ordnance officer during five years. He started with the Studebaker Corp. as branch manager of the vehicle division in New York and also had charge of the export business of that department. His efficiency was such that he was called to Detroit to become assistant sales manager of the Studebaker organization.

The Studebaker business has been growing to such an extent that it has been found advisable to increase the personnel of the sales department and to that effect G. L. Willman, the corporation's advertising manager, and W. T. Bush, manager of the Detroit Studebaker branch, have been appointed assistant sales managers. Mr. Willman will also continue to have charge of the advertising department. He will look after the sales end in the territory west of Detroit to the Pacific Coast, while Mr. Bush will supervise the territory east of Detroit.

To celebrate his election Mr. Ollier gave a dinner to forty associates and friends at the Detroit Athletic Club, Sept. 3.

DETROIT, MICH., Sept. 3—Most of the officials of the local Studebaker Corp. plants and several from the South Bend, Ind., plant tendered a luncheon to-day to E. R. Benson, who until recently was a vice-president and director of the corporation, and who resigned to become distributor of the Studebaker in the State of Maine and part of New York. The luncheon was given at the Detroit Athletic Club to-day.

Match Races for Twin Cities

100-Mile Event Scheduled for Sept. 12 and 200-Mile for Oct.

MINNEAPOLIS, MINN., Sept. 7—The second race on the Twin City Motor Speedway track is to be Sept. 12 between Dario Resta, Ralph De Palma, Bob Burman, Eddie O'Donnell and Pete Henderson, the last two in Duesenberg cars. It is to be a 100-mile event for a purse of $5,000.

The third race will be in October, 200 miles, in which the Stutz winners of Sept. 4 are expected to take part, Earl Cooper and Gil Anderson, also Resta, Burman, De Palma, Johnny Aitken and Howard Wilcox, and possibly Oldfield. A sanction has been asked following the Chicago race of Oct. 17.

Treasurer J. F. Sperry of the Speedway reported that the attendance last Saturday was more than 40,000 and that the receipts were about $190,000. More than 300 Minnesota cars outside the Twin Cities were in the Speedway Sept. 4 and 125 from other States.

Maker Can Fix Retail Price

CHICAGO, ILL., Sept. 8—*Special Telegram*—A decision was filed Sept. 4 in the U. S. district court by Judge Geiger which sets the precedent upon the legality of fixing prices upon patented articles by the patentee. The American Graphophone Co., the complainant, charged the defendant, a Boston store, with the sale of phonograph records at cut prices. The court ruled that the dealer must sell the article at the retail price fixed by the manufacturer without deviation.

Truck Standards Discussed

NEW YORK CITY, Sept. 8—The meeting of the Truck Standards Division of the Standards Committee of the S. A. E. was held on Sept. 7 as scheduled and a variety of subjects were discussed, the principal one being the possibility of reducing the S. A. E. standard diameters for wheels for solid tires to two sizes only. The conclusion reached was that a little more investigation was needed before any sort of action could be taken.

The Foreign Co-operation Division also met jointly with the other division, most of the members being common to both and sundry methods for advancing the work of obtaining universal solid tire standards were considered. Several valuable suggestions were made and it is expected that a progress report will be submitted to the meeting of the Standards Committee to be held in Chicago on Oct. 14.

Chalmers' Record Month

Value of Cars Shipped in August $2,000,000—Outlook Promising

DETROIT, MICH., Sept. 7—August was one of the best business months in the history of the Chalmers Motor Co. The value of the cars shipped during the twenty-six working days was $2,000,000. To August also goes the record for the cars shipped during July and August totaled considerably more than the total number shipped during the first six months of the past fiscal year, that is from July to January. According to officers of the company the outlook is for a continued increase in business. Chalmers representatives in their reports to the company show the business prospects to be as good in one part of the country as in the others. It is general and should affect the whole automobile industry and trade.

Cadillac Auto-Truck Co. Formed

CADILLAC, MICH., Sept. 2—Stockholders in the new automobile truck company organized here have decided to name the concern the Cadillac Auto-Truck Co. They elected the following officers: W. A. Kysor, president and general manager; J. P. Wilcox, vice-president, and C. J. Helm, secretary-treasurer. The three officers with F. O. Gaffney, J. C. Ford, Henry Ballou, Henry Knowlton, P. F. Powers and C. J. Shoff form the board of directors, all of which are Cadillac men. Details as to the truck that will be made will not be disclosed until the plans have been ratified by the officers.

Gibney Tire Business Gains

CONSHOHOCKEN, PA., Sept. 8—The annual meeting of the Gibney Tire & Rubber Co., this city, was held in Philadelphia, yesterday. A dividend of 6 per cent was declared. The factory is running night and day and its monthly business is showing an increase of several hundred per cent over corresponding months of last year. The plant is turning out five times the quantity of tires it was producing four months ago.

Gasoline Prices Based on Cost of Production

KANSAS CITY, MO., Sept. 7—The independent refiners and jobbers of the Middle West have boldly declared that henceforth, in that district, the prices of gasoline and kerosene shall be based solely on the cost of production. They are now in the midst of an apparently successful demonstration of their power to make good. They have taken the bit in their teeth and raised the price of gasoline against the competition of the Standard. They say they will be equally resolute in lowering prices on their own accord, when conditions warrant.

As a result of the conclusion by the independent refiners of the Middle West that an advance was necessary to save them from loss, the price of gasoline at the independent filling stations in Kansas City has been advanced from 8.8 cents to 9.8 cents. The Standard is still selling at 8.8 cents.

15,141 Carloads of Automobiles Shipped in August

NEW YORK CITY, Sept. 8—At a meeting of directors of the National Automobile Chamber of Commerce, Inc., held here to-day, it was reported that shipments of automobiles for the month of August totaled 15,141 carloads, as compared with 8352 for August, 1914.

The traffic department reported a pronounced shortage of freight cars due to the tremendous demand and is taking up the matter with every railroad in the country in the endeavor to prevent automobile freight cars being used for other purposes.

Drawings for space at the New York and Chicago shows will be held at the office of the Chamber Thursday, Oct. 7, members drawing in the morning and non-members in the afternoon.

Reports were made by the various committees, among them patents, good roads, jitney buses and a preliminary report by the committee on a proposed uniform time for the announcement of new models. A final report will be made at a meeting to be held later in the month.

Alfred Reeves, general manager of the Chamber, is to proceed with the organization of the local service managers in Detroit, Chicago and Cleveland, this having been already done in Indianapolis.

Resolutions of respect and sympathy were tendered the family of the late S. T. Davis, Jr., president of the Locomobile Co. of America, who was one of the organizers of the national body.

Those present at the meeting were: Charles Clifton, Pierce-Arrow; Alvan MacCauley, Packard; Carl H. Pelton, Maxwell; R. E. Olds, Reo; H. H. Rice, Waverley; W. H. Van Dervoort, Moline-Knight; Wm. E. Metzger, Argo; Windsor T. White, White; J. Walter Drake, Hupmobile; Howard E. Coffin, Hudson; John N. Willys, Willys-Overland; H. T. Dunn, Willys-Overland, and Alfred Reeves.

86,000 Cars in Minnesota

MINNEAPOLIS, MINN., Sept. 3—Every one of the 86,000 licensed automobile owners of Minnesota have been card-indexed by Julius Schmahl, Secretary of State.

3-Cent Gasoline by New Process

Patent Claimed to Render 100 Gal. from 100 Gal. Crude Oil Possible

ST. LOUIS, MO., Sept. 4—The perfection of a process whereby 100 gal. of crude oil will yield 100 gal. of a kind of gasoline 50 per cent more efficient than the present grade of automobile gasoline, is the achievement claimed by W. H. Stevens, for many years an employee of the St. Louis Water Department.

Stevens, after experimenting for three years to find a substitute for gasoline, has obtained a patent on his process. He is now negotiating with the Standard Oil Co. for the sale of his patent and the formula of chemicals used in his process. This process, Stevens says, is not simple, but is very economical and can produce gasoline at a cost of 3 cents a gallon.

The first step in Stevens' process is to strain the crude oil to remove from it all traces of carbon. After this chemicals, of which Stevens alone knows the formula, are added and the result is—according to the inventor—an amber colored fluid which does not leave carbon deposits on the cylinders.

Stevens has tried his substitute gasoline in a Ford, Dorris, Maxwell, Buick and Overland and to-day made a final test of it in a motorcycle. He claims that a car which will run 12 miles on a gallon of gasoline will run 18 miles on his substitute.

At present independent oil producers are able to get but 1 gal. of gasoline from 4 gal. of crude oil by distillation. The Standard Oil Co. has a process by which it gets 1 gal. of gasoline from 2½ gal. of crude oil. Stevens' process will produce gallon for gallon, the inventor says.

Complain of Poor Gasoline

BLOOMINGTON, ILL., Sept. 4—Some garage men of central Illinois are complaining about the poor quality of gasoline that is being supplied in some instances of late. They assert that kerosene is being mixed with it as an adulterant, creating difficulty in starting some cars when the engine grows cold, the kerosene requiring greater heat than pure gasoline before it will explode. After the engine has been running for some time the coal oil constituent vaporizes and burns more readily.

Miller Continental Purchasing Agent

DETROIT, MICH., Sept. 7—L. T. Miller has been appointed purchasing agent for the Continental Motor Mfg. Co., succeeding R. C. McMillen, whose assistant he was. Mr. McMillen will take up another line of work.

Trade Review of the Week

Firm Demand for Cars Continues—Factories Prolong Production Schedule

DETROIT, MICH., Sept. 7—A firm demand for cars coupled with a striking continuance of the optimistic views which have been held since the first of the manufacturing season stand out most strongly in a reviewing of the automobile industry here during the past week. There seems to be no cessation of the cry for cars from dealers everywhere, and with great impetus given to retail business by the generally good weather, it was a week of great manufacturing and selling activity.

Dealers Are Optimistic

Several district representatives of one of the larger companies were here for a conference, and as their views are those of men who are intimately familiar with the sections which they represent, their words are of special value. From the reports of these men, it is evident that the demand for cars never was so great, and that there is practically no section of the country which shows a striking lead over any other in the matter of selling. In most instances, the dealer with the cars does the business. The people do not want to wait, and going on the assumption that you get your money's worth in nearly any car you buy these days, they buy where they can get quickest delivery.

Heavy Crops

In some States, bumper crops are reported, while in other localities where there is a lively business in horses for the warring nations, the inhabitants are taking advantage of the prices offered for their stock and are grabbing the automobiles as fast as they can get them. This is particularly true in the Middle West.

Dealers Sold Out

Most of the dealers in representative cars here are well sold on their allotments and have a place for every car they get. Many of the Detroit sales agencies are doing business throughout the State with sub-dealers, and on this account they are able to say that business here is no brisker in proportion than it is in other parts of Michigan. The Reo agent here says that he has sold every 1915 model Reo he could get, and thinks others are in the same boat.

Materials Scarcity Relieved

Factories are laying their plans to continue their present manufacturing schedules well into the late fall, so confident are they that present conditions will hold out for several months yet. The activity cannot be expected to maintain its present status all winter, but it is very evident that manufacturing curtailment will be later than ever before.

The situation seems somewhat relieved as regards the obtaining of raw materials.

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$1,500,000 Order for Selden

ROCHESTER, N. Y., Sept. 2—The Selden Truck Sales Co. to-day confirmed the report that a large order for Selden trucks had been received for export. The order was placed by Gaston, Williams & Wigmore of New York and London, and is said to amount to more than $1,500,000. The chassis will be disposed of largely for commercial purposes, it is said, and are not a war order.

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Few Changes in Mercer Models

TRENTON, N. J., Sept. 8—Mercer's new series is now going through the factory on regular production schedule and shows no marked change over the series of last season. The new model is known as 22-72 and succeeds the 22-70, which was marketed for 1915 and what changes there are, are merely in the way of fittings. The prices remain the same, the six-passenger touring being $3,000, sporting four-passenger $3,000, runabout $2,900, and raceabout $2,750 or $2,900 with electric starting.

The Mercer motors are four-cylinder 3¾ by 6¾ with L-head block cylinders having the valves on the right. The wheelbase of the sporting and touring models is 130 in. and the raceabout and runabout 115 in.

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Cadillac School Gives Prizes

DETROIT, MICH., Sept. 3—At the semi-annual distribution of prizes to the pupils of the Cadillac Motor Car Co.'s School of Applied Mechanics, $250 in cash were distributed to-night. The first prize was $50, three were of $25, five of $15 and six of $10, and were given for perfect attendance. Although attending the school, the students are paid for the work they perform. Most of them after graduating secure good positions with the company. The school was started by Henry M. Leland in 1907.

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Tractor Demonstration at Bloomington

BLOOMINGTON, ILL., Sept. 3—Seventy tractors by actual count, representing nearly as many manufacturers of the United States, gave a demonstration in plowing upon a tract of 700 acres near here recently. A magnificent sight was afforded when thirty-two tractors, in perfect alignment, started across a 60-acre field of green stubble, with thousands of farmers following in the rear. The operator in charge of each machine was intent to plow a straight furrow. Ten thousand spectators assembled on each side of the great field. It was the climax of the Middle West Tractor Farming Demonstration which was successful far beyond the anticipations of the promoters.

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No Tire Plants in Brazil

RIO DE JANEIRO, Aug. 23—Although crude rubber constitutes the second great export product of Brazil, there are no automobile tire factories here, and the country is entirely dependent on foreign tires to supply its large number of automobiles.

English, French, German Italian and Belgian makes have dominated the Brazilian market. This has been due not so much to the excellence of the European product as to skill in marketing it, to the establishment of good local connections, and granting favorable credit terms to reputable local dealers. The European plants even went so far as to make tires in the standard American sizes. Despite a loss of nearly $10,000 in its sales of automobile tires to Brazil during 1914, the United States maintained its proportionate share of the year's trade, but this share is only 3 per cent of the total. France, Germany and Italy suffered severe losses during the year as compared with their trade in 1913, but Belgium and Great Britain made substantial trade advances. Brazil bought $477,086 worth of tires in 1914 as compared with $746,195 in 1913. Although France suffered a large loss, still it maintained the highest figures for 1914, which was $188,247. The United Kingdom was second with $100,965. The United States exported in $15,714 in tires during that year.

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Ford Buys 583 Acres

DETROIT, MICH., Sept. 3—According to the records in the register of deeds office, Henry Ford has purchased thus far 583 acres of real estate in the River Rouge district where the new Ford plants are to be erected. The total value of the land purchased is estimated at about $583,000.

A further purchase of 39.3 acres in the district was made by the representatives of Mr. Ford a few days ago.

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Jamison Gets Gold Medal

PITTSBURGH, PA., Sept. 3—H. V. Jamison, Advertising Manager of American Sheet & Tin Plate Co., Pittsburgh, has been awarded a gold medal by the Panama-Pacific International Exposition Society for valuable services rendered in the installation of the large exhibits of the United States Steel Corp. and its subsidiary companies.

Missouri Farmers Buying Cars

71,257 Registered—Gain of 40 Per Cent Over Entire Year 1914

JEFFERSON CITY, Mo., Sept. 4.—During the first seven months of the current year 71,257 passenger automobiles were registered in Missouri, while during the whole of 1914 little more than 50,000 were registered, showing an increase of 40 per cent for the seven months' registration of 1915 over the twelve months' registration of 1914.

Almost half the automobiles owned in Missouri, outside of St. Louis and Kansas City, are the property of farmers, an extraordinary increase being shown from the southeastern part of the state where crops this year were unusually good. As a result of this registration $299,570 already has been turned into the treasury and Good Road fund of the state.

Including motor trucks, motorcycles, transfers and dealers plates, the total registration to Sept. 1 was 83,980. The figures show 1089 automobile licenses for dealers and 1010 extra plates for demonstrating cars. St. Louis has a registration of 15,419 and Kansas City 8784. The counties having the largest registration are: Jasper, 2289; Buchanan, 2111; St. Louis County, 1908; Green, 1249; Jackson, 1157, and Nodaway, 1141. Six counties in the state have less than ten machines each.

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Additions for Warner Gear

MUNCIE, IND., Sept. 1—The Warner Gear Co. has recently added to its factory equipment a two-story brick structure 60 by 300 ft. The new addition is now in full operation, and that, together with additions which are at present under way to its older buildings, gives it an increased floorspace of 39,000 sq. ft. and a total force of more than 1200 men on a twenty-three-hour basis.

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$1,348,124 in Trucks Shipped from New York

NEW YORK CITY, Sept. 7—The total automobile and truck exports from this city, reported during the week ended Aug. 28, amounted to $1,348,124 in trucks and $365,926 in automobiles, compared with only $108,059 in automobiles last year.

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Flint Varnish Will Double Working Force

FLINT, MICH., Sept. 2—The Flint Varnish Works, which were formerly a department of the Durant-Dort Carriage Co., and are one of the largest varnish makers in the country, supplying automobile manufacturers and many railroads, will double their working force and employ at least 300 men when four additional factory buildings, to be started at once, will be completed. At a meeting of the directors, a 10 per cent dividend was declared on the $500,000 of common stock, which is half of the capitalization. The officers are: W. W. Mountain, president and general manager; J. E. Kepperly, vice-president and William Glidden, secretary-treasurer.

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All-Steel Motor Car Co. Locates in Macon

MACON, MO., Sept. 1—The plant of the All-Steel Motor Car Co., recently organized with a capital of $400,000, will be located in Macon, Mo. Gen. E. J. Spencer has been elected president and O. A. Trolicht, secretary. Among those financially interested are A. G. W. Simmons, J. E. Smith, and J. E. Pilcher.

The company will manufacture a roadster to sell at $350 and a touring car at $410. The capacity of the plant will be about 100 cars a day, and about 175 men will be employed.

The body of the car and its general makeup are patented, and is made of one piece of 22-gage steel. The sides are welded to the floor of the car, and the whole body can be removed from the running frame. The cars have solid disc wheels.

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Marion Tire To Start

MARION, OHIO, Sept. 4—The Marion Tire & Rubber Co., which was incorporated recently, has taken over the plant formerly occupied by a shoe company and will install tire-making machinery. It is announced that an Akron rubber man has been secured as general manager, but the name is not divulged. The capitalization of the company is $300,000, of which half is preferred and the other half common stock. The largest stockholders in the corporation are J. L. Price, S. B. Lippincott, W. H. Holverstott, R. T. Lewis, A. J. Berry, W. T. Jones and W. F. Moyer.

It is planned to start active manufacturing in about six months, when it is expected to employ seventy-five workmen.

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700 Pistons a Day

HOWELL, MICH., Sept. 3—An average of 700 pistons a day are now being made by the Spencer-Smith Machine Co., which had a daily output of only 150 a few months ago. Several large new contracts were recently secured from concerns which had not been on the customer's list. Indications are that night work will have to be started soon. There are over forty men on the working force now.

75,701 Registrations in Wisconsin

Gain of 22,540 Cars Over Total for 1914—1553 Dealers Registered

MILWAUKEE, Wis., Sept. 6.—Wisconsin passed the 75,000 mark in automobile registrations late in August, and on Sept. 1, at the beginning of business, license No. 75701 was issued. The total registration for 1914 was 53,161, so that already there are 22,540 new cars in Wisconsin this year. With four months to go, there is little doubt that the registration figures for 1915 will show that 25,000 cars have been absorbed by the Badger State this year. The figures of Aug. 31 show a gain of 25,500 over the corresponding date a year ago.

The 1553 dealers licensed in Wisconsin during 1914 showed a decrease of more than 250 from 1913, but the 1915 figures show a gain of 373.

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$70,000,000 in Wisconsin Cars

MILWAUKEE, WIS., Sept. 3—At the recent convention of the Wisconsin Bankers' Assn., it was brought out that there is an investment in automobiles of some $70,000,000 in that State, 90 per cent of which has been withdrawn from banks, either by withdrawal of deposits, money borrowed or notes purchased. This condition has caused a shortage of capital.

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Luck Tire Plant for Dallas

SAN ANTONIO, TEX., Sept. 4—A $100,000 factory to manufacture the new Luck pneumatic puncture-proof tire for automobiles is to be erected at San Antonio by the Luck Tire & Mfg. Co. The new tire was invented by John J. Luck of San Antonio. A demonstration of the qualities of the tire has been conducted for the past eighteen months by those who are supporting the enterprise. A set of the tires traveled 14,000 miles across some of the roughest roads in Texas.

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Detroiter in New Plant

DETROIT, MICH., Sept. 6—The Detroiter Motor Car Co., which succeeded to the Briggs-Detroiter Co. when Alfred O. Dunk purchased the latter's assets and which has been occupying the Briggs plant, has leased the plant which at one time was the home of the Wolverine Mfg. Co. In its new quarters the Detroiter company will have more room. Within a few weeks it is expected that the 1916 models will be ready for announcement.

Autocar To Build Addition

Five-Story Steel and Glass Structure for Engineering and Production Depts.

ARDMORE, PA., Sept. 7—The Autocar Co., this city, will start an addition in the near future to be finished before winter sets in. The new building will contain five stories and basement and will adjoin the recently enlarged three-story and basement building. Its frontage will be 100 ft. There will be a separate wing, 40 by 30 ft. The lighting specifications call for modern steel fireproof sash, and the plan is so arranged that 79 per cent of the area is lighting space against 21 per cent brick. The first floor will be used for general offices for the production department and the top floor for engineering and experiments.

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Hartford Automobile Parts Moves to New Britain, Conn.

HARTFORD, CONN., Sept. 7—The Hartford Automobile Parts Co., this city, will move to New Britain, Conn. A building company has been formed to erect a factory on East Ellis Street, New Britain. The building will be 60 by 200 ft., two stories, and so constructed that two additional stories can be added.

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Cadillac Ships Fifty-five Cars a Day

DETROIT, MICH., Sept. 4—During August the Cadillac Motor Car Co. shipped 1455 cars, or an average of fifty-five for each of the twenty-six working days of the month. Up to Sept. 3 there have been shipped 1854 of the new models. As in the case of most all other manufacturers of automobiles, the Cadillac company is experiencing some trouble in getting all the supplies of raw and finished materials needed.

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Eisemann Strike Off

NEW YORK CITY, Sept. 7—The strike of about 600 employees of the Eisemann Magneto Co. at the Bush Terminal, Brooklyn, has been called off, the workers having agreed to return to work tomorrow. The workers quit when their demand for a 48-hr. week with 52-hr. pay was refused, after negotiations lasting 2 weeks. The company is so rushed with orders, however, that the demands were agreed to.

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Fisher in New Factory

DETROIT, MICH., Sept. 6—The Fisher Electrical Works, manufacturers of the Fisher electrical starting and lighting system for Ford cars, are moving into their new plant at 32 Lynn Street. It is a two-story structure, 64 by 400 ft. The business of this concern has been consistently increasing, and for some time the quarters at 182 Learned Street were inadequate for manufacturing purposes. The concern has arranged with Nelson Hall, formerly instructor of electrical engineering at Tri-State College, to give daily lectures to the employees on the theoretical as well as the practical side of the fundamental principles of electrical engineering,

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1916 Moline Knight $1,375

EAST MOLINE, Ill.—A reduction of $100 in price and many refinements in connection with the new Moline-Knight 40 have been announced. The price is now $1,375 and although the materials used heretofore are continued, refinements have been made which make this an even better car than its predecessor at a lower price. Some of the specifications of the car, which is fitted with the Knight sleeve-valve motor, are bore 3¾ in., stroke 5 in., wheelbase 118 in., tires 34 by 4, three-speed gearbox, spiral bevel floating rear axle and up-to-date equipment throughout.

The bodies furnished are five-passenger touring and two-passenger roadster.

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Continental May Buy Property

MUSKEGON, MICH., Sept. 2—Negotiations are now going on between the Continental Motor Mfg. Co. and the P. J. Connell Co. which will probably lead to the purchase of the latter's property by the former. Should this happen, it is the intention, it is said, of the motor manufacturer to erect a drop forge steel plant on the property.

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Kelly Truck Now Sunset Truck Co.

SPRINGFIELD, OHIO, Sept. 6—One of the most important changes in the name of truck manufacturers has been made by the Kelly Motor Truck Co., of Springfield. The name of the concern has been changed to the Sunset Truck Co., by papers filed with the Ohio Secretary of State.

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O'Neil Tire Changes Name

AKRON, OHIO, Sept. 6—Papers have been filed changing the name of the O'Neil Tire & Protector Co. to the O'Neil Tire & Rubber Co.

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Gordon Rubber Changes Name

CANTON, OHIO, Sept. 6—The name of the Gordon Rubber Co. has been changed to the Gordon Rubber & Tire Co. The concern will specialize in the manufacture of automobile tires.

Two New Federal Trucks

Light Type and 6-Tonner To Be Built—August Sales Gain 125%

DETROIT, Mich., Sept. 4.—The annual convention of Federal Motor Truck Co.'s dealers and distributors was held this week. The announcement was made that the Federal company intends bringing out a new light truck, also a 6-ton model. It was also stated that in the near future the company may start to make its own motors. In fact tests and experiments are now being made with new designs to that effect. Although an addition to the plant has been just completed, the concern has purchased 5 acres of land adjoining the plant and will start shortly the erection of additional factory buildings.

About seventy-five dealers and distributors took part in the three-days' convention. Without exception those who cared to talk stated that the motor truck business has been very good thus far this year and indications are, that, provided the plant is able to keep its delivery promises, the sales will show great increases in all parts of the country. The biggest problem, in fact, the only important one which is giving the agents or distributors a lot of worry is the delivery question. This is in turn the big stumbling block for the manufacturer, as he is being held up in the receipt of materials and parts.

It is likely that a change in the contract policy will be made, it being the intention of the Federal company to start its fiscal year Jan. 1, instead of in September.

The past month was the biggest in the history of the Federal company, being 125 per cent ahead of August, 1914. To date, since the beginning of the year, the business increase is from 25 to 35 per cent ahead of 1914.

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Hupp Men Predict Big Year

DETROIT, MICH., Sept. 4—At the recent meeting of district salesmen of the Hupp Motor Car Co., there was but one word which practically every visitor expressed time and again, it being the word optimistic. No matter whether it was Ward Keller, the Pennsylvania Hupp man, or J. R. Overstreet from Texas or the Canadian Hupp overseer, K. R. Spencer, or eastern sales manager O. C. Hutchinson, the story was the same, namely, that this will be the biggest year the Hupp organization ever had.

These and many other men who have been on the ground and should know conditions pretty thoroughly, said that

the crops will be the biggest some States ever had, that on account of the great demand for horses for the warring nations, the ranchmen, farmers and others are selling their horses in such States as Wyoming, Colorado and Southern Montana and buying automobiles as fast as they are coming into the States. In the South, owing to the help of the Federal Reserve deposits conditions are very satisfactory for a big year. In Canada a bumper crop is predicted and this will have a corresponding effect upon the automobile trade.

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Signal Raises Prices on Three Models

DETROIT, MICH., Sept. 3—Beginning Sept. 15 the price of three out of the four models of trucks made by the Signal Motor Truck Co. will be raised.

The prices will be as follows: 1-ton model, $1,550 instead of $1,500; 1½-ton model, $1,750 instead of $1,700; 2-ton model, $2,100 instead of $2,000. The price of the 3½-ton remains $3,000. All models are worm-driven.

At the new prices the ton and the 1½-ton models will be furnished either with a 120 or a 144-in. wheelbase. Heretofore it cost $50 more for the latter-sized model. The 2-ton model is only made with a 150-in. wheelbase, and the 3½-ton model has a wheelbase of 168 in.

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A New Truck Wheel

MT. GILEAD, OHIO, Sept. 4—B. J. Aurand has tested a new steel motor truck wheel, and it has proved successful. The device is said to be noiseless, resilient and so fastened as to make it secure on all kinds of streets. The wheel is a continuous piece of steel coiled three times, the middle coil being slightly greater in circumference than the other ones. This provides for the resiliency. It is said that the wheels can be manufactured at considerably less cost than the rubber ones, and that they will last longer.

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More Homes Needed in Flint

FLINT, MICH., Sept. 4—Although up to date 207 more permits for new houses have been issued in this city during all of 1914, the business extension of the local plants is such that at least 500 more homes must be put up before winter in order to accommodate even only a part of the many workers who are without a house. It is estimated that between 2000 and 2500 more men are being employed now in the plants than at this time last year.

As an evidence of this constant growth, the pay roll of the Buick Motor Co. for the second half of August shows an increase of $37,450.18 over the previous biggest two weeks' pay, which was the second half of July. The August record was $330,573.18.

Would Increase Fees in Mass.

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Special State Revenue Commission Would Double Tax Per. Hp.—Fight Promised

BOSTON, MASS., Sept. 4.—That the automobile manufacturers and dealers will have another fight on their hands when the legislature meets next January is foreshadowed by the results of the meeting this week of the special commission appointed by the last legislature to devise ways and means to increase the State revenues. The commission devoted one forenoon to the problem of motor vehicles. Frederick T. Fuller, a member of the commission, stated that in his opinion all cars of 60 or more horsepower should pay at least $100 and that other cars should be made pay a proportionate part.

Frank D. Kemp, representing the Highway Commission, stated that he did not advocate an increase on passenger cars because the State now gets about $3,000,000 in taxes and fees from the owners of the 100,000 vehicles in Massachusetts. But he did favor increasing the fees on trucks to $1 per horsepower instead of the present tonnage rate. Mr. Kemp stated that at present the passenger cars pay about 80 cents per horsepower, but that Col. William D. Sohier, chairman, and James W. Synan, the two other commissioners, feel that this rate should be doubled.

This means, of course, that the special commission will report a plan for increased taxes, and with two members of the Highway Commission favoring increased fees for cars, and the other member advocating an increase in truck fees that the legislature will get two reports along those lines.

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Pope Holders Will Realize 91 to 92 Per Cent

BOSTON, MASS., Sept. 7—Holders of the Pope company's $1,600,000 notes and paper will receive within the next ten days their final dividend in settlement, thus about winding up the liquidation.

This payment will amount to around 38 per cent, and will make the total amount realized by holders of these notes equal to between 91 and 92 cents on the dollar.

The war saved the stockholders. It afforded a market for the Hartford plant, which was bought by the Pratt & Whitney people, and it made the Westfield works attractive enough for bankers to take up and use as the nucleus of a corporation which may develop a substantial amount of war orders.

BOSTON, MASS., Sept. 2—In a report filed in the U. S. district court to-day, the receivers for the Pope Mfg. Co. report that claims aggregating $1,649,000 have been allowed and approved, and that three claims amounting to $20,000 are still in dispute. After paying taxes and other charges the balance from the purchase price amounts to $722,095.

Two of the receivers, George Pope and C. A. Parsons, have asked the court to discharge them and to retain their colleague, C. A. Morse, for the purpose of winding up the receivership.

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Decree Issued in Rim Suit — Standard Welding Co. to Appeal

NEW YORK CITY, Sept. 4—Following the opinion of Judge Hunt in the case of Louis H. Perlman against the Standard Welding Co., reported in THE AUTOMOBILE for Aug. 26, an interlocutory decree has been issued in favor of Perlman, perpetually enjoining the Standard Welding Co. from further infringement of his patent No. 1,052,270 on rim construction and appointing Clarence S. Houghton of this city a special master to determine the amount of damages. Costs of the suit are to be paid by the Standard Welding Co. The decree upholds the validity of the patent and rules that Perlman's exclusive rights thereunder were violated. The decree was issued in the U. S. District Court for the Southern District of New York.

A brief survey of the decree indicates that not only do all side wedge demountable rims infringe the Perlman patent but also all split wedge-ring types fall within its scope.

An order has been issued allowing the Standard Welding Co. to appeal to the circuit court of appeals and bond has been fixed at $50,000.

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City Tax in Lincoln, Ill.

LINCOLN, ILL., Sept. 4—The City Council of Lincoln has adopted an ordinance which provides for a license for vehicles of all kinds. A previous ordinance was declared unconstitutional by the Supreme Court. The new measure avoids the defects of the old. The tax for motorcycles is $3; for all motor vehicles of 45 hp. or less, $5; for those of greater horsepower, $8, while those for public hire, $10. A reduction is made where a license is issued for less than a year. The ordinance takes effect Sept. 15. Automobile owners believe that a test case would win again in the upper court, and may decide to fight the city on the ground that it is illegal to collect both a state and a city tax.

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Stop Automobiling on Railroad Tracks

MILWAUKEE, WIS., Sept. 4—The practice of automobilists in isolated districts of Wisconsin in equipping their cars with flanged steel wheels for use on railroad

tracks and carrying passengers at regular rates has been stopped by a decision of the attorney general of Wisconsin to the district attorney at Medford, Wis., declaring it to be a violation of the statutes for a person to operate a motor car on railroad tracks without the permission of the company owning the tracks. The attention of the district attorney was called to the fact that a man is operating a car on the Soo line between Riblake and Chelsea, Wis., carrying passengers at 50 cents the trip. The idea had become quite popular between cities having few trains daily.

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Detroit Post Office Cars Are Now Government Owned

DETROIT, MICH., Sept. 1—Beginning to-day all the automobiles used by the local post office department are government owned. Those which had been used for more than one year up to last night were operated on a contract basis, being merely rented by the government.

There will be thirty-six postal automobiles in the service here for the present, and, as the local post office business is increasing most rapidly, there is no doubt that more motor vehicles will have to be added ere long.

The vehicles now operated consist of twenty-four Fords and twelve Whites, the latter being made up of seven 1½-ton vehicles, four ¾-ton and three 3-ton trucks. The latter will be used exclusively on runs between the post office and the railroad stations, while the other trucks will be used to carry mail between the main post office and the substations, also the depots. The Fords will be used especially for parcel post work and runs between sub-stations.

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Los Angeles Motor Reserve Formed

LOS ANGELES, CAL., Sept. 3—The Los Angeles Motor Reserve is now a completed organization with many of the most prominent men in the automobile industry of the city as active members. The object of the organization is to perfect an adequate motor reserve to serve the United States in time of war, to foster military training, especially rifle practice, among the automobile men of the city, and to co-operate with the National Guard in adding to its efficiency.

Ten prominent automobile dealers are on the executive board. The military officers are all men of long experience in military service, and army men declare that the organization promises to be one of the most efficient reserve corps in the country.

Such men as Teddy Tetzlaff, R. C. Hamlin, H. M. Hanshue, Louis Nikrent, T. Beaudette and Clifford Durant are on the roll.

To Boom Denatured Alcohol

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Fuel Becomes French Govt. Monopoly in 1917 and Will Be More Widely Used

PARIS, Aug. 28.—Denatured alcohol will become a French government monopoly in 1917 and measures will be taken to extend the use of this fuel for automobile purposes. This movement is part of a drastic scheme for the reform of the liquor traffic. It is intended to raise the duty on alcohol from $44 to $100 per 22 gallons. In 1900 there was an increased duty of $12.80, resulting in an immediate decrease of 88,000,000 gal. per annum in the annual human consumption of alcohol. Now that it is intended to increase the tax by $56—practically 4½ times the original tax—it is obvious that there will be a great drop in the amount of alcohol drunk in France. The question of state monopoly of the entire production of alcohol has been considered and abandoned in favor of the monopolization of denaturized alcohol only. A variety of interests must inevitably suffer by reason of the heavy taxation of alcohol, but by monopolizing denaturized alcohol the vital interests of the industry and the nation will be safeguarded. In other words the French nation which has drunk much alcohol and burned none will be made to drink less and burn much.

To Fix Price

Exactly what machinery will be employed to effect this radical change is not yet known. It is obvious, however, that the first and most important step will be the fixing of a market price for denaturized and carbureted alcohol. Up to the present the supply has been so uncertain and the price subject to such variations that denaturized alcohol has not been a commercial product capable of competing with other hydrocarbons. Nevertheless, the French have always taken an interest in alcohol as an alternative automobile fuel and the army authorities have insisted on every army automobile truck being built to run on alcohol. This was done in the annual army truck competition when for one-third of the time the vehicles ran on gasoline, for a third on benzol, and for the remainder of the time on denaturized alcohol. The same load and the same average speed had to be maintained on each fuel. No change of carbureter or compression was allowed, but the changing of jets and the making of adjustments was permitted. These competitions, which have been held for six or seven years, have shown that alcohol is a suitable fuel for all internal combustion motors, but it is doubtful if there has ever been a gallon of gasoline used on the road outside of these competitions. The object of the army authorities was to provide alternative fuels in case the supply of gasoline should be cut off by reason of war. Now that war has come, gasoline is the only fuel for army automobiles, benzol is monopolized for the making of explosives, and alcohol is ignored.

It has not yet been stated in what way the government intends to popularize the use of alcohol for driving automobiles. As there is no difficulty in getting an adequate supply of this fuel, the problem naturally resolves itself to one of price. It is thus safe to assume that denaturized alcohol suitable for automobile consumption will be put on the market at a considerably lower price than gasoline. The drop will have to be considerable to affect the ordinary motorist, for although benzol is a reliable substitute and costs appreciably less than gasoline it has only been adopted by commercial firms using big fleets of trucks. The private motorist is somewhat prejudiced and does not consider the reduction in price sufficient compensation for the supposed inferiority of benzol. The same will apply in a greater degree to alcohol, which is an unknown fuel for 90 per cent of ordinary motorists.

Gasoline 52 Cents a Gallon

However, it will not be a difficult matter to put home-produced alcohol on the market at a lower rate than imported gasoline. The average retail price for this latter is now 52 cents per gallon. Prior to the war the price varied between 46 and 48 cents per gallon. These rates are practically double those existing in England, to which country transportation rates are about the same as to France, and are due to the high import duty and local taxes on gasoline. It will be possible for the French government to sell alcohol for automobile use at nearly the same rates as gasoline in America and still secure a substantial revenue. This would cause an immense automobile development, for it cannot be denied that the high cost of fuel has had a restrictive influence on motoring, and particularly commercial motoring, in France.

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$148,509 for Automobile Education

MILWAUKEE, WIS., Sept. 4—Industrial education in Wisconsin, which includes as an important course the study of automobile engines and chassis, cost the State of Wisconsin $382,352 during the fiscal year ending June 30, 1915. The Milwaukee continuation school, where a course in automobile practice has been developed, spent $148,509 of the total, and had a total attendance of 10,908.

Cars Indispensable at the Front

Guyot, Racing Driver, Says Artillery Uses Tractors Extensively for Gun Hauling

PARIS, Aug. 28.—After thirteen months' active service at the front, during which time he has driven the General in command of one of the French army corps, Albert Guyot has returned to Paris on his first leave of absence for six days. The French race driver describes the automobile as one of the most essential instruments in modern warfare. Even at the present time, when the opposing troops are buried in 6-ft. trenches only 150 yd. apart, and progress either way is a matter of inches, often secured at tremendous loss of life, automobiles are indispensable. Large numbers of American trucks are employed by the army to which Guyot is attached, most of these trucks being Packards and Whites.

At the present time the automobile service consists in carrying ammunition and food from the depots to the trenches; in taking fresh men to the trenches and bringing away the men who have finished their spell of service; in moving wounded from the dressing stations to the main hospitals or hospital trains; in carrying material for mine digging and entrenching. There is no present use for armored cars, but the artillery is making extensive use of tractors for quick transportation of their guns from point to point. Guyot, who was one of the first men to learn to fly a Bleriot monoplane, expects to enter the aviation corps as a pilot within a short time.

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White Gets Grand Prize

CLEVELAND, O., Sept. 7—The Superior Jury of Award of the Panama-Pacific International Exposition at San Francisco has awarded the grand prize for motor trucks to the White Co., this city.

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Rowe Co. Raises Wages

DOWNINGTOWN, PA., Sept. 7—The Rowe Motor Mfg. Co., this city, has raised the wages of its machinists 10 per cent. It has also commenced work on a 100-ft. addition to the plant.

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No Touring in Switzerland

PARIS, Aug. 28—Statistics dealing with automobile traffic across the Swiss frontier show that motor touring in this part of Europe is practically non-existent. From the first day of January to the last day of June of the present year only 151 automobiles went by road from France to Switzerland. For the corresponding periods of 1914 the number was 3500. During the month of July of the present year thirty-nine automobiles passed over the French-Swiss frontier. The number for the month of July, 1914, was 2048. During the first seven months of 1914 the number of cars going across the frontier was 5548; the number has fallen to 190 for the corresponding period of 1915. As most of the cars reported at the frontier stations this year are owned by diplomats and government officials, it is obvious that the ordinary tourist is a negligible quantity.

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Tire Shortage in Sweden

STOCKHOLM, SWEDEN, Aug. 2—The situation of the automobile traffic in this city is becoming worse daily because of the inability to get tires. Now there are twenty-five machines out of service, and next week the number will be increased.

In this city there are 336 taxicabs, most of which belong to persons who own only one or two cars. The largest company is the Taxameter Co., owning twenty-five machines. It is estimated that this company can keep them going until Dec. 1. According to an investigation it is estimated that the traffic can be kept up two or three months longer with 150 or 160 automobiles. One rubber company here is renting out tires by the day to automobile owners.

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MacManus with Erwin & Wasey Co.

DETROIT, MICH., Sept. 4—Theodore F. MacManus, one of the best known automobile advertising men in this city, is now vice-president of the Erwin & Wasey Co. advertising agency in Chicago, and is in charge of the Detroit offices in the Kresge Building. Mr. MacManus will handle the advertising campaign of the Goodyear Tire & Rubber Co., Akron, Ohio, besides continuing to take care of his old accounts. Among former associates of Mr. MacManus who remain with him is Gerald Page-Wood, who will have charge of the art department. The Erwin & Wasey company was organized eighteen months ago, and C. R. Erwin is president.

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Severe Sentences in Milwaukee

MILWAUKEE, WIS., Sept. 4—Milwaukee courts have ceased to be lenient with motor car thieves. John Anderson was sent to the House of Correction for sixty days for stealing a laprobe and overcoat out of a car standing at Grand Avenue and Fourth Street. The man was caught before he had gone a block. For taking a car without the owner's consent Harvey Weeks was sent to the State Reformatory for three years. Weeks had been in trouble before and the penalty was made especially severe on this account.

Cut Accidents 54% at Ford Plant

Teaching of English to Workers in Factories Decreases Accidents 54 Per Cent

DETROIT, MICH., Sept. 3.—Speaking on the subject of teaching English to the foreign shop workers, R. Lee, in charge of the sociological department at the Ford Motor Co. stated a few days ago that since the English school has been established at the plant the number of accidents in the shops had decreased by 54 per cent.

This is but one of many advantages directly traceable to the English lessons given to the Ford foreign workers. Another important change brought about by these lessons is the fact that it eventually does away with the employ of interpreters who were very often influenced by the boss padrone or shop bosses who made no serious effort to really teach the laborer or worker the English language, as it was rather materially advantageous for the boss that these workers should remain ignorant as long as possible of our language. Still another advantage for the workers as well as the plant was that once they knew enough English they were less in fear or in doubt that they were not being treated or handled squarely. After they understood English and talked a little they were like new men, became more efficient and more pleased, which brought about better results.

Of the 18,000 men in the employ of the Ford company a year ago more than 50 per cent did not speak English. According to Mr. Lee every one of these foreigners if still in the employ of the company next year will speak nothing but English.

The Ford English classes are held twice a week and the entire course of teaching the foreigner to read, write and speak, extends over a period of thirty-four weeks, or sixty-eight lessons. Long before the sixty-eighth lesson is given the pupil is able to grasp enough of the language to understand. In fact there have been cases where the foreigner showed remarkable ability and learned exceptionally quick. The teachers are all volunteers and all belong to the Ford organization. Many of them are foremen and they teach the men of their department.

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Moon's August Sales Gain 77.21 per Cent

ST. LOUIS, MO., Sept. 8—Sales of the Moon Motor Car Co., this city, for the month of August, 1915, showed a gain of 77.21 per cent over the same period last year.

Falls Motor Co. to Expand

Orders for 12,000 High-Speed Motors Render Enlargement Necessary

SHEBOYGAN FALLS, WIS., Sept. 4.—So urgent is the demand for Falls motors from automobile manufacturers that the Falls Motor Co., Sheboygan Falls, Wis., has decided to make radical changes in its plant at once. The gray iron foundry, where all cylinders and similar work was cast, is being dismantled and will be transformed into a machine shop. Contracts have been closed with gray iron founders in Grafton, Manitowoc and Racine, Wis., and Muskegon, Mich., for these supplies. The erection of a large assembling shop is progressing rapidly. The company is now employing in excess of 300 mechanics and intends to put on a 24-hr. schedule when the improvements are completed. The Falls company has contracts calling for the delivery of more than 12,000 high-speed motors before spring. To accommodate this business, it was decided to discontinue the casting shop and buy castings outside, so that machining and assembling at Sheboygan Falls would be carried on without interruption and in the required quantities.

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Firestone Declares a 4 Per Cent Extra Dividend

AKRON, OHIO, Sept. 1—The Firestone Tire & Rubber Co. has declared an extra dividend of 4 per cent on its common stock, payable Oct. 15. This makes 16 per cent for the year. It is probable that the common dividends hereafter will be paid on a basis of 5 per cent per quarter.

Net profits after charges and dividends for the year were $4,343,000, a gain of $2,800,000. There was carried to surplus $3,853,000.

Sales during the fiscal year were $25,187,884.33, an increase of $5,937,774.41, or 31 per cent over the preceding year. Sales in 1914 amounted to $19,000,000; in 1913, $16,600,000; $11,500,000 in 1912; $7,500,000 in 1911 and $5,000,000 in 1910.

The company is now producing 7500 pneumatic tires daily. After the plant additions are completed it is expected that the output will be 12,000 tires daily, or an increase of 60 per cent. This increase of 4500 tires per day is larger than the output of the original new Firestone plant which was erected on its present site 4 years ago. Eleven hundred solid tires are made daily. Arrangements are being made to largely increase this production.

At the annual meeting of the stockholders held to-day, the following financial statement was submitted:

QUICK ASSETS	
Accounts receivable	$5,269,034.30
Bills receivable	123,480.91
Cash (set aside for new buildings and equipment contracted for)	800,000.00
Cash	1,103,427.64
Stock sold employees	112,200.11
Material and finished goods	3,643,477.83
	$11,251,620.79
LIABILITIES	
Accounts payable	$675,064.79
Net quick assets	10,576,556.00
	$11,251,620.79

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Few Market Changes

NEW YORK CITY, Sept. 7—The feature of the markets this week was the advance of 1 cent for gasoline, effective yesterday. Markets this week were dull with very few changes, the highest change taking place in the metal markets. Tin which had all week been irregular, rose 25 cents on Thursday. This rise continued throughout the rest of the week. The check in the advance on steel due to the mills which are unable to give early deliveries constitutes the chief obstacle toward booking much of the steel business that is in the market. Aluminum, which for several months has been steady, rose on Monday to 35 cents and on Thursday to 40 cents. The copper markets reacted last week to 17½ cents for electrolytic and 18½ cents for lake. The unlooked for demoralization of the foreign exchange was practically an insurmountable barrier to purchasing of the metal by England. Antimony was weak with some importers asking 26 cents. There was no change in the crude rubber situation either here or abroad. Locally, trading was quiet.

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N. Y. Gasoline Now 20 Cents a Gal.

NEW YORK CITY, Sept. 8—Gasoline is selling in this city for 20 cents a gallon, an advance of 4 cents in four weeks, and garage proprietors predict a further increase. Some garage owners who had a supply of gasoline are still selling it at 17 and 18 cents.

The upward tendency of prices is due to the enormous increase in the demand for the automobile grades, both for domestic and foreign consumption. For the fiscal year ended with June 30 the United States exported 240,018,306 gal. of naphthas and gasoline, which compares with 185,578,776 gal. in 1914 and 174,073,477 gal. in 1913. The exports in 1915 were valued at $27,102,501 against $26,568,682 in 1914 and $23,883,424 in 1913.

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Schwartzkopf Leaves Gray & Davis

NEW YORK CITY, Sept. 7—E. E. Schwartzkopf, who has held the title of sales manager for Gray & Davis, Boston, has resigned that position. The resignation takes effect Oct. 1. He has not yet made public his plans for the future.

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Big Automobile Shipments a Problem for Railroads

DETROIT, MICH., Sept. 4—That the great prosperity of the automobile factories of this city is a problem for the railroads is evident from a statement recently made by E. D. Bronner, General Manager of the Michigan Central Railroad. Demand for railroad cars is very strong, and the importance of this traffic in automobiles is recognized by this railroad, the most important one entering Detroit, in the recent order for 500 more 40-ft. box cars of the type required for automobile shipments.

Chairman A. T. Waterfall, Traffic Commissioner of the Detroit Board of Commerce, points out that much of the scarcity of box-car equipment of the automobile type, which is becoming more and more acute, is due to the fact that these same cars are also adaptable to other lines of shipping, and are in demand elsewhere as well as here. Then the large crops of the West are also contributing to the shortage, as these crops can be shipped in an automobile car as well as any other.

It is clearly up to the manufacturers of automobiles to make the most efficient use of the cars they do get hold of, and to make strenuous efforts to have their customers at the other end of the line

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.35	.35	.35	.40	..	.40	+.05
Antimony	.28	.28	.26	.26	..	.26	—.02
Beams & Channels, 100 lb.	1.51	1.51	1.51	1.51	..	1.51	.....
Bessemer Steel, ton	23.00	23.00	23.00	23.00	..	23.00	.....
Copper, Elec., lb.	.17¾	.17¾	.17¾	.17¾	..	.17¾	.....
Copper, Lake, lb.	.18½	.18½	.18½	.18½	..	.18½	.....
Cottonseed Oil, bbl.	5.81	5.77	5.92	5.99	..	5.85	+.04
Cyanide Potash, lb.	.23	.23	.23	.23	..	.23	.....
Fish Oil, Menhaden, Brown	.39	.39	.39	.39	..	.39	.....
Gasoline, Auto, bbl.	.15	.15	.15	.15	..	.16	+.01
Lard, Oil, prime	.85	.85	.85	.85	..	.85	.....
Lead, 100 lb.	4.85	4.82½	4.82½	4.82½	..	4.82½	—.02½
Linseed Oil	.54	.54	.54	.54	..	.54	.....
Open-Hearth Steel, ton	23.50	23.50	23.50	23.50	..	23.50	.....
Petroleum, bbl., Kan., crude	.75	.75	.75	.75	..	.75	.....
Petroleum, bbl., Pa., crude	1.60	1.60	1.60	1.60	..	1.60	.....
Rapeseed Oil, refined	.77	.77	.77	.77	..	.77	.....
Rubber, Fine Up-River, Para	.57	.56	.56	.56	..	.56	—.01
Silk, raw, Ital.	..	..	..	..	..	..	.....
Silk, raw, Japan					..		.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	..	.90	.....
Tin, 100 lb.	33.62½	33.50	33.62½	33.87½	..	33.87½	+.25
Tire Scrap	.04¾	.04¾	.04¾	.04¾	..	.04¾	.....

see that the cars are unloaded promptly and released. Concerted action of this kind will do much to relieve the condition.

Probably some of the tight box car situation is also due to the delays of motor vehicles while in transit, and the meeting of the traffic managers of the various manufacturers who are members of the National Automobile Chamber of Commerce here on Sept. 14 will probably throw considerable light upon this phase of motor-car shipping.

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Cardway a Packard Representative

DETROIT, MICH., Sept. 4—Fred Cardway, formerly director of the Saginaw Valley Bureau of Foreign and Domestic Commerce, Saginaw, Mich., and also formerly connected with the American Cash Register Co., is now a foreign representative of the Packard Motor Car Co.

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Winslow Secretary to Hupp Head

DETROIT, MICH., Sept. 4—Palmer E. Winslow, who during the past one and one-half years was with the advertising department of the Hupp Motor Car Co., has been appointed secretary to President J. Walter Drake of that company.

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Dividends Declared

Linde Air Products Co.; quarterly of 1½ per cent on preferred, payable Oct. 1; and 2 per cent on common, payable Sept. 30.

Kelly-Springfield Tire Co., New York City; quarterly 1½ per cent on 6 per cent preferred, payable Oct. 1.

Gibney Tire & Rubber Co., Conshohocken, Pa., 6 per cent.

Peerless Motor Car Co., Cleveland, Ohio, quarterly of 1¾ per cent on preferred, Oct. 1.

Security Prices Higher

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Steady Stream of Selling on Foreign Account—General Motors Features Market

NEW YORK CITY, Sept. 7—Securities have a decidedly restricted market at the moment. The best evidence of this is the fact that the great majority of the securities recorded advances. The strongest features were found in the specialties, some of which closed with noteworthy gains. General Motors once again features the market with a twenty-two-point gain on Saturday. Peerless rose twenty points. There were many other substantial gains but the latter two were the most noted. The tire issues also showed heavy gains. While the actual trade in the rubber stocks was light, the price tendency was firm and stronger. There were offerings of Firestone at five points higher, with no sales reported and no firm bids. Goodyear sold at 270 and closed at the figure bid. Portage common sold at 46 and 46½, establishing a new high record, and closing firm at 46½ bid. Kelly-Springfield made another high record of 195. The market appeared to pay no attention to the fact that Miller preferred is now ex-dividend. It closed at 107½ bid with a complete recovery of the quarterly disbursement of 1¾. It was reported after some hours that the market would again advance with some further activity at prices well above the 200 mark.

The Detroit issues were very active with many changes being noted and many stocks changing hands. General motors made a total gain of twenty-three points while Chalmer's closing bid was 99, a gain of 9½ points. The inactive stocks were dull, there being but one change this being a decline of one point for the Atlas Drop Forge Co. The rest of the active and inactive stocks made either small or no gains. The bond markets were weak with no trading and no changes.

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Paige Listed in Detroit Stocks

DETROIT, MICH., Sept. 4—This week the stock of the Paige-Detroit Motor Car Co. was added to the regular list of stocks to be quoted upon the Detroit Stock Exchange. The stock, which has a par value of $100, was quoted at $450 asked and $440 bid.

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Rawle Driggs-Seabury Director

NEW YORK CITY, Sept. 3—J. W. Rawle, for many years associated with the Bethlehem Steel Co. and at present vice-president of the J. G. Brill Co., has been elected a director of the Driggs-Seabury Ordnance Co.

The board of representatives of the New York Market Assn., has formally listed the 30,000 shares of common stock, par value $100, of the Driggs-Seabury Ordnance Co. The company is negotiating with foreign governments for war orders totaling over $20,000,000.

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Brooks Out of Pontiac Chassis

PONTIAC, MICH., Sept. 3—H. H. Brooks has disposed of his interest in the Pontiac Chassis Co. to R. A. Palmer, president of the company.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	110	..
Aluminum Castings pfd			102	..	+2
J. I. Case pfd			72	79	+2
Chalmers Motor Co. com			95	97	+4½
Chalmers Motor Co. pfd			95	98	..
Electric Storage Battery Co			75	79	+10
Firestone Tire & Rubber Co. com			530	535	+5
Firestone Tire & Rubber Co. pfd			111	..	..
General Motors Co. com			241	243	+22
General Motors Co. pfd			112	113	+2½
B. F. Goodrich Co. com			61¼	62¼	— ¼
B. F. Goodrich Co. pfd			107	108¼	+1
Goodyear Tire & Rubber Co. com			270	274	..
Goodyear Tire & Rubber Co. pfd			108	109½	— ½
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			30	31	+2
International Motor Co. pfd			60	65	+1
Kelly-Springfield Tire Co. com			195	205	+10
Kelly-Springfield Tire Co. 1st pfd			86	87	+1
Kelly-Springfield Tire Co. 2d pfd			185	190	+10
Maxwell Motor Co. com			43	44½	+1
Maxwell Motor Co. 1st pfd			90	91½	..
Maxwell Motor Co. 2d pfd			36¾	38	+1¼
Miller Rubber Co. com			190	194	..
Miller Rubber Co. pfd			107½	..	..
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			120	..	+3
Packard Motor Car Co. pfd			101½	..	+1½
Peerless Motor Car Co. com			120	..	+20
Peerless Motor Car Co. pfd			90	94	..
Portage Rubber Co. com			46	48	..
Portage Rubber Co. pfd			93	94	..
*Reo Motor Truck Co			17	18	..
*Reo Motor Car Co			32½	34	+ ½
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp. com			64	65	+1
Stewart-Warner Speed. Corp. pfd			105	107	..
Studebaker Corporation com			111	112	+ ½
Studebaker Corporation pfd			104	105	+1
Swinehart Tire & Rubber Co			88	90	..
Texas Company			151	153	+1
U. S. Rubber Co. com			49	50	..
U. S. Rubber Co. 1st pfd			104	104¾	+1
Vacuum Oil Co			226	228	+12
White Company pfd			110	..	..
Willys-Overland Co. com			182	184	..
Willys-Overland Co. pfd			..	..	..

No quotations available at this time on account of war.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	98	99	..	+9½
Chalmers Motor Co. pfd	..	..	95	97	..
Continental Motor Co. com	155	180	..	300	..
Continental Motor Co. pfd	..	75	84	88	+1
General Motors Co. com	..	..	240	244	+23
General Motors Co. pfd	..	..	111	114	+2½
Maxwell Motor Co. 1st pfd	..	..	89½	92	+ ⅛
Maxwell Motor Co. 2d pfd	..	..	37	39½	+1
Maxwell Motor Co. com	..	..	43	45	+1½
Paige-Detroit Motor Co.	..	..	440	450	..
Packard Motor Car Co. com	..	..	120	..	..
Packard Motor Car Co. pfd	94	..	100	..	..
*Reo Motor Car Co	20⅜	21½	33½	34¼	+ ¾
*Reo Motor Truck Co	..	12¾	17¼	17¾	— ¼
Studebaker Corporation com	..	..	109	112	—3
Studebaker Corporation pfd	..	..	102	106	..

INACTIVE STOCKS

*Atlas Drop Forge Co	21	..	26	29	—1
Ford Motor Co. of Canada, Ltd	..	500	..	1525	..
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	20¼	22	..
Regal Motor Car Co. of Canada pfd	23	..	..	21	..

BONDS

General Motors, notes, 6's, 1915	..	100	..	..	..
Packard Motor Car Co. 5's, 1916	..	..	99	..	..

*Par value $10; all others $100 par value.

Michigan Fair Show Opens

Fourteen Trucks and 73 Cars Exhibited—1916 Grant Six Shown

DETROIT, MICH., Sept. 6.—Probably the most interesting and noteworthy feature in connection with the automobile show at the Michigan State Fair, which opened to-day, is the comparatively large number of commercial vehicles on display. Out of a total of seventy-three cars and chassis there are fourteen for commercial purposes. Last year there were scarcely half a dozen at the show.

As a matter of fact an exhibitor who also was there last year stated that while no trucks were sold at the show in 1914 five sales were made thereafter and were exclusively to prospects who had registered their names during the show. Another commercial car representative said that after checking up the prospects who registered during the fair show and those who gave their names at the big city show, it was found that more prospects were found among the state fair visitors.

The Grant Six

There is only one new 1916 passenger car shown which had not yet been announced this year, namely the Grant six. It has a 112-in. wheelbase or 6 in. more than the 1915 model; the bore is 3 in. instead of 2⅞; the stroke is the same or 4¼ in. The radiator design is new, being of the double shell type, or similar to the radiator on the Grant four. The body is flush, of the modified boat line design and besides being of much neater design provides much more room, the front seats now being 40 in. wide and the rear seats 47 in. wide. There are other minor improvements but the price remains the same, $795 completely equipped.

A car which is making its début in Detroit in connection with this fair is the Allen, a touring car being shown. This car sells at $795 with either touring or roadster body.

In the truck line the new ones are the Kalamazoo and the Independent. The 2-ton Kalamazoo made by the Kalamazoo Motor Vehicle Co., Kalamazoo, Mich., selling at $1,650 without body and at $1,775 with the body, has a four-cylinder block Buda motor, 3¾ by 5½, a Shakespeare carbureter, Bosch ignition, Timken front and Russel rear axles, Firestone tires, 37 by 4 on the front and 37 x 3½ dual on the rear. The wheelbase is 146 in.

The Independent 1500-lb. truck is made in Port Huron, Mich., by the Independent Motors Co. and sells at $1,285 without body, with either a 112-in. or 128-in. wheelbase. The motor is a four-cylinder Continental block, 3½ by 5. The carbureter is a Marvel; ignition, Eisemann; transmission Brown-Lipe sliding gear. Solid tires, 36 by 3 front and 36 by 3½ rear, are furnished.

The passenger cars on display to-day are the Buick, Hudson, Oldsmobile, Mitchell, Allen, Paterson, Studebaker, Cadillac, Maxwell, Ross, Hupmobile, Saxon, Dodge, Chalmers, Ford, Chevrolet, Monroe, Scripps-Booth, Chandler, Oakland, Grant, Haynes, Overland. Both Buick and Overland show also a light delivery truck. Commercial vehicles shown are the Commerce, Denby, Federal, Vim, Standard, Independent, Kalamazoo and Reo.

Before the fair ends Sept. 15, the distributor for the Reo expects to receive the 1916 Reo passenger models.

Trucks to be shown for which space is reserved are the Signal and Tosmath.

Like last year the Ford Motor Co. has installed a miniature assembling plant where twenty-five cars are to be assembled daily.

Tractor Section of Interest

Another feature of the fair this year is the tractor section where the Ford motor tractor is shown for the first time in public. When all the tractor machines will be on the ground this section of the fair will be quite important.

The Olson tractor wheel for Ford cars also other cars is shown for the first time. It is made by the Swedish Crucible Steel Co., Detroit and Windsor. The wheels are all steel and manufactured with combination rims for tractor with either solid or pneumatic tires. They can be applied to any Ford model T by the removal of the latter's wheels and when the owner wishes to use his car as a passenger car he can easily take off the tractor wheels and put back his original set of wheels.

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Open Air Shows in New England

BOSTON, MASS., Sept. 6—The Boston Automobile Dealers' Association has approved plans made by the managers of the two big fairs in New England, the Brockton Fair in October and the Rockingham Park fair the latter part of September, to hold open-air automobile shows. A number of the Boston dealers plan to exhibit their 1916 models in both shows, and large sections of space have been set aside for the purpose, where the cars will be housed in tents. At the Marshfield fair last week there was a show, and it proved very profitable.

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Annual Electrical Show Oct. 6-16

NEW YORK CITY, Sept. 1—The ninth annual Electrical Exposition and Motor Show will be held in this city Oct. 6 to 16, at the Grand Central Palace.

Astor Cup Five-Year Trophy

To Be Won on Points—Five Makes of Cars Required for Each Race

NEW YORK CITY, Sept. 3.—Vincent Astor has made public the deed of gift and the conditions governing the series of contests for the permanent possession of the Astor Cup, the first race for which will be run on Oct. 2 at the new Sheepshead Bay Speedway.

The design of the cup is a Classic Grecian Bowl. It bears the inscription "Astor Challenge Cup" in raised letters. The decorations are bands of laurel and oak leaves. The height of the cup itself, which rests on an ebony base, is 28½ in. and its width is 20 in. It has a chased cover.

The conditions imposed by Mr. Astor in his deed of gift call for five annual competitions on the Sheepshead Bay Speedway, the cup going to the entrant and not the driver. The final possession of the trophy will be determined on a point basis, as follows:

1—The cup shall be contested for five successive times, at intervals of not less than one year.

2—The cup shall be loaned each year to the entrant whose cars finish first in competition. Said entrant to retain possession of same for a period of one year.

SCALE FOR WINNING CAR EACH YEAR

PLACE	POINTS	PLACE	POINTS
1	20	6	7
2	15	7	6
3	12	8	5
4	10	9	4
5	8	10	3

3—In case of a tie for the permanent possession of the trophy, the disposition of such shall be determined by a series of three 100-mile races on said speedway, one car each to be nominated by entrants' time tying for possession. Best two out of three in these sprints to be winner.

4—Not fewer than five different makes of cars shall constitute a competition, any year.

5—If any entrant should obtain sufficient points to insure permanent possession of trophy in fewer than five competitions, the fifth competition shall take place in due course.

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Transform Hall for Fall Show

MILWAUKEE, WIS., Sept. 4—The Milwaukee Automobile Dealers, Inc., is spending nearly $6,000 in rebuilding Machinery Hall at State Fair Park to make it an exposition palace for the first annual fall show, Sept. 13 to 17. In addition, about $5,000 will be spent for decorations and lighting effects. Machinery

Hall was built as a great, gaunt structure of concrete, without side walls, and designed for agricultural machinery and automobile exhibits indiscriminately. The M. A. D., however, plans to make the fall show a success and is transforming the structure into an inclosed auditorium. Space has already been sold to forty dealers and at least fifty are expected to sign before the lists close. These fifty will represent about eighty different makes of cars.

The recent booster tour undertaken by the M. A. D. is expected to result in the largest attendance ever known.

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Hyatt Offers $1,000 in Cash Prizes

DETROIT, MICH., Sept. 6—Cash prizes totaling $1,000 will be given by the Hyatt Roller Bearing Co. to the winners of a contest having for its object to find out the greatest mileage obtained from any car fitted with Hyatt bearings which have not been replaced since the car was first put into service. The winner of the contest, which is open to all car owners, will receive $500, second prize will be $200, third prize, $100, fourth, fifth and sixth prizes respectively $50, $30 and $20, and the next ten prizes $10 each. No one connected with the Hyatt company is eligible. The contest closes November first and the judges will be Alfred Reeves, general manager of the National Automobile Chamber of Commerce; Coker F. Clarkson, general manager of the Society of Automobile Engineers, and Julian Chase, editor of *Horseless Age*.

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Norma Offers Parade Prizes

NEW YORK CITY, Sept. 2—Among the special prizes to be awarded winners in the automobile parade and inspection on Sept 18, prior to the Sheepshead Bay races, is a silver plaque presented by the Norma Co. of America, to go to the winner in the class of decorated gasoline runabouts.

The Norma company is also to give two special prizes for the Astor Cup race on Oct. 2—a purse of $100 to be awarded the winner of the race, and a purse of $50 to go to the driver making the fastest lap during the race—provided their cars carry ignition apparatus equipped with Norma ball bearings.

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A Lozier Racing Team?

DETROIT, MICH., Sept. 4.—It was reported in some automobile quarters today that the Lozier Motor Co. expects to have a team of three racing cars next year and that Ralph Mulford, who was connected with the old Lozier organization and drove Lozier racing cars, will be in charge of the racing team and drive one of the cars. After his recent victory in Des Moines, Iowa, Mulford came to Detroit, and the matter was taken up with the officials of the company.

Wis. Jitneys Under New Law

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225 Out of 1100 Resume Business in Milwaukee After Meeting Requirements

MILWAUKEE, WIS., Sept. 6—Milwaukee was practically without jitney bus service for several days last week, due to the inability of jitney operators to qualify under the new State law regulating this mode of transportation, effective Sept. 1. Nearly every one of the 1100 jitneys licensed to operate under the city ordinances went out of business temporarily, but on Saturday night 225 resumed service under the permits granted by the Wisconsin public utilities commission. In the interim hundreds of people rode free, or ostensibly so, for no less than fifty operators remained on the city streets carrying signs, "Free Service," in retaliation of the efforts of the traction companies to put the business down and out by a stringent State law requiring indemnity bonds, regular schedules, hours of service and similar burdens.

When the law was passed about the middle of August, the jitney men's association organized a mutual insurance company to issue bonds as required by the new law. It was found impossible to perfect the details by Sept. 1, and the police of Milwaukee, Racine, Kenosha and other cities were obliged to stop operations until drivers qualified by filing an indemnity bond, routes, schedules, etc. The public utilities commission made an extraordinary effort to promote qualification and by Saturday night the mutual insurance company was able to issue policies, following which the holders were able to file their applications for permits to do business.

It is expected that not more than 300 of the total number of 1200 jitney operators licensed since May 1 will stay in business under the new law, because of the prohibitive premiums and selection of risks by the jitney mutual.

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Miller Rubber Starts Free Tire Service

AKRON, OHIO, Sept. 6—The Miller Rubber Co., Akron, Ohio, has started a free tire service in that city, which has attracted widespread attention. Five service cars have been placed in service, and no matter what make of tire is used a telephone call will bring a service car to fix the trouble free of charge.

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70 Texas Overland Dealers Meet

DALLAS, TEX., Sept. 4—Seventy automobile dealers were entertained Tuesday night in Dallas by the Overland Automobile Co. of Dallas at the Automobile Country Club. John F. Toole, special representative of the Knight division of the Willys-Overland Co., was guest of honor and principal speaker. The dealers discussed optimistically the automobile field and conditions in general. After the dinner the party met at the Overland company's headquarters in Dallas and discussed the business in different phases.

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Cleveland Ajax Dealer to Give Free Tire Service on Road

CLEVELAND, OHIO, Sept. 6—The Cleveland Free Tire Service Co., Ajax tire dealer here, originated a free service plan that is being widely copied. A motorcycle squad is in readiness at all times to go out on calls. The men change tires of any make, it matters not, without charge.

If it is a puncture the tube goes back to the service company to be repaired. The motorist has to have this done somewhere, and the Cleveland company wants the work chiefly to remind the motorist of the service he got. The repair charge is just as low as anywhere. Of course if a new tire or tube is supplied it is charged for at regular prices. But the motorist is not expected to pay for having the goods brought to him, no matter what the run is.

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Gets Ohio Cadillac Distribution

COLUMBUS, OHIO, Sept. 4—The Columbus Cadillac Co., organized several weeks ago with an authorized capital of $25,000, has taken over the Cadillac agency in twenty-two counties in central Ohio. The agency was formerly held by the Curtin-Williams Automobile Co. T. H. Towell is president, and E C. Mollitor, treasurer and general manager. Mr. Towell is also president of the Cleveland-Cadillac Co. and the Toledo-Cadillac Co., distributors of that make in those cities. The Columbus-Cadillac Co. will name a number of sub-agents in the territory controlled by it.

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New York Taxicab Rates Lowered

NEW YORK CITY, Sept. 3—The Public Service Commission has granted permission to the Westcott Express Co. to put into effect immediately a new tariff of taxicab rates from the Grand Central Station, the D. L. & W. and the Erie Railroad terminals at the foot of West Twenty-third Street, and the West Shore Railroad Terminal at the foot of West Forty-second Street.

The new tariff embodies a reduction in the rates heretofore charged. Under the previous tariff the lowest rate for the first zone was 60 cents for one or two passengers. Under the new rule this rate is reduced to 50 cents, and the number of passengers that may be carried for it is either one, two, three or four.

Factory Miscellany

Weber Adding—The Weber Implement & Automobile Co., St. Louis, Mo., is building an addition to its plant.

Apperson Building—The Apperson Bros. Automobile Co., Kokomo, Ind., is building a 150,000-sq.-ft. addition to its plant.

Canadian Ford Adds—Another addition is being made to the plant of the Ford Motor Co., Ford, Ont., to cost $60,000.

Friddle Car Co. to Build—The Friddle Motor Car Co., Tacoma, Wash., will build a plant, estimated to cost $50,000. J. A. Friddle is president.

Trenton Body Builds—Fitzgibbon & Crisp, Trenton, N. J., maker of automobile bodies, will build an addition to its plant on Bank street.

Dunlop Tire Enlarges—The Dunlop Tire & Rubber Co., Booth Avenue, Toronto, will build a three-story brick addition to its factory to cost $30,000.

Houk to Add—The Houk Mfg. Co., Buffalo, N. Y., has completed plans for an addition to its plant at Elmwood avenue and the New York Central Railroad Belt Line.

To Make Tires—A company is being organized by John Hotchkiss, William Stevenson and others to build a plant for the manufacture of tires in Sebring, Ohio. No details of construction have been decided.

New Tarrytown Addition—The Chevrolet Motor Co. will soon be ready for bids for construction of a two-story plant to be built at Tarrytown, N. Y., at an estimated cost of $40,000. The company has purchased a building at Toronto, Ont., and will install machinery and equipment.

To Make Automobile Clocks—The Thompson Electric Clock Co., Memphis, Tenn., is planning the manufacture of automobile timepieces. Its principal requirement will be electric batteries.

To Make Spark Plugs—The National Service Corp., Hummelstown, Pa., is equipping a plant and installing machinery for the manufacture of spark plugs, and will be ready to make delivery in 4 or 5 weeks.

General Vehicle Expands—The General Vehicle Co. has applied for permits for the erection of an additional unit, 200 by 400 ft., to its Long Island City plant. It is to be one-story, brick and concrete, located at Starr Avenue, east of Borden Avenue.

Puritan House Organ—The Puritan Machine Co., Detroit, Mich., intends publishing a house organ for general distribution among car owners and dealers. The title of the new magazine will be "Puritan Motor News." F. M. Eldredge, advertising manager, will edit the new magazine, the first edition having appeared Sept. 1, and to be published monthly thereafter.

Binghamton Plant to Be Enlarged—The plant of Crandal, Stone & Co., Binghamton, N. Y., will be enlarged in the near future, giving an additional 16,000 sq. ft. The company manufactures automobile accessories. The company has been specializing lately in bow sockets, the output of which has been greatly increased during the past 2 months from a large contract to manufacture for the Ford company. The new addition will be 100 by 40 ft. in size and one story high.

Waukesha Co. Builds Tractors—The Federal Bridge Co., Waukesha, Wis., formerly the Modern Steel Structural Co., started last week on the regular production of gasoline tractors. The company is building the machines for another interest and acts only as producer. The enterprise is in the hands of Waukesha capital, however, and the design is by Waukesha inventors. The tractor is to be sold at a price said to be attractive to even small farmers and orders are being received from all parts of the Middle West.

Stamping Co. Purchases Plant—The Geuder, Paeschke & Frey Co., Milwaukee, which recently established a department for the production of stampings for motor car manufacturers, has purchased the plant of the National Blower Works, adjoining its present plant, to obtain much-needed space. The Geuder-Paeschke working force will immediately be increased by 200 skilled workmen. The National plant consists of a main building, 100 by 200 ft., and several smaller structures, equipped for sheet metal work. The Geuder company is a large producer of tin, sheet iron and enameled products.

The Automobile Calendar

Sept. 6-9.....Worcester, Mass., Show, Dealers' Assn.
Sept. 6-10.....Indianapolis, Ind., Show, Indiana State Fair.
Sept. 6-15.....Detroit, Mich., Show, Michigan State Fair.
Sept. 8-11.....Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13-17.....Milwaukee, Wis., Show, Automobile Dealers' Assn.
Sept. 13-17.....Oakland, Cal., Pan-American Road Congress.
Sept. 17-18.....Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18.....Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Sept. 18-25.....Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Sept. 22.....New York City, Booster's Outing to Smithtown.
Sept. 22-25.....Rockford, Ill., Show.
Sept. 24.....Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 26-Oct. 10...Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Sept. 27-Oct. 2....Salem, Ore., Show, State Fair.
Oct.....Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2.....Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 2.....Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9.....Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 4-10.....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6.....Columbus, O., Garage Owners Convention.
Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9.....Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14.....Chicago, S. A. E. Standards Committee Meeting.
Oct. 16.....Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 18-19.....Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 20.....Corona, Cal., Road Race.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 31.....New York City, Show; Grand Central Palace.
Jan. 22, 1916.....Chicago, Ill., Show; Coliseum.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Feb. 19.....Newark, N. J., Show.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Hoar Manager Now—F. A. Hoar, for the past fifteen years with the International Harvester Co., has become manager of the Boston agency for the Moline Knight cars handled by Harrison Turner.

Manley Goes West—N. G. Manley, manager of the Metz branch at Worcester, Mass., for the past six months, has been promoted and sent West to manage the new Metz branch opened recently at Omaha, Neb.

Cobb Takes Charge—W. E. Cobb has taken charge as manager of the Locomobile branch in St. Louis, succeeding W. H. Roesch, who returned to resume his former position with the Locomobile branch in Chicago.

Asmus Dodge Assistant Export Manager—Oscar Asmus has been appointed assistant export manager of Dodge Bros., Detroit, Mich. He was formerly manager of the tourist cruise department of the Hamburg-American steamship line in New York.

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Dealer

Larger Quarters Needed—The Bradford Automobile Co. at New Haven, Conn., handling the Paige line has been so successful that it has had to lease the store at 240 George Street, two doors above its present quarters for additional sales and service quarters.

Reo at Worcester—W. T. McOwen, formerly with the J. M. Linscot Co., Boston, Mass., has gone to Worcester, where he has formed the Worcester Reo Co. to distribute that make in the territory with his salesrooms at 696 Main Street. The Reo was formerly represented in Worcester by E. J. Kehoe.

New Company Formed—G. W. Turner, who has been in the automobile business in Boston, Mass., for many years has just formed the Turner-Ring Co., with C. B. Ring of Springfield, and they have opened a place of business at 1118 Boylston Street, to handle Ford cars at retail and specialize in building commercial bodies for this type of car.

Builds New Garage—C. T. Wetherell, manager of the Co-operative Delivery Service, Springfield, Mo., is building a two-story brick garage opposite the present quarters of the company, which will be completed by Oct. 1. The upper story will be used for storage, the ground floor will be equipped for repair work. The present quarters will be continued.

Motor Men in New Roles

Herrington Leaves American Electric—Roy Herrington, general manager of the American Electric Car Co., Chicago, Ill., has resigned to become manager of the Rockford, Ill., branch of the Anderson Electric Car Co.

Collins King Special Representative—The King Motor Car Co., Detroit, Mich., has created the position of special factory salesman for Bert Collins, whose principal duty it will be to make quick trips to localities where co-operation with dealers is necessary. He will cover the entire country.

Otto Von Bachelle, who was formerly consulting engineer with the Hupp Motor Car Co. and prior to that with the E. R. Thomas Co., Buffalo, is now associated with the A. A. Crumley Co., which was recently formed and which is the Michigan State distributor for the King and also handles the Dort.

Whitney with Willard Chicago Branch—C. S. Whitney has been appointed sales manager and assistant to the manager of the Chicago branch of the Willard Storage Battery Co., Cleveland, Ohio. Mr. Whitney was formerly manager of the Chicago automobile department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Burk Returns to the Coast—W. E. Burk, until recently general manager and vice-president of the local Master Carbureter Corp., has returned to the Pacific Coast and will be associated with the Master Carbureter Co. of Los Angeles. Arthur L. Jelley, formerly of Kansas City, Mo. has been appointed general manager succeeding Mr. Burk.

Franklin Is Crumley Sales Manager—G. W. Franklin, manager of the local branch of the Regal Motor Car Co., Detroit, Mich., until this branch was discontinued, and who was a district sales manager for the Regal company during seven years, has been appointed sales manager of the A. A. Crumley Co., which was recently organized to handle the King in the State of Michigan.

Bromley and Jordan with Consolidated—E. W. Bromley, formerly with the Marmon organization, has been appointed district manager of Abbott-Detroit interests in Illinois and Indiana by the Consolidated Car Co., this city.

W. I. Jordan, formerly with the Hupmobile distributing organization in Chicago, has joined the Abbott-Detroit sales forces and is handling the distribution of this car in the State of Iowa.

Reynolds United States Tire Manager—F. I. Reynolds, formerly tire sales manager of the B. F. Goodrich Co., has been appointed manager of the automobile tire department of the United States Tire Co., New York City. O. S. Tweedy, the assistant general sales manager, will take on the complete charge and direction of all of the company's branches and depots throughout the country, in which work he will be assisted by the central district manager, G. S. Shugart, whose headquarters are in Chicago.

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Dealer

Philadelphia Paige Moves—The Bigelow-Willey Motor Co., distributer of the Paige car in Philadelphia, is moving its agency headquarters from 204 North Broad Street to 304 North Broad Street.

To Handle Paige Business—J. B. Sperry has assumed charge of the Paige Motor Co. of Rhode Island, just formed to handle that line in the State with headquarters at Providence in the salesrooms, 26-28 Snow Street.

Sebring Tire Co.—A company with $200,000 capital stock is being organized in Sebring to manufacture automobile tires. The capacity of the plant will be 500 tires a day, but only 100 tires a day will be made to start with.

Sheldon Relief Association Holds Outing—The annual outing and field day of the Sheldon Relief Association was held in Wilkes-Barre last week. This is an association of the Sheldon Axle & Spring Co.'s employees, formed for relief of any members sick or injured.

Two New Tire Agencies—Two tire agency and service companies have resulted in Kansas City, Mo., from the dissolution of the Byerly-Hoole Tire & Repair Co. at 2214 McGee Street. C. T. Byerly of that firm and Edward H. Mengel, for two years manager of the Byerly-Hoole company, have formed the Byerly Tire & Repair Co., and have opened a tire service establishment with complete new equipment at 1906 Grand Avenue. They have the agency for the Goodyear and the Republic Quality Tires, and the service stations for those tires. Mr. J. C. Hoole had personally been the agent for the Kelly-Springfield Tire, and retains that agency with the new company he has formed, the Hoole Tire & Repair Co. He has also obtained the agency for the Goodrich tire. His establishment is at the old Byerly-Hoole stand.

Automobile Agencies Recently Established

Alabama

Birmingham	Willys-Knight	The Overland-Birmingham Co.	

Arizona

Douglas	Oldsmobile	E. R. Pirtle Co., Inc.	

Arkansas

Lake Village	Hupmobile	E. L. Davis	
Marianna	Hupmobile	R. D. Jarrett	

Canada

Quebec	King	E. C. Brochu	
St. Catharines	Oldsmobile	International Garage	

Colorado

Castle Rock	Overland	E. C. Troplett	
Craig	Overland	Norman Mills	
Creede	Chevrolet	Samuel McKibbon	
Creede	Monroe	Samuel McKibbon	
Cripple Creek	Overland	Cripple Creek A. & E. S. Co.	
Ft. Collins	Chevrolet	Ben Mossman	
Colorado Springs	Chevrolet	C. T. Gauss	
Colorado Springs	Hudson	Steniger Motor Co.	
Colorado Springs	Monroe	C. T. Gauss	
Colorado Springs	Oldsmobile	Silver State Auto Co.	
Colorado Springs	Overland	J. W. Ross	
Denver	Haynes	L. E. Kelton	
Denver	Hupmobile	Hupp Motor Sales Co.	
Denver	Locomobile	Hupp Motor Sales Co.	
Denver	Maxwell	Maxwell Motor Sales Corp.	
Denver	Mitchell	Platt-Fawcett M. Co.	
Denver	Pullman	G. E. Hannan	
Denver	Stearns	Platt-Fawcett M. Co.	
Eads	Monroe	R. W. Wansted	
Eads	Chevrolet	R. W. Wansted	
Eagle	Overland	A. B. Koonce	
Eaton	Hudson	A. Johnson	
Eaton	Overland	Forest Lumber Co.	
Fairplay	Overland	G. M. Teter	
Flagler	Overland	Clyde Seal	
Ft. Collins	Hudson	N. C. Warren	
Ft. Collins	Monroe	Ben Mo sman	
Ft. Morgan	Buick	Patterson Automobile Co.	
Ft. Morgan	Overland	A. C. Gillette	
Fowler	Overland	J. A. Harmison	
Grand Junction	Hudson	Western Colo. Motor S. Co.	
Grand Junction	Oldsmobile	Western Slope Auto Co.	
Grand Junction	Overland	Ramsey Auto Co.	
Greeley	Cadillac	A. E. Nelson	
Glenwood Springs	Buick	J. F. McCoy	
Glenwood Springs	Oldsmobile	G A. Hopkins	
Glenwood Springs	Overland	C. R. Keck	
Gunnison	Overland	J. E. Wylie	
Haxtum	Hupmobile	G. W. Gordon	
Hot Sulphur Spgs	Buick	E. L. Chatfield	
Hot Sulphur Spgs	Dort	L. R. Hansen	
Hot Sulphur Spgs	Hudson	C. F. Free	
Hugo	Overland	V. L. Cobb & Hatton	
Idaho Springs	Chevrolet	E. F. Galligan	
Idaho Springs	Monroe	E. F. Galligan	
Idaho Springs	Overland	J. Meyer, Jr.	
Julesburg	Oldsmobile	Parker Bros.	
La Jara	Overland	Fletcher Hardware Co.	
La Junta	Overland	Ideal Garage & Mach. Shop	
Lamar	Overland	I. L. Maxwell	
Las Animas	Overland	Thomas Merchandising Co.	
La Salle	Saxon	W. W. Abarr	
Leadville	Overland	C. A. Edwards	
Leadville	Paige	Kock & Pfannenschmid	
Leadville	Reo	Kock & Pfannenschmid	
Leroy	Hupmobile	G. G. Granberger	
Littleton	Chevrolet	H. L. Potts	
Littleton	Monroe	H. L. Potts	
Longmont	Chevrolet	Watts & Hilton	
Longmont	Hudson	A. H. McKien	
Longmont	Monroe	Watts & Hilton	
Meeker	Chevrolet	H. Gordon	
Meeker	Monroe	H. Gordon	
Montrose	Overland	H. A. Hyatt	
Monte Vista	Overland	Almond & Gulzow	
Olney Springs	Dort	A. G. Bowers	
Ouray	Overland	W. G. McConnell	
Placerville	Overland	Trumble & Toniollo	
Pueblo	Monroe	Kneble Auto Co.	
Pueblo	Oldsmobile	Silver State Auto Co.	
Pueblo	Saxon	W. E. Grant	
Rifle	Overland	C. G. Kendall	
Saguache	Overland	Gotthelf & Tarbell Mer Co.	
Salida	Oldsmobile	Salida Auto Co.	
Sedalia	Dort	J. A. Kroeger	
Sedgwick	Dort	J. J. Kenney	
Sterling	Oldsmobile	Felkner Auto & Mch. Co.	
Sterling	Reo	H. B. Swedlund	
Stratton	Overland	C. A. Reish	
Tabernash	Overland	E. A. Morgan	
Trinidad	Dodge	J. C. Shy	
Trinidad	Hudson	J. C. Shy	
Victor	Hupmobile	Woods Auto Co.	
Walsenburg	Overland	A. C. Hill	
Walsenburg	Saxon	H. D. Palmer	
Windsor	Overland	Windsor Hardware Co.	
Wray	Overland	Model Auto & Mch. Co.	
Yuma	Overland	J. F. Heisdram & Son	

Connecticut

New Haven	Chandler	J. M. Henry	

Delaware

Wilmington	Chandler	Delmar Auto Co.	

Georgia

Eastman	Hupmobile	F. A. Roberts	

Illinois

Algonquin	Chandler	Peter Bros. Mfg. Co.	
Aaklikum	Chandler	Eugene A. Lemangger	
Aurora	Hupmobile	Hobbs Garage	
Chicago	Herff-Brooks	G. L. Brandeis	
DePue	Herff-Brooks	Frank H. Fowler	
Joliet	Detroiter	W. H. Scheik	
Kewanee	Chandler	Kewanee Garage	
Princeton	Chandler	Miles S. Fox	
Villa Grove	Herff-Brooks	Chas. F. Andrews	

Indiana

Huntington	Ford	Kelsey & Theime	
Indiana Harbor	Oldsmobile	Harbor Garage & Machine Co.	
Rushville	Hupmobile	Clark & Caldwell	
Sullivan	Hupmobile	Herman Helen	

Iowa

Des Moines	Herff-Brooks	Pegau Auto Co.	
Gilmore City	Chandler	H. Mulholland	
Humboldt	Hupmobile	Pahns & Son	
Indianola	Hupmobile	E. L. Haxel	
Merrill	Overland	Schneider & Anderson	
Newell	Chandler	W. D. Rust & Son	
Stanton	Chandler	C. J. Anderson	
Webster City	Overland	Webster City Auto Co.	
Whittemore	Hupmobile	T. S. McGovern	

Kansas

Ashland	Dort	Workman & Caldwell	
Belleville	Saxon	Hugh Van Natta	
Cawker City	Hupmobile	P. H. Schroeder	
Cimerron	Dort	Isley Lumber Co.	
Dodge City	Dort	R. J. Prior Auto Co.	
Hutchinson	Chalmers	Arnold Brothers	
Hutchinson	Dodge	Arnold Brothers	
Hutchinson	Oldsmobile	Wait & Benson	
Lawrence	Hupmobile	Lawrence Auto Co.	

Kentucky

Fort Thomas	Chandler	Highland Auto & Garage Co.	
Middlesboro	Hupmobile	Middlesboro Auto Co.	

Maine

Waldboro	Chandler	C. B. Stahl	

Maryland

Gaithersburg	Oldsmobile	C. A. Fulks & Bro.	
Hagerstown	Herff-Brooks	Young Motor Car Co.	

Massachusetts

New Bedford	Hupmobile	Knickerbocker Garage	

Michigan

Alma	Hupmobile	Nelson Smith	
Bessemer	Oldsmobile	Graham & Pecard	
Ida	Oldsmobile	N. A. Weipert & Son	
Lawton	Ford	Packer & Giddings	
Lowell	Hupmobile	Dr. E. D. McQueen	
Reese	Ford	Geo. Schemm	
Saginaw	Oldsmobile	Saginaw Cadillac Co.	
St. Johns	Ford	C. M. Sheldon	

Minnesota

Fairfax	Hupmobile	Reuben & Sell	

Missouri

Excelsior Springs	Hupmobile	Auto Transit & Storage Co.	
Farley	Hupmobile	A. E. Fankhanel	
Glasgow	Hupmobile	Emmett Ballen	
Kansas City	Paige	Bush-Morgan Motor Co.	
Palmyra	Hupmobile	C. L. Leggett	

Nebraska

Alliance	Cadillac	R. N. Henry	
Benedict	Hupmobile	B. J. Huff	
Bridgeport	Overland	C. C. Nelson	
Florence	Maxwell	J. H. Price	
Greenwood	Chandler	A. E. Pailing	
Haigler	Dort	M. M. Brumley	
Kimball	Overland	P. Maginnis	
McCook	Dort	M. M. Brumley	
Mitchell	Case	Ewing & Kinnaman	
Mitchell	Paige	C. Schlect	
Omaha	Oldsmobile	Oldsmobile Sales Co.	
Roca	Overland	Roca Auto Co.	
Roca	Willys-Knight	Roca Auto Co.	
Stratton	Dort	M. M. Brumley	
Scottsbluff	Overland	McCain & Harris	
Shelton	Hupmobile	H. M. Kithcart	
Sidney	Overland	E. C. Stockdick	
Wisner	Chandler	Chris Jensen	

New Jersey

Ocean City	Hupmobile	C. R. Stilwell & A. R. Togg	
Paterson	Hupmobile	Henry Schroeder	
Somerville	Herff-Brooks	Wm. R. Quimby	

New York

Fonda	Oldsmobile	Ochampaugh Garage	
Hemlock	Chandler	V. P. Owen	
Lyndonville	Oldsmobile	Housel & Hill	
Naples	Chandler	M. N. Fox	
Ogdensburg	Chandler	H. G. Chandler	
Perry	Oldsmobile	P. R. Davis	
Scottsville	Hupmobile	S. R. Stottle	
White Plains	Oldsmobile	Tri-State Supply Co.	

North Carolina

Charlotte	Chandler	Geo. Fitzsimon	
Hickory	Hupmobile	R. C. Buchanan	

North Dakota

Hebron	Allen	Theodore Bolke	

Ohio

Byron	Chandler	Erman Peterson	
Clarksville	Hupmobile	G. W. Stephens	
Hicksville	Oldsmobile	Kimble & Boom	
Lithopolis	Herff-Brooks	Thurman Lisle	
Marblehead	Oldsmobile	A. B. Jordan & Son	
Middletown	Chandler	H. R. Gardner	
Napoleon	Hupmobile	S. E. Bissonnette & Son	
Oak Harbor	Oldsmobile	Geo. Tilton	

Oklahoma

Oklahoma City	Regal	Knox Auto Co.	

Pennsylvania

Clarion	Chandler	R. F. McClain	
Haverford	Hupmobile	Longstreth Service Co.	
Jerome	Chandler	C. F. Truax	
Myersdale	Hupmobile	Myersdale Auto Co.	
Norristown	Oldsmobile	Keystone Auto Co.	
Sheffield	Oldsmobile	John G. Cochran	
Spring City	Oldsmobile	E. Kugler	
Tarentum	Hupmobile	H. M. Martin	

Porto Rico

San Juan	Franklin	R. A. Macfie	

South Dakota

Watertown	Hudson	Blain Auto Co.	
Watertown	Packard	W. C. Nissen	
Watertown	Studebaker	W. C. Nissen	

Texas

Alice	Hupmobile	W F. Wurtz	
Gregory	Hupmobile	E. W. Sanders	
Hamlin	Hupmobile	Payne & Phito	
Wichita Falls	Chandler	M. M. Cooke	

Virginia

Newport News	Chandler	Hudson Hardy Co., Inc	

Wisconsin

Ladysmith	Oldsmobile	W. D. Morgan	
Prairie Farm	Hupmobile	Geo. Beiswange	
Sheboygan Falls	Hupmobile	Henry Frich	

Wyoming

Baggs	White	Blackwell Bros.	
Casper	Cadillac	C. L. Manbeck	
Casper	Oldsmobile	H. J. Bingenheimer	
Casper	Overland	W. A. Smith	
Cheyenne	Hudson	W. E. Dimmeen	
Encampment	Overland	E. H. Lenke	
Glenrook	Pai e	Clifford Smith	
Hanna	White	G. H. Film	
Laramie	Hudson	W. H. Inman	
Lost Cabin	Dor	G. C. Stout	
Lusk	Overland	J. A. Agnew	
Medicine Bow	Dort	Scofield & Call	
Medicine Bow	Saxon	W. F. Shields	
Rawlins	Buick	Wyoming Supply Co.	
Rawlins	Hudson	Sundin & Rumsey	
Rawlins	Overland	C. R. Watson	
Riverton	Overland	H. C. Lawer Co.	
Rock Springs	Overland	L. Dendsen	
Sheridan Shoshoni	Hudson	T. C. Diers	
Thermopolis	Cadillac	C. Typer	

Recent Automobile Incorporations

New York City

Thedford Transportation Co.; $5,000. R. Thedford, George Glynn, Joseph Farber, 137 W. 89th street.

Republic Motor Sales Co.; $15,000. Solomon Wall, Joseph Pendleton, Irving Eisner, all of 261 Broadway.

Wilcox, Taylor Auto Co.; $1,600. W. H. Wilcox, J. J. Taylor.

Empire State Sight-Seeing & Trucking Co.; $1,000. C. F. Fuchs, Rudolph Pick, Walter Latzer, 989 Simpson street.

Samot Taxi Cab Co.; $1,000. M. J. Larkin, A. W. Heitel, R. E. Weldon.

Parcel Post Delivery Co.; $5,000; to operate garage, deliver mail, trucking, etc. F. M. Monahan, J. J. Monahan, Thomas Monahan, all of 216 W. 18th street.

Eastern Motor Sales Corp.; $10,000. F. S. Hannah, A. G. Keinath, C. M. Fleming.

Yorkville Auto Supply Depot; $10,000. Michael Walpin, Frieda Richman, Sydney Richman, both of 1235 Lexington avenue.

Forty-eighth Street Garage; $5,000. Morris Bonsole, M. M. Bonsole, Max Bonsole, all of 877 8th avenue.

Brautigam Taxi Co.; $3,000. Emile Brautigam, R. Froelich, S. Rubin.

Biltmore Garage; $10,000. E. E. Jacobsen, C. J. Steierman, M. J. Hanlon.

Falls Tire Co.; $15,000; manufacturer. Henry Weiss, Marcella Sanger, A. G. Sanger, 1947 7th avenue.

Automobile Owners Purchasing Corp.; $10,000. F. B. Wood, J. R. Clevenger, C. S. Lorentzen, 88 Park Row.

Traveller Tire and Tube Co.; $50,000; manufacturer. Samuel Marx, L. M. Barman, Louis Bayer, 117 Leonard street.

Miller Centrifugal Motor Co.; $600,000; manufacturer. Martin Lippman, E. L. Meyer, Emma Ullmann, 228 Duncan avenue, Jersey City, N. J.

Automobile Agencies Recently Established

Alabama

Roanoke	Saxon	D. M. Yates

Arizona

Clifton	Maxwell	Clay & Ruth
Ray	Overland	Miller Bros.
Walnut Lake	King	R. A. Pickens & Son
Williams	Chevrolet	Babbitt & Polson
Williams	Metz	R. Davenport
Winslow	Maxwell	M. W. Dadey

Arkansas

Monticello	Oldsmobile	F. H. Boyd

California

Artesia	Apperson	Artesia Garage & Tool Co.
Burbank	Apperson	C. I. Lovejoy
East Hollywood	Apperson	Charles Erb
Elsinore	Apperson	Charles Hudson
Hemet	Apperson	Phillion & Sanborn
Inglewood	Apperson	Bush Bros.
Santa Ana	Haynes	R. L. Draper
Pasadena	Haynes	J. C. Lavene
San Bernardino	Haynes	J. L. Warnock
San Dimas	Apperson	J. S. McIntyre

Colorado

Denver	Chevrolet	H. E. Maines
Walsenburg	Oldsmobile	H. D. Palmer

Connecticut

Stamford	Koehler	N. J. Wadham

District of Columbia

Washington	Oakland	Smith-Trew Motor Co.

Florida

Jacksonville	Allen	Jacksonville Motor Car Co.
Orlanda	King	O. B. Gooden
Tallahassee	King	Brown's Garage

Idaho

Boise	Cornelian	J. C. Johnson
Muncie	Oldsmobile	Cary Shaffer
Rupert	King	Rupert Auto Co.

Illinois

Aurora	King	F. W. Hartsburg
Brownstown	Auburn	C. E. Stine
Chicago	Owen	Chicago Coach & Carriage Co.
DeKalb	King	E. F. Nevins
Evanston	King	H. G. Gemmill
Gillespie	Oldsmobile	Gillespie Garage
Libertyville	King	G. L. Crane
Newark	King	Robert Koska

Iowa

Clarinda	Oldsmobile	Wm. Wehmiller
Lanyon	King	Peterson Auto Co.
Sabula	King	E. L. Smith
Sioux City	Ohio Electric	J. W. Ohlman Auto Co.

Kansas

Hutchinson	King	C. H. Livingston Auto Co.

Kentucky

Buffalo	Overland	E. S. Farrell & Son
Corbin	Saxon	B. J. Edwards
Dawson Springs	Overland	V. C. Iglehart
Eminence	Saxon	H. S. Drane
Greenville	Overland	Irvin, Gilman & Green
Guthrie	Overland	Longstaff & Grube
Hardinsburg	Overland	T. J. Hook
Henderson	Overland	Park Garage Co.
Jeffersontown	Overland	Meyers & Blankenbaker
Lebanon Junction	Overland	R. L. Mudd
Lebanon Junction	Saxon	Hocker & Samuels
Leithfield	Overland	E. A. Parsons
Louisville	Chandler	Callahan Motors Co.
Midway	Saxon	G. R. Wallace
Mt. Washington	Overland	Horace McGee
St. Matthews	Overland	A. J. Eline

Louisiana

Garyville	King	H. S. Preston

Minnesota

Foxhome	Oldsmobile	H. Nieland
Lake City	King	John Schmaus
Madison Lake	Oldsmobile	John Casper
Mendota	Oldsmobile	E. Bernier & Sons

Massachusetts

Melrose	King	F. S. Boardman
W. Somerville	King	Clarendon Hill Auto Repair Shop
Worcester	Ohio Electric	Wm. W Hodges

Mississippi

Clarksdale	King	J. W. Turner

Michigan

Brighton	Oldsmobile	Pitkin & Son
Waldron	Oldsmobile	E. I. Wilson

Missouri

Booneville	Oldsmobile	F. C. Brickey
Eagleville	King	Tom H. Tuggle
Jefferson City	Koehler	P. M. Garage
Kansas City	Cornelian	Ericson Auto Service Co.
Kansas City	Pullman	Herff-Brooks Motor Co.
St. Louis	Halladay	F. J. Koehler
St. Louis	Herff-Brooks	Mogul-Vulcan Sales Co.
St. Louis	Studebaker	J. W. Leigh
St. Louis	Westcott	Westcott Motor Sales Co.

Nebraska

Clarks	Oldsmobile	W. Chamberlain, Jr.

Nevada

Tonopah	Oldsmobile	H. H. Bacon

New Hampshire

Hinsdale	King	H. C. Holland
Manchester	Ohio Electric	E. E. Austin
Milford	Oldsmobile	Souhegan Auto & Electric Co.

New Jersey

Atlantic City	King	H. L. Adams
Red Bank	Owen	F. R. Boice & Co.

New York

Hastings-on-the Hudson	King	J. Morrison Gilmour
Olean	Westcott	Mazza & Questa
Rochester	Westcott	Roy F. Snapp
Schenectady	King	McDonald Garage Co.
Watertown	Oldsmobile	Watertown Auto & Supply Co.

North Carolina

Mt. Airy	Saxon	Banner & Tucker

North Dakota

Bismark	Oldsmobile	National Highway Motor Co.
Carrington	Hupmobile	J. Buchanan & Sons
Cavalier	King	H. A. Rygh
Enderlin	Oldsmobile	Rex Lindemann
Forest River	Oldsmobile	David H. Moltman
Jamestown	Oldsmobile	Jamestown Motor Co.
Portal	Cornelian	R. J. Maurer

Ohio

Akron	Westcott	Akron Westcott Sales Co.
Bellefontaine	Oldsmobile	George W. Cronley
Carrollton	Oldsmobile	Carrollton Motor Car Co.
Cleveland	Regal	H. & G. Company
Columbus	Jackson	Cott-McKelvey Co.
Columbus	Pierce-Arrow	Capital Motor Car Co.
Cumberland	Overland	Young & Mann
Dillonvale	Studebaker	Gerke & Carcon
Fostoria	Oldsmobile	Harry Nestterod
Kent	Oldsmobile	Portage County Garage
La Grange	Oldsmobile	E. L. Adams & J. A. Nicols
Louisville	Westcott	Westcott Auto Sales Co.
Mansfield	Westcott	Mansfield Motor Sales Co.
Pomeroy	King	D. A. Davis
Prospect	Oldsmobile	Court & Almendinger
Sebring	Oldsmobile	Sebring Auto Co.
Spencer	Oldsmobile	Spencer Garage
Springfield	Westcott	C. S. Burke
Washington C. H.	Westcott	O. E. Powell

Pennsylvania

Franklin	King	H. Smith
Leola	King	N. E. Martin
Millersville	King	Eshbach & Eshbach
Millway	King	J. H. Reitz
Philadelphia	Herff-Brooks	National Motor Co. of Phila.
Philadelphia	Owen	Carl H. Page Motors Co.
Ridley Park	King	Ridley Park Garage Co., Inc.

Rhode Island

Westerly	Herff-Brooks	S. H. Davis

South Dakota

Deadwood	Saxon	C. R. Wagner

Texas

Midland	King	Western Auto Supply Co.
Schulenberg	King	I. E. Clark
Yorktown	King	Gus Zedler

Utah

Logan	King	King Motor Sales Co.

Virginia

Cape Charles	King	Thomas Parsons

Washington

Spokane	King	Cole Spokane Motor Co.
Spokane	Franklin	W. J. Maxwell
Tacoma	King	Field & Thoresen
Wooley	King	Chase Garage

West Virginia

Wadestown	King	J. O. Clark

Wisconsin

Beloit	Ohio Electric	Wm. C. Schultz & Son
Beloit	Dort	J. F. McKearn
Columbus	Chandler	Fred T. Belinke
Galesville	Oldsmobile	Galesville Auto & Livery Co.
Menomonie	King	H. C. Knack
Milwaukee	Westcott	Collin's Garage
Washburn	Ford	T. H. Washburn
Westville	Dort	Schauer Bros.

Wyoming

Casper	Dort	W. A. Sm th
Dixon	Paige	E. W. Reader
Douglas	Oldsmobile	J. D. LeBar
Douglas	Buick	W. J. Morse & Son
Douglas	Paige	Rice Hdw. & Motor Co.
Evanston	Oldsmobile	L. E. Reaney
Lander	Oakland	C. E. Thomas
Lander	Dort	C E. Thomas
Lusk	Dort	Wolfe & Son
Rawlins	Oakland	Murphy-Reedy Co.
Rawlins	Dort	J. J. Cullen & Son
Wheatland	Paige	E. A. Tisch

Recent News from Dealers' Field

Midgley Tire in Rochester—The Alpha Motor Car Co., Rochester, N. Y., has secured the agency in that city for The Midgley Tire and Rubber Co., of Lancaster.

Los Angeles Federal Tire Moves—The Los Angeles branch of the Federal Rubber Co. has moved from South Olive Street to larger and better equipped quarters in the Morrison Hotel Building at Pico and Hope Streets.

New St. Louis King Station—The Monarch Auto Sales Co., a newly organized concern, has opened a service station and salesroom at 1419 Locust Street, St. Louis, Mo., from which it will distribute the King line of automobiles.

New Studebaker District—Santa Barbara, Cal., is headquarters for a new Studebaker district, including northern Los Angeles and several counties. L. H. Boydston, who has been with the Studebaker Corp., for several years, is in charge.

Dallas Ford Increases Output—The Ford assembling plant in Dallas, Tex., will have a daily output of forty-five to fifty cars during the coming year, as compared with about forty cars for last year.

St. Paul Trade Happenings—The Joswich Mfg. Co., St. Paul, has moved from 352 Cedar Street to Fifth and Market Streets. It carries the Chandler and Saxon cars. The Bartles Oil Co. has leased a plot of ground and will erect a filling station and a two-story building for automobile sundries. Seven stores adjoining will be designed for automobile accessory firms.

Maxwell Divides Canadian Territory—To facilitate the distribution of Maxwell cars in Western Canada, the territory in the Prairie Provinces has been re-divided and three new branch offices have been opened. One division has been placed in charge of J. T. Dohn, who has his headquarters in Calgary. N. J. C. Henderson is in charge of the district for which Saskatoon is the center, and F. W. Wilkins will look after the interests of the company in the district surrounding Regina. J. Lever has been appointed salesman for Manitoba and he will look after the agencies there, while P. B. Lyman will act in a similar capacity. C. L. Ackerson of Winnipeg will act as supervisor for the whole Western territory.

Recent Incorporations in the Automobile Field

Canada

HAMILTON—The Burlington Rapid Transit & Motor Mfg. Co.; $50,000. T. H. Crerar N. J. Petrie, W. S. Steuart.
TORONTO—The Automobile Signal System Co.; $100,000. T. R. Wray, T. Lines, W. J. Miller.
TORONTO—The Buckeye Tire Co.; $150,000. N. A. Craig, C. H. Blaxill, F. C. Noise and others.
TORONTO—The Miller Rubber Co.; $50.000. James Miller. J. Karn, Michael Montag and others.

Colorado

DENVER—Dry Climate Tire Mfg. Co.; $200,000; to manufacture tubes and casings. J. W. Thomas, E. M. Clark, G. H. Hall.
DENVER—Sherman Crane Automobile & Signal Co.; $100,000. E. T. Sherman, W. H. Crane, F. B. Tait.

Illinois

CHICAGO—Auto Sales Co.; $300,000. W. L. Githens, M. C. Hogard, E. A. Bates.
CHICAGO—Automobile Engineering Co.; $12,000. C. S. Frank, E. H. Foster and J. Fawkner.
CHICAGO—Para Auto Tire Co.; $10,000. A. R. Weber, H. L. Goetz, J. A. Bugee.
CHICAGO—Re-Con-Struc-Two Tire Co.; $5,000. R. B. Donnelly, J. A. Herrmann, H. G. Saal.
EAST MOLINE—Victor Auto Accessories Co.; $1,000. V. C. McLain, M. F. McLain, C. M. Noah.
QUINCY—Irwin-Overland; $5,000 to $50,000. L. Irwin, A. Wittlock, F. R. Lusk.

Indiana

CONNERSVILLE—Inland Sales Corporation, to Inland Motor Sales Corporation.
INDIANAPOLIS—The Pathfinder Co.; $250,000. C. W. Richards, G. I. Lufkin, L. Kaminsky.

Kentucky

BARDSTOWN—The Dixie Central Highway Association; $100,000. A. F. Wathen, T. P. Stoner, W. Brown.
BARDSTOWN—The Jackson Highway Association; $100,000. W. Brown, A. S. Wathen, T. P. Stoner.
CARLISLE—Carlisle Garage; $3,000. R. Harper, W. Harper, C. W. Colliver.
LOUISVILLE—The Highland Auto Supply Co.; $10,000. E. G. and H. Schoen, J. S. Escott.
LOUISVILLE—The Medanich Motors Co.; $125,000. D. B. Medanich, J. R. Wright, O. H. Kelsall.
LOUISVILLE—Peerless Tire & Rubber Co., to Wolke Rubber Co., and capital to $25,000.

Massachusetts

BROCKTON—Reinforced Inner-Tube Co.; $300,000; manufacturer. F. L. Price, F. H. Briggs, Harold Bent.

Michigan

DETROIT—American Dadco Co.; $200,000. W. F. Carroll, E. P. Heaton, C. S. Seymore, J. F. Troy.
DETROIT—Century Mfg. Co.; $40,000. P. Breitmeyer, E. Denby, John Gillespie, William M. Pagel.
DETROIT—Detroit Auto Accessory Co.; $2,000. T. A. Ballinger, J. C. Beck, O. R. Hull.
DETROIT—Detroit Bronze Casting Co.; $2,000. K. K. Hall, M. Hall, A. F. Mochrie.
DETROIT—Eagle Electric Automobile Co.; $100,000. H. A. Schmidt, C. C. Smith, H. C. Judson.
DETROIT—Federal Brass Works; $50,000. C. R. Murphy, F. A. Behr, S. C. Reynolds.
DETROIT—Michigan Auto Top & Painting Co.; $25,000. Harry Bullen, E. E. Pratt, W. Y. Hoskins, C. D. Girard.
DETROIT—Pronovost Torsion Spring Wheel Co.; $50,000. G. H. Ropers, H. and J. Pronovost.
DETROIT—The R. T. W. Auto Accessory Co.; $20,000. Ray R. Cowan, R. T. Williams, E. M. Williams.
DETROIT—Wadsworth Mfg. Co.; $250,000. Fred. E. and M. M. Wadsworth, H. E. Cronenweth.
PONTIAC—American Forging & Socket Co.; $100,000. E. and W. W. Stoler, H. W. Wiley.

Minnesota

MINNEAPOLIS—Power Gas Products Co.; $125,000; automobile chemicals. S. A. Stockwell, E. H. Sherwin, C. F. Heberle, J. S. Calder, T. O. Ofstun, A. J. Edwards, George Wollman.

Mississippi

YAZOO CITY—Orr Modern Motor Co.; $2,000,000. No incorporators named.

Missouri

EAST ST. LOUIS—Rothe Motor Co.; $10,000. W. F. Rothe, A. Straub, A. Lantz.
JEFFERSON CITY—Central Machine, Garage, Supply & Power Co.; $2,000. A. Stout, A. H. Lyons, E. J. Short.
JEFFERSON CITY—Gate City Motor Co. of Kansas City; $10,000. H. P. Sutton, J. R. Castor, W. C. Riggs.
KANSAS CITY—Dorris Motor Sales Co.; $2,000. C. M. Blackmar, H. A. Bundschu, E. Swartz.
KANSAS CITY—Kansas City Auto Parts Co.; $200,000. G. Nelson, O. H. Nelson, L. F. Kempton.
ST. LOUIS—Stearns-Knight Auto Co.; $10,000. D. D. Brownback, E. H. Conrad, I. F. Brownback, T. A. Conrad.
ST. LOUIS—Union Vulcanizing Co.; $10,000. G. S. Brunton, F. Warner, M. E. Brunton, C. Warner.

New York

BARKER—Barker Oil Co.; $2,000; manufacturing and dealing in lubricating oils, greases, etc. A. J. Todkill, J. E. Morgan, A. J. McAdam.
BROOKHAVEN—135th Street Garage Corporation; $20,000. J. Martin, F. C. Martin, D. V. D. Reiley.
BROOKLYN—Quincy Automobile Co.; $4,000. M. Dempsey, J. Soden, Charles P. Frizelle.
BROOKLYN—Fox Accessories Co.; $15,000; manufacturer. A. M. Eddy, G. E. Eddy, A. S. Hart.
BROOKLYN—Berger-Madden Garage; $20,000; O. R. Berger, W. J. Madden, K. C. McDonald, 641 McDonough Street.
BROOKLYN—Machine Appliance Corp.; $2,000; manufacturer of motors, trucks, etc. A. C. Kellogg, 30 Broad Street, New York City; C. E. Buckley, L. E. Taft.
BROOKLYN—B. M. C. Co.; $1,000; dealer. H. Onwin, C. M. Bishop, W. A. Sellon.
BRONX—McGee Garage Co.; $10,000. W. C. McGee, M. O. O'Halloran, T. J. Ryan.
BUFFALO—Love Automobile and Coach Co.; $10,000; renting. John Martin, W. A. Irving, R. J. Mahar.
BUFFALO—Schoepflin-Baxter Co.; $6,000; dealer. A. F. Baxter, H. C. Schoepflin, L. G. Schoepflin, all of Buffalo.
EASTCHESTER—Roeben's Scarsdale Garage, Inc.; $1,000; to do a general garage business. R. M. Roeben, J. Roeben, H. Hauswirth, all Johnson Street, Scarsdale, N. Y.
FARMINGDALE—Farmingdale Auto Garage Co.; $3,000. Arne Meyer, E. Agren, G. A. Conroy.
HUDSON FALLS—Community Auto Co.; $10,000; dealer. F. H. Packer, F. E. Jones, J. B. Davis.
HUNTINGTON—Supreme Tire and Rubber Co.; $10,000; manufacturer. H. T. Mahan, B. C. Young, R. S. Snevily.
HUNTINGTON—Carson-Orcutt Sales Co.; $5,000; garage. J. A. Carson, H. E. Orcutt, J. H. Velsor.
ITHACA—Guardol Oil Co.; $10,000; manufacturer. R. J. Lindsau, C. W. Bennett, Arnold Fahnestock.
LONG ISLAND CITY—Comet Storage Battery Co.; $10,000; manufacturer. Gustav Kiel, Hugo Kiel, J. A. Hurst, 14 Steinway avenue.
MINEOLA—Interstate Motor Corp.; $5,000. J. A. Wilkens, J. A. Bloom, J. B. Sackmann.
NIAGARA FALLS—Reiger-Meisler Auto Sales Co.; $15,000. H. M. Reiger, J. Reiger, H. A. Constantine.
OSSINING—Westchester County Auto Bus Line; $2,500; bus line between Ossining, Briarcliff and Pleasantville. F. S. Yardley, G. B. Hubbell, Albert Kamp.
QUEENS—Private Auto Rental Service; $10,000. H. Whitney, C. A. Abel, Frank Schwarz.
RICHMOND BORO.—St. Paul's Motor Co.; $10,000. A. M. Shake, A. W. Shake, H. Kuhn.
ROCHESTER—Alpha Motor Car Co.; $16,000. L. K. Opdyke, Jr., H. F. Heughes, F. L. Heughes, 190 South street.
ROME—Rome Taxi and Garage Co.; $5,000. G. T. Tunbridge, A. Tunbridge, E. H. Evans.
SCHENECTADY—Dworkowitz Garage; $600. David Dworkowitz, Abe Dworkowitz, Annie Dworkowitz.
SAVANNAH—Enkel Motor Co.; $100,000. C. A. Thomas, C. H. Williams, K. Deligren.
SYRACUSE—The Mac Mfg. Co.; $50,000. F. F. MacLean, E. E. Tilton, B. Wiles.
TROY—Troy Auto Car Co.; $35,000; dealer. L. W. Schupp, J. E. Schupp, G. A. Vanderbilt, 701 Fifth avenue, Upper Troy.
UTICA—L. R. Gardinier Motor Co.; $15,000; dealer. J. R., E. M. and I. R. Gardinier, 1561 Kemble Street.
YONKERS—The Mitchell Shop; $1,000. W. E. Willis, E. F. Germain, D. Morris.

New York City

NEW YORK CITY—Ashley Rim Co.; $10,000; manufacture auto supplies and appliances. R. W. Ashley, E. G. Kittel, R. H. Kittel, all of 505 Fifth Avenue, New York City.
NEW YORK CITY—Automobile Patents Corporation; $1,000. P. M. Pelletreau, D. J. Wagner, C. H. Ludder.
NEW YORK CITY—Auto Utilities Corporation; $25,000. A. H. Rosen, T. C. O'Connor, F. B. Wood.
NEW YORK CITY—John W. Briarly Auto Service Co.; $10,000. John W. Briarly, S. Marx, Louis Bayer.
NEW YORK CITY—Braun Wagon Lock Co.; $10,000; to manufacture vehicle locks. H. Minners, Otto E. Brain, A. Dubber.
NEW YORK CITY—Bonnite Insulator Co.; $4,000. G. H. Clark, A. H. Bergman, P. Bergman.
NEW YORK CITY—Burford & Co.; $2,000. H. C. Burford, F. C. Lord, T. H. Wight.
NEW YORK CITY—Coney Auto Co.; $10,000. A. E. Black, M. Solomon, M. Hyman.
NEW YORK CITY—C. B. C. Auto Specialty Co.; $50,000; dealer. N. Lipman, F. V. Goldstein, M. Shienhart, 439 E. Seventeenth Street.
NEW YORK CITY—Floating Wedge Lock Nut Co.; $50,000. C. E. Eckel, H. H. Waller, M. S. Wilson.
NEW YORK CITY—Hupmobile Company; $2,500. O. C. Hutchinson, Detroit, Mich.; K. R. Miner, Yonkers, N. Y.; H. Sumnich, Mountain Lakes, N. J.
NEW YORK CITY—Kansas City Tire & Rubber Corporation; $335,000. L. M. Lehr.
NEW YORK CITY—Motor-Vim Co.; $30,000. Charles W. Forbes, J. G. Guinn, Jr., F. W. Sonther.
NEW YORK CITY—Phillips Auto Seat Co.; $5,000. N. M. Lynn, C. A. Phillips, F. A. Phillips.
NEW YORK CITY—Primax Motor Co.; $10,000. A. Kaiser, H. Gabel, J. Karpa.
NEW YORK CITY—Safety Ford Starter Corporation; $3,000. J. Collins, J. S. Merton, D. L. ConkMn.
NEW YORK CITY—Smith-Haines; $5,000. R. L. Smith, D. R. Smith, R. M. Procter.
NEW YORK CITY—Speedy Carbon Eradicator Co.; $3,000. T. H. McCarrick, J. B. Maxwell, H. W. McIntyre.
NEW YORK CITY—Spitler Puncture Plug Co.; $4,950. J. B. Dulany, T. N. Tull, J. Spitler.
NEW YORK CITY—Superior Motor Power Co.; $20,000. N. Loeb, B. D. Cahn, L. D. Cahn.
NEW YORK CITY—State Motor Car Co.; $10,000. A. Parkinson, W. Parkinson, A. H. Stephens.
NEW YORK CITY—Time Clock Auto Co.; $3,000. M. J. O'Brien, T. St. John Lacy, C. A. Lewis.

Ohio

CARLISLE—Carlisle Garage; $3,000. R. Harper, Mrs. R. Harper, W. Harper, C. W. Colliver.
CLEVELAND—The Automobile Owners Casualty Co.; $50,000; to insure automobiles. M. E. Balcom, L. A. Bechler, J. J. Angel, G. B. Thomas, E. Rider.
CLEVELAND—The Auto Record Co.; $5,000; to do automobile advertising. J. W. Hickey, D. G. Hickey, F. J. Ross, C. J. Brown, C. L. Sexton.
CLEVELAND—The Federal Gear Co.; $1,000; to manufacture gears. P. C. Kassaulker, C. N. Shaver, J. Stephens, A. A. Stephens, K. Kornfeld.
CLEVELAND—The Grant-Meriam-Ford Co.; $50,000. Horatio Ford.
CLEVELAND—The Lohse Automobile Improvement Co.; $25,000 to $100,000.
CLEVELAND—The Highway Traffic Signal Co.; $10,000; to manufacture traffic signalling devices. F. B. Shonff, T. B. Jones, N. Burroughs, R. Hyatt, G. Higgins.
CLEVELAND—The Manhattan Tire Co.; $10,000; to handle tires and accessories. D. J. Dye, F. R. Dye, J. Cantillon, J. D. Fackle, E. F. Gardner.
COLUMBUS—The Vincent-Franz Automobile Co.; $5,000. H. Franz, F. L. Vincent, K. W. Rittenhouse, W. H. Love, F. F. Little.
CLEVELAND—The Ohio Tire & Supply Co.; $5,000. R. B. Tripp, G. T. Miller, L. G. King, M. R. Burnage, C. T. Townes.
CINCINNATI—The H. G. Burford Co.; $250,000; motor vehicles. W. A. Lucas, J. W. Forsythe, J. W. Worst, L. C. Worst and J. W. Fero.
COLUMBUS—The Columbus Auto Show Co.; $1,200; to give motor shows. J. P. Gordon, Frank B. Raymond, H. D. Brasher, Hugh Huntington, G. R. Hedges.
FREMONT—The H. G. Burford Co.; $250,000; to manufacture motor vehicles. W. A. Lucas, J. W. Forsythe, J. W. Worst, L. C. Worst, J. W. Fero.
PIQUA—The W. F. Robbins & Sons Co.; $5,000; to operate a bus line. W. F. Robbins, M. R. Robbins, B. C. Robbins.
TOLEDO—The Toledo Jitney Service Co.; $5,000; to operate a jitney line. J. Fisher, S. Slotnick, W. Friberg, L. Levine, J. Frednar.
WILMINGTON—The Brown Accessory Mfg. Co.; $12,000; to make automobile accessories. R. M. Brown, L. C. Barnes, R. E. McCoy, C. O. Murrell, B. J. Hiatt.

Oklahoma

OKLAHOMA CITY—Sutton-Johnson Motor Co.; $1,000. G. M. Sutton, E. C. Johnson.

Tennessee

CHATTANOOGA—Hamilton Motor Car Co.; $10,000. A. R. Pryor, L. T. Prigmore, E. M. Prigmore, H. C. Kelly, L. R. Darr.

Texas

BROWNSVILLE—Harrison-Charney; $4,000. H. M. Harrison, H. C. Harrison, Ellis Charney.
KINGSVILLE—Kingsville Auto & Electric Co.; $2,000. C. H. Flato, Jr., J. D. Finnegan, E. W. House.

Virginia

RICHMOND—Baines Automobile Corporation; $10,000. K. H. Khorr, president; T. C. Baines, secretary.
RICHMOND—Imperial Auto Supply Co.; $10,000. C. S. Sampton, H. A. Grant.
RICHMOND—Staunton Auto Transportation Co.; $25,000. T. K. Hackman, president; W. F. Brower, secretary.
RICHMOND—Staunton & Monterey Auto Transportation Co.; $5,000. J. W. Spitler, president; L. C. Davison, secretary and treasurer.

Washington

SEATTLE—Washington Auto Bus Co.; $25,000. K. K. Carrick, Everett; Forest P. Dexter, Seattle; James B. Howe, Seattle.

Wisconsin

MILWAUKEE — Wisconsin-Oakland Co.; $100,000; dealer. R. Hokanson, G. P. Miller, W. M. Thompson.
MILWAUKEE—The Demerath Two Minute Quick Detachable Rim Co.; $25,000. Theodore Sternemann, Joseph Demerath, Edward M. Sullivan and Theodore Naus.
MILWAUKEE—The Wisconsin Auto Exchange; $10,000. Harry Kohn, Fred W. Smith, N. L. Bierbach and L. J. Klug.
RACINE—The Wisconsin Metal Products Co.; $20,000. J. H. Dwight, Taylor Jolliffe.

VOL. XXXIII. NEW YORK—THURSDAY, SEPTEMBER 16, 1915—CHICAGO NO. 12

The AUTOMOBILE

Middle West Crops Presage Increased Car Sales

Automobile Registrations Make Rapid Gains—Wheat and Corn Bring Unprecedented Prosperity to Farmers—Prices Higher for Lead, Zinc and Oil —Livestock Booms with High Prices for Cattle

KANSAS CITY, MO., Sept. 11—If good crops and high prices make for good times, the West never faced a period of greater prosperity. The reasons are: The second greatest wheat crop in the history of the West. The second largest of all corn crops in the making, depending only on the late frosts in States north of Kansas. A great impetus in the oil industry, due to a rise in price. Big prices for lead and zinc. The highest prices ever paid at this season of the year for sheep and lambs. High prices for cattle. A heavy demand for horses and mules, and double prices due to the exportation of 425,000 horses since the war began. Bank deposits greater than last year, due to the sale of livestock, farm and mineral products to supply foreign demands therefor. A thriving milling industry due to war exports. Unusually fine pastures, due to a rainy summer. Freedom from labor troubles. The general employment of all skilled and unskilled labor.

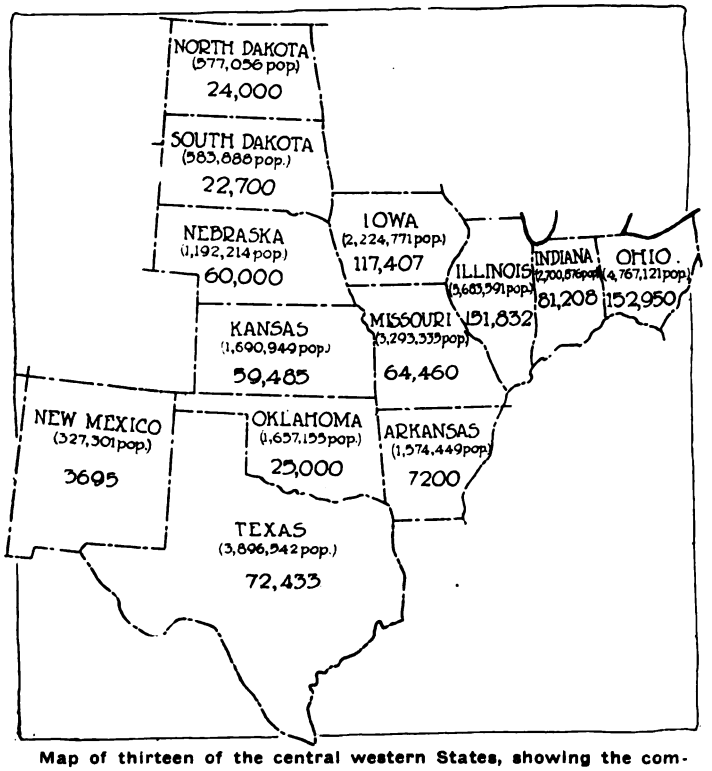
Record Corn Crop

The big rains that came to the West just as the wheat harvest was beginning cut the winter wheat crop in the big grain States by a tremendous amount, amounting in Kansas alone to 60,000,000 bu., but the same heavy precipitation is giving to these States the greatest corn crop of their history.

The losses in winter wheat will be offset by the gains in corn which could not have resulted in a year of hot winds and high temperatures. Automobile dealers in the West have been watching reductions in the wheat estimate during the last month with some chagrin, although the Southwest will have a crop exceeded only by one other, that of last year. But they failed generally to take into account that the reductions of wheat have meant big increases in corn and the farmer makes more money from corn than he does from wheat, although it is not such a ready money crop. And the spring wheat crop in the northern tier of western States is the greatest in their history. Kansas estimates for wheat at the beginning of the season were for 160,000,000 bu. of wheat and as late as the latter part of July J. C. Mohler, of the Kansas Agricultural Department looked for 135,000,000 bu. of wheat. This month, however, Mr. Mohler, with reports from all counties on threshing, says Kansas will raise 100,000,000 bu. of wheat, which is, however, a bumper crop even for Kansas.

Eleven Reasons for Prosperity in the West

1—Second greatest wheat crop in West's history.
2—Second largest of all corn crops in the making.
3—Oil industry given impetus by higher prices.
4—Lead and zinc mines rushed by demand due to war.
5—Record prices for sheep and lambs at this season.
6—Cattle selling for prices steadily above normal.
7—Double prices for horses and mules for war purposes.
8—Increased bank deposits due to large foreign business.
9—Milling industry thrives—Business steadily gaining.
10—Unusually fine pastures due to a rainy summer.
11—Employment plentiful—Freedom from labor troubles.



Map of thirteen of the central western States, showing the comparative population and registration of automobiles. This section of the country has been making tremendous gains in car registration during the past two years and the record crops now being harvested presage a still greater advance in this respect

After the big wheat crop of last year, thousands of mortgages were paid off or reduced in the Southwest, so that the big corn returns this year and the wheat crop which would be a record breaker for any year except last year will put the farmer in splendid condition and give him money to spend he would not otherwise have. Illinois, however, will come forward, the latest returns indicate, with an increased wheat yield, while Oklahoma will reach its original estimate of 40,000,000 bu. The loss will be considerable in Kansas, Missouri and Nebraska, but the panhandle of Texas, as big as most other States, will show a tremendous increase in its wheat production.

Corn—2,900,000,000 Bushels

The size of the corn crop is largely dependent upon a late growing season. If frosts hold off until the middle of October in the Dakotas and Nebraska and later in the States further south and east, the corn crop of the country will be second only to that of 1912, when 3,124,000,000 bu. were raised. This year's crop should exceed 2,900,000,000 bu., 230,000,000 bu. more than last year. The corn crop is practically made in Oklahoma, Texas and the South generally and will make a high record in these States. The southern planters diverted several million acres of cotton land this year to corn, 25 per cent more than last year and they are going to be in better shape than when the war was tearing cotton prices to pieces.

There is slight danger of frost in Kansas. That State will have a record crop, although the acreage is smaller than in the last twenty years. It was this small acreage that blinded the eyes of grain men generally to the possibilities of the corn crop and under no other conditions could it have happened except where rain fell practically every few days through the corn belt, all through the time that generally brings hot winds and high temperatures.

Frost Only Danger

This is true also in all the big corn States. Well informed grain men say that if there is no frost damage to corn, yields in the big corn States will be practically as follows:

State	This Year Bu.	Last Year Bu.
Illinois	400,000,000	300,000,000
Iowa	350,000,000	390,000,000
Nebraska	200,000,000	174,000,000
Kansas	140,000,000	108,000,000
Missouri	190,000,000	158,000,000
Indiana	200,000,000	163,000,000
Ohio	150,000,000	142,000,000
Oklahoma	120,000,000	50,000,000
Texas	175,000,000	125,000,000

Livestock Booms

The livestock industry everywhere in the western States is in first class condition and most of the western States have recovered from their scare about the foot-and-mouth disease and lifted their quarantines. While this scare existed it upset one of the greatest industries of the West. Prices are high for cattle, horses and sheep and fair for hogs. The steady sale of horses for war purposes has raised the price of all breeds of horses in the West from 50 to 100 per cent since the war began a year ago. And the demand continues. Since a year ago 425,000 horses have been exported for war purposes.

The West never had finer pastures or crops of hay and all the minor feeding stuffs such as kafir and the various forms of feeding sorghums which are an important factor in farm prosperity in the western Dakotas, western Nebraska, western Kansas, Oklahoma and the Texas panhandle.

Kansas City Gains

Just what the livestock market is to the West cannot be understood by eastern men who have not had experience in the West, but thousands of men are employed in the central markets themselves from livestock commission brokers and cattle money lenders to the packing house laborers. Omaha and Kansas City are largely dependent on the livestock market for their prosperity, so that figures from the livestock yards of these two cities are of especial interest right now. In the month just ended, 9381 carloads of live stock were received at the Kansas City Stock Yards. This is an increase of 981 cars, or 11 per cent over the receipts in August, 1914, and represents a gain of 10,800 cattle, 26,200 hogs, 34,200 sheep and 938 horses.

Kansas City and Omaha, the big western markets, show increases in all departments for the month just ended. In Chicago there were increases in cattle and hogs and a decrease in sheep. St. Louis reported decreases in cattle, hogs and sheep.

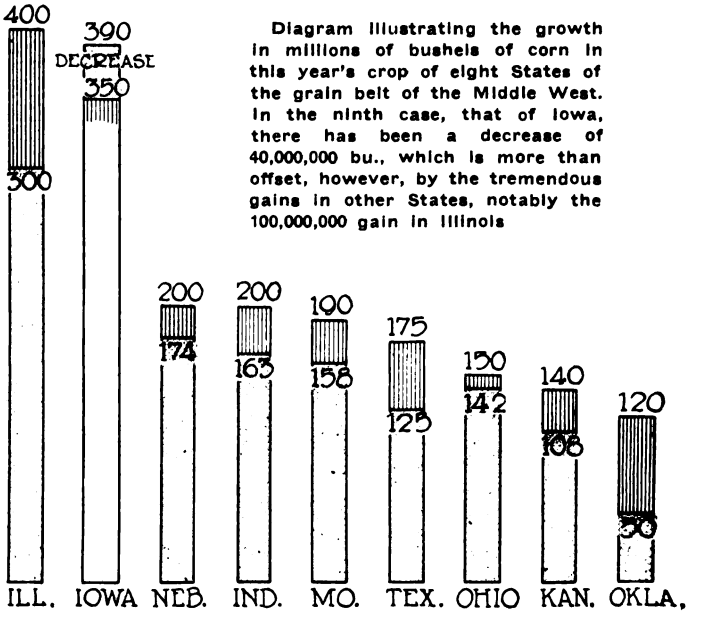


Diagram illustrating the growth in millions of bushels of corn in this year's crop of eight States of the grain belt of the Middle West. In the ninth case, that of Iowa, there has been a decrease of 40,000,000 bu., which is more than offset, however, by the tremendous gains in other States, notably the 100,000,000 gain in Illinois

In sheep, the most interesting feature in years is developing and is reflected in increased receipts in Kansas City and Omaha, and a big drop in the Chicago supply. Here sheep increased 31 per cent over a year ago and in Omaha there was an increase of 13 per cent.

Official reports at the Kansas City Stock Yards for August were: 173,636 cattle; 12,197 calves; 142,729 hogs; 145,598 sheep, 3030 horses.

Receipts of cattle, calves included, hogs and sheep in the five big western markets are here shown as an index to western prosperity. Receipts in eight months this year and last:

Cattle	Five Western Markets
Eight months 1915	4,139,100
Eight months 1914	3,992,250
Increase	146,850
Hogs	
Eight months 1915	11,393,850
Eight months 1914	10,023,450
Increase	1,370,400
Sheep	
Eight months 1915	5,854,900
Eight months 1914	7,238,800
Decrease	1,373,900

Lead and Zinc Develop

The lead and zinc district, comprising an important area in Kansas, Oklahoma, Arkansas and Missouri, has come into renewed prosperity in the last few weeks. For a time, in fact, for about ten months after the war broke out, zinc ore was selling for three times what it formerly sold at and then came a sudden slump that sent the price down more than 50 per cent. A revival in price, however, has followed that has put the district into good humor again. Zinc blend sold last week at $70 to $86 a ton, where it had sold the week before at $50 to $70 and the market was still climbing.

More Cars Registered

Just how important the price of zinc ore is may be understood from the fact it is often said that every other man in southwest Missouri and southeast Kansas owns stock in a zinc mine. Also thousands of investors are represented in the western cities in the thousands of zinc mines in the Joplin district. And while many more investors are represented than appears in the half dozen counties where the mines are located, the effect on the automobile industry may be gaged by the fact that Jasper County, Missouri, in the mining district, has shown an increase alone from 1768 to 2450 cars since the first of the year.

$25,000,000 in Ores

It means something when it is said that the Kansas-Missouri-Oklahoma-Arkansas lead and zinc district will produce $25,000,000 of lead and zinc in ores alone. To get the comparison a little better, possibly; all the gold mined in the United States and Alaska in 1913 amounted to only $88,000,000.

This is a condition that has come about only in the last year and one that will last a year at least and probably longer after the war is over. The cause is simple. Before the outbreak of the war, about one-half of the world's output came from Germany and Belgium. The war has shut down nearly every zinc mine in Germany and Belgium. The trouble in Mexico has cut off production there and the Australian zinc ore can not be smelted in America at a profit, so that the world is dependent on America for zinc.

Brass Demand Great

Now, while the war lessened by one-half the production of zinc, it vastly increased the demand for it, because brass

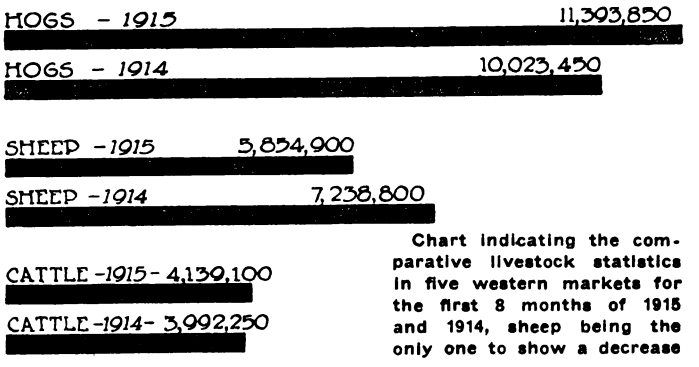


Chart indicating the comparative livestock statistics in five western markets for the first 8 months of 1915 and 1914, sheep being the only one to show a decrease

is made of about 50 per cent of zinc. Brass enters into the making of almost every cartridge.

In 1914 the Joplin district produced 257,047 tons of zinc ore, valued at $9,702,804, which is a little less than $40 a ton. This year with the increased activity, the output ought to be 300,000 tons, the experts say, and at $75 a ton this would bring into the district $22,500,000. This much zinc ore would make 150,000 tons of spelter valued at $45,000,000.

But zinc ore is not smelted in the Joplin district because of lack of fuel there. It is cheaper to carry the ore to the Kansas districts of cheap fuel than to carry fuel to the zinc districts, so the smelters are in the gas and coal fields.

Everywhere in the zinc fields around Webb City and Joplin are men who are becoming rich, men who a year ago had nothing and are making thousands of dollars a month now with prospects of that income keeping up as long as the war lasts and a year or two afterward, for even after the war ends, it will take a year or two to get the Belgian and German industry on its feet again. Nearly everybody in the Joplin district has some interest in a mine.

Prospective Car Owners

In Webb City and Joplin, the barber who shaves you may have an income of $100 a week from his one-eighth or one-sixteenth interest in a zinc mine. The waiter who serves you may be getting from $50 to $100 a week from his mining interest; and the man in overalls over on the corner, who was a shoveler a year ago earning $2.50 a day, may have an income now of several hundred or even a thousand dollars a week. There are lots of instances of that kind.

Road Improvement a Factor

These mines of this district produce a grit that makes fine roads and radiating out of Joplin are 600 miles of grit roadway. These roads help to make the automobile industry grow, too. The mines are located all over the district and some of them are twenty miles from a good-sized town so that the automobile is not only a luxury, but a necessity. The light cars are most in demand, but the most expensive kind are also to be seen.

Field Widens in Texas

A territory that the automobile trade is hearing from now and is to hear more from this fall is the panhandle of Texas. This empire, which formerly was given over to the open range and frequented by coyotes and prairie dogs, is being broken up into farms. The present season is the greatest in its history. Wheat is threshing an average of 25 bu. to the acre and forage crops are very luxuriant. It's the panhandle's greatest year since any record of rainfall and crops has been kept.

Amarillo, the commercial center, with a population of about 13,000 has a licensed registry of more than 900 cars of all makes. Its newspapers are carrying expensive automobile advertisements and the smaller towns are rapidly establishing car agencies. This blanket of prosperity extends

(*Continued on page* 519)

Physical Qualities of Castor Oil

Careful Experiments Determine Densities and Viscosities as Functions of Temperature, Chill Point, Flash Point and Boiling Point

IN order to arrive at a set of scientifically accurate figures on the qualities of castor oil, THE AUTOMOBILE has submitted to the Sibley College of Cornell University a sample of grade AA castor oil as produced by the Baker Castor Oil Co., New York City, for test.

The results of the test are shown in the curve herewith. The experiments were performed by P. G. McVetty, of Sibley College, using formulæ derived by Prof. G. B. Upton for the determination of absolute viscosity. The curve shows the attempt to bring the viscosity readings down to a basis which is absolute and not in the arbitrary scale of any one viscometer. The report of the test is as follows:

Tests have been made to determine the density and viscosity as functions of temperature; also the chill point, flash point, and burning point.

Density of Sample .9599

The density of the sample at 21.0 deg. C. or 69.8 deg. Fahr., was determined by weighing a known volume (200 c.c.) which gave a value of 0.9599, distilled water at 4.0 deg. C. being taken as unity. Also a hydrometer was used to determine the variation of density with temperature, resulting in the following data:

In distilled water at 62.4 deg. Fahr., hydrometer read. = 0.994
Actual density of water at 62.4 deg. Fahr. = 0.9989
Constant of hydrometer is then $\frac{0.9989}{0.994}$ = 1.0049

Oil Temp. Deg. Fahr.	Density of Castor Oil Water at 4.0 Deg. C. = Unity Hydrometer Reading	Corrected Density
68.7	0.956	0.961
115.0	0.940	0.945
135.0	0.932	0.937
150.0	0.927	0.932

The hydrometer used had an enclosed thermometer which read to 150 deg. Fahr. This prevented the use of higher temperatures.

As a check on this work, the following data have been taken from "Lubrication and Lubricants," by Archbutt & Deeley, page 185.

Temp. deg. Fahr.	Density
100	0.9473
150	0.9284
212	0.9050

Also at 60 deg. Fahr. the density of a number of samples varied from 0.958 to 0.967, the usual value being 0.962 to 0.963.

Curves have been plotted from both these sets of data and it will be noted that the difference between the two curves is less than half of 1 per cent, while the variation given by Archbutt & Deeley as existing between different samples of the oil is about 1 per cent.

Upton's Formulæ Employed

The determination of *absolute viscosity* from the time readings obtained with practically any form of flow viscometer (viscosimeter) has been made possible by the use of a theoretical equation derived by Prof. G. B. Upton, the peculiarities of any individual instrument being taken care of in the constants of the equation. These constants may be obtained experimentally or computed from the dimensions of the instrument. The following discussion is abridged from a paper by Prof. Upton.

"A flow viscometer does not measure viscosity. It measures the ratio of viscosity to density, at atmospheric pressure, and at the temperature which the fluid possesses as it approaches and runs through the discharge tube of the viscometer. The general form of the equation, connecting the ratio of viscosity to density with the time of flow of a set quantity of fluid from a given viscometer is:

$$\frac{n}{d} = At - \frac{B}{t}$$

in which

n = absolute viscosity in dynes per sq. cm.
d = density at the temperature of measurment.
t = time in seconds for the efflux of a fixed quantity of fluid.
A and B are instrument constants readily found."

In reporting tests on the Engler viscometer it has been customary to use the term "Engler number," which is defined as the ratio of the actual efflux time at any constant temperature for 200 c.c. of the fluid being tested, to the time for the same volume of water at 20 deg. C. Since the Engler number is proportional to time, the general equation may be written:

$$\frac{n}{d} = Ae - \frac{B}{e}$$

in which e is the Engler number.

The following equations are given by Professor Upton for the *average* instrument of each type, and are used in the following computations where the data at hand are insufficient for determining the time constants of the individual instruments:

Standard Engler $\frac{n}{d} = 0.0730\,e - \frac{0.06294}{e}$

Saybolt Universal $\frac{n}{d} = 0.001930\,t - \frac{1.242}{t}$

Redwood $\frac{n}{d} = 0.002322\,t - \frac{1.387}{t}$

Reduce to Absolute Figures

The following data were obtained by test of a sample of the oil in a Standard Engler viscosimeter on March 18 and 22, 1915, and are reduced to absolute viscosities by means of the Upton formula, making allowance for the constants of the instrument used ($e = \frac{t}{52.3}$, for this instrument).

Temp., Deg. Fahr.	Engler Time (t)	Engler Number (e)	$0.0730\,e$	$\frac{0.06394}{e}$	$\frac{n}{d}$	d	n
208.5	144.0	2.76	0.2016	0.02283	0.1788	0.910	0.163
80.0	4150.0	79.40	5.80	0.0008	5.799	0.956	5.55
77.0	4696.0	89.80	6.56	0.0007	6.559	0.958	6.28
73.0	6352.0	121.55	8.87	0.0005	8.87	0.959	8.50

These viscosities have been plotted against temperatures as shown on curve sheet.

To check the above work, and the reliability of Upton's equations in general, all the available data on castor oil viscosities have been collected and plotted on the same curve.

On page 355 of "Lubrication and Lubricants" by Archbutt & Deeley, we find the following data:

"Twenty-three samples of Indian castor oil, tested by Deering and Redwood in the Redwood viscometer required from 1160 to 1190 sec. for the outflow of 50 c.c. at 100 deg. Fahr."

Taking the average time = 1175 sec., we have

$$\frac{n}{d} = 0.002322 \times 1175 - \frac{1.387}{1175} = 2.728$$

From density curve, d at 100 deg. Fahr. = 0.949.
Hence, $n = 0.949 \times 2.728 = 2.59$ at 100 deg. Fahr.

Cites Stratford's Paper

In a paper entitled "How to Test and Use Oils and Greases," by C. W. Stratford, read at the June, 1915, meeting of the Society of Automobile Engineers, is given a curve in which times of efflux from a Saybolt universal viscometer are plotted against temperatures.

The following values have been picked from this curve:

Temp. Deg. Fahr.	Saybolt time Seconds
100	1350
150	300
200	110
250	60+
300	50—

These values reduce to absolute viscosities as follows:

Time, Seconds (t)	0.001930 t	$\frac{1.242}{t}$	$\frac{n}{d}$	Temp., Deg. Fahr.	d	n
1350	2.605	0.00092	2.604	100	0.949	2.471
300	0.579	0.00414	0.575	150	0.931	0.535
110	0.212	0.01130	0.201	200	0.913	0.184
60	0.116	0.02070	0.095	250	0.896	0.085
50	0.0965	0.02484	0.072	300	0.878	0.063

As a check on all the computed values, the following from Archbutt and Deeley have also been plotted.

Temp. Deg. Fahr.	Absolute Viscosity
100	2.729
150	0.605
212	0.169

An inspection of the curve will show that all the data agree very closely, which confirms the accuracy of the method of computation.

Chill Point Not Determined

The *chill point* has not been definitely determined, and it is evident from the attempts that have been made to obtain this value that some special apparatus must be arranged for the purpose. One sample of the oil was kept at a temperature of —4.5 deg. Fahr. for 1 hr. but no apparent solidification resulted. Another sample was cooled below —100 deg. Fahr. by surrounding it with liquid air. This solidified suddenly with the formation of plate-like crystals, probably due to entrained moisture. The subsequent reheating on exposure to the air was too rapid for the determination of the chill point. It is probable that this determination might be made by using carbon dioxide snow. Archbutt and Deeley give ±0 to 14 deg. Fahr. as the approximate solidifying point. The value obtained depends largely upon the method used.

Open Cup Tester Used

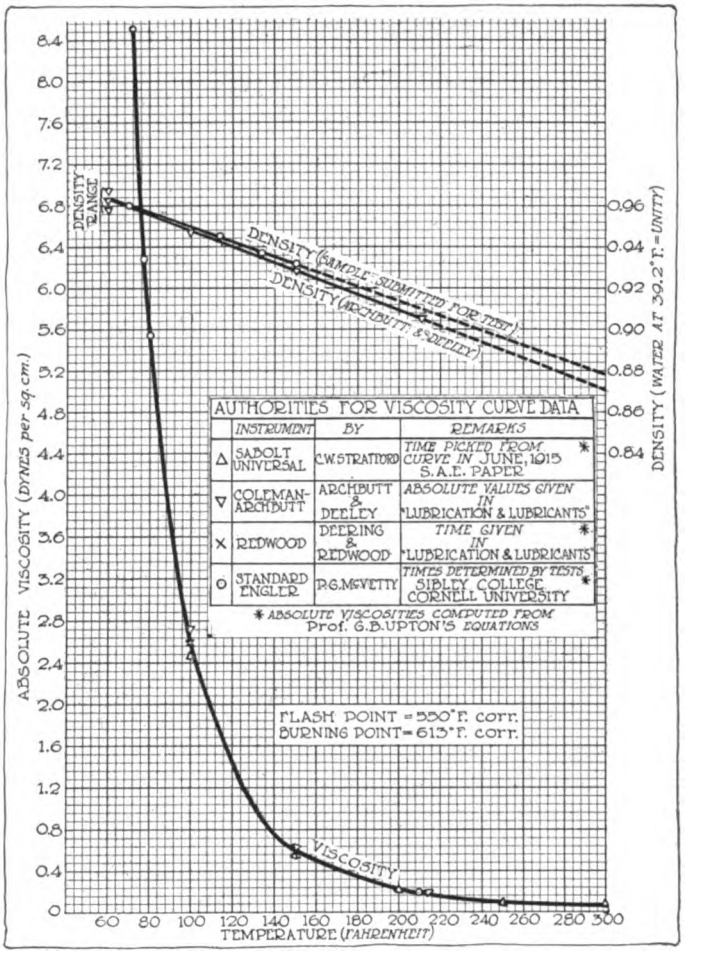
The *Flash Point* and *Burning Point* were determined in an open cup tester, using care to avoid air currents across the apparatus. The reason for not using the standard Pensky-Martens instrument was that the temperatures involved were considerably beyond its working range. As the open cup tester does not give close check values, eight tests were made for both flash and burning points and the average of the best readings used. One thermometer was placed in the oil and was used to keep it stirred; another was so placed as to give the mean temperature of the emergent stem of the first. Both were calibrated and the proper corrections applied. From these data were obtained

Flash point = 550 deg. Fahr. corrected;

Burning point = 613 deg. Fahr. corrected.

In conclusion, the following points may well be emphasized:

(1) The value of any oil as a lubricant depends upon its viscosity in the working range of temperature. On account of the importance of this property, the viscosity-temperature curve has received more consideration than the other items. The viscosity values of castor oil are approximately the same as those of a "heavy" petroleum oil, and its lubricating action will be similar to such an oil. The choice of one or the other will then be controlled by considerations of price. Reference may be made to Mr. C. W. Stratford's paper, previously mentioned, for a discussion of this point.



Curves showing castor oil densities and viscosities as functions of temperature, determined by tests at Sibley College, Cornell University

(2) A knowledge of the density of an oil has little practical value. The temperature-density relations have been determined with a fair degree of accuracy because they are necessary for the computation of absolute viscosities.

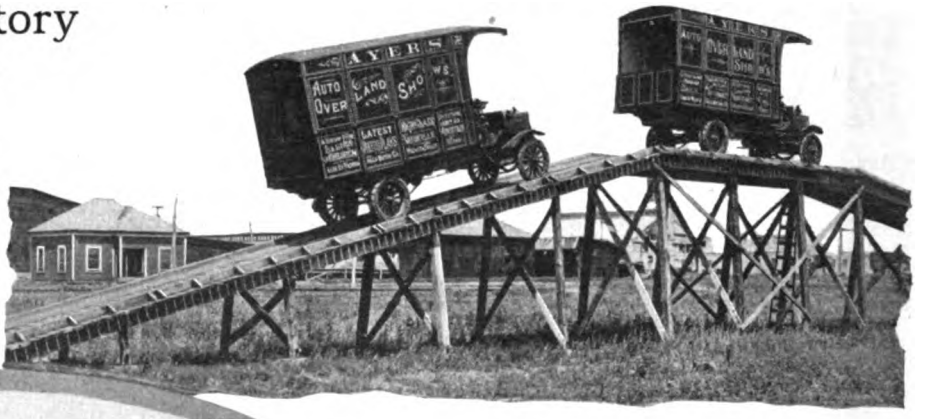
(3) The chill point affects the distribution of the oil to the bearings and the starting of a machine in very cold weather.

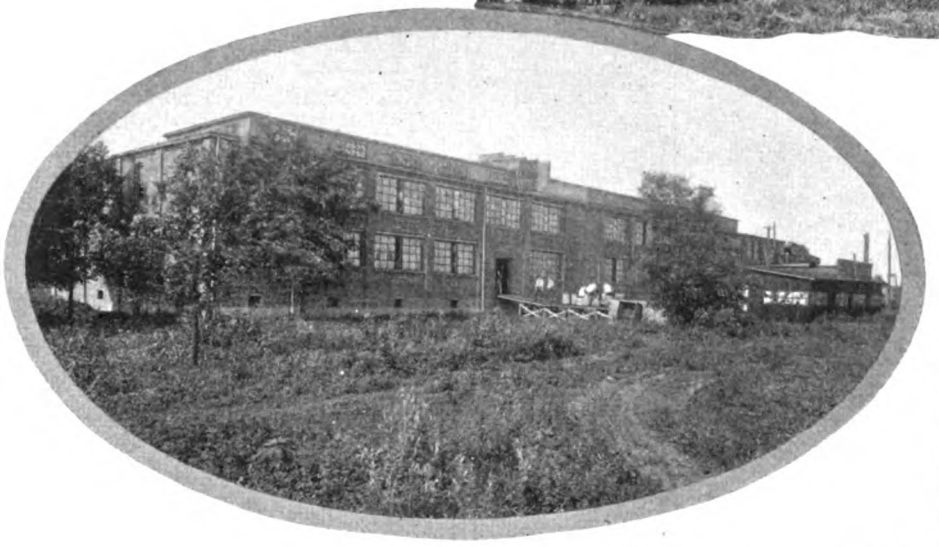
(4) The flash and burning points of an oil used for motor cylinder lubrication have practically no importance, if above 300 to 350 deg. Fahr. For a discussion of this point, see the paper by Lieut. G. S. Bryan in the February, 1915, Journal of the American Society of Naval Engineers.

(5) The absolute values obtained in all tests of castor oil may be considerably in error. It is a glyceride and, like glycerine, has the property of absorbing water from the air. On this account, it is evident that both viscosity and density will change with the atmospheric conditions and the time of exposure of the oil to them. Upon heating the oil to determine the change in its properties with temperature, this water is driven off, which causes a change in composition during the test. There is also evidence that the chemical composition changes even when heated only slightly because the oil becomes darker in color. These variations, which cannot well be controlled, may seriously influence the results of any test, but reasonable care has been taken to make the results as nearly accurate as possible.—P. G. McVETTY, Instructor, Experimental Engineering, Cornell.

Some Recent Factory Developments

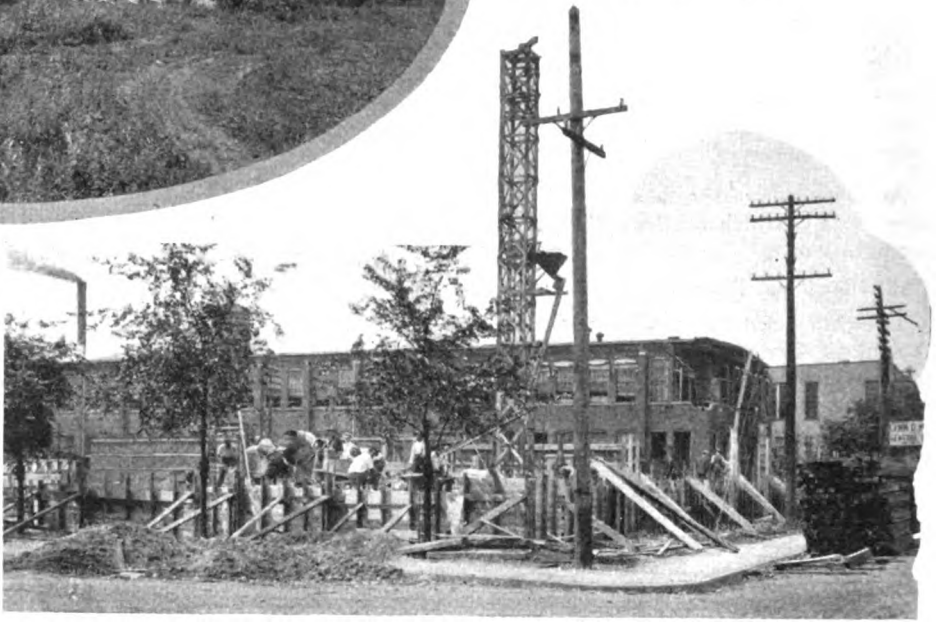
At the right is illustrated the testing trestle in use at the factory of the Wichita Falls Motor Co., Wichita Falls, Tex., with a 27 per cent grade on one side and 18 per cent on the other. This trestle is located just outside the Wichita factory and all Wichita trucks are tested on it in addition to making test runs over the plains.





At the left is illustrated one side of plant No. 2 of the Warner Gear Co., Muncie, Ind., this building having recently been added to the factory equipment of the company. It is a two-story brick structure 60 by 300 ft. and is now in full operation. Another view appears at the bottom right of this page.

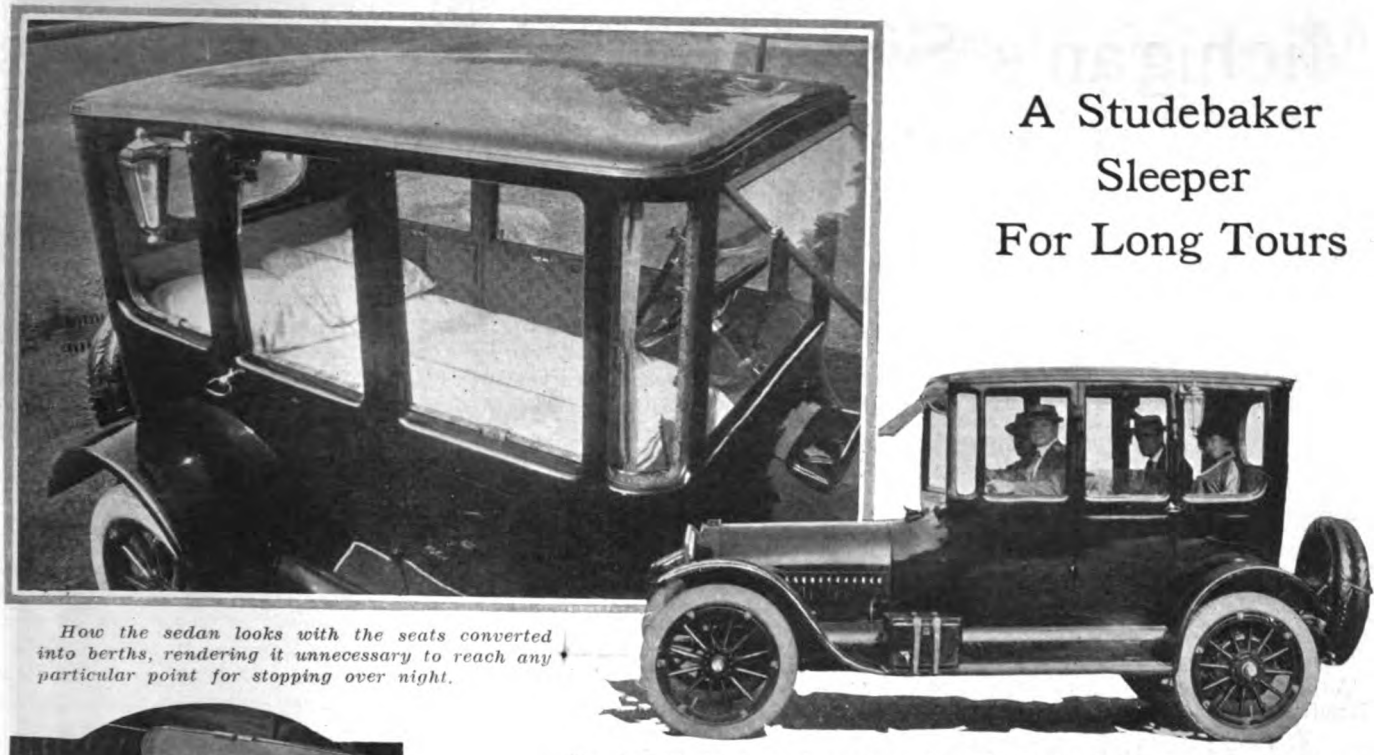
At the right is construction on the new factory buildings erected by the National Motor Vehicle Co., Indianapolis, Ind. One building is 38 by 278 ft., the other is 80 by 400 and both are two stories in height, being of concrete and steel construction and absolutely fireproof. One of the new buildings will include the general offices of the company. The National company's plant now occupies a solid city block. Work is being rushed on the additions.



***At the left is the assembly plant of the** Ford Motor Co. of Louisville, Ky., now being completed so as to be ready for occupancy October 1. It is a four-story steel and concrete structure with basement and sub-basement and trimmed with terra cotta and ornamental brick. Floorspace is 88,000 sq. ft., with 53,500 sq. ft. of window space.*

At the right is another view of plant No. 2 of the Warner Gear Co., Muncie, Ind., illustrated in the oval above. With this addition the increased floorspace of the company's plant is 39,000 sq. ft., the total working force being 1200 men on a twenty-three hour basis.

A Studebaker Sleeper For Long Tours

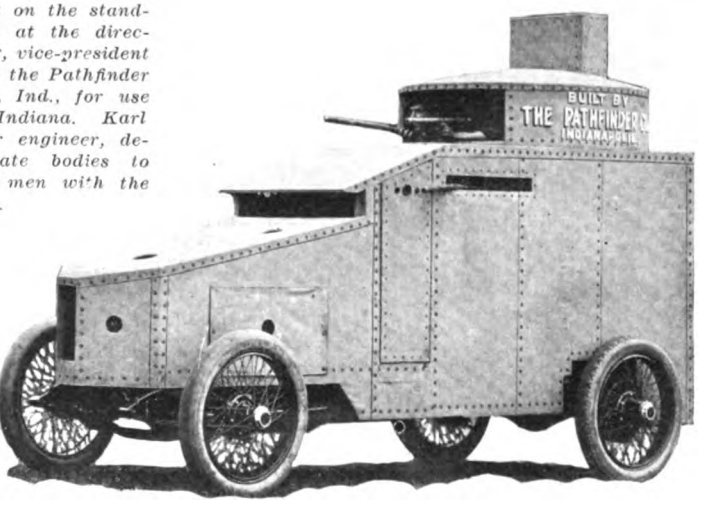


How the sedan looks with the seats converted into berths, rendering it unnecessary to reach any particular point for stopping over night.

The two illustrations above show the 1916 Studebaker sedan specially designed for S. Sproat of New York City, which is fitted with seats convertible into berths and with the ingeniously constructed compact refrigerator illustrated at the left. With this car Mr. and Mrs. Sproat, who have started on a tour to extend over a period of 2 to 3 months through New England, Canada and the West, are relieved of any dependence upon hotels since they may make their overnight stop where they wish without pushing forward or going back for sleeping or eating

The ingeniously designed, compactly constructed refrigerator which is carried strapped to the left runningboard of the special Studebaker sedan illustrated above.

At the right is illustrated one of the two armored cars built on the standard Pathfinder chassis at the direction of W. E. Stalnaker, vice-president and director of sales of the Pathfinder Company, Indianapolis, Ind., for use in the recent war in Indiana. Karl Feilcke, the Pathfinder engineer, designed these boiler-plate bodies to carry a crew of four men with the usual quick-firing guns.



An interesting method of making a tractor has been originated by A. W. Bell, a resident of Saskatoon, Sask. The car from which the improvised tractor has been made is a 1912 Overland and it was converted into a tractor by the simple arrangement of putting in an extra axle under the frame 2 ft. in front of the rear axle of the car on which were placed two binder wheels. After removing the rear wheels of the car, Mr. Bell replaced them with small sprocket wheels which were connected with larger sprockets on the drive wheels by chains.

Michigan's Six Months' Registrations

First Half of 1915 Shows Over 20,000 More Cars Licensed Than During Entire Year 1914

By Marc Braun

Gasoline Cars

	Jan.	Feb.	March	April	May	June	Total
Passenger.....	25,343	9,691	22,262	17,942	9,419	6,987	91,683
Commercial....	1,259	170	304	362	248	156	2,499
Total.....	26,602	9,861	22,566	18,304	9,667	7,143	94,182
Foreign.....	20	3	6	5	—	5	39
Total.....	26,622	9,864	22,572	18,309	9,667	7,148	94,221

Electric Vehicles

	Jan.	Feb.	March	April	May	June	Total
Passenger.....	1,219	93	118	56	44	22	1,552
Commercial....	98	6	—	5	1	1	111
Total.....	1,317	99	118	61	45	23	1,663
Manufacturers' and dealers' cars.....							523

Different Makes

Total number.....	390
Gasoline passenger cars.....	239
Electric passenger cars.....	24
Gasoline commercial cars.....	102
Electric commercial cars.....	7
Foreign gasoline cars.....	18

AUTOMOBILE licenses numbering 96,368 were issued by the Secretary of State of Michigan from Jan. 1 to June 30, 1915. In those six months 20,046 more cars were registered in Michigan than during 1914.

Taking the State official's records since 1909, when the first official count was taken, it is shown that the half-year record for 1915 is 84,650 licenses ahead of all of 1909, 78,013 more than that of 1910, 68,572 over the 1911 record, 56,999 better than the registrations of 1912, 42,002 beyond the 1913 total and, as stated above, already 20,046 past the total of last year.

Canadian Element Not Counted

In going through the motor vehicle license lists as compiled by the State license department and in making the count of the various, or different cars, no cars credited to Canadian residents or to residents of other States were taken into account, it being the intention to make a record only of the cars owned in the State of Michigan. This will account for the difference of 2106 cars or license numbers when the total as recorded by the Secretary of State and the total as compiled by the writer are compared. The State records give the total number as 98,474.

Among the 96,368 cars counted, there are to be found the makes of 390 different automobile manufacturers, a great many of whom long ago ceased to make automobiles, or have either been absorbed by other concerns, or given up the automobile end of their business.

Of the total of 96,368 cars 94,182 are gasoline driven, and 1663 are electric vehicles. There are 91,644 gasoline passenger cars and 1552 electric vehicles, for passenger use. Commercial cars total 2610 of which 2499 are gasoline trucks

(*Continued on page* 519)

GASOLINE PASSENGER CARS

	Jan.	Feb.	Mar.	April	May	June	Total
Abbott	178	32	64	40	19	15	348
American	48	15	30	12	6	5	116
Auburn	30	31	70	51	14	15	211
Alpena	9	5	20	19	6	3	62
Apperson	18	5	10	19	11	1	64
Alter	5	6	18	19	19	19	86
Allen	3	1	4	6	6	3	23
Anhut	3	5	5	4	2	1	20
Austin	6	2	7	2	2	2	21
Amplex	4	..	1	1	..	..	6
Aerocar	4	..	3	1	3	4	15
Aurora	..	..	1	..	..	..	1
Argo	..	..	..	14	3	2	19
Buick	1594	617	1880	1472	615	446	6624
Briggs	116	46	120	71	39	21	413
Brush	54	40	117	180	80	59	530
Briscoe	22	7	20	30	27	11	117
Bloemstrom	5	..	6	4	3	..	18
Benham	..	2	1	2	..	..	5
Badger	1	..	..	..	1	..	2
Baines	..	1	..	..	..	..	1
Bergdoll	..	..	2	..	2	..	4
Busser	..	..	1	..	..	..	1
Brownell	..	1	..	..	..	..	1
Bates	..	..	..	1	..	..	1
Black Crow	..	..	..	1	1	..	2
Cadillac	1382	212	437	382	195	105	2713
Chalmers	463	111	190	198	91	63	1116
Cartercar	311	85	166	129	53	29	773
Chevrolet	140	76	119	99	80	413	657
Cole	124	25	47	30	24	12	262
Cutting	70	24	62	40	13	11	220
Crow	17	18	35	26	21	8	125
Case	15	4	23	41	10	4	97
Columbia	16	..	9	11	3	1	40
Car-Nation	2	2	9	5	7	4	29
Courier	10	1	5	3	1	1	21
Clark	6	5	2	5	1	1	20
Cunningham	6	5	1	2	1	..	15
Cleveland	1	1	2	1	1	..	6
Chandler	38	4	7	21	29	21	120
Crescent	3	2	2	2	1	..	10
Carhartt	9	3	3	4	..	..	19
Corbin	1	..	2	3	1	..	7
Cameron	1	..	1	5	3	..	10
Consolidated	..	1	..	1	..	1	3
Cooley	..	1	..	..	..	..	1
Campbell	..	1	..	..	..	..	1
Colby	1	..	..	..	..	..	1
Clermont	..	..	1	..	..	..	1
Chicago Coach	..	..	..	1	..	1	2
Cornelian	..	..	..	..	2	2	4
Dodge	16	32	124	188	205	153	718
DeTamble	4	2	9	4	2	4	25
Deal	..	..	4	2	..	..	6
Detroit-Dearborn	3	2	3	5	3	1	17
Deere	..	1	..	..	..	..	1
Day	..	1	1	1	..	..	3
Davis	2	..	1	..	..	..	3
Demotocar	..	..	2	4	5	5	16
Detroit-Chatham	..	..	2	2	..	1	5
Delson	..	..	1	2	2	2	7
Dort	..	..	1	5	12	16	34
Dawson	..	..	1	..	..	..	1
Dewning	..	..	..	1	..	..	1
De Luxe	..	..	..	1	..	1	2
Dragon	..	..	..	..	1	..	1
Dalton	..	..	..	..	1	..	1
E-M-F	143	91	305	253	87	50	929
Elmore	27	14	33	32	26	11	143
Everitt	31	13	27	30	13	7	121
Empire	15	9	14	15	9	9	71
Elkhart	7	2	17	7	1	3	37
Enger	..	..	..	1	2	2	5
Ford	9613	4304	8880	7316	4126	3040	37,379
Franklin	66	13	43	61	15	14	212
Flanders	..	..	..	44	22	24	90
Firestone	..	..	..	..	..	1	1
Fall	..	..	..	1	..	..	1
Fuller	..	..	..	..	3	..	3
Fisher	..	..	..	1	..	..	1
Frayer-Miller	..	..	..	..	..	1	1
Grant	47	23	48	34	22	21	195
Gaylord	3	..	1	..	..	..	4
Great Western	..	2	..	3	1	1	7
Glide	8	8	1	3	1	..	21
Garford	4	3	4	6	1	2	20
Hupmobile	588	181	403	340	123	80	1715
Hudson	617	105	242	205	86	76	1331
Haynes	38	18	23	25	15	17	136
Halladay	4	8	5	3	2	3	25
Herreshoff	49	14	23	20	9	4	119
Henry	10	3	20	11	9	1	54
Havers	19	6	10	7	4	..	46
Henderson	7	1	3	1	..	..	12
Herff-Brooks	..	2	4	3	5	..	14
Huron	..	2	4	1	..	..	7
Homer	..	1	..	..	..	..	1
Holsman	..	1	..	..	1	..	2
Howard	..	..	..	1	..	1	2
Hercules	..	..	..	2	..	1	3
Hartford	..	..	..	1	..	..	1
Hollier	..	..	..	..	..	1	1
Imperial	120	60	134	68	24	15	421
Interstate	6	3	7	3	2	1	22
Ideal	..	..	..	1	..	..	1
Jackson	226	123	225	173	75	56	878
Jeffery	78	28	90	85	45	18	344
Krit	285	109	223	105	59	27	808
King	130	21	53	35	31	19	289
Kisselkar	66	5	20	31	13	8	143
Keeton	5	..	3	2	..	1	11
Kenmore	..	..	1	..	..	2	3
Kath	..	..	1	..	..	..	1
Kron	..	1	..	..	..	..	1
Knox	..	..	..	1	1	..	2
Knight & Kilbourne	..	..	..	..	1	..	1
Lozier	126	12	15	20	4	9	186
Little	44	22	50	33	7	8	164
Lion	24	15	48	40	10	5	142
Lambert	17	9	34	28	11	9	108
Locomobile	33	2	4	7	8	1	55
Lexington-Howard	1	..	1	..	..	..	2
L-P-C	1	..	1	1	1	4	8
Maxwell	426	279	687	563	330	267	2552
Mitchell-Lewis	155	54	149	126	54	44	582
Maxwell-Briscoe	70	47	124	148	45	17	451
Metz	40	28	78	87	43	24	300
Metzger	40	28	50	36	11	6	171
Michigan Motor	40	6	53	32	17	8	156
Michigan Buggy	41	22	41	19	7	3	133
Michigan Auto	..	..	..	..	..	2	11
Marmon	11	4	7	4	2	1	29
Millercar	15	5	5	3	3	1	32
Mercer	8	2	..	1	1	1	13

GASOLINE PASSENGER CARS

	Jan.	Feb.	Mar.	April	May	June	Total
Marquette	12	5	5	10	1	2	35
Mason	3	1	..	..	1	2	7
Monroe	1	4	27	48	48	34	162
Monarch	19	6	6	6	2	1	40
Marathon	6	3	5	5	2	..	21
Meline	5	..	4	9	3	2	23
Marion	14	3	9	14	3	2	45
Moon	5	2	3	4	2	..	16
McIntyre	..	..	3	1	..	..	4
Matheson	2	2	1	1	..	..	6
Mora	1	..	3	1	..	1	6
Midland	1	..	..	2	..	1	4
Marvel	1	..	1	..	..	1	3
McFarland	1	..	2	..	..	1	4
Marlette	..	..	1	..	..	..	1
Meteor	..	..	..	2	1	..	4
Metercar	..	..	4	5	1	..	10
Mt. Pleasant	..	..	.	2	..	1	3
Middleby	..	..	..	1	..	..	1
Melbourne	..	..	..	..	1	..	1
National	15	5	7	6	4	3	40
Northern	5	3	6	13	8	11	46
Nyberg	..	..	6	4	4	2	16
Norwalk	1	..	..	..	..	..	1
Northway	1	..	..	..	..	..	1
Northwestern	..	1	..	..	..	..	1
Nicholds	..	1	..	1	..	..	2
Oldsmobile	328	69	161	148	90		876
Oakland	523	215	442	325	[123	89	1717
Overland	1262	590	1852	1259	634	627	6224
Owen	5	4	3	1	3	..	16
Orient	..	2	..	..	..	..	2
Orion	..	1	..	..	..	..	1
Olympic	..	..	..	1	..	..	1
Ohio	..	..	..	..	3	..	3
Packard	410	22	45	47	35	15	574
Paterson	107	57	164	86	39	15	468
Peerless	60	8	16	14	4	8	110
Pierce-Arrow	95	4	13	10	9	7	138
Paige-Detroit	517	128	277	180	86	67	1255
Pope	41	5	19	20	15	9	109
Premier	7	1	4	4	1	1	18
Pullman	..	1	6	12	14	8	41
Partin-Palmer	..	..	4	1	1	..	6
Parry	..	2	6	4	1	..	13
Palmer-Singer	1	1	3	3	..	..	8
Peninsular	..	..	2	..	..	..	2
Perfection	..	..	1	..	..	..	1
Pastera	..	..	1	..	..	..	1
Pilgrim	..	1	..	..	..	..	1
Pioneer	..	1	..	..	..	1	2
Pratt-Elkhart	..	1	..	4	..	1	6
Pilot	2	1	..	..	..	..	3
Princess	1	..	..	1	..	2	4
Puritan	1	..	..	..	1	..	2
Pathfinder	..	..	..	1	..	..	1
Reo	1162	378	1183	872	386	249	4230
R-C-H	145	72	141	92	39	15	504
Regal	169	116	236	173	105	55	854
Rainier	4	2	6	2	1	1	16
Rider-Lewis	..	1	3	2	..	1	7
Ross	..	..	2	1	..	1	4
Read	8	3	..	1	..	..	12
Royal	2	..	1	2	1	1	7
Remington	..	1	..	..	..	..	1
Rambler	..	..	..	2	..	..	2
Rayfield	..	..	..	..	..	1	1
Studebaker	1206	562	1168	755	343	236	4270
Saxon	107	56	158	198	170	145	834
Stevens-Duryea	40	2	22	13	4	3	84
Staddard-Dayton	56	19	32	24	14	15	160
Stutz	7	3	5	2	1	2	20
Stearns	5	..	2	10	1	2	20
Simplex	4	..	1	4	1	..	10
Scripps-Booth	15	9	5	12	15	12	68
Schacht	5	4	7	4	4	3	27
Speedwell	4	5	3	6	3	3	24
Stanley	7	2	11	4	7	3	34
Suburban	7	1	3	..	..	..	11
Sears	..	..	13	14	6	2	35
Stewart	..	..	..	..	..	1	1
Sphinx	..	..	1	1	1	1	4
Selden	3	..	2	1	1	1	8
Springfield	..	..	..	1	..	..	1
Sultan	..	1	..	..	..	..	1
Stover	..	1	..	2	1	..	4
Thomas	28	2	15	14	14	7	80
Templeton	..	1	..	..	..	..	1
Triumph	..	..	..	..	..	1	1
Velie	10	5	6	13	2	7	43
Vulcan	..	2	4	2	2	1	11
Valey	7	..	1	..	..	..	8
Victor	..	..	..	1	..	..	1
Winton	154	26	62	38	19	29	328
Warren	163	53	81	51	33	20	401
Welch	31	3	19	14	5	4	76
White	41	6	18	28	12	5	110
Wayne	9	6	4	5	8	8	40
Westcott	13	3	7	3	3	1	30
Wahl	2	2	2	1	..	..	7
Wolverine	1	..	..	..	..	..	1
Whiting	..	..	..	..	1	..	1
Zimmerman	..	1	4	3	1	..	9
Miscellaneous	433	50	49	60	62	32	686
	25,342	9691	22,062	17,942	9420	7088	90,664

ELECTRIC PASSENGER CARS

	Jan.	Feb.	Mar.	April	May	June	Total
Argo	30		10		..	..	46
Baker	97	4	3	..	1	3	08
Broc	8	..	1	1	..	..	10
Babcock	8	1	..	2	..	..	11
Berland	..	1	..	1	..	..	2
Century	63	4	8	2	1	1	84
Colonial	..	1	..	..	..	..	1
Church-Field	27	3	1	..	1	1	33
Columbus Buggy	24	2	2	3	2	1	34
Detroit	521	34	28	16	14	5	618
Eagle	..	1	..	..	..	..	1
Fuller Buggy	1	2	12	8	..	..	23
Flanders	8	3	11	..	..	..	22
Grinnell	108	15	10	1	10	2	146
Hupp-Yeats	41	4	3	3	..	3	54
Milburn	..	..	1	2	..	1	4
Ohio	38	2	7	4	4	1	56
Phippe-Grinnell	4	..	..	..	..	1	5
Rauch & Lang	139	4	12	4	4	2	165
Rex	3	..	..	..	..	..	3
Standard	..	..	1	3	2	..	6
Sterms	..	..	..	..	1	..	1
Walker	14	1	..	..	..	..	15
Woods	80	8	8	3	4	1	104
	1219	93	118	56	44	22	1552

COMMERCIAL GASOLINE VEHICLES

	Jan.	Feb.	Mar.	April	May	June	Total
Alden-Sampson	27	4	4	10	6	5	56
Autocar	6	4	8	13	7	4	42
Alco	1	..	1	..	..	1	3
Aetna	1	..	1	1	..	..	3
Atterbury	..	..	..	1	..	..	1
Admiral	..	..	1	1	..	..	2
Atlas	..	..	..	1	1	..	2
Avery	..	..	..	1	1	..	2
Beyster	..	2	3	4	1	..	10
Bowling Green	..	..	..	1	..	..	1
Boyden	..	..	..	..	1	..	1
Bale	..	..	..	..	..	3	3
Commerce	77	5	8	9	13	5	117
Chase	23	2	4	4	2	2	37
Cass	8	2	6	5	5	1	27
Commercial	3	..	..	..	1	1	5
Crown	..	..	..	1	..	1	2
Duplex	3	..	4	..	1	2	10
Durant-Dort	19	6	18	32	10	6	91
Denby	1	1	1	1	4	..	8
Detroit Motor	..	..	..	..	4	..	4
Dudley	1	..	..	..	..	..	1
Dart	..	..	1	..	..	..	1
Diamond T	1	..	..	..	1	1	3
Driggs-Seabury	1	..	..	..	..	..	1
Dewagiac	..	..	..	..	..	..	1
Decatur	..	1	..	2	..	..	3
Enterprise	..	..	..	1	..	..	1
Federal	177	8	15	9	9	10	228
Four-Wheel-Drive	1	..	1	..	2	..	4
Falcon	..	..	..	..	1	..	1
G.M.C	194	6	25	17	11	6	259
Grabowsky	36	3	6	10	4	2	61
Grand Rapids	3	..	..	..	..	1	4
Gramm	11	1	2	1	..	..	15
Gaeth	1	..	1	..	..	..	2
Gaylord	..	..	..	12	4	..	16
Galleway	..	..	..	1	..	..	1
Horner	24	2	3	2	3	1	5
Hewitt	1	..	..	..	..	..	1
Huron	..	..	..	1	1	..	2
International Harvester	81	20	77	71	49	26	324
International	..	9	4	4	1	..	18
Johnson	..	..	..	1	..	1	2
Kelly-Springfield	29	20	5	2	1	3	60
Koehler	2	..	..	..	..	..	2
Kosmath	5	..	1	..	..	..	6
Krebs	..	..	1	..	..	..	1
Knox	4	1	..	..	..	..	5
Kalamazoo	..	..	2	7	5	4	8
Kiblinger	..	..	..	2	..	..	2
Little Giant	11	3	..	1	2	2	9
Lauth-Juergens	..	2	2	..	..	..	4
Lippard-Stewart	2	..	..	..	..	..	2
Logan	..	..	1	..	..	1	2
Mais	1	..	2	..	..	..	3
Mogul	2	..	..	..	..	..	3
Menominee	..	1	..	2	..	..	2
Mack	..	2	..	..	1	..	3
Motor Wagon	..	1	..	..	..	1	2
Moniter	..	..	..	1	..	..	1
Mercury	..	..	..	..	1	..	1
Motor Vehicle	..	..	..	..	..	1	1
Oliver	6	2	1	3	1	1	14
O.K	..	..	..	1	1	..	2
Packard	94	4	9	3	5	5	120
Pess	16	4	2	2	3	..	27
Parcel Post	6	2	2	..	1	..	11
Pierce-Arrow	17	..	..	..	..	1	18
Peerless	20	..	2	2	2	..	26
Peyer	8	1	4	7	4	1	25
Pull More	..	1	..	..	..	..	1
Standard	41	1	1	1	2	1	47
Star	20	4	1	3	1	..	29
Signal	15	3	2	3	..	1	24
Selden	3	..	2	..	..	..	5
Streator	..	..	2	5	..	1	8
Seitz	7	2	2	1	..	1	13
St. Louis	..	..	..	..	1	..	1
Stegeman	1	..	3	..	1	..	5
Sternberg	..	..	..	..	..	2	2
Sampson	..	..	3	..	..	..	3
Stewart	..	..	..	1	..	..	1
Superior	..	1	..	..	1	1	3
Soules	..	..	..	1	..	..	1
Sterling	..	..	2	4	..	1	7
Schmidt	..	..	..	1	..	..	1
Republic	43	11	18	26	17	12	127
Rapid	17	4	15	4	7	9	56
Reo	11	1	8	31	21	10	82
Reliance	8	..	..	1	1	1	11
Randolph	..	1	3	2	3	..	9
Universal	109	11	5	7	7	5	144
United	..	4	..	..	..	..	4
U.S. Meter	9	..	2	2	3	..	16
U. S. Truck	3	2	..	..	..	..	5
Vim	2	1	..	..	..	..	3
Van Dyck	1	1	2	6	..	1	11
Van	..	..	1	2	1	1	5
Wagenhals	7	2	..	..	1	..	10
White	18	1	1	2	2	1	25
Wilson	..	..	1	..	..	..	1
Miscellaneous	18	..	2	9	11	8	48
	1257	170	304	362	249	157	2499

COMMERCIAL ELECTRIC VEHICLES

Baker	20	2	..	..	..	..	22
Champion	3	..	..	..	..	..	3
Couple Gear	6	1	..	2	..	..	9
Detroit Elec	51	..	..	2	1	1	55
Electric Vehicle	3	1	..	..	..	..	4
General Vehicle	15	1	..	..	..	..	16
M. & P	3	..	..	..	..	..	3
Walker	..	1	..	..	1	..	2
	101	6	0	5	1	1	114

FOREIGN CARS

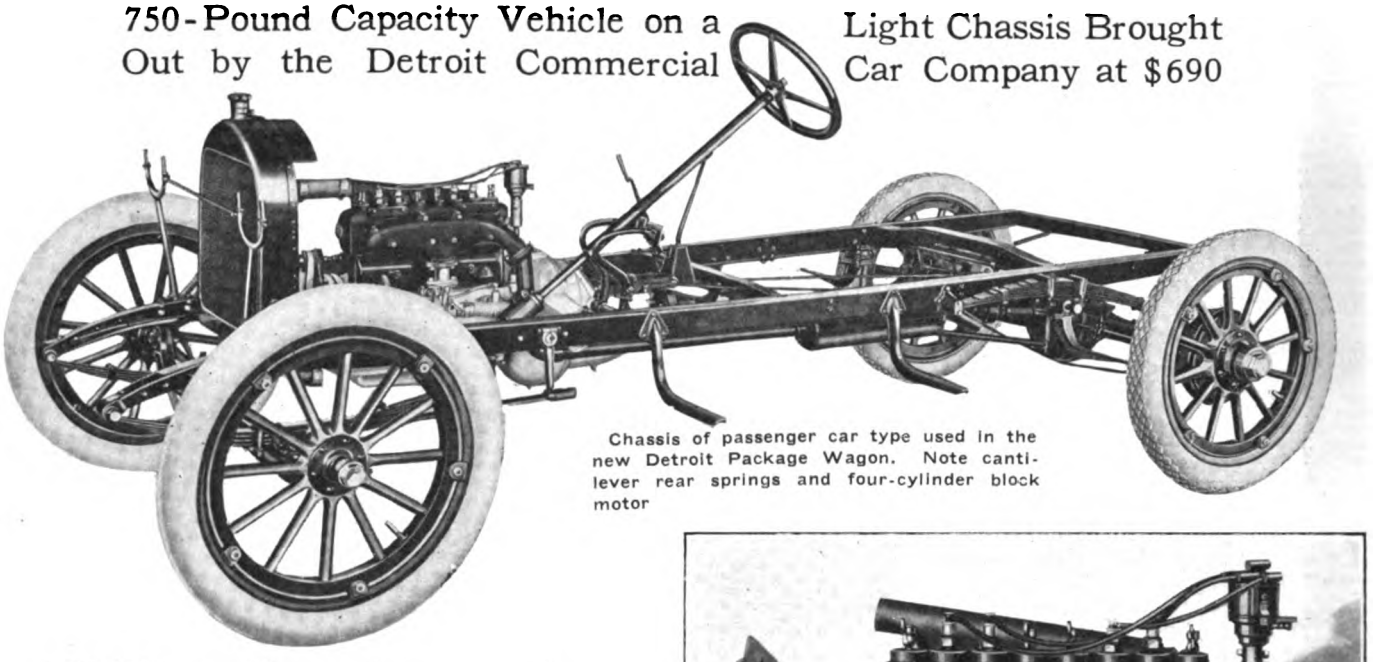
Benz	4	..	1	..	..	..	5
Brennabor	..	..	2	..	..	..	2
Bianchi	..	..	1	..	..	..	1
Berliet	..	..	1	..	..	1	2
Clement	..	..	..	1	..	..	1
Darracq	2	..	..	..	..	..	2
De Dion Bouton	..	..	1	..	..	..	1
Daimler	1	..	..	1	..	..	2
Fiat	1	2	..	..	..	..	3
Hispana-Suiza	1	..	..	..	..	..	1
Hotchkiss	..	..	..	1	..	..	1
Mercedes	1	..	..	..	..	..	1
Mors	..	..	..	1	..	..	1
Napier	1	..		..	..	..	1
Panhard	..	..	..	..	..	1	1
Renault	8	1	..	1	..	1	11
Rolls-Royce	1	..	..	..	..	1	2
Welseley	..	..	..	..	..	..	1
	20	3	6	5	..	5	39

MANUFACTURERS' AND DEALERS' LICENSES

Manufacturers	119	3	2	1	3	..	128
Dealers	165	57	99	43	19		392
Manufacturers and Dealers	2	..	1	..	..	..	3
	286	60	102	44	22	9	523

Detroit Package Wagon Enters Field

750-Pound Capacity Vehicle on a Light Chassis Brought Out by the Detroit Commercial Car Company at $690



Chassis of passenger car type used in the new Detroit Package Wagon. Note cantilever rear springs and four-cylinder block motor

DETROIT'S automobile roster is to carry another name. The Detroit Commercial Car Co. has been formed with W. D. Paine, formerly a zone supervisor of the Maxwell Motor Co., as its president and general manager. The personnel of the company other than Mr. Paine has not been made public, but it is understood that sufficient capital is available for extensive manufacturing operations. Headquarters are being established at 1225 Woodward Avenue.

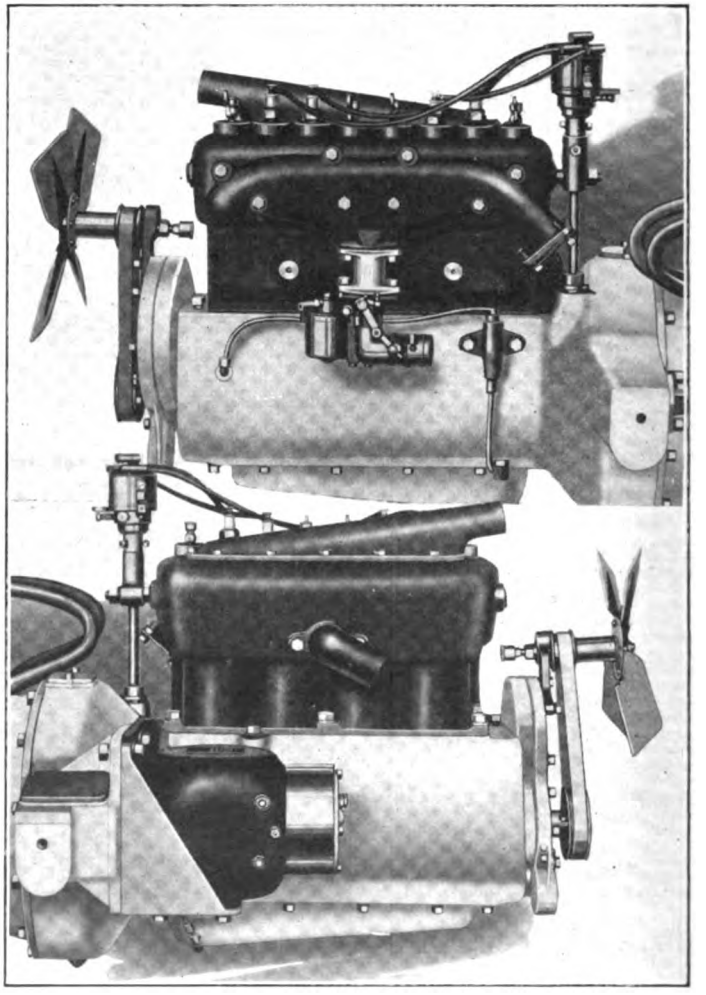
The product of the Detroit Commercial Car Co. is to be a light delivery vehicle, known as the Detroit Package Wagon, and having a rated capacity of 750 lb. Three types of light-delivery bodies are listed, one a standard panel body form of vehicle selling at $690; another style having an open express body and also selling at $690; and the third a full panel type of more elaborate body construction at $745.

The chassis is practically the same as that used by a passenger car of similar size. This is quite a logical thing, because the load rating of 750 lb. along with the desirability of moderate speed in getting from place to place put the requirements of such a business vehicle very much in the same class as those of the average moderately light passenger automobile.

3¼ by 4 Block Motor

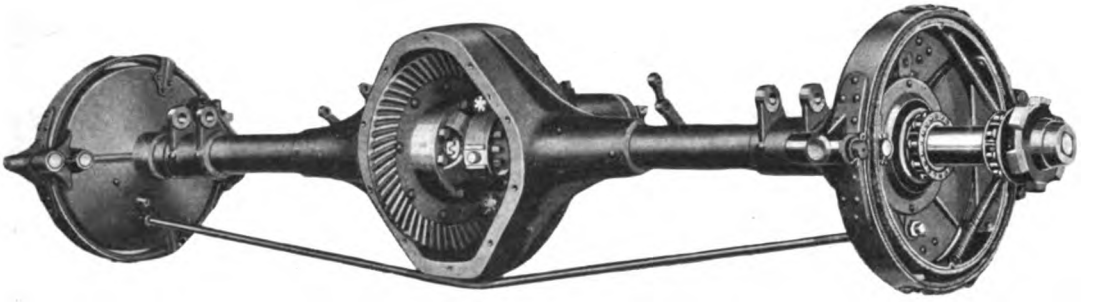
The chassis possesses a wheelbase of 106 inches and is powered with a four-cylinder block motor, 3¼ by 4. This develops 25 hp., it is claimed. The springing is rather out of the ordinary for a delivery car in that the rear suspension is by full cantilever springs. Tires are 30 by 3½ pneumatic. Also suggestive of the passenger type of vehicle is the floating rear axle which incorporates spiral-bevel gearing. Gearset and clutch, both in unit with the engine, are compactly designed. The clutch is a multiple disk type, and the gearset gives the conventional three speeds. The equipment at the prices above includes a single unit electric cranking and lighting system, which is a desirable feature in light delivery work, saving time of stopping and re-starting the engine, and also having an effect upon the fuel economy.

In detail, the engine offers nothing out of the standard beaten bath, being a compact unit. The cylinders are of the L-head form with all valves on the left, cover plates inclosing the rods in good fashion. To promote lightness the crankcase, which is of barrel form, is of aluminum, being in unit with the housing of the flywheel. The cylinder block

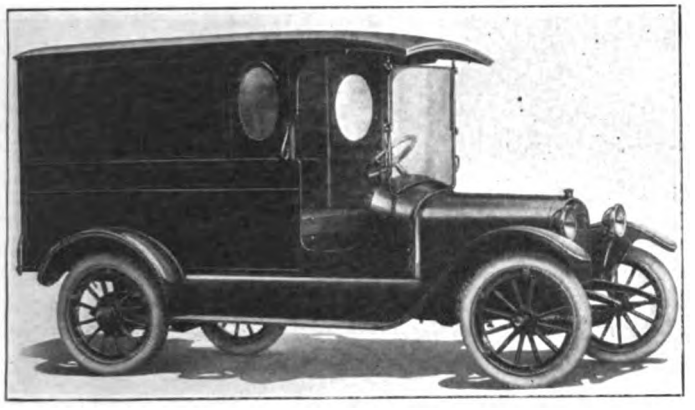


Above—Manifold side of the 3¼ by 4-in. four-cylinder block motor used in the Detroit Package Wagon showing mounting of carbureter and ignition distributer. Below—Right side of motor, showing motor generator

Right—Floating type of rear axle used on Detroit Package Wagon, with cover plate removed showing spiral bevel driving gear. Brakes are 12-in. in diameter with a width of 2 in.



Below—Detroit Package Wagon with standard panel body selling for $690



bolts to the case, and a bottom portion serves as the oil reservoir and cover for the bottom of the power plant as well. Its removal exposes all of the main bearings.

One-Piece Combined Manifold

Simplification of the intake and exhaust manifolding is brought about by the casting of both in one piece. The intake portion is below the exhaust part, and opening at the bottom center of the combination being for the carbureter attachment, while the exhaust-pipe connection is at the rear. This not only serves to clear up the valve side of the engine, but it has the advantage of bringing the incoming gases into intimate contact with the hot-exhaust piping, thus doing much in the interests of vaporization of the fuel.

Chrome-nickel steel is used for the camshaft and crankshaft alike. Each is carried on two bearings of good size, and numerous tests are said to have developed no weaknesses in these important parts. Standard construction is rigidly adhered to in the design of the valves, pistons, connecting-rods, and other internal parts, with lightness one of the aims. The idea has been to attain speeds which would put the engine in the so-called high-speed class. This ought to be most desirable for commercial car work, as the higher speed must necessarily have a beneficial influence on the gasoline economy.

The helical timing gears are neatly inclosed in aluminum housings at the front, while the drive for the motor-generator is provided for by a silent chain running in oil. This electric unit is carried on the right rear side of the crankcase on a specially-provided bracket. The end of the electric-unit housing is flanged to bolt directly to the crankcase support, thus making for good alignment of the parts concerned. Operating in the customary manner, the electric unit drives the crankshaft through its chain connection when doing its starting duty, and is in turn driven from the crankshaft when ordinarily running as a generator.

Connecticut Ignition System

Energy for ignition comes from the storage battery, its distribution being taken care of by a Connecticut coil and distributer mounted in a vertical position at the rear of the cylinder block and driven from the rear end of the camshaft by spiral gear connection.

Thermo-syphon cooling in conjunction with a honeycomb-type radiator has been well adapted to the car, and splash lubrication has also been nicely laid out for the motor. These two items are very important for commercial work especially, for the cars get little rest, and must have substantial oiling arrangements along with adequate cooling facilities.

Smooth action of the clutch is also very important, and the maker states that the matter of gradual starting has not been neglected. Many times costly and fragile merchandise must be handled without jarring, and thus the clutch is called upon to be sweet of action. The clutch is therefore made to run in oil, with the plates held in engagement by one large main spring operating on four levers, the construction permitting the use of a comparatively light spring, and at the same time, owing to the large leverage obtained, providing a heavy gripping power.

Hotchkiss Drive

Drive is transmitted by a chrome-nickel steel shaft and two universals. The drive is taken on the Hotchkiss principle. That is, instead of having a torsion tube or a torsion rod alongside of the propeller shaft, the springs are used to push the car as well as to take the torque. This makes for a flexible chassis, and is doubtless well fitted for work in the light delivery-vehicle field, although somewhat unusual as compared with the average truck or delivery-car chassis.

Both differential and driving gears are of chrome-nickel steel, and the mechanism of the rear axle is all mounted on ball and roller bearings. At each side of the spiral bevel gearing there are both ball and roller bearings, the latter taking the thrust. At the wheel ends of the axle shafts they are carried by two roller bearings. Brakes should prove amply powerful for the vehicle with their width of 2-in. and 12-in. diameter.

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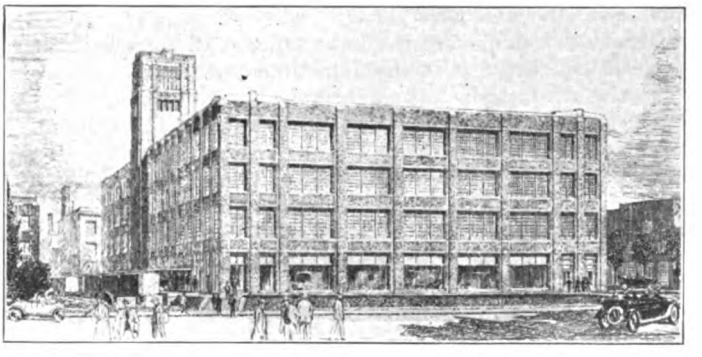
Willys-Overland Building in St. Paul



The Willys-Overland Co. has started work on a new four-story and basement building in St. Paul, Minn., with a frontage of 461 ft. and a depth of 188 ft., 6 in. Part of the structure will be used as a service station and salesroom and the balance will be utilized for warehouse purposes. The structure will be of brick and steel and fireproof throughout. When completed it will contain 435,000 sq. ft. or approximately 10 acres of floor space, or about the area contained in four city blocks. St. Paul was chosen as a distributing point because of its location in the heart of a prosperous farm belt and being the largest railroad center in the Northwest. The records of the company show that 60 per cent of the Overland product goes to farmers, and Wisconsin, Minnesota and the Dakotas rank high in its sales reports.

The Engineers' Forum

Aluminum versus Steel in Motor Construction—J. E. Diamond Replies to F. R. Porter

By James E. Diamond
Engineer, Aluminum Castings Company

CLEVELAND, OHIO—Editor THE AUTOMOBILE:—Mr. Finley R. Porter's letter published in THE AUTOMOBILE of Sept. 2, equals in interest his contribution in the Aug. 12 issue. However, in several major particulars there still remains the same lack of coincidence in our respective views, though on one or two points we seem to be in a little closer agreement. Your contributor concedes that where rigidity is a main consideration, as in crank and transmission cases, aluminum is the proper material. This would leave undecided the question of the motor in which crankcase and motor block are cast integrally, the conclusions drawn by Mr. Porter being against the aluminum cylinder proper. As a matter of fact this design is rapidly gaining favor, and is a most desirable proposition from the aluminum standpoint.

Aluminum Piston Aids Efficiency

There seems to be as much of a difference of opinion concerning the aluminum alloy piston as before existed. I feel just as strongly that the aluminum piston will prove entirely successful in a high-duty motor as Mr. Porter does that it will not. Not only will the Lynite piston go hand in hand with this new type of motor, but it will be a factor in its greater successes. My conclusions are based as much on experience as anything else. Certainly some of the recent racing creations may truthfully be characterized as high-duty motors, and unless I am misinformed, practically all of the motors competing in recent speedway events have been equipped with aluminum alloy pistons, and that in addition, less piston trouble was experienced with those of this type than with the steel ones.

Mr. Porter minimizes the importance of the much greater thermal conductivity of the aluminum piston. My belief is that the advantages this offers may not be minimized. He bases his belief that this thermal property of the aluminum pistons has no real value due to the clearance between piston and cylinder, that is, that the piston is heat insulated. Unquestionably there is a retardation in the transference of heat, due to this condition, the heat having to pass through either an air space or an oil film, but in the final analysis is this the governing consideration? After all, is not the conduction of heat away from the piston head the main consideration?

The temperature generated by the explosion is conceivably momentarily intense, possibly exceeding even the melting point of iron, but in an exceedingly brief period of time this heat is being conducted to every portion of the piston. While this is taking place it is reasonable to suppose that the cylinder wall is abstracting a large quantity of this heat. In the distribution of the remainder of this heat throughout the entire piston, it will assume a higher mean temperature, and yet well within the safe temperature limit of the alloy.

That the cylinder walls will abstract a great deal of this heat in the succeeding strokes, or until the next power one, may not be doubted. The fact that the carbon deposit on the head of aluminum pistons is much less than on iron ones would seem to show that the piston head is always cooler. Possibly the foregoing reasoning is false but it is the only one that seems to explain the results obtained in some recent experimental work. The case might be cited of a 5-in. Lynite piston being used in a high compression motor developing 170 hp. or thereabouts, well ripped, the transverse rib running nearly to the bottom of the skirt, with a skirt clearance of but 0.008 in. Without the ribs much greater clearances were necessary. In my opinion the significance of this is that these ribs conduct the heat away from the head, distributing it uniformly throughout the entire piston. Perhaps the additional radiating surface has something to do with it also. I am convinced that there is no weakening of the head of the Lynite piston, due to the exceedingly brief duration of the explosive temperature, and its immediate distribution. In any event, the head might be made three times thicker, and yet introduce no additional weight. Mass for mass the head of the light piston would compare very favorably in strength with the head of the steel piston advocated by Mr. Porter.

Unquestionably, the high-duty motor is the motor of the future, but as stated previously the Lynite piston is not going to be left behind. Regardless of the horsepower to be developed per cubic inch of displacement (0.5 hp. per cubic inch seems extraordinarily high), this type of piston will answer all requirements, and especially there need be no worry whatever about substituting this type for motors of the bores mentioned, namely 3 in. and it is self-evident that the steel pistons will always cost much more than the aluminum one.

Failures with Steel Pistons

I believe it quite proper to state that several engineers here have at one time or another looked longingly toward the steel piston, and where tried, that realization has fallen short of anticipation in many respects. One of these engineers has told me that he had found it necessary to allow much greater clearances than for luminum alloy ones, the permissibly thinner sections used, and necessary with weight-saving an object, expanding exceedingly quicker, and the expansion no mean amount. This seemed to be the main source of trouble. Further when the steel piston seized it invariably damaged the cylinder, whereas the seizure of the aluminum alloy pistons very rarely did any damage. The question of clearances with the aluminum pistons has not proved to be the troublesome problem anticipated, and several methods of eliminating piston slaps have been developed.

Question of Tensile Strength

The writer purposely placed the figure for the tensile strength of aluminum low, merely for purposes of com-

parison. In stating that the average strength of the steel used in an all-steel job would be nearer 60,000 lb. than 120,000, which figure is arrived at by accepting as fact Mr. Porter's statement that the strength of aluminum is but one-sixth that of the modern steel, the steel casting was assumed to play a very important factor in the all-steel motor. Merely as a matter of general interest, my company is prepared to furnish Lynite alloys which have a tensile strength between 40,000 and 50,000 lb. per sq. in. I certainly appreciate the extraordinary strength of some of the recent steels after proper heat treatment. I assumed that steels with a strength ranging between 200,000 and 300,000 lb. would be used for the camshaft, crankshaft, wristpin, etc. Concerning cast iron, my opinion still is that the average tensile strength will not exceed 20,000 lb. and that if a strength of 38,000 lb. is being obtained the material must be a semi-steel and it is not fair to classify it as an iron.

Aluminum Motors on Stocks

Mr. Porter still seems to be doubtful as to the feasibility of the sleeve construction in the design of the all-aluminum motor. My personal opinion is that the matter has passed beyond the stages of academic discussion in view of the fact that one manufacturer of the highest grade cars already has started fairly large production (nearly 1000 motors) and will, I believe, shortly announce an all-aluminum motor. Certainly an intense interest has recently been displayed in the possibilities of this material in motor construction. Certain other manufacturers have told the writer of their determination to build aluminum motors exclusively when conditions again become normal.

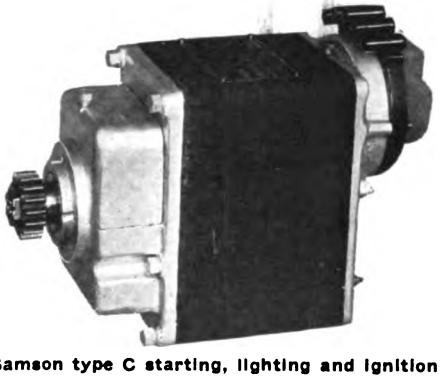
Were the writer given to prophecy he would say that the aluminum motor was going to play a mighty part in the future of the motor industry, though he hastens to agree with your contributor that an all-steel motor may be built that will occupy a position of superiority all its own—but at what cost? The Mercedes aeronautical motor can never become a production proposition, and can never be less than extravagantly costly, and the matter of cost is certainly a vital factor to-day.

My impression is the same as your contributor's that the goal is the elimination of useless expenditure for material and methods not consistent with the results obtained. The writer submits that if the desired results are attainable by the use of aluminum; and where this is the case, why use the all-steel job, the cost of which is infinitely higher than the aluminum?—JAMES E. DIAMOND, Engineer, Aluminum Castings Co.

Samson Electric System for Cars Under 25 Hp.

Starting and Ignition Switch Are Combined

FOR small cars having motors developing not in excess of 25 hp., the Samson Engineering Co., Louisville, Ky., has brought out, under the name of type C, a complete electrical system for starting, lighting and ignition. The entire system comprises three units with the various accessories necessary for their operation. These units are a small motor generator with ignition apparatus built integrally with it, a 30-amp. hr. storage battery and a combination starting and ignition switch.



Samson type C starting, lighting and ignition system

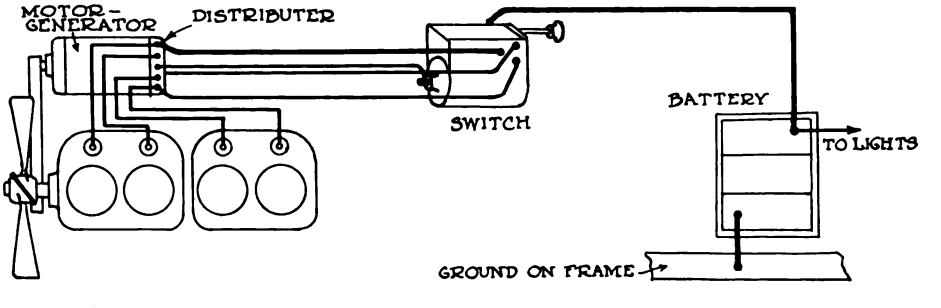
Inherent Regulation

The motor generator has inherent regulation, the winding being so arranged that below certain speeds it acts as a motor and above certain speeds, as a generator. It is connected to the crankshaft by a silent chain with 3 to 1 gear reduction and exerts 40 ft. lb. at the armature shaft. The motor generator is constantly engaged with the crankshaft and when the latter is running under its own power the motor generator acts as a dynamo furnishing current to the storage battery at a constant rate.

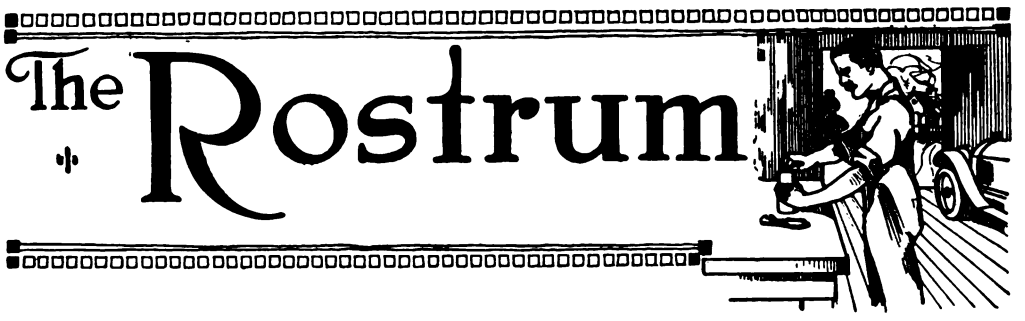
Easily Accessible

The ignition apparatus is a high-tension battery system having either automatic or hand advance. The interrupter mechanism is designed to eliminate lag and the breaker box and distributer are arranged to be accessible. The entire ignition outfit can be examined by the removal of a thumb screw which releases a small aluminum cap and exposes all the working parts. The system operates on the closed circuit principle and the transformer coil is a part of the dash unit, thus giving a convenient mounting. For the ignition wires at the back of the dash unit there are suitable terminals and a housing to protect the connection. The starting and ignition switches operate together, thus giving an adaptation of the so-called non-stalling principle in which at low engine speeds, additional torque is furnished by the starting motor.

The operation is simple and is well adapted for the lower priced cars. To start, the switch knob is pushed all the way in, which cranks the engine, and as soon as the latter is running under its own power, the knob is released connecting the battery for recharging. In stopping the car, the knob is pulled out until it is held which breaks the connection between the dynamo and the battery disconnects the ignition and when the key is removed, leaves it locked in this position. There are no automatic reverse current relays or cutouts, and everything has been done to keep the device simple and efficient and at the same time of low price. A special design is being made for Ford cars. The type C motor generator is 8 in. high, 5 in. wide and 13½ in. long, weighing 40 lb., and an arrangement has been made with the Columbia Machine Co. of Brooklyn, N. Y., whereby the latter concern will manufacture the Samson system. The headquarters of the Samson company, however, will remain at Louisville, and the marketing of the product will be handled from the Louisville office. The price has not as yet been fixed.



Wiring diagram of the new Samson type C electric system for cars under 25 hp.



Refers to Power Consumption in Motor Braking

EDITOR THE AUTOMOBILE:—Referring to your reply to A. W. P.'s inquiry of Fort Barry, Cal., in the Rostrum Department for Aug. 19, this seems to me to be such an important subject that I cannot refrain from giving my views on the tooth pressure question. I have always thought it the best practice to use the motor as a brake, thus saving the brakes as well as running less chance of accident through failure of the brakes. Many of my friends drive in the same way, and I have yet to hear of a stripped gear due to this practice.

Referring to your illustration of the train of gears: If when you turn a train of gears by the pinion you use a crank equal to the radius of the pinion, and when you turn the large gear, a crank equal to its radius, you will find the pressure required on the two cranks will be the same, and is exactly the pressure exerted on the teeth of the gears.

In other words, the tooth pressure on each gear of a pair must be approximately the same at any moment, because the teeth of the driven gear cannot receive more pressure than is transmitted by the teeth of the driving gear. This being true, the tooth pressure will be the same, when transmitting the same power, no matter which gear is driving.

As you state, the gears will transmit the same power whether starting or stopping in the same distance, provided we do not consider friction. But, when we consider that the friction of the rear axle and front wheels as well as the road friction must be overcome by the motor in starting, while this friction helps to bring the car to a stop, it will be seen that the power transmitted by the gears in stopping will be considerably less than in starting.

Los Angeles, Cal. C. V. C.

Points on Tire and Tube Repair

Editor THE AUTOMOBILE:—It appears to me that you might publish some good points from time to time on repairs for tires and tubes. There are many minor repairs that the individual can do in his own garage, but he lacks the courage or proper knowledge of how to do the thing well. An interesting question is, what can a man do properly, and the manner of doing it, explaining any useful tools and their use? Should tubes be repaired by self-vulcanizing patches for minor troubles and limitations of same? Why are same more apt to blister, etc? Where a vulcanizer is used, should there be an outside or inside repair and what will be the dividing line between the two types. Note that very small outside repairs with heavy tubes are apt to mean a thin wall at point of puncture, and kindly give the best method for preventing same, etc., etc.

2—For shoes: means of repair and limits of ordinary equipment? Advisability of plastics, doughs, etc.? Treatment of blowouts by inside and outside patches, together with reliners, etc., and best types.

South Bethlehem, Pa. W. P. J.

—Such a treatise was given in THE AUTOMOBILE for Sept. 18, 1913, and the subsequent issue. This covered in two parts a complete course in what to do for tire repairs both on the roadside and garage. In this it was pointed out exactly how to repair different kinds of punctures, what tools to use, how to go about the work, and the necessary precautions to take to do a good, complete job. Shoes and vulcanizers are also carefully treated, and if you have a copy of this issue on file it will answer all the questions asked in your inquiry.

Bijur Electric System on Packard

Editor THE AUTOMOBILE:—Will you please explain the self-starting system used by the Packard cars, and the name of same?

2—Does a mechanical lubricator need any adjusting as to how much oil to feed is needed?

3—How can one tell whether the height of level in the splash system is correct?

N. Y. City. L. K.

—For starting and lighting the Bijur constant voltage two-unit system is employed on the Packard. Ignition is by a timer with both automatic and hand advance; this is a special Delco product with one breaker cam operating two complete six-cylinder systems.

2—A mechanical lubricator generally has adjustments for each of the individual pumps which force the oil through the independent leads. The adjustment generally controls the length of the pump stroke, which in turn governs the amount of oil fed.

3—The oil level in a splash system can generally be determined by a riser gage mounted on one side of the crankcase. The level in the troughs is generally governed automatically, and if the oil is of sufficient depth in the pan to give a feed to the pump, the oil in the troughs will be correct. If the motor smokes it is sometimes an indication that the level is too high in the crankcase, but as a rule, the splash level is worked out in the factory and need not be touched by the driver.

Wants to Increase Motor Power

Editor THE AUTOMOBILE:—I have a 1913 Hupmobile 32 which I intend overhauling this fall, and in doing so would like to make a few changes. I would like to cut some weight off the reciprocating parts and I thought of boring some holes in the lower part of the piston and reducing some of the weight this way. Would you advise this?

If so, how close to the rings would I dare bore and what size holes and how close from center to center, the bore and stroke being 3¼ by 5½? Would there be any other way in which I could reduce the weight without interfering with the strength of the parts? I notice also that on the timing marks on the flywheel, the valves do not open until the mark is about ½-in. past center and closes about ½-in. before the mark reaches center. I believe the cams are worn too much, thus affecting proper valve action. Am I correct in this, and if so, what would you recommend me to do to overcome this?

I would like to increase the power of this motor, also reduce the vibration at the higher speeds. Anything further which you may think of to suggest would be appreciated.

Lancaster, Pa. E. W. K.

—Drilling holes through the pistons would not so much endanger the strength of the piston as it would the supply of oil to the rings. A number of these holes, if carelessly arranged, would act to starve the cylinders of lubrication with the result that the cylinders would rapidly wear. There would probably be no harm in drilling a few ¼-in. holes scattered about the skirt of the piston, but the weight reduction gained in that way would amount to very little.

There is a possibility that the timing is incorrect due to cam wear, but you can readily determine this by checking up the timing with the following:

If the car is model *K*, inlet opens 11 deg. past top center, closes 43 deg. past bottom center. Exhaust opens 38 deg. before bottom center, closes 6 deg. after top center. If the car is model *H*, inlet opens 25 deg. past top center, closes 35 deg. past bottom center. Exhaust opens 40 deg. before botton center, and closes 20 deg. past top center.

You could probably increase the power of this motor if you wanted to go to the expense by putting in a new camshaft with flat-faced racing cams and by having aluminum pistons, and tubular connecting-rods made. This would be quite an expense however, and it is doubtful if the gain would justify the expense. The ignition timing can also be advanced to give the earliest possible spark at extreme high speeds.

Some Automobile and Other Terms

Editor THE AUTOMOBILE:—What does Grand Prix mean?

2—What does Marathon mean when used in connection with races?

3—What is the meaning of garage? Does it mean a barn and is it a French word?

4—What speed should a racing car be capable of making with a four cylinder motor 3 7-8 by 5 1-2? The motor speed on the block is 3500 r.p.m., and the car weighs 1190 lb. and has 30 by 3 tires on wire wheels. The car is a special. The builder claims a maximum speed of 120 m.p.h. The present owner claims that at a recent test on a beach, the course straightaway, that a full mile was made in 34.09. This would be close to 103 m.p.h. Do you think it reasonable to expect from the foregoing description that the car would make that speed?

Center Village, N. Y. M. J. C.

—Grand Prix are the French words signifying grand prize.

2—The word Marathon in connection with races signifies a contest held as a test of endurance and speed over a course on the open road, 26 miles, 385 yd. in length, or around a track in which the same distance must be covered, an imitation of a race run originally during the new Olympic games at Athens, Greece, in April, 1896. The name is derived from the legendary run of Pheidippides, who is supposed to have run to Athens after the Battle of Marathon, announced the victory and dropped dead in the market place. The distance the legendary runner covered is said to have been that given above. This name is never used in connection with automobile races except at the Montamarathon, where the name has been given as a pun on the Montamara Festival, which is held at the time of the race.

3—The meaning of the word garage is a building for the storage of automobiles. It is derived from the French word meaning the same.

4—It would be impossible from the data which you furnish to give any estimate of what the speed of the car can be as there are too many other factors which enter into the determination of speed.

Speedometer Shaft Should Be Tight

Editor THE AUTOMOBILE:—Following is a little experience which I have had and which may be of value to some of the readers of THE AUTOMOBILE. A year ago I had a speedometer which bothered me by the speed indicating dial not remaining steady but oscillating back and forth. I tried a number of different experiments and finally tightened the swivel joint on the end of the flexible shaft near the gear. I also strapped the shaft to the radius rod of the car, thus preventing it from swinging. This remedied the trouble. This year I have another speedometer and it gave me the same trouble which I remedied by tightening the swivel joint.

There are two cases which I know of where the garagemen have told the owners of the cars that the inside parts of their speedometers were worn out and would have to be renewed. Their trouble was finally remedied by simply preventing the flexible shaft from swinging.

W. Somerville, Mass. J. H. M.

Ammeter Wanted on Cole 1915 4-40

Editor THE AUTOMOBILE:—I have a 1915 model 4-40 Cole car equipped with Delco electric system. I have recently purchased a Weston ammeter which I have connected to this system. While it works it only seems to record about half the amount that it should.

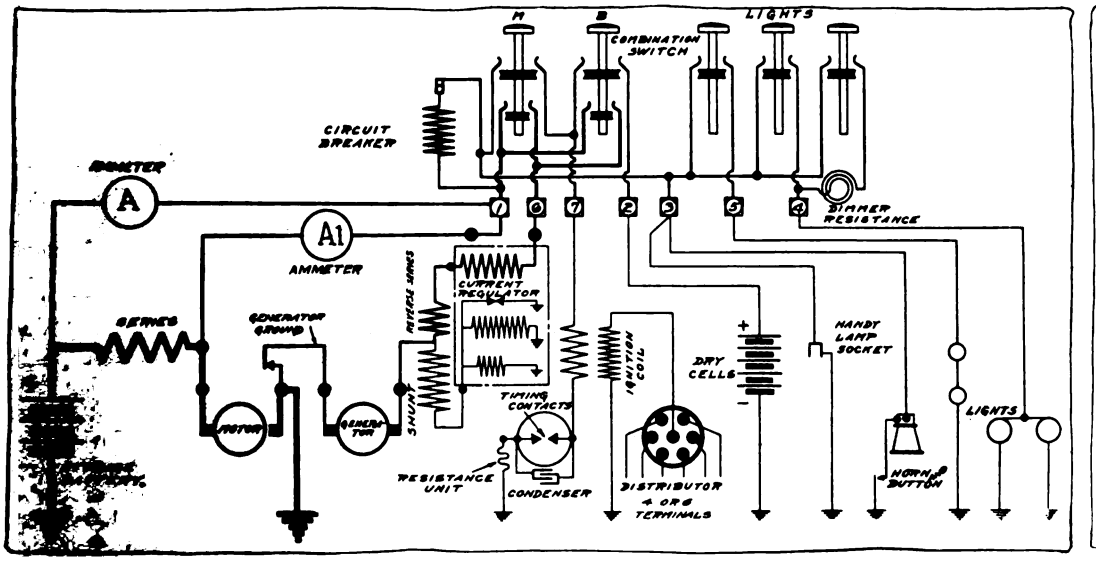


Fig. 1—Wiring diagram showing the installation of the ammeter on the Delco system. When connected at A1, the ammeter only shows a portion of the current. It should be connected at A

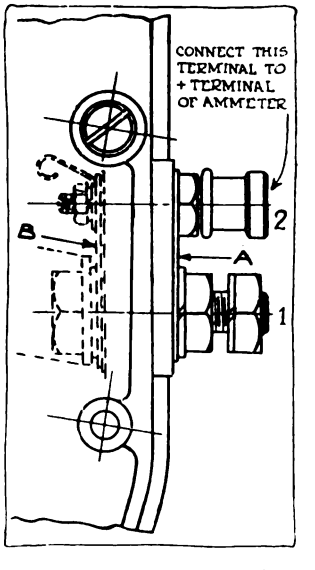


Fig. 2—Strap to be cut in connecting ammeter to Delco

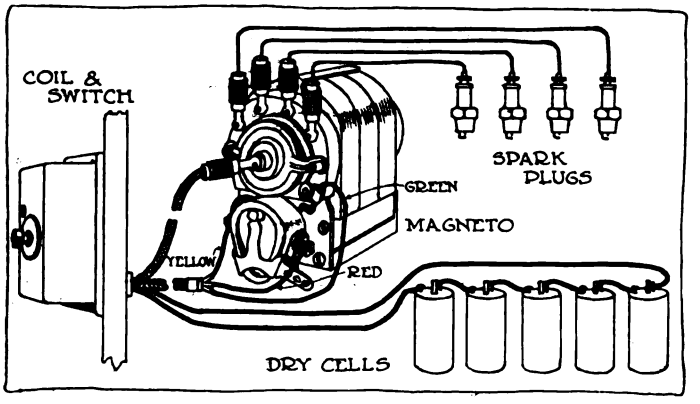


Fig. 3—Remy ignition for Regal model A 1909 cars

This ammeter is connected from the positive pole of the battery through the ammeter to the button marked M or to the circuit numbered 1, which is supposed to be in parallel with the charging circuit, as I understand it, and as I was so instructed to connect it by the Weston people.

It seems to me that by connecting it in the above manner I am only getting half the current through the ammeter, and any information which you can give me or a rough sketch of the manner of connecting this instrument will be greatly appreciated.

Paterson, N. J. A. F. W.

By referring to Fig. 1, the ammeter should be installed in the circuit given as No. 1 between No. 1 post on the combination switch and the lines running to the storage battery, connecting the positive pole of the ammeter nearest the combination switch and the negative pole of the ammeter on the wire running to the storage battery, as the current runs from the combination switch to the battery. The highest charging rate on the generator on this model is 14 amperes or thereabouts, and the average is considerably lower than this.

From your letter it is not quite possible to tell how the ammeter is installed, but from what you say, it seems to be correct, although the generator does not charge as high as it should. Nevertheless, the charging rate is never higher than 14 amperes.

As you state this meter is connected in parallel with the charging circuit as shown by A' would indicate only a part of the charging current. This meter should be connected in the charging line as shown by A.

Connecting Ammeter on Hudson 6-40

Editor THE AUTOMOBILE:—Kindly advise me whether an ammeter can be put on a Hudson 1914 six-cylinder 40 hp. car.

Oil City, Pa. H. J. F.

—To connect an ammeter on the 1914 6-40 model of the Hudson car proceed as follows: Remove three cap screws from top cover plate of motor generator housing and remove cover plate. This will expose the cutout relay; disconnect the black wire at the top right hand terminal of cutout relay and connect to positive ammeter wire; connect the negative wire of the ammeter to the cutout relay top right hand terminal where the black wire was disconnected; start the engine running and the ammeter will give the entire charging rate. Weston ammeter model 301 is generally used for this purpose and may be obtained from the Weston Electrical Instrument Co., of Newark, N. J., at a price of $6.

Magneto Armature Windings Vary

Editor THE AUTOMOBILE:—What is the length, size and weight of wire used in the low-tension winding of a high-tension magneto of any standard make?

2—What is the length, size and weight of wire used in the high-tension winding?

3—What is the strength of the permanent magnets used on high-tension magnetos and how are they magnetized?

West Milford, W. Va. P. W.

—The amount of wire used on the armature winding of the different high-tension magnetos varies with the different makes. A good example, however, of practice in this respect is that used on the armature of the Remy model P magneto where 1 lb. of number 18 Cotenamel wire is used. In the separate winding 8 1-2 lb. of secondary wire and 0.156 lb. of single primary wire are used.

2—This is answered under the previous paragraph.

3—The magnet of the Remy model P magneto will sustain about 3 lb. The magnets are magnetized by passing an electric current through a coil which surrounds the magnet in a charging apparatus.

Wants to Buy an S. A. E. Handbook

Editor THE AUTOMOBILE:—Kindly tell me how I could obtain an S. A. E. handbook, complete as described in the July 29 issue of THE AUTOMOBILE on page 210.

If possible to secure, could I do so free of charge, and if not, what would the cost be?

Dayton, O. H. T.

—The S. A. E. Handbook can be obtained from the Society of Automobile Engineers, 29 West Thirty-ninth Street, New York City. It cannot be secured free of charge, but must be purchased from the Society, which will furnish you the price upon request.

Wiring Diagram for 1909 Regal

Editor THE AUTOMOBILE:—Kindly give me a diagram of the correct wiring of a Regal model A 1909 equipped with a Remy high-tension magneto.

2—In what turns do the cylinders fire?

3—Could you give me the commencing and closing serial numbers of the 1916 Fords?

Horton, N. Y. H. B. C.

—The wiring diagram showing how the ignition is connected on the Remy system for the Regal 1909 model A is given in Fig. 3. According to the Regal company, the Remy low-tension system was used on this car and not the high-tension, and if the high-tension was put on, it must have been installed after the car left the factory.

2—The cylinders in the 1909 model A car fire in the order 1, 2, 4, 3.

3—The Ford fiscal year ended July 31, 1915, and August 1, 1915, was the beginning of the 1916 year. The first car built on August 1, 1915, had serial No. 856,516, and this is the first or opening number of the 1916 Fords.

Timing Valves by the Flywheel

Editor THE AUTOMOBILE:—Kindly explain in the columns of THE AUTOMOBILE how to time valves on the ordinary car by the flywheel in a simple manner for an amateur?

2—What is the best speed of a 1912 Winton six, in good condition?

Berkley, Va. P. M. P.

—In general you will find the flywheel of a motor marked for the proper timing so that you will not have to do anything further than to see that the marks register with the indicator at the proper time. In case the flywheel is not marked, however, the method of procedure is as follows:

Bring the piston of No. 1 cylinder to upper dead center. On the frame of the motor, close to the flywheel, make a mark and then on the flywheel directly opposite this mark make another so that the two register when the piston of No. 1 cylinder is on upper dead center. If there is no portion of the engine frame sufficiently close to the flywheel for the

two marks to register it will be necessary to fasten to the engine some sort of an indicating mark such as a piece of sheet metal which extends close to the flywheel. The marks can then be made on this indicator. It is very often possible to slip a piece of sheet metal bent in a Z-shape between the two halves of the crank case with a hole so arranged that one of the bolts passes through the sheet of metal and holds it solidly.

With the piston of No. 1 cylinder on upper dead center, which can be determined by placing a stick of wood on the top of the piston and moving the crank upward until the stick is at its highest point or by some other means which will vary with the make of engine, the valves are allowed to both be closed resting against their seats. The intake valve is then arranged to open at anywhere between dead center and 10 deg. past. This is determined on the flywheel by passing a tape around the circumference starting with the mark for upper dead center of No. 1 cylinder and going entirely around and then laying off the length of the tape in 360 equal parts, each of which when laid around the flywheel will represent a degree. The timing gears are then meshed so that the intake starts to open a few degrees past top center. The exact number of degrees will be determined by the arrangement of the gear teeth, but it must be kept close to the top center. The time of closing of the intake will be determined by the cam and need not trouble you. When you have the mark on the flywheel for the point at which the intake starts to open for a No. 1 cylinder you should mark it I.O. No. 1. The point of exhaust opening is then determined in about the same manner, the opening of the exhaust starting between 35 and 40 deg. before lower center on the down stroke succeeding the intake stroke which, of course, is a down stroke. With the cams determined by the fact that the camshaft is in your possession, only the openings of the valves need be determined.

After you have marked on the flywheel E.O. No. 1, signifying the exhaust opens for No. 1 cylinder, you should go to the next cylinder which comes into operation, and mark the flywheel. After having determined the proper firing position for the No. 1 cylinder, the other cylinders will take care of themselves, since the camshaft and crankshaft have been designed to act in unison.

2—This car should be able to make 60 m.p.h. or better.

Width and Height of Two 1916 Cars

Editor THE AUTOMOBILE:—What is the entire width and height of the 1916 Overland and Maxwell cars? At what points are these the widest?

New York City. C. G. S.

The width of the 1916 model 83 Overland is 67 in. and the widest point is across the rear fenders from tip to tip. The length with the top up is 148 1-2 in. and with the top down 161 1-2 in. The height of the car with the top up in 82 in.

The Maxwell touring car is 6 ft. 10½ in. high at the highest point, which is directly over the third bow of the touring car top when it is up. The widest point is from the outer end of the front hub caps at which point the width is 5 ft. 7 1-4 in.

Light Weight Cuts Fuel Consumption

Editor THE AUTOMOBILE:—How is it that the Franklin car obtains such a wonderful mileage on gasoline? What make of carbureter do they use?

2—What make of car is the Disbrow's Jay-Eye-See?

3—Did the Chalmers company ever try out a Weidely motor?

4—Why did the Premier company discontinue its use?

5—When in good running order, what speed should an Overland, model 60, 1912, car attain?

Somerville, Mass. C. R. N.

—The reasons given by the Franklin company for their good mileage on gasoline are the following: 1—light weight; 2—air cooling, giving high thermal efficiency; 3—valve-in-head construction giving high thermal efficiency; 4—good mechanical efficiency for moving parts under load; 5—dash control of carbureter needle valve permitting mixture to be adjusted to suit varying conditions; 6—cord tires. The Franklin carbureter is used as shown in Fig. 4.

2—The Jay-Eye-See was made by the J. I. Case Threshing Machine Co., Racine, Wis.

3—The Chalmers company has never tried out the Weidely motor in their plant; nor made a full investigation of it.

4—The Premier company has not discontinued or abandoned the Weidely motor but, on the contrary, is building at the present time cars regularly equipped with this power plant.

5—According to the claims of the Willys-Overland Co., the Overland model 60 will develop 45 to 50 m.p.h. on good roads.

Valve Timing of Ford Opposed Motor

Editor THE AUTOMOBILE:—What is the correct valve timing, or as near as you can give it, of the old Ford double opposed motor? There is nothing which will tell me just when this motor was made.

White City, Kans. L. W. G.

—There were three types of two-cylinder motors built by the Ford company known as Models A, C, and F, and the following information will advise you as to the way of determing which model the car is and also as to the valve timing of each of the three models.

The Model A has an 8-hp. motor with two cylinders with a stroke and bore of 4 in. each. The Model C, two-cylinder motor, 10 hp., with a stroke and bore of 4¼ in. each, and the Model F, two-cylinder motor, 12 hp., has a bore of 4½ in. and a stroke of 4 in.

In a Model A car the inlet valve opens 3⅜ in. after center and closes at 3⅛ in. before center. The exhaust opens 7¼ in. before center and closes on center. In the Model C the inlet valve opens 4 in. after center and closes at 3 3/16 in. after center; the exhaust valve opens at 6¼ in. before center and closes on center. The Model F inlet valve opens at 4⅛ in. after center and closes at 7⅝ in. after center, while the exhaust valve opens at 3 1/16 in. before center and closes on center. These measurements given above apply on the rim of the flywheel.

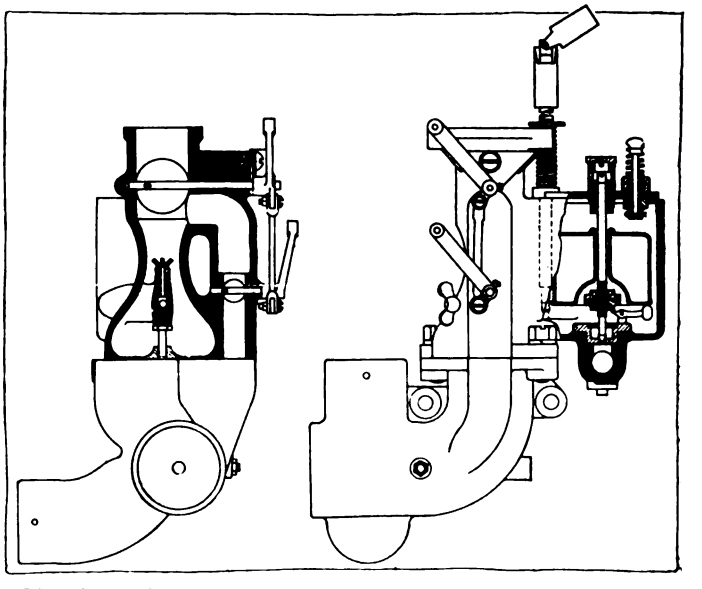


Fig. 4—Sectional views through the carbureter used on the Franklin car. This is a Franklin product, and according to that company is a factor in securing low fuel consumption

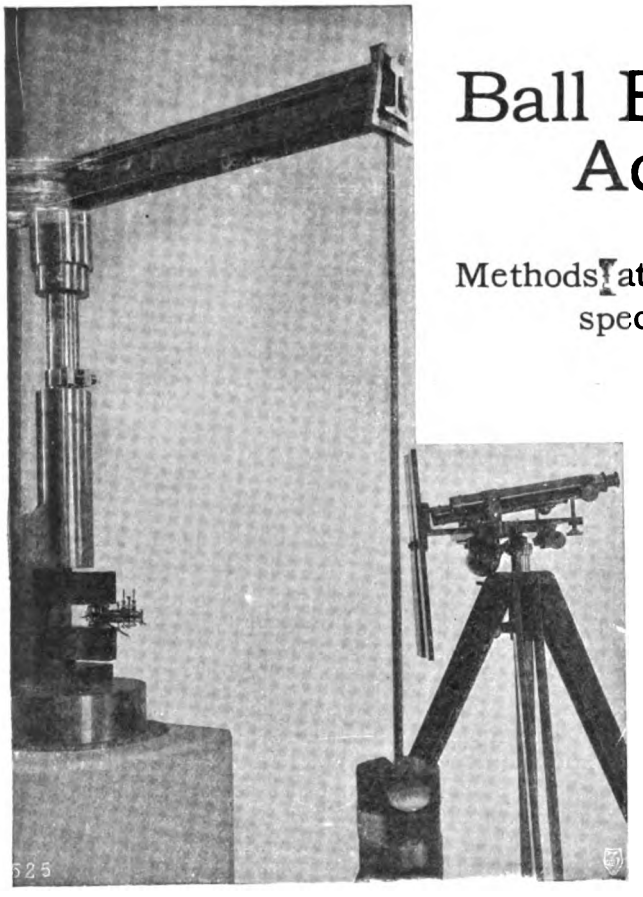


Fig. 1—Determining the elastic limit in the S. K. F. laboratory by Professor Stribeck's bending test

Ball Bearing Tests Involve Accurate Apparatus

Methods at S.K.F. Ball Bearing Factory Include Inspection of Material and Finished Balls with Latest Apparatus

By Arthur V. Farr

IN the new laboratory which has recently been completed in connection with the factory in Gothenburg, Sweden, of the S.K.F. Ball Bearing Co., a series of tests are installed for its ball bearings which are an example of up-to-dateness in the care and precision of bearing finish, and inspection. In no industry which involves the use of modern steels is it necessary to be more careful with the material. Fineness of structure is a necessity, and for this reason the steel is refined from the best Swedish ores in small charcoal furnaces and then melted in small crucibles with the alloying substances added to form the special S.K.F. steel.

Three Important Properties

After all the care has been taken in the selection of the initial materials and in the manufacturing processes, there are three important properties which a ball bearing must have. They are first, high fatigue limit; second, high resistance to

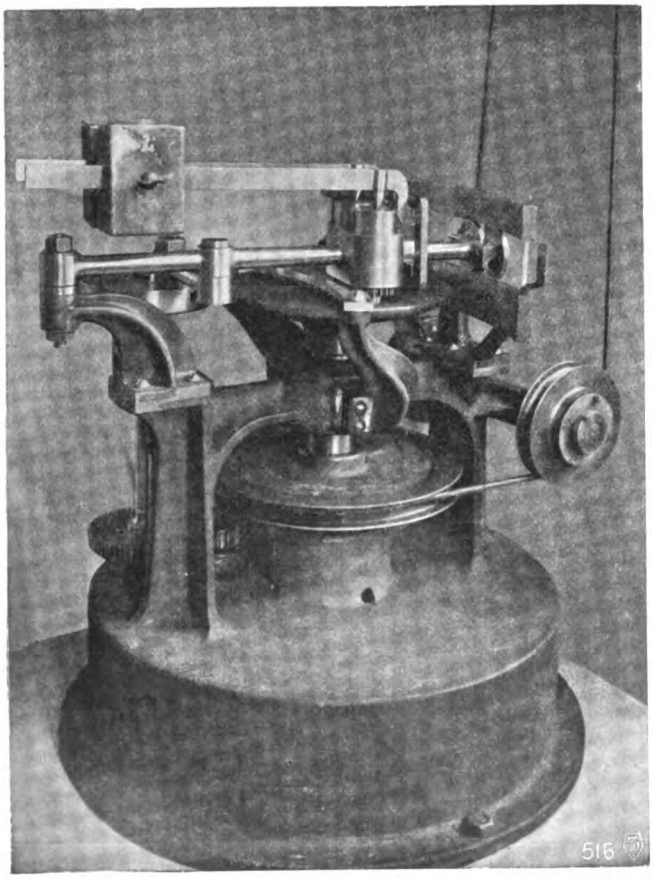


Fig. 2—Machine used in S. K. F. laboratory for wear tests by direct grinding

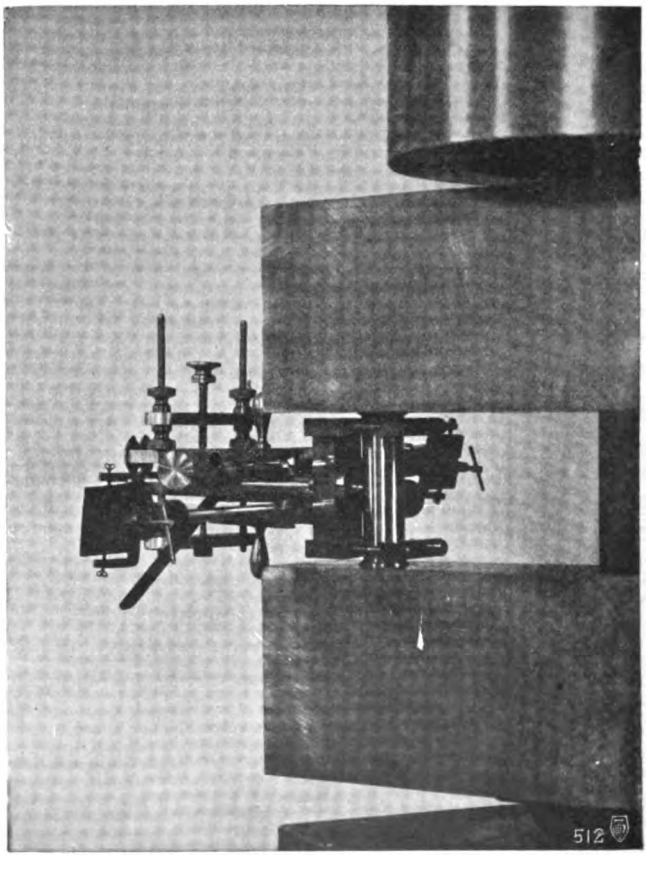


Fig. 3—For determining the elastic limit and modulus of elasticity, the above arrangement is used

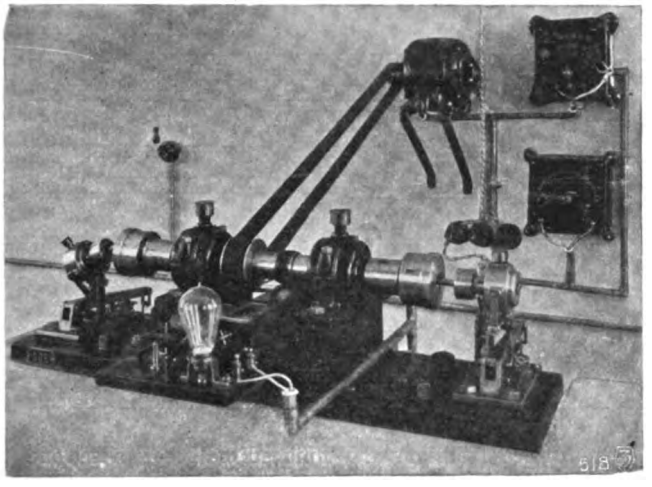


Fig. 4—The Woehler machine for testing the limit of fatigue by direct fatigue tests

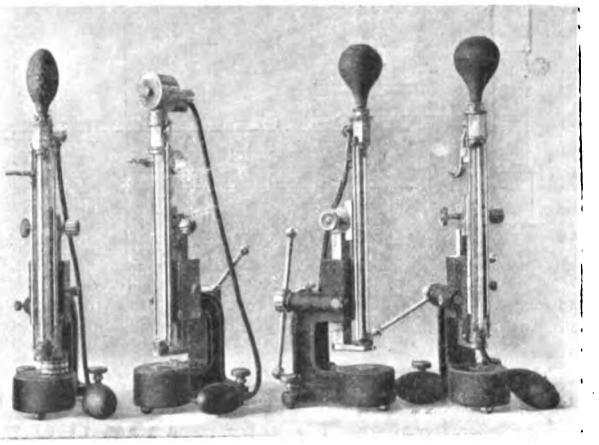


Fig. 6—Reboundimeter or scleroscope used for testing for hardness

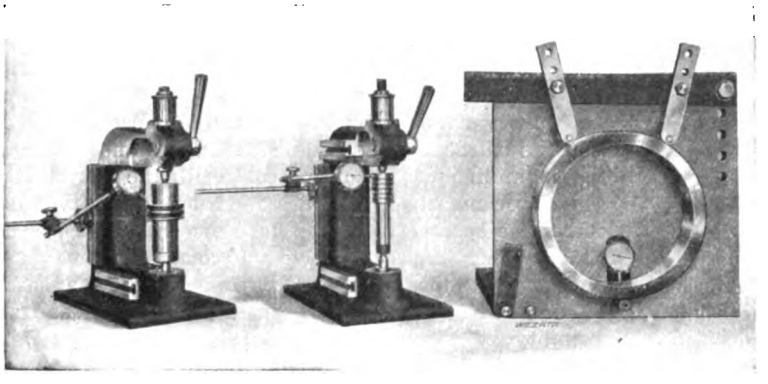


Fig. 5—Testing the finished balls for accuracy in a special appliance

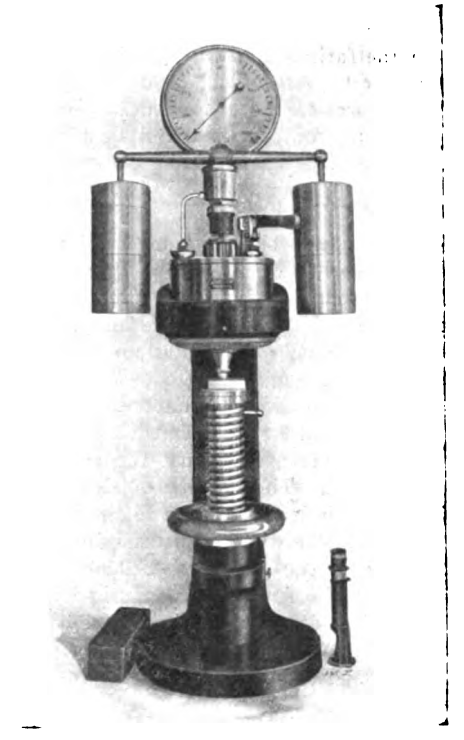


Fig. 7—Center of right column—The Alpha machine. This machine is used in Brinnell's ball pressure test for hardness

blows and shocks, and third, highest resistance to wear. In other words, high tensile and compressive strengths and hardness with great elastic limit are the requirements.

Two Tests Are Necessary

There are two ways in which tests for these qualities can be carried out and both are necessary. First, by test pieces which have been treated exactly the same as the finished product, and second, tests on the actual finished balls. In the S. K. F. laboratory for the heat treatment of the test pieces there is an electric Heracus 300 to 1300 deg. C. adjustable furnace, and an American gas furnace for temperatures up to 1100 deg. C., which is a muffle design with the muffle inclosed by a fire-clay chamber approximately of the same shape as the muffle. The burners project into the combustion chamber from opposite sides and force the flame into the space surrounding the muffle. There is also an oil bath heated by gas for lower temperatures up to 300 deg. C. In these furnaces the measuring of the temperatures is accomplished by a Le Chatelier pyrometer which operates upon the principle of measurement of a current of electricity produced by heating a couple of two wires composed one of platinum, and the other platinum with 10 per cent rhodium. The current is measured by a galvanometer.

The Bending Tests

After the proper heat treatment has been accorded with the apparatus described, the work of determining the elastic limit and the breaking load, or fatigue limit, is done by making bending tests. The method consists of inserting a test piece in two parallel jaws which are loaded and operated as shown in Figs. 1, 3, and 8. In determining the elastic limit and the modulus of elasticity, the deflection for each successive load is carefully determined, as in Fig. 3, by transmitting the deflections to a steel pin which is pressed against the middle of the test bar by a spiral spring. The movements of the pin are measured by the aid of a Marten's mirror apparatus. The test is so carried out that as soon as a permanent set has taken place, the load has been noted.

For fatigue limit, direct fatigue tests are performed in accordance with

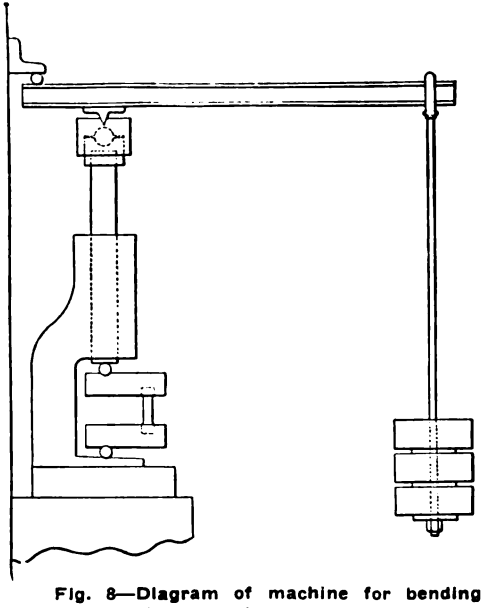


Fig. 8—Diagram of machine for bending tests, showing how the test piece is held in jaws and the system of levers

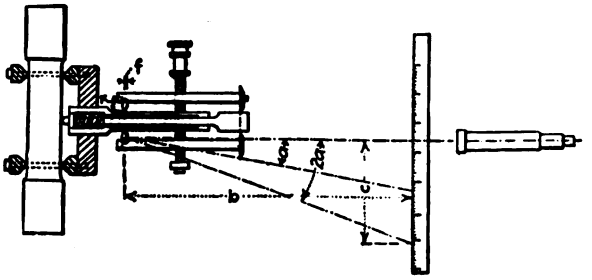


Fig. 9—Diagram of deflectometer, showing how the deflections, produced in the hardened steel test piece, are measured on the scale, the readings being made by the telescope, shown to the right

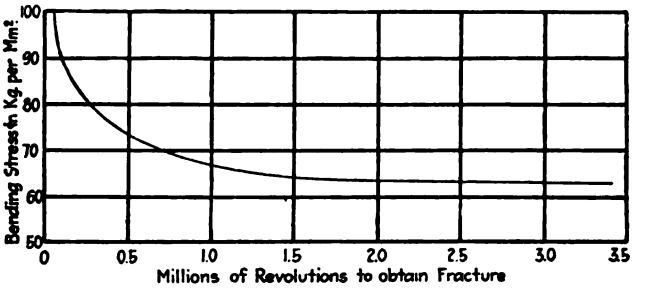


Fig. 10—Curve plotted to show the highest load reached without causing a fracture. This is the limit of fatigue

Woehler's method, which briefly consists of a shaft of steel rotating in two ball bearings and driven by a belt pulley from an electric motor, as shown in Fig. 4. The test piece is at each end of the shaft and is loaded at its outer end with a load resting with a ball bearing on the test piece. For each revolution a surface fiber of the material passes through a cycle of rest and maximum stress in each direction. A speed of 1400 r.p.m. is used with the starting load as near the fatigue limit as possible in order to shorten the time of the test. After each 2,000,000 revolutions, the load is increased until fracture ensues. The highest load, without causing a fracture, is the limit of fatigue. The method is illustrated in Fig. 10.

Resistance to Shock

Resistance to shock is measured by tenacity, and to ascertain the degree of this property, shock tests are made with a Charpy's hammer having a capacity of 72-ft. lb. This hammer gives a blow of measured impact by permitting a known weight attached as a pendulum to fall through a given number of degrees against the test piece.

Resistance to wear or hardness is tested for in the Brinnell machine. With this a hardened steel ball is forced under hydraulic pressure against the polished surface of the steel being tested. The quality of the material is judged by the size of the indentation due to the pressure of the ball on the test piece. The ball size used in the S. K. F. laboratory is 0.2 in. and the pressure 22,000 lb. For very hard steel, Professor Marten's scoring method is used. By this process the polished surface is scratched by a diamond under a fixed load. The width of the scratch gives a comparison of the hardness. Reboundimeter or scleroscope tests are also used.

Direct Grinding Testing

Fig. 2 shows the S. K. F. direct grinding wear testing machine on which two test pieces are fixed simultaneously to a moving arm which carries them backward and forward over a rotating disk. This method gives a combined comprehension of hardness and elasticity and is exceedingly accurate in its work.

The direct tests on the finished ball comprise one for elasticity by the Marten's mirror process as shown in Fig. 13, and one for hardness as shown in the illustration in which three balls are placed one upon the other. These are loaded and unloaded three times up to a certain given pressure, and after each series of loadings the center ball is taken out and the permanent set measured. If trials are performed with a number of balls of different diameters, the curves as shown in Fig. 12 are obtained by plotting the squares of the ball diameter as abscissae and the permanent set in millimeters as ordinates. With the curves it is possible by comparison with a standard set of curves to determine whether the balls are hard enough or not. This provides a ready and exact means of comparison.

In testing the finished races for accuracy, a special appliance such as shown in Fig. 5 is used to determine the equality of the thickness of the outer race. With this apparatus the race is slowly revolved on a mandrel, and the small errors are indicated on the dial of the instrument. For the inner race a similar method is used. In meeting the limit requirement, the measurements are made on combination gages which are designed to be accurate to within 0.000039 in.

Allowable Tolerances

The following tabulation gives the allowable limits:

For the bore—

Maximum + 0.005	mm.	(0.0002 in.)
Minimum — 0.010	mm.	(0.0004 in.)

For the outside diameter of small and medium brgs.

Maximum ± 0.000	mm.	(0.0000 in.)
Minimum — 0.015	mm.	(0.0006 in.)

For large brgs.

Maximum + 0.000	mm.	(0.0000 in.)
Minimum ± 0.030	mm.	(0.0012 in.)

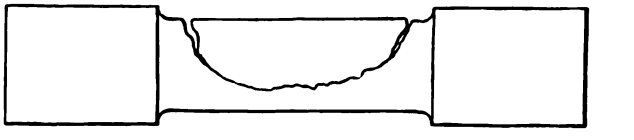


Fig. 11—Characteristic break of a hardened steel test piece

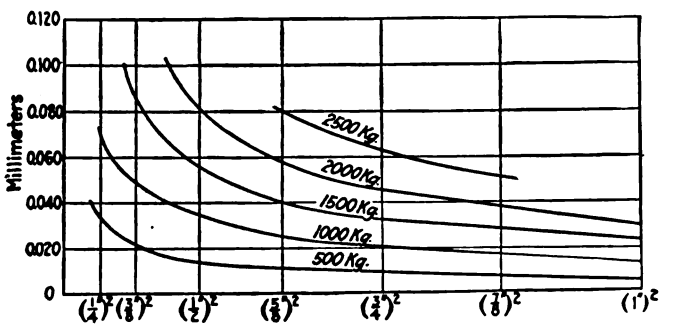


Fig. 12—Characteristic curves from ball tests

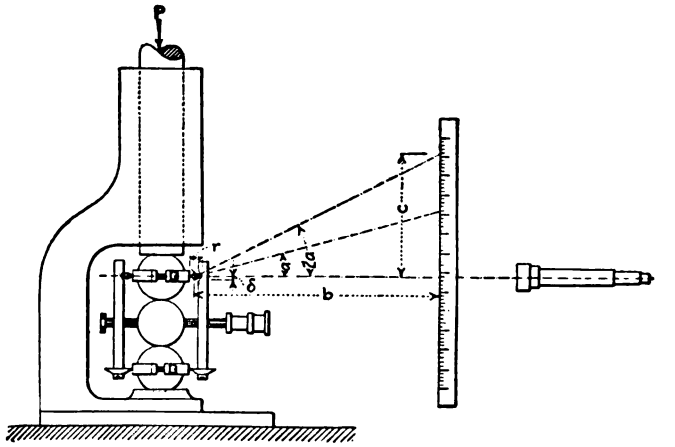


Fig. 13—Diagram of method of making direct test on balls. The elasticity is measured by the use of a Marten's mirror, the readings being noted by the use of the telescope

The Car That Stays Young

By M. C. K.

(*Continued from Sept. 2, page 431*)

ONE paragraph was devoted to fenders in the foregoing, the object being to present the most important considerations which have to do with their durability, especially their protection against disfigurement. Although fenders constitute one of the simplest features that could have been selected for beginning the sifting of data from which The Car That Stays Young may eventually be mentally evolved, it became plain at once that a whole little book could be written on fenders alone if it were desirable to mention every detail by which they may influence the style, durability and value of a car. Yet, fenders are not an organic element in automobile construction; a car can have the worst kind of fenders and be a good car in every other respect, and a sensible opinion of them can be formed without much previous study of automobile engineering. Though the nature and operation of the vehicle affect the durability of the fenders, they do not react upon the working parts of the power mechanism or the steering and therefore do not affect the operation. Perhaps for the reason that "there is nothing to understand" about features of this accessory nature, scarcely any attention has been given to explanations of their influence upon car values—not even in catalogs, where there would be room for complete monographs to help the public, as well as salesmen, to keep in mind the numerous little details which bear on car value but are easily overlooked.

Building an Opinion

In this place, where room must be made for all reasonable differences of opinion, each of the many subjects related to the fixed accessories or similar features can be followed only in its larger lines. The thing to be done, on this plan for quickly establishing a working basis for a final discussion, is thus to force one self to give definite expression in writing, for the purpose of ready reference, to the most important relations to durability and car value which seem associated with each of the simple construction features of an accessory character in automobiles, and to do the same, in so far as it seems practicable, with regard to working parts, exercising one's judgment during the progress of the compilation to limit the amount of material by excluding factors whose bearing upon durability and value is too difficult to determine, too indefinite or purely quantitative.

In each instance, after actual and tried forms of construction have been considered, there remains always the question if higher durability and value, as well as style, could not be attained by some method which has never been tried or which has been tried insufficiently or indifferently. In this respect the whole process for getting the subject under consideration should be of value for suggesting improvements, and these may subsequently, after being tried long enough, be turned into fresh data for a later type of The Car That Stays Young.

In the matter of fenders—to illustrate the method—the question of the gage and weight of the material was not referred to, as it is very hard to decide. Dents and bent corners are noticed in many very heavy fenders of city cars, and while thin fenders suffer more and more conspicuously they can also be more cheaply replaced. The matter of leather fenders stretched over a frame was also left unmentioned, as this type is being used less and less for automobiles. The use of cloth fabric and of thin boards was passed by as an evident makeshift in point of style. Shaped sole leather fenders with unsupported edges were ignored because they have never been regularly manufactured and no means for making them hold their shape and giving them an attractive and waterproof finish has been developed.

There remained the following proposition of data, subject to proof, disproof or elaboration from the funds of superior experience or special knowledge on the subject:

Fender Requirements Restated

For cars of high price: Full-crowned fenders with rolled edges front and rear; secured to brackets in such manner as to leave outer edges as free as possible to yield a trifle. Material, sheet steel probably not more than 1/16 in. thick or aluminum alloy about twice as thick. Finish, paint or chemical coloration.

For cars of medium price: Crown-top fenders with reinforced edges. Material, sheet steel. Finish, paint.

For low-priced cars: Flat fenders of sheet steel, painted, with outer edges preferably flared at the most exposed portions in front and at the rear.

For all cars: Fenders should be so short and narrow as not to become buffers in all directions, even with some sacrifice of the protection against mud splashing. Front and rear ends (which are nearly always disfigured first) are either curved down to hug the wheels or reinforced with visor-like tips that are bent down sharply to catch the last of the splash, and the latter method seems to have the advantage in the matter of avoiding disfigurement and for style and light weight. Which of these conformations is preferable seems, however, to depend largely on the positions of the wheels; the down-curved fenders being most suitable for a wheelbase that is short in comparison with the over-all length of the vehicle and the short and tipped fenders for wheels that are placed far to the front and rear, respectively. The inference may be that wheels so placed provide a very considerable measure of protection for other portions of the car, by causing the pneumatic tires to act as bumpers much more frequently than where other portions project farther at the front and rear.

Since the protection obtained for fenders by making them narrow and short is due to the relatively greater projection of other portions of the car obtained by this means, it follows that additional protection can be obtained by making such parts as hub caps and running-boards unusually prominent and that the carrying of spare tires at the side or rear may be turned to account on the same principle. But little deliberate development of these provisions is seen in practice; fenders are usually more exposed than strictly necessary. The choice for the purchaser lies therefore at the present time, so far as fenders are concerned, among a number of more or less satisfactory compromises.

A Suggested Innovation

With regard to the future, one can imagine improvements of different sorts. The writer would be inclined to look hopefully upon experiments, for example, with sheet metal fenders having less than half the width that is now usual and arranged to receive an extension at the outer edge of much more pliable yet fairly stiff light material requiring no special finish, such as may be found among cellite or fiber compositions, or impregnated textiles. It might not be easy to make such a built-up fender compare well in style with a perfectly new full-crown or crown-top all-metal

fender, but much more difficult style-problems have been solved and the comparison with a more or less disfigured all-metal fender in its third or fourth year of service might be to the advantage of the innovation. In lightness and in the convenience and cheapness of replacement—which should affect only the extension edge—it could no doubt be made superior and in efficiency as a mud guard fully equal. Fenders with channel iron reinforcement of the edge already suggest a method for attaching a non-metallic extension in the form of a down-flaring rim, whose shape would be supported by the curvature of the line of attachment while its moderate width of four to six inches would lend it sufficient resilience to make it resume its original conformation and surface after an accidental impact. The strongest advance argument against a fender of this nature is perhaps that the extension edge would not be substantial enough for a person to lean against or to resist malicious meddlers, but the ordinary leather fender as well as the pneumatic tire and all fine and lustrous finish are more or less open to one or the other of these objections, and they are not found important in practice.

Radiators

Louis Renault many years ago presented to the world his solution of the problem relating to radiators for The Car That Stays Young. It is effective on the point of contributing to the preservation of the car's appearance, not only by taking the radiator out of harm's way but also by rendering the motor accessible, so that adjustments and repairs can be made with small chance of denting the motor hood. But the Renault method involves the technical principle of cooling the motor by means of a relatively larger quantity of very slowly circulating water, meaning considerable weight and incumbrance. With the height required of a thermo-syphon radiator to make it function acceptably for the average modern motor of 2000 r.p.m. or more, the only place for the radiator is between the motor and the dash, as selected by Renault in the first place, and by this disposition the feet and legs of the driver are heated uncomfortably unless the dash is double-walled and provided with heat insulation. These and other factors make it necessary to consider the standard radiator located at the front end of the vehicle frame and operated with forced circulation as the type to be kept in mind.

Widespread Desire for Strength

Assuming that a radiator of this type has been found capable of taking care of its thermal work when new and that the same may be said of a number of other radiators which are of the same general type but varying in details, the practical question is one relating to these details and to the provision made in each case for protecting the radiator against deteriorating influences. These are in the main torsion of the car frame, vibration, rust and external shocks and are all fully recognized in the practice of automobile building. Opinions differ only with regard to the price that should be paid for minimizing them and for reconciling any precautions that may be adopted with considerations of traditions and style. It is safe to say that, if The Car That Stays Young had been the ideal ordinarily guiding the public's choice of a car, robust construction and flexible mounting for pleasure car radiators would have come into fashion before truck makers had shown the way and certain standards would in that case have been developed by this time and would have been satisfactory even for cars which are driven roughly. Actually, however, the condition of a radiator after one year of use indicates mostly how the car has been treated and whether suitable shock absorbers have been fitted to the front springs or not. If the radiator remains as good as new in spite of rough car service there is apparently always question of a construction of much higher first cost than could be contemplated for a popular car, and, if the past year has brought out any radiator equipment for a low-priced car of which something decidedly better can be said, testimony to that effect has not yet been made known broadly. For The Car That Stays Young a radiator that steams too easily is better than one which springs leaks from either rust or vibration or frame torsion, and it is also usually cheaper, having larger water channels, thicker metal and fewer joints, but it should of course be possible to combine mechanical strength with thermal efficacy and economical construction. A good part of the problem involved in this need lies, according to testimony of radiator engineers, in making the air current produced by the cooling fan or by the car motion strike all of the water channels instead of only a portion of their surface and reconciling this with moderate dimensions by having the air spaces as small as practicable. In the Solex type, used for trucks and omnibuses, these requirements seem to be met except in so far as the centrifugal fan in the middle of the radiator occupies a considerable space which could not be spared so well in the case of pleasure cars. On the whole the development tends toward the use of plain thin vertical or circular water tubes of copper or aluminum, a top reservoir of more than nominal capacity and a centrifugal water pump of rather small dimensions—a sort of compromise between thermo-syphon and forced circulation but with all the needed improvements in the matters of flexible mounting of the radiator and increased efficiency in the management of the cooling air current still awaiting the final word of approval.

External Protection

Only in the external means for protecting the radiator against impacts is there anything definite whose undoubted value for tending to keep the radiator from deteriorating may be weighed against simple considerations of price and style. The use of a tie rod between the two lamp brackets, the transverse buffer and a well advanced position of the front wheels operate together with the sheet metal apron now frequently placed between the frame horns to keep a honeycomb radiator intact in its somewhat frail ornateness, though they scarcely suffice to prevent the thin metallic cooling fins on tubular radiators from being mussed or mashed.

Fastidious motorists complain that the use of all the four factors referred to—tie rod, buffer, apron and advanced wheels—which incidentally with their other purposes serve as outer defenses for the radiator, gives the front part of the vehicle a cluttered appearance, and hold that in point of style only the wheel position and the buffer are admissible. Coupled with the fact that the principal weakness of the radiator is internal and should be remedied first, this objection, which seems well taken if clean style is bound to prevail in the long run and to influence prices and values, points apparently to something entirely new which may give the radiator a more positive external protection than it now receives while also rendering possible the proper bracing of lamps and perhaps in some manner connecting with the installation of a motor starter. The whole situation seems complex with reference to The Car That Stays Young and suggests the need of a good deal of hard work on the part of designers.

Rusty Mufflers and Exhaust Pipes

Aluminum paint does not stay long on the muffler or the end of the exhaust pipe and they are usually freely abandoned to the inroads of corrosion, a running-board apron concealing the eyesore, and there the matter is dropped. Perhaps this matter is too small to dwell upon, yet it is noticed that sticklers for a clean style in vehicle lines are not enamored with running-board aprons or with the general plan of concealing unpresentable details, so much less as these thereby usually become still more unpresentable through

neglected accumulations of dirt. At least for high-priced cars it might be demanded that the muffler and the exhaust pipe should be made of aluminum rather than of sheet iron, especially as the high conductivity of aluminum would help to cool and contract the exhaust gases, reduce the noise and obviate muffler explosions.

The Fashion in Valances

More actual, and probably more important, at the present time is the question of the running-board apron, or valance, itself. It is fixed, semi-detachable or detachable and in some cases a small portion of it can be unbuttoned to make a gateway. Apparently its purpose is wholly one relating to appearances and the methods for grooming the vehicle. Whether it is desirable or not, when new, may therefore be considered a matter of taste, but experience must also be consulted when one is to decide whether it is always a good feature for The Car That Stays Young. It is unavoidably scuffed more or less, so that a high finish for it seems unlikely to last as long as that of the rest of the car body, and this is clearly against the high finish. In other instances, when the running-board is high and the car frame low, its appearance is less obtrusive and perhaps entirely acceptable, and again its place is taken by a piece of thick but pliable leather of rough finish which is buttoned or hooked to the board and the frame. The considerations which arise with reference to The Car That Stays Young are in all cases perfectly plain and elementary, once mentioned, but it would be interesting to make sure of what the general opinion is with regard to the prospective permanence of the fixed valance as a style feature.

Motor Hoods

Sheet metal which has received an exceptionally smooth surface in the rolling mill is indispensable for taking a high finish which is also thin and therefore hard and lasting, but the difficulties formerly met in obtaining such material, and having it also sufficiently plastic, no longer exist, being reduced to a question of price. In the cheap car, paint is therefore as durable as enamel, for the hood. Some shapes take and hold a dent which under otherwise similar circumstances would be avoided with other shapes, but probably no other rule on this subject could be formulated except that sharp curvatures are most liable to be dented. Much more tangible are the simple questions relating to joints and hinges and to the fastenings of the hood on the frame. Where edges come together rainwater lodges and unless special precautions are taken streaks of rust are formed and spread to the sides under the finish. These precautions take so many different forms in well-built cars that no special mention of any of them is necessary and are withal so inexpensive that they might be found in every car. The fastenings at the base of the hood used to be troublesome and noisy but now nearly always include the necessary element of elasticity which prevents rattling permanently.

(*To be continued*)

Middle West Crops Presage Increased Car Sales

(*Continued from page* 499)

over the semi-arid plains of western Oklahoma and New Mexico as well.

A 20-cent raise in the price of oil has caused great activity in the Kansas and Oklahoma fields. The impression is abroad in the oil field that the Standard Oil Co., whose field company sets the price for the mid-continent district, is badly in need of crude for refined purposes. It is offering all kinds of inducements to operators who open up leases and the oil men are taking the statement of the Prairie Oil & Gas Co. that it wishes to open up production at its face value. Independent producers predicted a month ago that the "big raise" was due. It means nearly $50,000 a day more money to Oklahoma producers alone.

The banks continue to hold immense deposits in the West and money is easy for all legitimate purposes, although the war makes many persons chary of starting in new enterprises.

Manganese in Missouri

Of interest to the automobile industry is a discovery reported by the mining bureaus in Springfield, Mo., in the Ozark Mountains. What is said to be the first manganese discovered in Missouri has been uncovered in Christian County. It is believed that there are other rich deposits in these mountains. Manganese is used in hardening steel and has been in great demand since the war began.

Jitney Business Settles Down

The jitney business in Kansas City, which looked bad for a time, has recovered somewhat and the 5-cent cars are doing a good business although there are not more than 100 small cars and twenty buses operating now, where three months ago the number of small cars was about 250 and the number of buses about forty. The failure of one line of buses—capitalized, as some said, on a "shoestring"—put a crimp in the business and kept new jitney men from entering the field. The other buses put their prices up to 10 cents, but lack of patronage forced them down to the original "jitney" a few days later.

No More Failures

No more bus failures have been reported. The line which failed was operating fifteen buses and carrying a very heavy overhead expense, which seems to have been recognized in the jitney business as a sure "jitney breaker." Many jitney drivers who went into the game with rattle-trap cars or cars of high cost have dropped out, leaving the men who were equipped with cars more suitable for the traffic. Many of these say they are making good money and that they expect to continue in it.

Michigan's Six Months' Registrations

(*Continued from page* 504)

and delivery cars, and 111 are electric vehicles. Only thirty-nine foreign or European-made cars were found, all being gasoline passenger cars.

Registration Heaviest in January

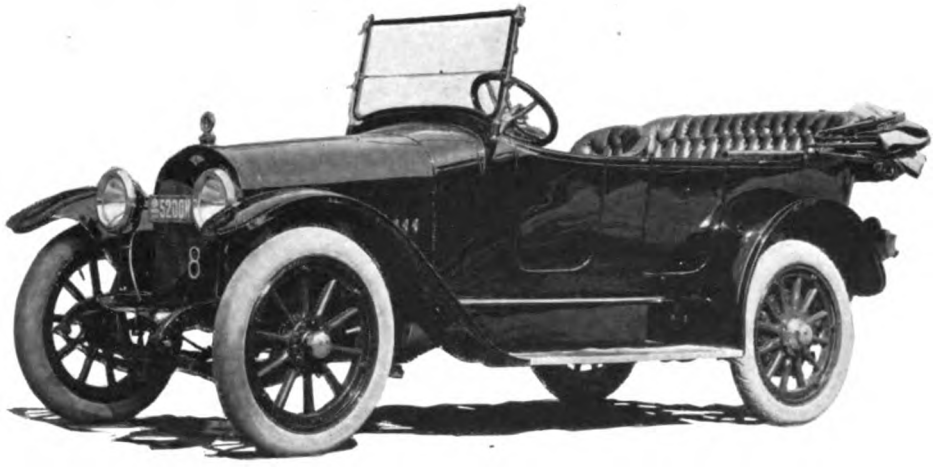
The heaviest registration was recorded in January, the total for the month being 25,343. March was the second big month with a total of 22,262, and is followed by April with a total registration of 17,942. In February 9691 licenses were supplied, in May 9419, and in June only 6987. This is the record for the gasoline passenger cars only.

Commercial vehicles to the number of 1259 were registered the first month of the year, while for the succeeding five months the registration licenses issued were respectively 170,304, 362,248, and 156.

The biggest registration of electrics took place in January when 1219 were recorded. February shows a total of 93, March 118, April 56, May 44, and June only 22.

Bore Larger in Abbott-Detroit Eight

Increased from 3 to 3 1-4 In.—Piston Displacement 332 Cu. In.—Individual Front Seats—New Folding Type in Tonneau



The new Abbott-Detroit eight-cylinder, seven-passenger touring car which sells at $1,950

THE 1916 Abbott-Detroit model, made by the Consolidated Car Co., Detroit, Mich., the successor of the old Abbott-Detroit Co., is a high-powered and gracefully designed machine offered at $1,950. Equipped with an eight-cylinder engine, it follows a somewhat foreign body trend, with an accentuated slope to the hood and a consistently parallel slope to the body.

Bore Increased to 3¼

Chief among the changes, as compared with the model of 1915, is the increasing of the bore of the Herschell-Spillman V-type eight from 3 to 3¼ in., with the stroke remaining at 5 in. The motor is said to have a maximum horsepower of 80, this giving rise to the model designation of 8-80. The S. A. E. horsepower accorded it is 33.8, and the piston displacement is 332 cu. in. The car is said to be handled by the motor at from 1 to 70 miles an hour on high, and that it will do 40 miles an hour nicely on second speed.

Described on several occasions, this eight is not new to the public. It was used in the 1915 Abbott, and follows the same general lines as before with the increase in bore practically the only change of importance. The cylinder blocks, arranged at 90 deg. on the two-piece aluminum crankcase, are offset from one another the width of the connecting-rod and bearing so that the two rods of opposite cylinders attach side by side to the bearing, instead of using a yoke or a knuckle construction. This makes all the rod ends alike and interchangeable.

Separate Cam for Each Valve

Three main bearings support the crankshaft, and the camshaft, with sixteen integral cams, is also a three-bearing design. The offsetting of the two cylinder blocks makes possible the use of a separate cam for the operation of each valve instead of using one cam for two opposite valves.

Driven by spiral gear at the front is the pump shaft which operates the centrifugal water pump at the right front side of the engine. This is a double type of pump, effecting plenty of water circulation through the two blocks of cylinders. There are four water outlet connections to each of the water outlet manifolds, these being at the upper edge of the castings, thus taking the water off from the highest and hottest part of the cylinders.

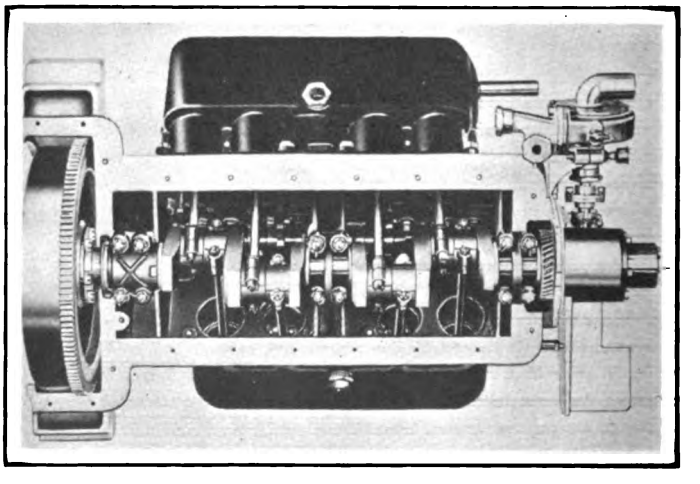
Pressure Lubrication

Pressure lubrication maintains a constant feed of oil on the main bearings, and it is regulated by a valve which discharges the excess pressure of oil onto the spiral gears at the front.

Chassis differences over the model 8-44, the 1915 type, are few. The springs are longer by 1 in. than previously and somewhat straighter. This gives a better riding proposition, and there is less strain upon the springs. Mounted almost horizontally, and with less of a bow, the action is more nearly on both sides of the horizontal, and the springs are under less initial tension. This uniform action above and below the horizontal serves to make the spring strain more equal, with better results upon the metal. The springs are underslung, permitting the joints to be hung low, and also aiding the riding qualities. The spring perches are swiveled on the axle.

Three-Speed Gearset

In the driving system, a three-speed gearset and multiple-disk clutch with ball throwout are employed. These units deliver their power through an ample propeller shaft to the floating rear axle. This is of the same design as heretofore, but instead of straight bevel gears, the later type of spiral bevels are fitted. In this construction, the teeth are given a curved form, and there is a rolling action of the teeth of pinion and gear. Silence is thereby promoted, and another point of the spiral-bevel is that the force is distributed over



Bottom view of Herschell-Spillman eight-cylinder motor used in the 1916 Abbott-Detroit

more tooth surface. Chrome-vanadium steel shafts have been adopted, along with chrome-nickel steel for the gears.

Individual Front Seats

The main features of the entirely new body design, in addition to the sloping lines already mentioned, are the use of individual front seats and the new type of concealed auxiliary seats. The front seats are entirely separate as in the commonly called phaeton models, and there is an aisle between them allowing access to the rear seat from the front.

A type of folding seat has been worked out which slides under the front seat and entirely out of view. A leather flap is provided on the back of the front seat, thus completely hiding the folding seat. They are also adjustable as to position, which is a commendable feature. In fact, the Consolidated concern thinks so much of these new auxiliary chairs that it has applied for patents upon them, it is said.

Enamelled leather upholstery has been applied, with the inner sides of the body trimmed with a vertical roll, and the tops of the doors with a double metallic Spanish roll, so called.

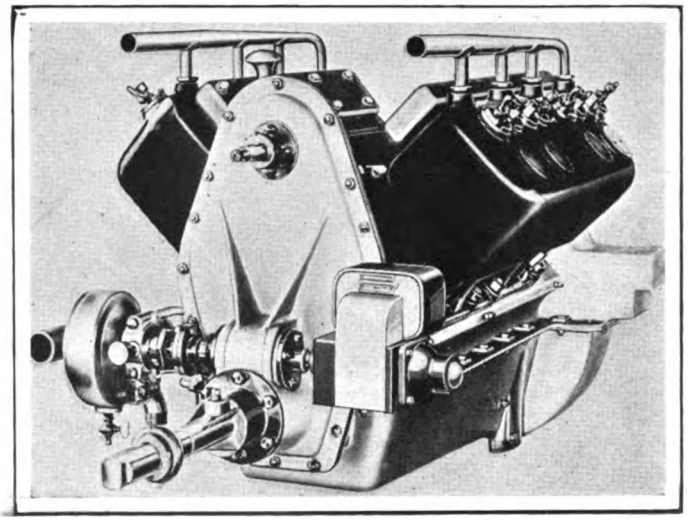
Windshield Slopes Backward

A feature which adds to the appearance is the mounting of the windshield. It is made to slope backward from the bottom to the top. There is said to be a special utilitarian value to this, as it makes it possible for the driver to see the road ahead when cars with glaring headlights are coming toward him. The idea is that the slanting shield glass reflects the rays of the approaching headlights downward so that they do not trouble the man at the wheel. It is also useful in eliminating back draft, insuring good ventilation, and acts as a storm-vision shield.

Fuel Tank at Rear

In the new car, the gasoline tank has been shifted from under the front seat to the back of the chassis, and the feed is by the Stewart vacuum tank system. Should the tank get out of order for any reason, there is a hand pressure pump provided which may be used to force gasoline to the carbureter. Special precaution against gasoline line troubles has been taken in the use of a rubber covering over the copper piping. This cushions jars, and has other obvious advantages.

A tilting steering wheel has been fitted, this not having so much use for getting into the drive seat, but being of special merit when it is desired to move about and turn around in getting from the front seat into the back of the car, through the aisle between the seats. The wheel hinges at the column and may be swung so as to be either above or below the post. A latch holds it in driving position. It controls a triple-pitch worm and full gear steering mechanism, and is on the left, the control levers being in the center.



The 3¼ by 5-in. eight-cylinder Herschell-Spillman motor used in the 1916 Abbott-Detroit

In fitting a new type of top, a special feature has been incorporated, in that the entire back portion can be rolled up out of the way, making the top really a sunshade with free air circulation all around, when desired.

Equipment Is Complete

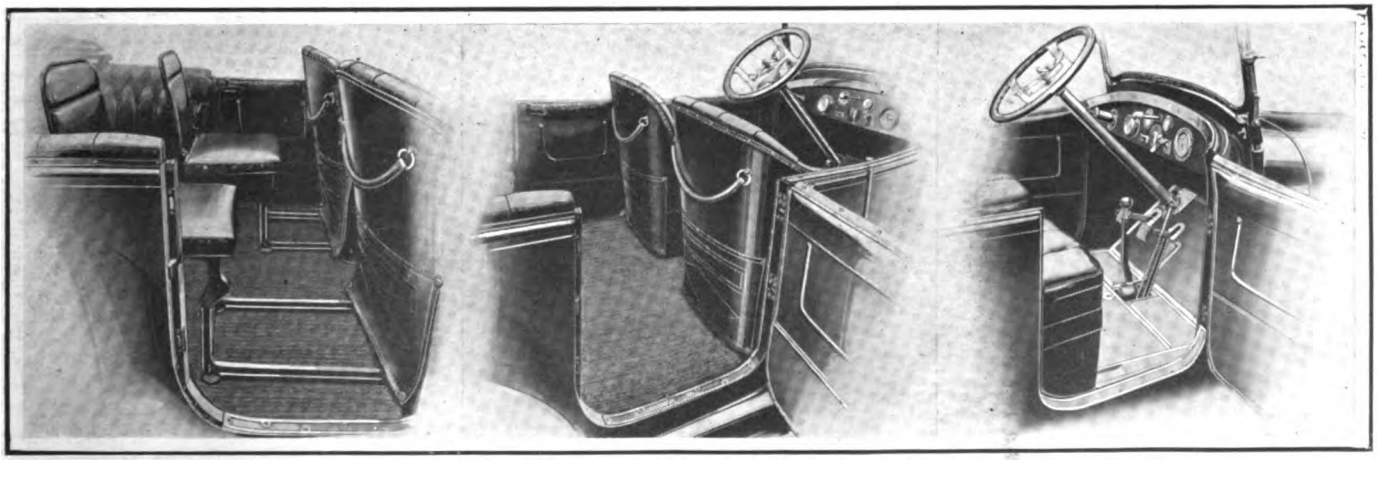
Equipment is unusually complete, some of the special items being a Boyce Motometer on the radiator cap, showing the temperature of the cooling water; power tire pump; trouble lamp; aisle-way lamp, and a master-key and lock system providing one key for the tire lock and other locks on the car.

The wheelbase is 121 in., and 35 by 4½-in. tires are used, the rear set being of the non-skid variety.

—

Armored Cars Cut Wire Entanglements

REPORTS from the front in the battle for the Dardanelles indicate that the armored automobiles are rendering valuable service, particularly in destroying wire entanglements erected before trenches or fortifications. The cars dart up to the wires, their armor protecting the crew from the fire of the enemy, grapple the wire with short hooks attached to chains and then make full speed to the rear, tearing away the wire so that a gap of over 150 yd. was open for a bayonet charge by the infantry.

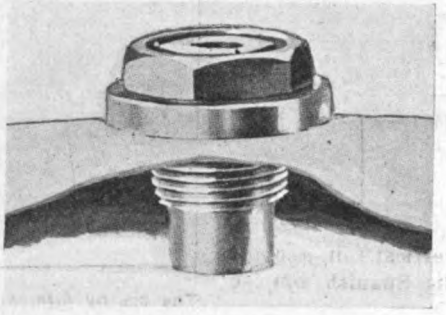


Left—The new Abbott-Detroit folding auxiliary seats open. Center—How the tonneau entrance appears when the new auxiliary seats are folded away out of sight. Right—Driver's compartment of the eight-cylinder Abbott-Detroit showing control members

ACCESSORIES

McNutt Non-Explosive Cans

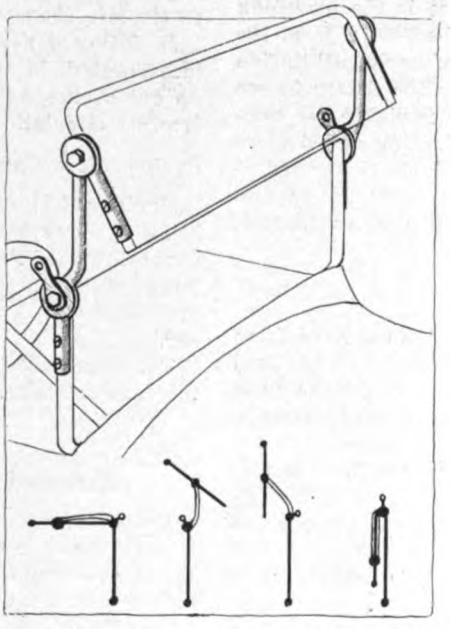
THE principle of all McNutt cans is to allow a gradual outlet for the expanding gas in case of great heat. In the safety bung, the plug closure garage can and the larger Eclipse can made by this concern, this pressure outlet is automatically protected by a fusible plug. When the internal pressure reaches 10 lb. or when the temperature rises to 400 deg. the valve in the plug is raised and allows the expanding gas to escape and burn instead of causing an explosion. Under extreme heat the fusible plug will melt, making the escape of expanding gas doubly certain. These cans can be thrown into the fire full of liquid, according to tests made by the manufacturer, without ever causing an explosion. The fusible plug prevents the explosion and the fire screen acts the same way as the screen in a miner's lamp, preventing the fire from starting. The price of the tank safety bung which generally fits motor boat tanks and small cars, such as the Ford, is $4.50. The plug closure can of 5 gal. capacity is $5. The large Eclipse can of 5 gal. capacity is $6.—John C. Eames, Inc., New York City.



Fusible plug used in McNutt non-explosive cans and similar products

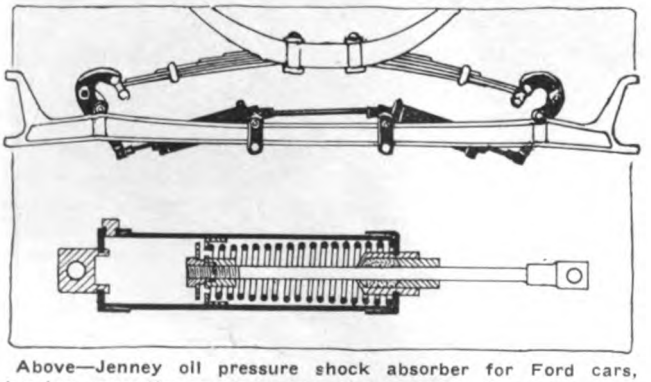
Jenney Shock Absorber

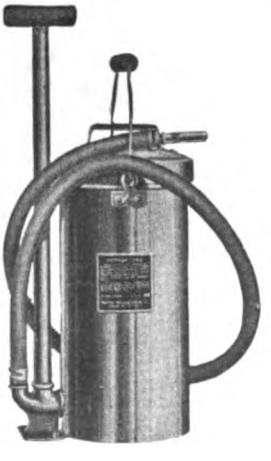
An oil pressure shock absorber for Ford cars has been brought out, in which the rebound of the springs is checked through a liquid absorbing medium. The shock absorbing medium is fastened to the springs in such a way that when the springs are depressed a plunger is forced through an oil cylinder, compressing a spring contained therein. Thus the spring acts in one direction and the oil pressure in the cylinder in the other. The spring, which is inclosed in the steel tube, is compressed by a downward pressure on the main leaf by means of linkage connected at the spring shackles. The tube is filled with oil, and as the piston is filled with a series of holes, the oil passes through these freely while the spring is being compressed on its outward stroke, but as soon as the plunger starts back on the return stroke, due to the rebound of the spring, a washer presses against the piston, closing the holes, thus compelling the oil to be squeezed between the piston and the tube. This space is so small that considerable pressure is created, causing the return stroke to be retarded, thereby preventing the tossing action generally found on front spring rebound. A stuffing box prevents the oil from leaking past the piston rod. The manufacturers claim that a full set can be attached to a Ford car in about 2 hr. No holes need be drilled nor any parts altered. The price of the absorber is $20 for a complete set of four.—Jenney Shock Absorber Co., Indianapolis, Ind.



Illinois windshield hinge for Ford cars with diagrams of various positions

Smith rubber handled insulating screwdriver





Above—Jenney oil pressure shock absorber for Ford cars, showing mounting and construction. Right—Runyen grease cabinet with air pump

Illinois Windshield Hinge

To transform the windshield of the Ford 1915 model to a rain-vision, ventilating type, this device has been brought out, and fits directly on the 1915 Ford with the cowl dash. All that is necessary to do is to take off the hinges as applied by the factory, which are on the windshield, open the Illinois windshield so that the hinge is at an angle of about 35 deg. to make it convenient for attaching, and then place the hinges on, the lower half first, afterward applying to the upper half. The same tapped holes and screws which are on the car may be used. The price is $5.—Illinois Brass Mfg. Co., Chicago, Ill.

Runyen Grease Container

The Runyen grease container works on much the same principle as the ordinary hand grease gun, only is much larger and uses air pressure delivered by a pump to force the grease or oil through a long hose and nozzle direct to the desired point.

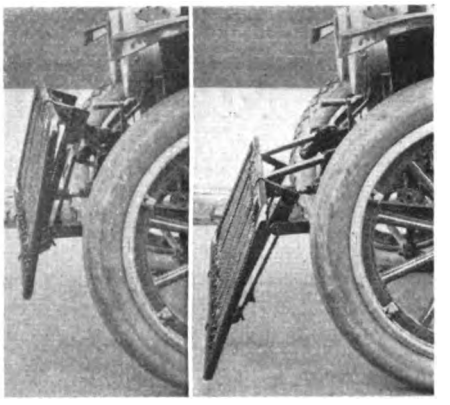
The illustration shows the device with the hose and nozzle in place. This apparatus is also self-measuring, for with each stroke of the handle it delivers ¼ lb. of grease or oil into the differential, timing gears, universals or gearset, and hence by counting the number of strokes or part strokes it is very easy to know exactly how much of the lubricant is being supplied.

There is obviously a saving of time with a device of this kind, for it takes much less time than hand application would. There is also no handling of the grease, and consequently any waste through handling is obviated. Then, too, such grease or oil ought to be cleaner when it reaches the part than it might be under hand operating circumstances.

The Runyen cabinet comes in three sizes. These are No. 1, which is of 7.5-lb. capacity, and which sells at $6; No. 2 of 15-lb. capacity, and costing $7; and No. 3, which can hold 23 lb., and is offered at $8.—Runyen Mfg. Co., Grand Rapids, Mich.

Hero Safety Fender

The Hero safety fender is a device adaptable to any car or truck which places under the control of the driver a safeguard against running over pedestrians, animals, etc., which may happen to stray in the path of the vehicle. The device is folded out of the way when not needed, but when an emergency arises a pressure on the brake pedal releases it and the protection against accidents is automatic. The device, which is under the driver's control, is quick-acting, and in city traffic and on the country road is out of the way.—The Hero Mfg. Co., Philadelphia, Pa.



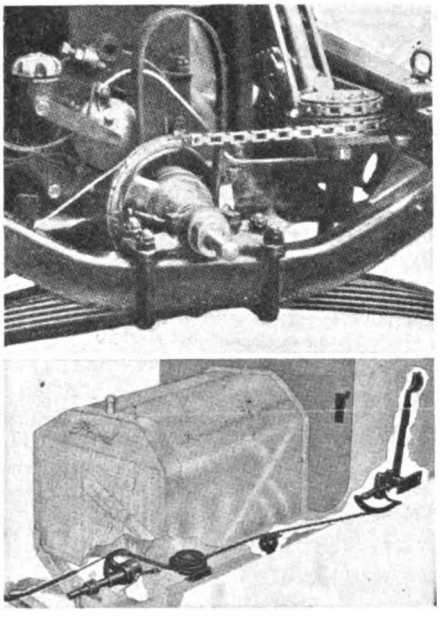
Two positions of the Hero safety fender

Taylor Tire Pump

The Taylor is a diaphragm pump, there being no communication between the crankcase and the compression chamber so that oil cannot get to the tires. The pump is mounted on the end of the crankshaft when in use, and carried in the tool box or other convenient place at other times. Has no gears or brackets. Made for Hudson, Overland, Reo, Chandler, Studebaker, Stearns-Knight, Dodge and Chalmers cars. Price $12.50 each.—Taylor Mfg. Co., Detroit, Mich.

Giant Ford Starter

The Giant starter is a mechanical instrument intended especially for Ford cars. It is mounted on the forward end of the crankshaft and is entirely under the hood, with the exception of a pedal which is fastened to the dash except when in use. The operation of starting consists of releasing the pedal, allowing it to rise upright in a convenient position, and it is then pressed forward with the foot, rotating the crankshaft and starting the motor. The pedal is geared in such a way that one stroke gives a half turn to the motor.



Detail and mounting of Giant starter for Fords

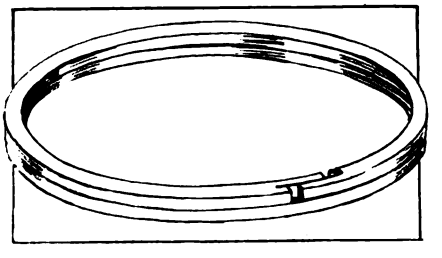
The starter is so arranged that should the motor backfire at any time, the pedal is held by a spring and the starter itself automatically releases. The working parts are all of nickel steel, and the chain used is motorcycle link, which is heavily designed to avoid breakage and stretching. It is stated that the starter can be attached in about 2 hr., as no boring need be done, the starter bolting directly to the motor and car frame as they are. In ordering it is necessary to specify whether the Ford is 1914 or 1915. The entire outfit, f.o.b. factory, sells for $25.—Standard Starter & Specialty Co., Cleveland, Ohio.

Smith Insulating Screwdriver

An insulating covering of rubber is moulded over the handle and part of the blade of the Smith screwdriver which is 11¼ in. long over all and has a 6-in. blade; the rubber provides insulation against shocks which are likely to occur when work is done on any machinery or apparatus where current is flowing at high tension—especially ignition systems. The covering meets the blade flush so that there is no shoulder; the tool is smooth from end to end. Width of blade, ⅜ in. Price $9 per dozen.—H. D. Smith & Co., Plantsville, Conn.

Detroit Power Tire Pump

The Detroit is a power tire pump of the type mounted at the forward end of the crankshaft where the crank is usually applied, and may be dismounted and stowed away in the toolbox or other part of the car when not in use. It drives directly without the use of gears and weighs 4½ lb. It is adapted to Chandler, Dodge, Overland, Hudson, Reo, and Studebaker cars. Price, $7.75.—Detroit Motor Accessories Co., Detroit, Mich.



B-W piston ring, showing joints

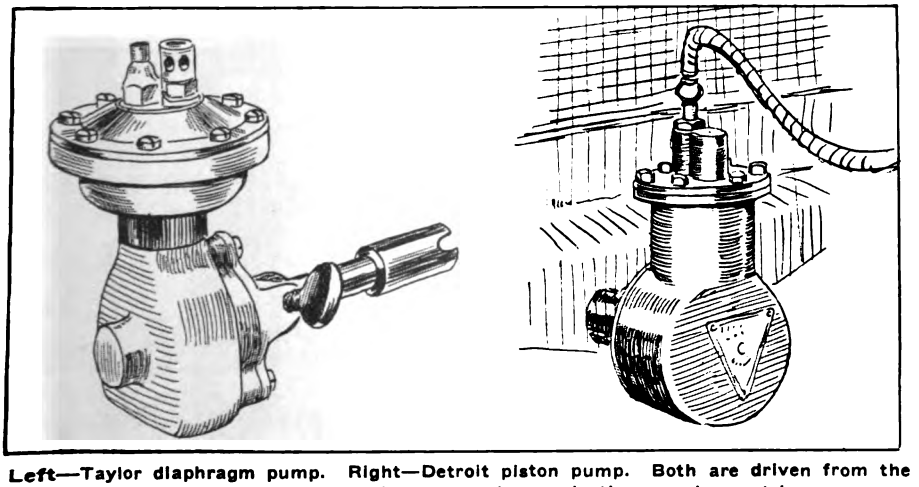
B-W Piston Ring

In this piston ring two eccentric rings are pinned so that their joints are opposite, the thick section of one ring being over the joint in the other. Leakage at the joints is prevented by the scarfing of the ends. The material is soft so that it will not wear the cylinders, yet it is said to possess considerable resiliency. The rings are tool finished and the surface is not ground.—Ballman-Whitten Mfg. Co., St. Louis, Mo.

Cyclone Carbon Remover

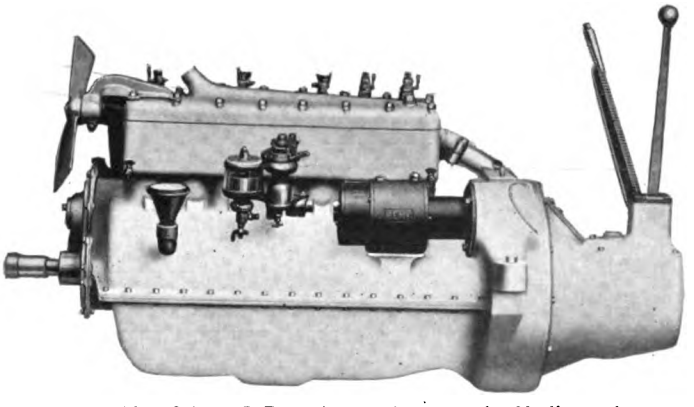
Cyclone is the name of a carbon remover in liquid form which, when sprayed into the motor while the cylinders are warm, though not hot, is said to loosen the deposits so that they are easily blown out through the exhaust when the motor is started. A pint is sufficient for four or five cleanings. The liquid is harmless.

Price, $1 per pint.—Cyclone Co., Greenwich, Conn.



Left—Taylor diaphragm pump. Right—Detroit piston pump. Both are driven from the front end of the crankshaft and are stowed away in the car when not in use

Three Bodies on Madison Six Chassis



Left side of 3 by 5 Rutenber motor used in Madison six

ANNOUNCEMENTS of the Madison six-cylinder cars show the line of the Madison Motors Co., Anderson, Ind., to include a roadster and a touring car at $985 and a seven-passenger car at $1,085. These bodies are all on a single chassis model which is fitted with a Rutenber unit power plant with 3 by 5 L-head cylinders. The catalog rating of the Rutenber motor is 40 hp. It has a three-bearing crankshaft of six throws drop forged from 0.35 to 0.45 carbon steel heat treated to give an elastic limit of at least 70,000 lb. per square inch. The elongation is 20 per cent in 2½ in. and the reduction of area 50 per cent. The maximum stress put on the shaft section is 20,000 lb. per square inch. The bearings and pins are accurate to within 0.001 in. limit. Each shaft is balanced on the Norton machine.

Oil Relief Groove in Piston

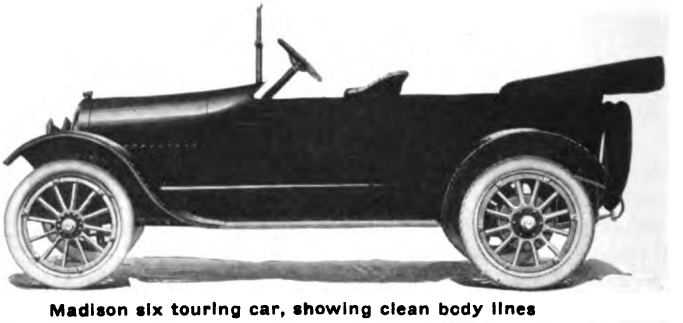
The piston pin bearing is phosphor bronze. It is carried in the upper end of the connecting-rod with the pin fastened with a set screw directly into the piston. The pistons have three rings with an oil relief groove directly under the lower ring. This eliminates any possibility of an over-supply of oil in the combustion space. The motor has for additional features detachable head, and nickel steel valves of 1 5/16 in. diameter and 5/16 in. lift.

The timing gears have helical teeth and the valve lifters are of the mushroom type both of which features tend to quiet the valve operation. Lubrication is provided by a constant splash and a vane pump feed direct to the bearings. Cooling is taken care of by a centrifugal pump and full cellular radiator of the modified V-shape with a German silver crown.

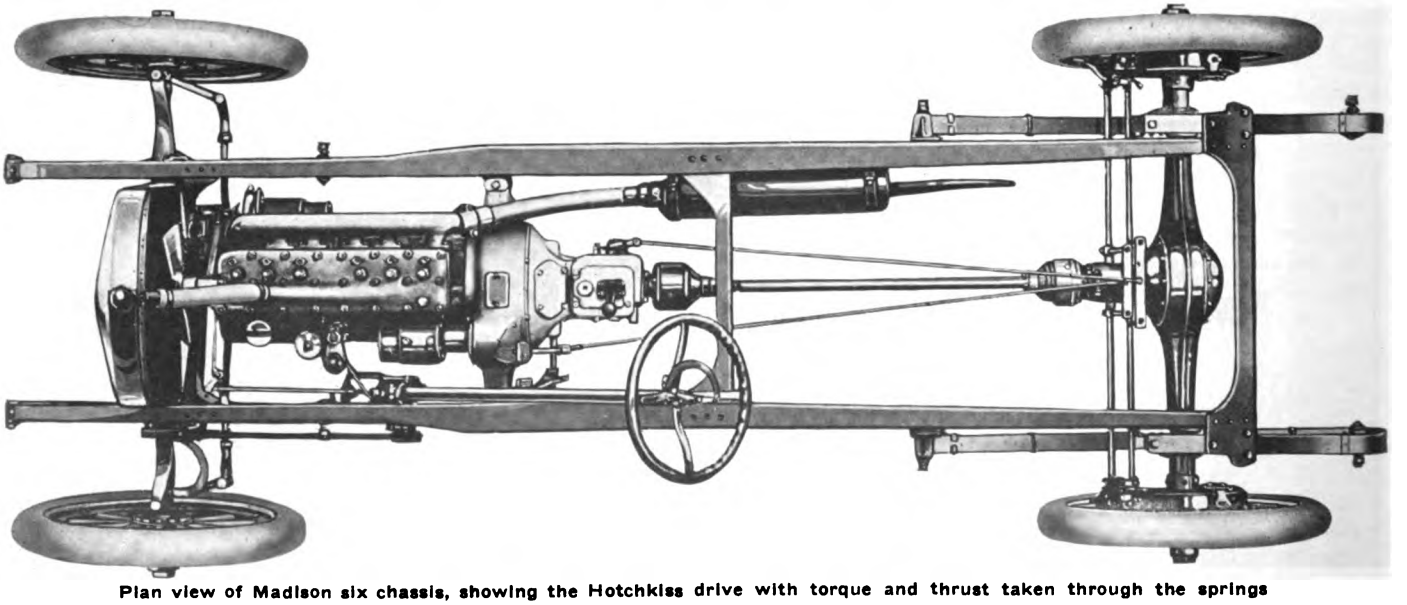
Remy equipment constitutes the electric plant of the car, ignition and lamps being taken care of by a generator with which is combined a magneto type distributer. The other portion of the two-unit system, the starter, drives through the flywheel by means of gearing inclosed in the flywheel housing.

From the engine power is transmitted through a dry plate clutch of the Detroit Gear & Mfg. Co. make. This design uses 13 disks, alternating asbestos face and steel. The gearset is made by the same concern and offers three speeds forward. New departure bearings are used throughout the gearset. The drive is taken through an open propeller shaft with universal at either end on the Hotchkiss system, the driving effort being carried through the three-quarter elliptic springs. A specially heavy forward attachment is provided for the lower half of the springs to take this extra effort. The rear axle is an American Gear & Mfg. Co. product, is of the floating type with large Gurney annular bearings and Brown-Lipe nickel steel spiral gears in the final drive. The steering is a Warner worm and full gear with an 18-in. corrugated rim and carries the horn button in the center.

Braking system consists of internal and external brakes operating on 1¾ by 14-in. brake drums. Tires are 34 by 4 in. with Stanweld demountable rims. Equipment is complete on all models.



Madison six touring car, showing clean body lines



Plan view of Madison six chassis, showing the Hotchkiss drive with torque and thrust taken through the springs

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, September 16, 1915 No 12

THE CLASS JOURNAL COMPANY
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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Banks and Automobiles

FINANCIAL America now recognizes the automobile. One of the largest banking institutions in the country calls it a great public utility. Bankers everywhere are ready to do their part in lending financial aid to the automobile industry—ready to help boost it and make it a still greater success. Dealers find a more open mind on the part of the banks as regards financing them and loaning on their stock.

Everywhere in financial circles the old antagonism against the automobile is rapidly giving way to a spirit of understanding and realization that the motor vehicle is bringing closer intercourse between all sections. They see what it is doing to increase property values in otherwise isolated districts. They know of its helpful influence through the greater general prosperity of the people as a whole, for this is at once reflected in their own business, which has increased in every financial district.

The bankers used to say that the vastly increasing use of automobiles was making the people extravagant. Now they realize that by opening up greater distances, making possible more thorough intercourse and decreasing non-productive transportation time the motor car has a very important place in the general scheme of things, and that it is really a factor for economy, all things considered. It is a necessity.

The Multicylinder V Engine

ABOUT a year ago the S. A. E. had McCall White's paper on the Cadillac eight, and this week J. G. Vincent gives his ideas on the twelve, treating the latter rather as a development of the eight so far as the V principle is concerned, but as a development of the six from the wider aspect of automobile design generally. The important point in Mr. Vincent's paper is the fact that his reasoning leads to the twelve entirely without regard to the eight.

Excluding interested parties, there is a remarkable tendency amongst engineers to regard both eight and twelve as here to stay, at least as long as the automobile remains much the same generally as it is now, but a point which is likely to be discussed vigorously at the meeting where the paper is read is whether we have yet done all possible with the six. Here opinion divides into two schools, one holding that the eight and twelve will between them drive the six almost out of existence, and the other that there is plenty of room for all types. Next year will show some sixes of a higher grade of engineering than most that have been made so far, and it is likely to be several years before the matter is settled either way.

Meanwhile it is interesting to observe how quietly the twelve has been accepted, which is explained no doubt by the fact that the eight has proved the V motor principle and proved the advantage of small impulses in quick succession. The eight and twelve together have had the effect of raising the standard of automobile engine design and construction for all types, but the effect of that raising is only apparent in very recent new designs and will not reach its full expression for at least another twelve months.

Before a company adopts a new product involving the expenditure of thousands of dollars for new tools and the scrapping of thousands of dollars of old, good reasons must be shown for this policy.

The All-Weather Car

WITH the coming of autumn and cooler weather, which naturally may be expected to follow, the car owner begins to consider the approach of winter. But this year, in a much more marked degree than ever before, the prospect is less likely to cool his ardor as an automobilist, for both automobile and body manufacturers are bringing out the widest assortment of all-weather bodies that has ever been put on the market.

These all-weather cars embody a combination of the best features of the conventional, open touring car and the limousine which used to be practically a monopoly with the wealthier automobilists, and have the added advantage that they may be converted from one to the other in a very short time, according to weather conditions and the mood of the owner. Every improvement in this direction of making the automobile an all-year comfort and convenience is to be commended, and the manufacturers should continue their efforts and surpass their already excellent designs.

Dealers to Blame for Car Shortage

Delay Unloading and Thus Hold Up Railroads, N. A. C. C. Traffic Managers Find

DETROIT, MICH., Sept. 14—*Special Telegram*—At to-day's meeting of traffic managers of the National Automobile Chamber of Commerce, Inc., there were representatives from the Dodge, Cadillac, Ford, Briscoe, Maxwell, Studebaker, Reo, Olds, General Motors, Willys-Overland, Hupmobile, Kelly-Springfield, Anderson electric, Chalmers, National, Mercer and Nordyke and Marmon companies.

The principal topic was the car situation and it was brought out that the automobile dealers are much to blame for the shortage of cars because of a great many delays from several days to sometimes more than two weeks before taking delivery of their automobiles. This not only causes prejudice to the railroads but greatly handicaps the manufacturers in getting back the cars from the roads. The railroads now threaten to charge the dealers $5 a day instead of $1 for delay in taking delivery.

It was also announced that the chamber had received assurance from almost all the railroads in the country that they will co-operate in the car matter. Many other minor topics were discussed.

Rittman Process a Success

WASHINGTON, D. C., Sept. 11—Secretary Lane cancelled a contract to-day made by the Department of the Interior with the Aetna Explosive Co. of New York, under which the company had agreed to expend $200,000 in the development of the process discovered by Dr. Walter F. Rittman for the manufacture of benzol and tuluol from petroleum. This action was taken because it is certain that the process is in such shape as to warrant its use by plants on a commercial basis.

Briscoe May Take Over Flanders Building

PONTIAC, MICH., Sept. 11—It is reported but not confirmed that Frank Briscoe is negotiating for one of the factory buildings making up the Flanders estate. It is said that Mr. Briscoe may start a new industry in the city.

Peerless to Build F.W.D.

CLEVELAND, OHIO, Sept. 11—An unconfirmed report is current here that the Peerless Motor Car Co. has received another large truck order from abroad, among which four-wheel-driven trucks are included and that arrangements have been made to manufacture the latter under license from the Four Wheel Drive Auto Co., Clintonville, Wis. It is expected that for the next four months, twenty-five trucks will be manufactured daily, or a total of 3000 in that time.

It is said that a recent French order, amounting to 500 trucks has been split between the White and Peerless companies, the former getting the contract for 300 and the latter for 200. The Russian four-wheel-driven truck order is said to amount to 200.

New Pilot Eight and Six

RICHMOND, IND., Sept. 14—*Special Telegram*—The Pilot Motor Car Co., which has heretofore confined itself to making high-priced, high-powered cars has announced two new models at much lower prices for 1916. One of these is a six known as the six-45 to sell as five-passenger touring and four-passenger roadster at $1,100; the other is an eight-cylinder, known as the eight-55 in two- and five-passenger form at $1,785.

This gives four chassis for the 1916 Pilot line, the six-75 at $2,485 and $2,400; the six-55 at $1,685, and the two new cars. The new pilot models are featured by double cowl streamline bodies, the four-passenger roadster being even more unusual it is called the Get Chummy type by the maker. In this car the front seats are individual with an aisle between which gives access to the rear seat which accommodates two people. The six-45 has an L-head 3 by 5-in. block motor, cantilever springs and Delco electric system. The eight-55 has 3 by 5⅛-in. cylinders and the valves are operated by a single camshaft. Wheelbase of this car is 126 in.

To Sell Cars Direct

In connection with the announcement of the new models a change in selling methods also is announced. Heretofore the sales have been handled entirely by the Pilot Car Sales Co., a separate selling organization, this arrangement now has been discontinued and the cars will be marketed by the Pilot Motor Car Co. through branch houses and distributors. George E. Seidel, president and general manager, has assumed active management of the company's affairs. Joseph W. Connor, formerly district sales manager for the Leyman Buick Co., Cincinnati, Ohio, has been appointed sales manager.

Ford Buys Tractor Plant Site

DETROIT, MICH., Sept. 24—*Special Telegram*—There is an unconfirmed report afloat that Henry Ford has purchased a 200-acre tract near Libertyville, Ill., for a demonstrating ground for the Ford tractor and that later an assembly plant will be erected there when the manufacture of tractors starts in Detroit.

Prest-O-Lite Buys Brown Battery

Also Purchases Four Special Maxwell Racing Cars—Rickenbacher to Manage Team

INDIANAPOLIS, IND., Sept. 14—*Special Telegram*—The Prest-O-Lite Co., this city, has purchased the Brown-Smith Battery Co., Bloomington, Ind., which has specialized on batteries for house lighting purposes. This acquisition broadens the Prest-O-Lite battery line which heretofore included ignition and starting and lighting batteries.

At the same time, the Prest-O-Lite company has entered racing, purchasing from the Maxwell Co. the four special Maxwell racing cars which will be raced in the speedway circuit as a Prest-O-Lite team under the management of E. V. Rickenbacher. These are four-cylinder cars 3.75 by 6.75 and can be used with either eight or sixteen valves.

Two of these cars will be entered at the Sheepshead Bay speedway race, one driven by Rickenbacher and the other probably by Harry Grant. It is understood that the price was in excess of $25,000, this to include repair parts damaged in practice or races during one year and engineering advisory service.

Mason Plant Brings $35,000

WATERLOO, IOWA, Sept. 10—*Special Telegram*—The plant and assets of the Mason Motor Co. were sold yesterday to the Blackhawk Improvement Co., a recently organized concern whose members are interested in automobile construction for $35,000, $20,000 of which will be used to pay preferred claims on the Mason company. For some time past the company has been building and assembling cars for L. C. Erbes and the plant will continue in this work producing machines bearing the L. C. E. trademark.

Walker-Weiss Axle Adds Men

FLINT, MICH., Sept. 11—The Walker-Weiss Axle Co., which has been employing 350 men, is adding 200 to its force and is going to operate its plant night and day. Owing to the lack of houses in the city it has been difficult to get all the skilled workers needed as they generally look for good houses.

$100,000 Hayes Truck Wheel Co.

ST. JOHNS, MICH., Sept. 11—The new Hayes concern which is now occupying the plant formerly operated by the St. Johns Table Co. will be operated under the name of Hayes Truck Wheel Co. It will be incorporated and have a capital stock of $100,000. C. B. Hayes, president of the Hayes Wheel Co., Jackson, is president of the concern.

$12,302,345 in July Exports

4118 Passenger Cars and 2469 Trucks Shipped—Parts $1,663,997

WASHINGTON, D. C., Sept. 13—The Department of Commerce announces that $12,302,345 in automobiles, trucks and their allied parts, were shipped during the month of July, 1915, as compared with $1,670,794 in the same month in 1914.

Passenger cars were valued at $3,835,347 and numbered 4118 as compared with $1,143,419 and 1265 in 1914. Trucks were valued at $6,803,001 and numbered 2469 as compared with only $106,400 and 50 in the same period in 1914. The parts amounted to $1,663,997 against $420,975 in 1914.

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4908 Packards Built in Year

DETROIT, MICH., Sept. 14—Although the detailed annual statement of the Packard Motor Car Co. covering the fiscal year ending Aug. 31 will not be forthcoming for about a month, preliminary figures as to total business are available. The report will show that during this past fiscal year, a total of 4908 automobiles and trucks were built and sold. The total value of these vehicles, including parts and service for same, was $15,553,650, approximately.

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Norton Resigns as Case V.-P.

RACINE, WIS., Sept. 9—F. Lee Norton, vice-president and general manager of the J. I. Case T. M. Co., Racine, Wis., has resigned and will devote his time to the conduct of his large stock farm at Racine. Frederick Robinson, vice-president, resigned a short time ago. Mr. Norton was associated with the company twenty-six years and it is stated that he retains his financial interest in the company.

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Grady Canadian Studebaker Manager

WALKERVILLE, ONT., Sept. 10—J. E. Grady has succeeded W. T. Bush as general sales manager of the Studebaker Corp. of Canada. After the factory gets abreast with the orders, Mr. Grady is expected to take a trip to western Canada. In future Mr. Bush will devote his whole time to the retail sales department.

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Gasoline Lower in Northwest

TACOMA, WASH., Sept. 14—While the price of gasoline is inclined to soar in the eastern states, it has been gradually lowered in the Pacific Northwest. Figures obtained from the Standard Oil Co., Tacoma give a record of wholesale price on gasoline for the past year and are as follows:

Sept. 1, 1914—12½c.	Sept. 7—12c.
12 cts until Oct. 22	Oct. 22 red. to 11 cts.
11 cts. until Feb. 2-15	Feb. 2 red. to 10 cts.
10 cts. until July 7	July 7 red. to 9½c.

Price of 9½ cents. wholesale still in effect Sept. 8.

Texas and Gulf gasoline are not sold in the Northwest, but instead Shell and Union gasoline are used in this field. These companies maintain the same prices as those put into effect by Standard Oil Co. Retailers making price from 1 cent to 1½ cents above wholesale price to customers.

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Jay Succeeds Vail as Chairman of Maxwell Board

NEW YORK CITY, Sept. 14—At the meeting of the board of directors of the Maxwell Motor Co., Detroit, Mich., held here to-day, John P. Jay, Jr., vice-president and sales manager of the Pennsylvania Steel Co., Philadelphia, Pa., was elected a director and chairman of the board to succeed J. A. Vail who resigned last week, wishing to retire from business.

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Wollering a Studebaker Director

SOUTH BEND, IND., Sept. 9.—M. F. Wollering, production manager of the Studebaker Corp., has been elected a member of the board of directors of the company. Mr. Wollering is a son of Fred Wollering, Milwaukee, and gained his experience in Milwaukee shops, becoming associated with Studebaker when that concern first embarked in the motor car field.

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Portage on Cleveland Exchange

CLEVELAND, OHIO, Sept. 11—Portage Rubber common and preferred stocks yesterday were listed for trading on the outside board of the Cleveland stock exchange. There was outstanding April 30, 1915, the date of the last available statement, $586,200 of 7 per cent cumulative preferred out of an authorized $750,000 and $472,900 common out of an authorized $500,000. There are no bonds. No dividends are being paid on the common.

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Ideal Light Car Co. Formed

COLUMBUS, OHIO, Sept. 10.—A new automobile manufacturing company has been launched in Columbus by the incorporation of the Ideal Light Car Co. with an authorized capital of $100,000 by J. H. Axline, C. O. Howard, S. C. Hill, F. E. Hill and Barton Griffity. The company has been temporarily organized by the election of J. H. Axline, president and general manager; F. E. Hill, secretary and treasurer and S. C. Hill, vice-president.

Claims Front-Wheel-Drive Rights

J. W. Moakler Issues Patent Notice Stating All Makers of That Type Infringe

NEW YORK CITY, Sept. 13—Claiming United States patents priority for the front-wheel-drive, as used on motor vehicles at the present time, John W. Moakler, East Worcester, N. Y., has issued a patent notice dated August, 1915, stating that all manufacturers of front-wheel-driven vehicles are violating his U. S. patent No. 766,191, of Aug. 2, 1904, and that all parties making such vehicles, their agents and customers will be held responsible for damages.

The claims allowed in patent No. 766,191 cover broadly the use of a universal joint in proximity to the pivoted parts of a steering knuckle, either above or below the knuckle or at its center.

Mr. Moakler claims to have built a three-wheeled electric vehicle in June, 1888, and to have patented a four-wheel-driven, worm-driven electric vehicle under patent No. 500,022, dated June 20, 1893.

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Motor and Accessory Manufacturers Adds Five Members

NEW YORK CITY, Sept. 11.—The following concerns have been added to the list of members of the Motor and Accessory Manufacturers: Eclipse Machine Co., maker of Eclipse Bendix starter and steering gears, Elmira, N. Y.; The John O. Heinze Co., starters and electrical apparatus, Springfield, Ohio; the Oakes Co., fans, horns, etc., Indianapolis, Ind.; William Shakespeare, Jr., Co., carbureters, Kalamazoo, Mich., and the Penberthy Injector Co., carbureters, 360 Holden Avenue, Detroit, Mich.

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$1,000,000 Du Pont Co. Formed

DOVER, DEL., Sept. 9—The Du Pont Co., New York City, has filed a charter here with a capital of $1,000,000, to manufacture, sell and deal in and with automobiles, trucks, etc. S. A. Anderson, J. F. Curen, and S. B. Howard of New York City, are the incorporators.

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Chemical Engineering in Columbia

NEW YORK CITY, Sept. 14—The department of chemistry of Columbia University has established a separate department of chemical engineering. The head of the new department will be Prof. M. C. Whitaker.

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Bijur Strike Off

HOBOKEN, N. J., Sept. 13—The strike of 450 workers in the plant of the Bijur Motor Lighting Co., this city, since Aug. 20, has been declared off.

Reasons for Twelve-Cylinder Motor

Extracts from a Paper Read Before the Detroit Section of the Society of Automobile Engineers by J. G. Vincent, Vice-President of the Packard Motor Car Co.

DETROIT, MICH., Sept. 16—At the opening meeting of the fall season of the Detroit section of the Society of Automobile Engineers held here to-night, J. G. Vincent, vice-president of the Packard Motor Car Co., was scheduled for a paper on "The Reasons for the Twelve-Cylinder Motor." Some of the more important parts of Mr. Vincent's paper are here extracted as follows:

"While getting the data together for this paper, I came across a copy of my recommendation addressed to Mr. Henry B. Joy, president Packard Motor Car Co., written just after I had completed exhaustive experimental work with various types of motors, in which I finally recommended the adoption of the twin six type of motor in our cars. In this recommendation I went into the subject very thoroughly in order to put the entire situation before Mr. Joy in a manner to enable him to properly present it to the business men composing our board of directors, and I know of no better way to explain why we adopted this type of motor than to quote from this report, which I will do, in part, as follows:

How Many Cylinders?

"Now in regard to how far it pays to go in the number of cylinders, let us consider the possibilities of the twin four type of motor, as this is a type that had received considerable attention and seems to be the next logical step after the six.

"For the purpose of comparison, let us consider that we desire a motor of about the same cubic inch piston displacement as our Packard 338 six-cylinder motor, which is 4-in. bore by 5½-in. stroke and contains 414.7 cu. in. It would be entirely practical to design a twin four motor of practically this same cubic-inch piston displacement within the above-mentioned desirable bore-stroke limits; in other words, a motor of 3 7/16-in. bore by 5¾-in. stroke will contain just over 53 cu. in. per cylinder, or a total of just over 424 cu. in. Such a motor of proper design and workmanship would have certain advantages and disadvantages when compared with our 38 six-cylinder motor. I will outline them briefly, as follows:

"So far as the character of the *torque* is concerned, the twin four motor would have the advantage over the six by reason of the more frequent impulses of lesser intensity.

"So far as weight is concerned, a twin four would have some advantage over a six, particularly in the crankcase, the crankshaft and flywheel, as the shorter crankshaft can be made smaller, both because it is shorter and because the light pistons and small impulses do not have the same tendency to twist the shaft.

"So far as smoothness is concerned, the eight would be better than the six at moderate speeds because the more even torque would show to advantage at these speeds, and the inherent vibration due to unbalanced inertia forces would not be a factor, but at the higher engine speeds, the advantage would switch to the six-cylinder motor, as the unbalanced inertia forces become a very important factor and in spite of the lighter pistons and shorter crankshaft, the vibration would be a great deal more pronounced in the eight than in the six. This is a very undesirable feature, because one of the reasons for using more cylinders is to increase the range of motor ability and at the same time increase its smoothness.

Accessibility Is Desirable

"So far as *accessibility* is concerned, the twin four is at a very great disadvantage when compared with the six, as the 90-deg. angle makes it impractical to mount the generator, water pump, starting motor, etc., in the usual place alongside the crankcase and just inside the frame. This makes it necessary to mount this equipment either below the frame or between the cylinder blocks. Any of the equipment mounted below the frame is, of course, exposed to mud and water, and in addition to being very inaccessible is very apt to be damaged. The larger part of these units are usually mounted between the cylinder blocks or in what might be called 'valve alley,' with the result that the valves are rendered very inaccessible, and this is not a desirable result, to say the least. The required angle of the cylinders also makes it very difficult to design into the car a proper substantial steering gear and still render assembling practical. In the best workouts that I have seen, the assembling and disassembling of the steering gear is a very difficult matter and, in most cases, at least, it is necessary to remove the body and partially remove the motor in order to get the steering gear out.

"So far as the *turning radius* is concerned, the twin four is at a disadvantage when compared with the six, as the frame must be made wider than is necessary for the six-cylinder motor in order to get the steering gear in at all. An inch in width on each side of the frame will increase the length of the turning radius a great deal more than 3 or 4 in. added to the wheelbase. In other words, the amount that the wheelbase can be shortened in the twin four will not make up so far as turning radius is concerned, for the extra width required at the front end of the frame.

"All things considered, it was obvious that along with the acknowledged advantages obtained from the twin four, reappear the characteristics of the four which the six was designed to overcome, and the search for further refinement was, therefore, insistently pressed, as it was desired to obtain the advantage of the small-bore, high-efficiency, multi-cylinder motor without inheriting any disvantages.

Properly Designed Six Is Balanced

"As mentioned above, the six-cylinder motor is in absolute theoretical and practical balance, providing it is properly designed with a crankshaft that is strong enough to take care of the inertia forces in order to enable them to properly cancel out.

"As further explained above, the only disadvantage of a six-cylinder motor is the fact that in order to get a reasonable size motor the crankshaft must be rather long and the inertia forces are rather large owing to the necessarily large pistons. Since a single six-cylinder motor is in perfect balance, however, there is no reason why we cannot combine with it another six-cylinder motor, V-type, and still have a motor that is in absolute theoretical and practical balance. In designing this twin six motor, however, it is necessary to set the cylinders at an included angle of 60 instead of 90 deg., as there will be six impulses per crankshaft revolution instead of four, and a circle divided into six parts gives 60 deg. In order words, the impulses follow each other at inter-

vals of 60 deg., and this, of course, determines the angular position of the cylinders.

"Let us see how this type of motor compares with the six and the twin four as regards advantages and disadvantages.

"It is obvious that the character of the *torque* of this twin six motor is bound to be 50 per cent better than the twin four and 100 per cent better than the single six. Six impulses per crankshaft revolution blend together so closely as to make it absolutely impossible to distinguish any pause between impulses, even at very low engine speeds pulling through traffic on up-grades. The only thing that I can liken it to is the action of steam.

"So far as *weight* is concerned, the twin six motor is just about a stand-off as compared with the twin four, but lighter than the single six. The twin six motor is slightly longer than the twin four, but owing to its smaller bore and stroke and lesser angle it makes up in absence of width for what it exceeds the twin four in length. The weighing up of actual motors proves this to be a fact.

"Owing to the perfect balance of the six-cylinder principle, this twin six motor is absolutely *smooth* at all speeds.

Twin Six Has Accessibility

"So far as *accessibility* is concerned, the twin six motor is far superior to the twin four and just as good as the single six. The 60-deg. included angle allows us to build a 424-cu. in. motor 21⅛ in. wide over-all, as compared with 28 9/16 in., as in the case of the twin four. This allows the placing of the generator, water pump, starting motor, etc., in the usual place alongside the crankcase and between it and the frame, without widening the frame over the Packard narrow standard. It also allows the easy assembling and disassembling of a properly designed steering gear. This leaves only the carbureter to be placed between the cylinders, and by placing it well above the motor 'valve alley' is left entirely open and all valves are easily accessible for adjustment or replacement.

"So far as the *turning radius* is concerned, the twin six is far superior to the twin four and slightly better than the single six, as it assembles into the same width of frame as the single six, but allows a substantial reduction in the length of wheelbase.

The tremendous difference in power output of different motor types at the higher speeds is, of course, partly due to the increased compression, partly to the more effective valve area, but largely, I believe, to the lightness of the reciprocating parts and the consequent tremendous reduction in friction. In this connection it is interesting to note that both the single six and twin six motors have valves whose diameter in the clear equals half the bore, but that with the single six valves lifting ⅜ in. and the twin six only 5/16 in., the effective valve opening is approximately 22 per cent greater in the twin six. This is due to the fact that the piston area decreases as the square of the diameter, while the effective valve opening decreases directly with the diameter.

The power curve of the single six cylinder motor was, of course, made from a 338 motor such as we used last year, and the output of the high-efficiency six-cylinder motor mentioned in my report to Mr. Joy was considerably higher, as it ran up to approximately 75 hp. at 2200. But, in order to obtain this additional power, I not only had to lighten the reciprocating parts, but I also had to raise the compression, in order to obtain more efficient combustion; or, in other words, I had to increase the intensity of each explosion. This resulted in exactly what we were not looking for, a rougher motor than the 338, while the public was demanding a smoother one, in connection with more range of ability. I believe that the curve, taken from the well limbered up 338 motor represents about the maximum output that can be obtained from a single six-cylinder motor without raising compression to the point where the result will be objectionable to the user. Whereas, on the other hand, power can be obtained from a twin six motor with a degree of smoothness far in advance of the result obtained from the six-cylinder motor, even with its considerably smaller power output.

The Question of Gear Ratio

"While this twin six motor has the ability to turn up to 3000 r.p.m.—smoothly and safely—its magnificent torque at low speed, makes it possible to use a gear ratio that keeps the motor down to a point very little above that of so-called slow speed motors. As our 135 car, equipped with twin six motor is approximately 300 lbs. lighter than our 338 and has on an average 10 per cent more power up to 1500 r.p.m., as outlined above, it will be readily understood that we could have used our 338 gear ratio and secured an excellent performance. I have driven the 135 twin six car, equipped with our standard 338 gear ratio, i. e., 25 m.p.h, at 900 r.p.m. of the motor, and found its performance to be excellent. As this motor has the ability to turn up to high speed without any undue strains on the bearings, however, we decided to make the gear ratio slightly lower, in order to give our customers a measure of ability that would be satisfactory under all conditions. We, therefore, adopted a 23.5 mile gear ratio, or, in other words, when the twin six motor is turning 900 r.p.m. the car is traveling but 1½ miles slower than was the case in last year's single six 338 car. This means at 70 m.p.h., the motor only turns approximately 2700 r.p.m.

"While I have shown by the above that we are not running our engines at extremely high speeds, I still want to make the statement that we could run them at high speeds, that is, up to 3000 r.p.m. and have it safer than a six-cylinder motor at considerably lower speed.

"In this connection, the following comparisons are very interesting. This table shows the comparative weights of the rotating and reciprocating parts and the resulting bearing pressures of not only our 338 single six-cylinder motor and our new twin six motor, but I have also added, as a mater of general information, the corresponding data of the high-efficiency six-cylinder 338 motor mentioned in my report to Mr. Joy:

	338 Six,	Special 338 Six,	Twin Six,
	Lb.	Lb.	Lb.
Piston assembly, complete with rings, piston pin and set screw	4.125	2.11	0.814
Connecting rod, upper end	1.38	.828	.625
Connecting rod, lower end	3.31	2.421	1.52

The following table gives a comparison of forces due to gas pressure and inertia at 2000 r.p.m. of the same motors.

	Lb	Lb.	Lb.
Inertia of one piston assembly complete	2,130	1,140	492
Centrifugal forces of one connecting rod, lower end	1,030	754	430
Centrifugal forces of one pair of connecting rods, lower ends	....	....	860
Crank pin bearing pressure per square inch, due to inertia	768	433	379
Crank pin bearing pressure per square inch, due to gas pressure	916	916	871

As a matter of general information, I will state that the lightening of the parts in the special six-cylinder motor was accomplished by making the connecting rods out of alloy steel and machining them all over and by using alloy pistons. In other words, the rotating and reciprocating parts of this special motor were up to the same standard of engineering as our twin six motor, which makes the comparison of this motor with the twin six very interesting. It will be noted that on account of the lightness of the rotating and reciprocating parts of the twin six motor, the bearing pressures, due to inertia, at 2000 r.p.m., are far below the corresponding pressures, due to gas pressure on the piston, which makes it quite clear that the speed of the motor would have to be raised far above 3000 r.p.m. in order to make the pressure, due to inertia, come anywhere equal to ordinary working pressure of the bearings due to gas pressure.

There are so many interesting engineering problems in connection with the designing of a twin six motor that

I could go on at considerable length, but fear that this paper has already grown too long. I have purposely stuck to a discussion of the results desired and the broad underlying principles of motor design and have refrained from discussing motor details. There are, of course, a great many possible arrangements of a lot of the details of construction of a twin six motor, and in the design of our motor I can only say that we considered each detail as carefully as we knew how, and, after exhaustive research work, selected what we thought to be best. No doubt the discussion of this paper will run somewhat into the details of construction, and I will be very glad indeed to answer any question and give you reasons for our particular arrangement."

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Joy Favors North Route Around Salt Lake for Highway

SALT LAKE CITY, UTAH, Sept. 7.—In a recent letter to Chas. Tyng, counsel for Utah for the Lincoln National Highway, Henry B. Joy, president of the highway association, points out the necessity for improving the road south of Great Salt Lake and says that unless this is done Salt Lake City cannot expect to have the automobile travel come by this route. President Joy said: "There is no doubt in my mind, after having driven the southern route in June and having talked with dozens of tourists and citizens of Utah, but what the northern route is to-day the best and most drivable road."

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McGraw Makes $300,000 Additions

EAST PALESTINE, OHIO, Sept. 14—Contracts have been let by the McGraw Tire & Rubber Co., this city, for additional steel and brick buildings and machinery to cost $300,000. Three additions are covered by the contracts awarded, as follows: a 195-ft. three-story extension to the vulcanizing building; a 98-ft. three-floor annex to the present mill room, and a 150 by 66 ft. three-floor addition to the compounding department.

In addition to the 98-ft. mill room extension, this department will be enlarged by transferring the present compounding room to its new quarters in the 150 by 66 ft. extension to the main building.

All buildings will be connected with overhead bridges and tunnels which permit direct routing of material through various departments of manufacture.

New mills, calenders, with direct motor drives, elevators, conveyors and other equipment have been ordered, and it is anticipated that all will be in full operation by Nov. 1, 1915. The increased floorspace will approximate 800,000 sq. ft., and the daily output of the plant will be doubled.

Trade Review of the Week

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State Fair Helps Detroit Sales—Factories Continue Unabated Activity—Other Sections

DETROIT, MICH., Sept. 14—Stimulus to the business of many of the Detroit dealers was given last week by the State Fair held here. This occasion is recognized as an excellent chance for the selling and showing of cars to the farmer element of the State as well as offering a means of gathering a good-sized prospect list among local intending buyers.

In the factories, there is little change over the previous week, activity everywhere being with the aim of keeping pace with demand. Packard has now started shipments of its Twin Sixes, although none of them went out last week. It is expected that before the present week is over there will be twenty-five of them out.

Orders Are Plentiful

From the Scripps-Booth Co. comes the information that a French dealer has contracted for 500 cars within the next year.

Ford factory sales continue to be very strong. The concern is between 80,000 and 90,000 cars behind orders now, which is practically the same as it has been right along. The daily output last week averaged about 1200 cars, this number being made in the parent plant and in the assembly branches throughout the country. At Detroit, the daily average has been running about 500. Ford officials state that there is no prospect of a slackening.

Factories look for increased war business following the completion of the present war loan. It is hard to see how some of them could take on more of this work, but it, of course, would largely be confined to the truck field.

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50 to 100 Per Cent Increase in Minneapolis Sales Expected

MINNEAPOLIS, MINN., Sept. 13—Automobile trade conditions for this territory as gathered from the attendance at the automobile exhibit at the Minnesota State Fair, Sept. 6-11, and at the agencies in Minneapolis and St. Paul, are for a large business.

Conservative men place the probable increase in sales for 1915-1916 over 1914-1915 season at from 50 per cent to 100 per cent. Some even go higher where they have popular price lines of machines. With a crop in sight for Minnesota of some $300,000,000 and more than $600,000,000 for the ninth federal bank district centering in Minneapolis, the sales possibilities are staggering to the dealers.

The State Fair show developed no more than the normal week's report of new agency contracts, but it showed that the farmer is going to buy automobiles this fall when he realizes on his crops. Some five salesmen for each of the forty-three exhibits of automobiles at the fair were busy most of the time, and the people asking questions were the direct buyers of cars.

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A New Caille Perfection Motor

DETROIT, MICH., Sept. 15—*Special Telegram*—The Caille Perfection Motor Co., which for the past fifteen to twenty years has been making gasoline and especially marine engines, will start the manufacture of automobile motors within the next thirty days with a light six-cylinder engine designed by Ralph Lewis, former chief engineer and general manager of the Beaver Motor Mfg. Co.

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Opinion Rendered in Horn Suit

NEW YORK CITY, Sept. 15—In the suit of the Lovell-McConnell Mfg. Works vs. the General Auto Supply Co., Judge A. Hand has written an opinion in which he states that patent No. 1,105,324 issued to George C. Dean, infringement of claim No. 7 of which was the cause of the suit, is void for lack of invention. For this reason the opinion states that the bill should be dismissed. The defendants, the General Auto Supply Co., according to the opinion, have made no contention of non-infringement on the above patent, but anticipation and lack of invention. The particular point in claim seven, which the suit hinged upon, reads—"And a casing having a cylindrical threaded wall and transverse wall, said transverse wall being spaced from and substantially parallel to said diaphragm and serving as a bearing for one end of the armature shaft, . . . the threaded engagement of said shell and said casing serving to adjust the position of said rotor in respect to said diaphragm."

The opinion states that all the elements seem old, but the combination was what was claimed to be new and useful, particularly the threaded engagement which serves as an adjustment, and also a substantially air-tight chamber in the rear of the diaphragm in which air is compressed and expanded during the operation of the horn. According to the opinion, a similar threaded engagement appears in British patent to Rogers No. 23,802 and French patent to Monnot No. 422,256. The air space is substantially the same as in Miller Reese Hutchison's patent No. 1,411,463. Therefore, concludes the opinion, no novelty can be seen in the combination and the patent is void for lack of invention and the bill should be dismissed. The case is in the U. S. district court for the southern district of New York.

212,882 Registration in N. Y.

Ohio 168,000, Illinois 166,886, Pennsylvania 151,523 and California 150,232

NEW YORK CITY, Sept. 14—Registrations in the four leading automobile states are booming. Up to Sept. 1, according to the figures collected by the Ohio State Automobile Association, there were 849,531 cars registered in the five leading states, New York, Ohio, Illinois, Pennsylvania and California.

New York State leads 212,882; Ohio is second with 168,000; Illinois, third, with 166,886; and Pennsylvania, next with 151,523. California is close to Pennsylvania with 150,232 registrations.

10,800 Cars Licensed in Vermont

MONTPELIER, Vt. Sept. 11—The receipts from automobile registration in the State of Vermont during the period between March 1 and Aug. 1, 1915, amounted to $175,992.31. This amount exceeds the receipts of any previous year, the period between March, 1914, and March, 1915, having brought forth registration receipts of $160,362.10, the largest up to that time. The number of cars up to Aug. 1, 1914, is nearly 10,800, or a ratio of more than one automobile to every thirty-two persons living in the state.

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Daniels 8 at $2,350

READING, PA., Sept. 11—The Daniels eight which, as was stated in THE AUTOMOBILE for Sept. 2, is to be built by the Daniels Motor Car Co., this city, the president of which is Geo. E. Daniels, who was president and general manager of the Oakland Motor Co., Pontiac, Mich., will be a car built practically to order, to sell for $2,350. The wheelbase will be 127 in. and the tires 34 by 4½. Unusual attention will be given to the finish and equipment of the seven-passenger body, which will have a double cowl, heavy mahogany rail all around the top, long grained hand-buffed leather upholstery, mahogany cabinet fittings and other luxurious features.

3¼ by 5 Motor

The motor will have V-type L-head cylinders 3¼ by 5, giving a rating of 33.8 under the S. A. E. formula; the cylinders will be in two blocks with integral intake manifolds and bolted-on exhaust pipes and the valves will be actuated by a single camshaft carrying sixteen cams. Staggering the cylinder blocks permits placing the big ends of the connecting-rods side by side on the crankpins, which are made sufficiently long for the purpose. Water circulation will be by duplex centrifugal pumps, lubrication by pressure feed, ignition, lighting and starting by the Westinghouse system. The carbureter will be a Zenith.

A Brown-Lipe-Chapin three-speed gearset will form a unit with the motor, the disk clutch will run dry and will have a ball-bearing release. Two Spicer universals will be used on the propeller shaft, which will be uninclosed; drive will be taken through the springs, and an arm will resist torque stresses.

Vacuum Fuel Feed

Three-quarters construction will be employed for the rear axle, which will have taper roller bearings, spiral bevel gears and pressed steel housing. Rear springs will be semi-elliptic, underslung, 2½ in. wide. The gasoline tank, of 20 gal. capacity, will be hung at the rear, a vacuum system feeding the carbureter.

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Can't Shoot from Car in Wisconsin

MILWAUKEE, WIS., Sept. 9—It is lawful to travel to hunting grounds in a motor car, but unlawful to shoot game birds or animals from a car, according to the ruling of the attorney general of Wisconsin. The last Legislature passed a law prohibiting shooting at game from cars, bringing up the question of whether or not such prohibition covered driving to the place where it was intended to hunt. The attorney general interprets the law, for instance, to make it unlawful for a motorist-hunter to scare up a covey of birds with his car and then alight from the car and shoot the birds.

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Non-Glare Law in Dallas

DALLAS, TEX., Sept. 9—The city of Dallas now has an automobile dim light ordinance. The law became effective only recently. It provides a fine of from $5 to $200 for a violation. It applies only to the corporate limits of the city. A move is on foot to have the Legislature pass a dim light law that will cover the State. So far as Texas is concerned Dallas is the first city to enact this ordinance.

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To Build Waco Car in Seattle

SEATTLE, WASH., Sept. 9—The Western Automobile Co. has recently been incorporated in Seattle to manufacture the Waco car. Those interested in the new concern are C. A. Cawley, G. L. Grant and S. W. North. A large factory building has been leased at Rainier Avenue and Lane Street for manufacturing purposes. The first Seattle-built car, a Waco, has already run 2000 miles and delivery of cars is promised for March 1, 1916.

1916 Russell-Knight —Two Bodies

Refinements a Feature—Five-Passenger Type Sells for $2,650 and Seven $2,750

TORONTO, ONT., Sept. 11—Several refinements are noted in the 1916 Russell-Knight 32 made by the Russell Motor Car Co., Ltd., West Toronto, Canada. It is made in two body styles, five and seven-passenger the former selling for $2,650 and the latter $2,750. The body is the conventional streamline design with doors having concealed hinges. In the equipment are included Bijur electric starting and lighting system, new dome fenders, improved headlights, power tire pump, Warner speedometer and clock and demountable rims with one spare.

The engine is a four-cylinder, 4⅛ by 5½, rated at 32 hp. The cylinders are cast in pairs with separate removable heads, while the sleeves have 2¼ in. travel. Cooling is accomplished by a centrifugal pump through the cylinder water jackets to a large cellular radiator. A high-tension magneto independent of the lighting and starting system furnishes the ignition. Force-feed lubrication is used, with a special regulator that is said to cut down all consumption.

The Russell-Knight uses a multiple-disk clutch running in oil. It has a selective gearset with three speeds forward and one reverse. Center control and left drive are used. Floating Timken rear axles with worm-bevel gears are to be found on this car; also semi-elliptic springs in front and three-quarter elliptic in the rear. Wheelbase is 120 in.; tires, 36 by 4½; wheels, artillery type with demountable rims.

The upholstering has Turkish type cushions with wood frames. Colors are royal blue for the body and running gear with an option of brewster green or deep wine.

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Haydock Car at $720

CINCINNATI, OHIO, Sept. 9—The Haydock Motor Car Co., located at Richmond and Carr Streets, Cincinnati, Ohio, announces the completion of a four-cylinder automobile, called the Haydock. The car is of the lighter type and sells for $720.

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No Successor for Poole

DETROIT, MICH., Sept. 13—No successor has been named by the Hupp Motor Car Co. to take the place of John L. Poole, who was European export manager of the company for the last five years.

Mexican Border Work Tests Trucks

Conveying 4000 Troops During Controversy — Encounter Bad Road Conditions

FORT SAM HOUSTON, TEX., Sept. 11—What is said to be the severest and most practical trials that were ever made of trucks and automobiles in actual military field service by the United States army are now in progress in the lower Rio Grande region of Texas, where more than 4000 troops are operating against raiding bands of Mexican outlaws.

Conditions Are Trying

The conditions under which the new adjuncts to the transportation department of the army are being operated are particularly trying. The border country is almost entirely lacking in good roads, with the exception of a limited system of improved highways radiating out of Brownsville and extending only short distances to nearby towns. In order to reach many of the more remote patrol camps with trucks carrying supplies it was found necessary to cut a road through an almost impenetrable wilderness of chaparral. The low-growing brush that covers the whole country is all thorn-bearing. The mesquite, the cats-clay, the prickly pear and a variety of other plant life, indigent to the border, are covered with thorns that are an ever-present menace to automobile tires. The lack of any convenient repair shops makes it necessary for the motor transportation equipment to provide its own means for its upkeep.

It requires a considerable amount of supplies to keep an army of 4000 men going and the trucks are kept constantly busy. It is planned to greatly increase the number in service.

In former years, when the War Department maintained large garrisons of soldiers at Fort Brown, Fort Ringgold and Fort McIntosh, all military posts on the lower Rio Grande frontier, there was a Government road that extended up the river for a distance of about 250 miles, connecting these different stations. The abandonment of the road for military purposes several years ago caused the highway to rapidly fall into bad condition and there are now long stretches of it that are impassable for almost any kind of vehicle. Temporary improvements have been made recently to some sections of the old highway and plans are on foot to rehabilitate it along its entire length.

Equal to the Test

It is stated that the motor trucks which are now in use on the border have proved equal to the many hard tests that they have been compelled to undergo. The chief difficulty has been the lack of roads. The patrol camps are often situated close to the river bank in localities that are almost inaccessible.

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5-Year Blair Order

NEWARK, OHIO, Sept. 10—The Blair Motor Truck Co., Newark, Ohio, has received an order for motor trucks to be delivered in fixed quantities over a period of five years. Although the officials of the company are reticent about the details of the order, it is understood that the order emanates from one of the large European exporters with headquarters in New York City and that the number to be delivered monthly exceeds thirty. These trucks, it is understood are to be 3-tonners and of the gasoline, worm-driven type which has been standard with the Blair company for several years. Another order for gasoline-electric vehicles made by the same concern is pending. It is emphatically stated that it is not a war order. The plant has been thoroughly rehabilitated for the steady demand upon it that will result and J. P. McCune, general manager, is arranging for the requisite materials.

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Bell Forced to Expand

YORK, PA., Sept. 14—Increased production and the demand for cars from its agents have caused the Bell Motor Car Co. to start work this week on the erection of a large addition at its plant along the Columbia & Frederick division of the Pennsylvania Railroad at the intersection of Center Street. The building will be a one-story frame structure of the saw-tooth type, 80 ft. by 60 ft. in dimensions. It will be used as an assembling room and paint shop. The company's rapidly growing business has made it necessary to seek larger quarters and efforts are now being made to secure a site for the erection of a large modern daylight factory building. The present building is leased by the company. Work on the addition is being rushed and it is expected to have it completed within two weeks. The company will have about 25,000 sq. ft. of floorspace.

The daily production of the plant is being increased and an average of one and two cars are being built every day. Night work is now in progress. It is the aim of the company to increase this production to ten cars a day.

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McCord Buys Wyandotte Plant

DETROIT, MICH., Sept. 11—The McCord Mfg. Co., which makes the McCord radiators, McKim gaskets and other automobile accessories, has purchased a plant at Wyandotte, Mich., and will make its gaskets there. At least 125 men are to be employed.

43 Truck Makers in P. O. Bids

To Furnish Twenty or More Gasoline Trucks in Fiscal Year Ending June 30

WASHINGTON, D. C., Sept. 8—Under a call for bids for furnishing twenty or more gasoline trucks for the postal service during the fiscal year ending June 30, 1916, the purchasing agent of the post-office department to-day opened forty-three bids from various manufacturers and dealers. The quantities to be purchased are five or more of ½-ton capacity; five or more of ¾-ton capacity; five or more of 1½-ton capacity and five or more of 3-ton capacity. It is possible before the end of the contract year that the department will purchase 100 trucks under the propositions received to-day. The contracts are expected to be awarded on or before Oct. 1, next.

The bids were submitted under these classifications: A, trucks of ½-ton capacity, complete with body; B, trucks of ¾-ton capacity, complete with body; D, trucks of 1½-ton capacity, complete with body; DD, trucks of 1½-ton capacity, with slight changes in specifications from class D trucks; F, trucks of 3-ton capacity; FF, trucks of 3-ton capacity, with slight changes in specifications from class F trucks. The bidders and their prices were as follows:

O. K. Motor Truck Co., Flint, Mich., f.o.b. Flint, Class B, $975, $975, $1,000, $975, $1,025, $975, $978.

Warren Motor Truck Co., Warren, Ohio, f.o.b. Warren, Class B, $1,550, $1,450; Class D, $1,885, $1,785; Class DD, $1,925, $1,825; Class F, $2,550, $2,450; Class FF $2,550, $2,450.

Union Garage Co., Washington, D. C., f.o.b. Washington, Ford, Class A, $600.

F. N. Harper, Washington, D. C., f.o.b. Toledo, Overland, Class A, five bids, $830.

Commercial Garage, Washington, D. C., Bessemer, Class B, three bids at $1,225, $1,175, $1,250, $1,225; Class D, $2,090, $2,025, $2,090, $2,065 $2,090, $2,205; Class DD, $2,090, $2,025, $2,090, $2,065, $2,090, $2,205; Class F, $3,280, $3,305, $3,280; Class FF, $3,350, $3,375, $3,350.

Tiffin Wagon Co. Tiffin, Ohio, Class B, $1,244 $1,297, $1,244, $1,322, $1,297; Class D, $1,738, $1,660, $1,685, $1,713, $1,660; Class DD, $1,742, $1,664, $1,689, $1,717, $1,664; Class F, $2,263, $2,238; Class FF, same bids as Class F.

Semmes Motor Co., Washington, D. C., Class A, Wilcox, $1,210; Vim, $775; Class B, Wilcox, $1,775; Class D, Wilcox, $2,050; Class D, $2,100.

Charles A. Leichliter, Chicago, f.o.b. Detroit; Class A, three bids at $831.50, $800; Class B, three bids at $1,872.50, $1,912.50; Class DD, four bids at $1,950, $1,990; Class FF, $3,300, $3,275.

Wadsworth Mfg. Co., Detroit, f.o.b., Detroit, Ford, Class A, $580.80, $578.80, $591.80, $578.80, $590.80, $578.80.

Dart Motor Co., Waterloo, Iowa, f.o.b. Washington, Class A, two bids at $1,145, $1,095, $1,180; Class B, two bids at $1,715, $1,665, $1,750; Class D, $2,265, $2,190, $2,300, $2,265, $2,365; Class F, $3,190, $3,165.

Miller Bros. Automobile & Supply House, Washington, D. C., f.o.b. Washington, Ford, Class A, $638.50, with various supplemental bids; Class B, Flint, $1,364.

Commercial Automobile & Supply Co., Washington, Studebaker; Class A, $940, $965; Class B, $960, $985; this bidder also made several supplemental bids for equipment.

Peerless Motor Car Co., Cleveland; f.o.b. Cleveland; Class F, $3,455, $3,410; Class FF, same prices as Class F.

Lippard-Stewart Motor Car Co., Buffalo,

f.o.b. Buffalo; Class A, $996.50, $1,016.50, $996.50; Class B, $1,438, $1,428, $1,463, $1,438, $1,466, $1,438; Class D, $2,140, $2,115, $2,143, $2,115, $2,115; Class DD, same prices as Class D.

Commerce Motor Car Co., Detroit, f.o.b. Detroit; Class B, $975, $995, $985, $1,030, $1,015.

DeKalb Wagon Co., DeKalb, Ill., Class D, $2,175, $2,100, $2,125, $2,100, $2,100; Class DD, same prices as Class D.

International Harvester Corporation, Chicago, f.o.b. Akron, Ohio, Class A, five bids at $1,040, $1,000; Class B, $1,040, $1,000.

Duplex Power Car Co., Charlotte, Mich., Class F and FF, $3,300.

Buick Motor Co., Detroit, branch, f.o.b. Detroit, Class B, $1,340.90, $1,337.39, $1,340.90, $1,330.90.

Touraine Co., Philadelphia, Pa., f.o.b. Philadelphia, Class A, four bids at $835, $865.

Mais Motor Truck Co., Indianapolis, f.o.b. Indianapolis; Class D, $2,550, $2,515, $2,550, $2,500; Class DD, same prices as Class D; Class F, $3,050, $3,025; Class FF, same prices as Class F.

Packard Motor Car Co., Detroit, f.o.b. Detroit; Class D, $2,712.50, $2,682.50, $2,742.50, $2,682.50, $2,707.50; Class DD, $2,722.50, $2,692.50, $2,752.50, $2,692.50, $2,692.50, $2,717.50; Class F, $3,645, $3,505.85; Class FF, $3,645, $3,585.

Kelly-Springfield Truck Co., Springfield, O., Class D, $1,875, $1,900, $1,925, $1,950, $1,875, $1,900; Class DD, same prices as Class D; Class F, $3,050, $3,000; Class FF, $3,125, $3,075.

Four Wheel Drive Co., Clintonville, Wis., Class F, $4,400 and $4,350, both less 20 per cent; Class FF, same prices as Class F, with same discount.

White Co., Cleveland, Class B, $1,970, $1,970, $1,985, $1,970, $1,970, $1,958; Class D, $2,720, $2,705 $2,720, $2,708, $2,720, $2,720; Class DD, same prices as Class D; Class F, $3,315, $3,303; Class FF, same prices as Class F.

Thos. B. Jeffery Co., Kenosha, Wis., Class D, $2,785, $2,760, $2,760, $2,750, $2,760, $2,860; Class DD, same prices as Class D; Class F $3,900, $3,890; Class FF, same prices as Class F.

Locomobile Co. of America, Bridgeport, Conn., Class F, $4,022.50; $3,950; Class FF, same prices as Class F.

Dorris Motor Car Co., St. Louis, Class B, four bids at $1,885, $1,860, $1,845.

Couple Gear Freight Wheel Co., Grand Rapids, Mich., f.o.b. Grand Rapids; Class F, $4,000, $4,000; Class FF, sames prices as Class F.

Standard Motor Truck Co., Detroit, f.o.b. Detroit; Class D, $1,885, $1,850, $1,875, $1,850, $1,850; Class DD, same prices as Class D; Class F, $2,480, $2,450; Class FF, same prices as Class F.

General Motors Truck Co., Pontiac, Mich., Class B, $1,250, $1,295, $1,250, $1,275, $1,250; Class D, $2,045, $2,000, $2,025, $2,000, $2,000, $2,125; Class DD same prices as Class D.

Sterling Motor Truck Co., Milwaukee, m f.o.b. Washington or New York; Class B, $1,050, $1,040, $1,075, $1,050, $1,080, $1,050; Class F, $3,150, $3,100; Class FF, $3,300, $3,270.

Denby Motor Truck Co., Detroit, f.o.b. Detroit; Class B, $1,075, $1,100, $1,075, $1,101, $1,135; Class D, $1,690, $1,665, $1,700, $1,665, $1,655, $1,725; Class DD, $1,690, $1,665, $1,725, $1,690, $1,690 $1,740.

Avery Co., Peoria, Ill., Class FF, $2,500, $2,480.

Jos. W. Moon Buggy Co., St. Louis, f.o.b. St. Louis, Class D, $1,650, $1,620; Class DD, $1,675, $1,645.

C. L. Barker, Norwalk, Conn., Class D, $1,565, $1,540, $1,565, $1,540; Class DD, $1,575, $1,550, $1,575, $1,550.

Sandow Truck Co., Chicago, Class D, chassis only, $1,625; with body, $1,920, $1,875, $1,905, $1,875, $1,875, $1,900; Class DD, chassis only, $1,625; with body, $1,935, $1,890, $1,920, $1,890, $1,890, $1,915; Class F, chassis only, $2,565; with body, $2,945, $2,915; Class FF, chassis only, $2,555; with body, $2,935, $2,905.

Corbett Auto Co., Henderson, N. C., Class D, $2,050. $2,000, $2,025, $2,000, $2,075, $2,000, $1950.

Baalstrum Co. Battle Creek. Mich., Class A, $1,285, $1,283. $1,285, $1,277; Class B, $1.375, $1.373, $1,375, $1,363.

Beck's Son, Cedar Rapids, Iowa, Class B, $1,200, $1,175.

Service Motor Truck Co., Wabash, Ind., f.o.b. Washington: Class B, $1,492, $1,468; Class D, $2,068: Class DD, $2,100: Class F, $2,744; Class FF, same prices as Class F.

Gabriel Auto Co., Cleveland, Ohio., f.o.b. Cleveland: Class B, $1,700. $1,690. $1,700, $1,675, $1,735, $1,700; Class D. $2,200. $2,175, $2.235, $2.200, $2,200, $2,200; Class DD, same prices as Class D.

Federal Motor Truck Co., Detroit, f.o.b. Detroit: Class D. $2,090, $2.070, $2,107.50, $2,090, $2.090, $2,090; Class DD, same prices as Class D.

Baldwin Locomotive Builds Trucks

300 Under Construction at Eddystone Plant—Flat Iron Wheels and Trailers

PHILADELPHIA, PA., Sept. 11—Three hundred trucks are being made at the Eddystone plant of the Baldwin Locomotive Works for use by the Russian army. It is understood that more trucks will be built later and that the 20-acre plant the company is building will probably be used in carrying out the large war orders. This company is also doing a large parts business for a prominent tractor concern in this State.

Fifty Are Finished

The trucks being built for Russia, fifty of which are already finished, run on flat iron wheels rigged to prevent skidding. When in use, several small trailers will be attached. They will be used to transport foodstuffs and merchandise to railroad and water terminals during the war, as well as to haul munitions.

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Republic Truck Adds Three New Buildings

ALMA, MICH., Sept. 8—During the last thirty days the Republic Motor Truck Co. has started the erection of three new factory buildings, which will provide a total of 54,500 more square feet of floor space. Work on the latest addition was begun a few days ago. This structure will be one story high and have 35,000 sq. ft. of floorspace. The company will employ at least fifty more men when the buildings are ready. Production at this time is being pushed to the limit. Orders are far ahead of any previous year's business, and will keep the plant running for a long time with a full force.

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Canadian Ford to Build Tractors

DETROIT, MICH., Sept. 9—Ford tractors are to be made by the Ford Motor Co. of Canada, Ltd. A plant to be devoted exclusively to this end of the Canadian company's business is to be erected soon. It will be of such size that ultimately from 5000 to 10,000 men will be employed there. When the plant will be in operation nobody can fortell, but it is said that it will start about one year before the first tractors will be marketed.

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Detroit Weatherproof Body Gets Plant

DETROIT, MICH., Sept. 13—The Detroit Weatherproof Body Co., recently organized to make weatherproof tops for Ford and other cars, will occupy the plant formerly occupied by the Kemiweld Can Co. and which has been leased by the C. R. Wilson Body Co. with which the new concern is closely related. The plant is located at Clay Avenue and St. Aubin Street and contains about 80,000 sq. ft. of floorspace. A force of 400 to 500 men will be employed. The Wilson company has secured an option to purchase the plant at a price said to be about $100,000.

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Warner Mfg. Co. Gives Hour Cut

TOLEDO, OHIO, Sept. 9—During October the Warner Mfg. Co. will reduce its working week to a 48-hr. basis, or a 12-hr. cut. The present scale of wages will be continued. T. W. Warner, president, states that this action will be purely voluntary and that the move is experimental, its permanency depending wholly upon the men.

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Tractor Uses Gas-Kerosene Carbureter-Electric Lighting

OSHKOSH, WIS., Sept. 11—A. J. and O. G. Patch, Oshkosh, Wis., for ten years associated with the Rumely and Fairbanks-Morse interests as tractor designers, are making exhaustive practical tests of a new gas-kerosene tractor they have developed at the Dauber-Kratsch machine shops in Oshkosh. Among the new features is a full electric lighting equipment, opening new possibilities in agriculture, such as night plowing and general haulage.

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Hudson to Build on Newly Acquired Land

DETROIT, MICH., Sept. 13—The Hudson Motor Car Co. recently purchased a piece of land 500 by 380 ft. from the Anderson Forge & Machine Co. This property is located across from the present Hudson plant. A new engine-house and power plant will be erected on part of the land at once and later the construction of several large factory buildings similar to those of the present plant will be started.

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Weed Assembling Plant in York

YORK, PA., Sept. 14—An assembling plant of the Weed Chain Co., Bridgeport, Conn., has been opened in this city in the plant of the York Engineering Co., North George Street and Hamilton Avenue. Employment is given to about sixty men. The automobile chains are manufactured by the Standard Chain Co., of this city, and instead of shipping them to Bridgeport, are assembled at the new factory. The plant will remain in operation here for at least six months. The same assembling plant was in operation last year.

S. K. F. Incorporates in Conn.

American Organization Capitalized at $2,000,000 to Make Bearings in Hartford

NEW YORK CITY, Sept. 10—The S. K. F. Ball Bearing Co., Hartford, Conn., was incorporated Sept. 4, with a capitalization of $2,000,000, having for its object the manufacture and sale of the ball bearings known by this name.

The S. K. F. ball bearing was introduced into the U. S. A. in the year 1910, three years after the patents for the invention exploited by the parent concern, The Aktiebolaget Svenska Kullagerfabriken of Gothenburg, Sweden, had been granted. At that time the present American S. K. F. Ball Bearing Co. was incorporated with a capital of $50,000 as a selling organization for the bearings manufactured by the Swedish concern.

One of the problems of the company has been, how best to take care of its customers in America, so as to avoid undue delay in delivery and it has therefore had to carry at its New York place of business one of the largest stocks of complete ball bearings in the country.

The possibility of manufacturing in the United States has long been under consideration, and after exhaustive inquiries as to the manufacturing facilities and the possibilities of producing in this country a product, which should in every respect be equal to the Swedish-made bearing, steps have been taken to carry out this plan. It is now the intention of the company to build a factory at Hartford, Conn. A suitable factory site of about 8 acres along the New York, New Haven and Hartford Railroad tracks has been acquired and the erection of the first building will be shortly started upon.

Special Crucible Steel

The special Swedish crucible steel, known as S. K. F. steel, used by the parent concern, will be used in the American-made bearings, and will be imported from abroad for this purpose.

To carry out the proposed plans, there has been incorporated the new S. K. F. Ball Bearing Co. in which prominent American interests are represented. This company will as stated be a Connecticut corporation and will have a fully paid-up capital of $2,000,000. Among the directors of the new company will be B. W. Hanson, vice-president of Messrs. Pratt & Whitney of Hartford, Conn. The general selling policy of the company will, however, not in any way be affected by this change, and the executives and other members of the old company will join the new corporation.

Buyers Cared For

Until the new factory is in a position to supply American-made bearings, the S. K. F. company, which has not suffered any interruptions in its source of supply, will continue as hitherto to import Swedish-made bearings and will continue to do so as long as may seem desirable.

It is intended to start with a plant employing about 300 men, which will, to begin with, be able to produce only a portion of the bearings annually sold by the company in this country, the remainder coming from Sweden.

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Market Prices Firm

NEW YORK CITY, Sept. 14—The markets this week were somewhat firmer with a steady demand in all products. Although there were a number of gains they were not as heavy as usual. The metal markets recorded the largest gains. Steel, which for some weeks had been very steady, rose on Tuesday to a high mark. Bessemer steel rose $1 and open-hearth $1.50. The copper market was dormant and quotations are entirely nominal. Producers are asking 17¼ cents to 17½ cents, but producers are not interested, being well supplied for the next two months at least. Many of the largest selling agencies continue to ask 18 cents. The total sales of all producers during the business week in August, including both 16- and 18-cent copper, were well up to 60,000,000 lb. While during the whole month of August, approximately 125,000,000 lb. were sold.

The aluminum markets continued firm with prices showing marked advances. Antimony is strong with fairly large quantities having been sold here in the past ten days. Trading in crude rubber continued quiet last week, and the market developed an easier tone. Up-River Para fine was available at 55½ cents per pound for prompt delivery. The oil and lubricants markets were a bit unsteady yesterday when a rise on Pennsylvania crude and Kansas crude oil occurred, both of which made a total gain of 5 cents. The rest of the markets remained unchanged.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.40	.40	.40	.40	.40	.40	..
Antimony	.26	.26	.28½	.28½	.28½	.28½	+.02½
Beams & Channels, 100 lb	1.51	1.51	1.51	1.51	1.51	1.51	..
Bessemer Steel, ton	23.00	24.00	24.00	24.00	24.00	24.00	+1.00
Copper, Elec., lb	.17½	.17	.17	.17	.17	.17	—.00½
Copper, Lake, lb	.18½	.17½	.17½	.17½	.17½	.17½	—.01
Cottonseed Oil, bbl	5.75	5.85	5.96	5.98	5.98	6.05	+.30
Cyanide Potash, lb	.23	.23	.23	.23	.23	.23	..
Fish Oil, Menhaden, Brown	.39	.39	.39	.39	.39	.39	..
Gasoline, Auto, bbl	.16	.16	.16	.16	.16	.16	..
Lard, Oil, prime	.85	.85	.85	.85	.85	.85	..
Lead, 100 lb	4.82½	4.82½	4.82½	4.65	4.65	4.65	—.17½
Linseed Oil	.54	.54	.54	.54	.54	.54	..
Open-Hearth Steel, ton	23.50	25.00	25.00	25.00	25.00	25.00	+1.50
Petroleum, bbl., Kan., crude	.75	.75	.75	.75	.75	.80	+.05
Petroleum, bbl., Pa., crude	1.60	1.60	1.60	1.60	1.60	1.65	+.05
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	..
Rubber, Fine Up-River, Para	.56½	.56½	.56½	.56½	.56½	.55½	—.01
Silk, raw, Ital	..	..	3.90	..	..	3.90	..
Silk, raw, Japan	..	..	3.65	..	..	3.65	..
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	1.00	+.10
Tin, 100 lb	33.25	33.25	33.12½	33.25	33.25	33.62½	+.37½
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	..

Detroit Battery Makes 50 per Cent Price Reduction

DETROIT, MICH., Sept. 11—A reduction of 50 per cent from the list prices on all its batteries has been made by the Detroit Battery Co. At the same time a new policy of a fixed retail price, quoting on each battery one price only from which there will be no deviation, has been inaugurated.

As an illustration of some of the reductions it might be mentioned that the price of the standard 6-volt, 80 battery which was $33 is now $16.50; the 6-volt, 100 battery which listed at $39 is now sold at $19.50; the 6-volt, 120 which cost $43 now sells at $21.50.

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Allen Motor Co. Elects Officers

FOSTORIA, OHIO, Sept. 10—The annual stockholders' meeting of the Allen Motor Co. was held Tuesday in this city. The following officers were elected: President, E. W. Allen; first vice-president, G. H. Baker; second vice-president and sales manager, J. E. Wright; W. O. Allen, treasurer and general manager; A. E. Wyant, secretary; L. A. Sommer, general superintendent of factories. The officers reported that a "liberal dividend from the profits of 1916," had been declared. The company announces that it will build 10,000 cars in 1916.

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Morton Truck Capital Increased

HARRISBURG, PA., Sept. 9—The Morton Truck & Tractor Co., this city, has increased its capital from $100,000 to $1,000,000. The actual increase notice, filed with the Secretary of the Commonwealth, however, was from $100,000 to $420,000. The company is busy on tractor orders from the Russian Government.

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Pope Creditors to Receive a 38½ per Cent Dividend

BOSTON, MASS., Sept. 8—The receivers of the Pope Mfg. Co. were ordered by Judge Dodge in the U. S. District Court

to distribute a dividend of 38½ per cent among the creditors. The total available for this purpose and for the expenses of the receivership amounts to $722,095. The court allowed $67,500 to be paid the receivers as compensation, including counsel fees. Col. George Pope and C. A. Persons, two of the receivers, were discharged at their own request. The third receiver, C. A. Morse, has been retained to settle three disputed claims amounting to $20,000.

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Reo Pays Extra Dividend of 12½ Per Cent

LANSING, MICH., Sept. 8.—In addition to the regular quarterly dividend of 2½ per cent, the Reo Motor Car Co. will pay an extra cash dividend of 12½ per cent Oct. 1, to stockholders of record Sept. 30.

The stockholders of the Reo Motor Truck Co. will be paid a cash dividend of 10 per cent on the same date.

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Regular Dividends

Rubber Goods Mfg. Co., New York City: Quarterly of 1¾ per cent on preferred, payable Sept. 15.

J. I. Case Co.: Quarterly preferred of 1¾ per cent, payable Oct. 1.

Gray & Davis, Boston, Mass., quarterly of 1¾ per cent on preferred, payable Oct. 1.

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500 Scripps-Booths for Paris

NEW YORK CITY, Sept. 14—Peters & Sons, Ltd., Paris, France, have placed an order for 500 Scripps-Booth cars.

Securities Market Strong

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Kelly-Springfield Features Market—Goodyear Also Makes High Mark

NEW YORK CITY, Sept. 13—Tire issues last week featured the market with many notable gains. The heaviest gain occurred on Friday when Kelly-Springfield second preferred rose fifteen points and that of the common rose nine points. Goodyear common followed closely behind with a gain of fourteen points. The rest of the tire issues showed small losses. Among the specialties General Motors made a high record on Saturday when it rose fourteen points above last week's rating. Peerless common's closing bid was 127, seven points above last week. The rest of the stocks were irregular, although the tone of speculation in the main was weaker. However, the weakness was prominent in the specialties, some of which suffered losses. The market was active and the dealings were fairly well diversified.

Detroit Quotations Weak

Although General Motors common was the feature of the Detroit markets with a gain of nineteen points and the preferred with a gain of two and one-half points, there was very little trading. Studebaker common closed at 114, a total gain of five and one-half points, while its preferred rose one and one-half points. The rest of the active stocks closed with small losses, ranging from one-half to three and one-quarter points. The inactive stocks were irregular, no gains taking place. There were two losses, Atlas Drop Forge dropping two and one-half points and the W. K. Prudden stock one-quarter point. There was no trading in the bond market.

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Gilbert Gibney Tire Vice-President and Sales Director

CONSHOHOCKEN, PA., Sept. 10.—J. M. Gilbert was elected vice-president and director of sales of the Gibney Tire and Rubber Co., this city, at a special stockholders' meeting of the company held in Philadelphia, Sept. 7.

Mr. Gilbert, who takes over a substantial stock interest, will direct the entire sales of the company, under the advisory guide of President J. L. Gibney. His offices will be in New York City, where the whole Gibney sales organization will have its center.

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Duck with United Truck

NEW YORK CITY, Sept. 13—George H. Duck, former president of the Motor Truck Club of America, Inc., and for about a year with the Sewell Cushion Wheel Co., Detroit, Mich., has just been appointed general sales manager of the United Motor Truck Co., Grand Rapids, Mich. Mr. Duck will establish his headquarters at the United plant in Grand Rapids. Before joining the Sewell organization, he was the manager of the motor truck department of the New York City branch of the Locomobile Co. of America, Bridgeport, Conn.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			102	..	..
J. I. Case pfd			75	81	+3
Chalmers Motor Company com			105	..	+10
Chalmers Motor Company pfd			95	100	..
Electric Storage Battery Co			70	74	—5
Firestone Tire & Rubber Co. com			530	535	..
Firestone Tire & Rubber Co. pfd			111	..	..
General Motors Co. com			255	256	+14
General Motors Co. pfd			113	115	+1
B. F. Goodrich Co. com			61	63	— ¼
B. F. Goodrich Co. pfd			106	108	—1
Goodyear Tire & Rubber Co. com			284	288	+14
Goodyear Tire & Rubber Co. pfd			108½	109½	+ ½
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			27	30	—3
International Motor Co. pfd			56	58	—4
Kelly-Springfield Tire Co. com			204	206½	+9
Kelly-Springfield Tire Co. 1st pfd			89	91	+3
Kelly-Springfield Tire Co. 2d pfd			200	210	+15
Paige-Detroit Motor Car			..	450	..
Maxwell Motor Co. com			42	43	—1
Maxwell Motor Co. 1st pfd			86	87	—4
Maxwell Motor Co. 2d pfd			36	38	— ¾
Miller Rubber Co. com			190	194	..
Miller Rubber Co. pfd			107½	..	..
New Departure Mfg. Co. com			153	155	..
New Departure Mfg. Co. pfd			107	..	..
Packard Motor Car Co. com			120	130	..
Packard Motor Car Co. pfd			100	..	—1½
Peerless Motor Car Co. com			127	140	+7
Peerless Motor Car Co. pfd			93	94	+3
Regal Motor Car Co. pfd			..	21	..
Portage Rubber Co. com			46	48	..
Portage Rubber Co. pfd			93	94	..
*Reo Motor Truck Co			17½	17¾	+ ½
*Reo Motor Car Co			32	33½	+ ½
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp. com			65	66	+1
Stewart-Warner Speed. Corp. pfd			105	107	..
Studebaker Corporation com			114	116	+3
Studebaker Corporation pfd			105	106	+1
Swinehart Tire & Rubber Co			88	90	..
Texas Company			150	154	+1
U. S. Rubber Co. com			48¾	50	— ¼
U. S. Rubber Co. 1st pfd			103⅞	105	— ⅛
Vacuum Oil Co			228	232	—2
White Co. pfd			110	..	..
Willys-Overland Co. com			187	189	+5
Willys-Overland Co. pfd			107½	108	..

No quotations available on account of the war.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	98	103	..	+4
Chalmers Motor Co. pfd	..	..	95	97	..
Continental Motor Co. com	155	180	..	300	..
Continental Motor Co. pfd	..	75	84	..	..
General Motors Co. com	..	..	259	263	+19
General Motors Co. pfd	..	..	114	116	+2½
Maxwell Motor Co. com	9¼	11¼	42	44	—1
Maxwell Motor Co. 1st pfd	29	31	86	89	—3¼
Maxwell Motor Co. 2d pfd	..	..	36	39	— ¾
Packard Motor Car Co. com	..	..	120	130	..
Packard Motor Car Co. pfd	92	..	100	101	..
Paige-Detroit Motor Car Co	..	..	..	450	..
*Reo Motor Car Co	20½	..	33	33¾	— ¼
*Reo Motor Truck Co	..	11½	16¾	17½	— ¼
Studebaker Corporation com	..	..	114	116	+5½
Studebaker Corporation pfd	..	..	104	107	+1½

INACTIVE STOCKS

*Atlas Drop Forge Co	21	..	29	31	—2½
Ford Motor Co. of Canada	..	500	..	1525	..
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	20½	22	— ¼
Regal Motor Car Co. pfd	25	..	..	21	..

BONDS

General Motors, notes, 6s, 1915	..	100	..	..	..
Packard Motor Co., notes, 5s, 1916	..	..	99	..	..

*Par value $10; all others $100 par value.

21 Entries for Narragansett

Will Hold Elimination Trials —100-Mile Race Scheduled —$11,000 in Prizes

PROVIDENCE, R. I., Sept. 13.—To date twenty-one drivers have officially entered for the opening races on the 1-mile asphalt speedway at Narragansett Park, Saturday, Sept. 18. Both Babcock and Walter are endeavoring to make post entries with Peugeots. As only fourteen cars can start, it will be necessary to hold elimination trials.

There are three events, namely: 1-hr. motorcycle race; 25-mile automobile free-for-all and a 100-mile for cars for 450 cu. in. displacement. The prizes amount to $11,000. Frank Lowry is starter.

DRIVER	CAR
De Palma	Stutz
Rickenbacher	Maxwell
Burman	Peugeot
G. Bergdoll	Erwin Special
E. Bergdoll	Erwin Special
Vail	Mulford Special
Haupt	Duesenberg
O'Donnell	Duesenberg.
Henderson	Duesenberg
Dickinson	Stutz
Alley	Ogren Special
Jessop	Chevrolet
Sartori	Mercedes
Connery	National
Myers	National
Sorreco	Stutz
Lecain	Pugh Bros. Special
Grant	Sunbeam
C. Basle	Bugatti
Jones	Peugeot
Mulford	Peugeot

Denver Run Is Called Off

DENVER, COL., Sept. 11—After being postponed twice on account of recent obstacles, the 860-mile economy and reliability run scheduled to start from Denver through the Colorado Rockies Sept. 6, was finally called off last night. The starting date was first changed to the 7th on account of Labor Day events, and then to the 12th on account of delayed entries. Now the difficulty on part of nearly all the dealers to get cars from the factories is continuing to such an extent that Charles F. Roehrig, promoter of the tour, believes it best to postpone the run until next season.

Golden Rule Traffic Booklet

CHICAGO, ILL., Sept. 13—Called the Golden Rule Traffic Booklet by the superintendent of the Chicago police department, a small folder entitled, Some Traffic Suggestions, published by the Chicago Section of the Electric Vehicle Assn. of America, earns its appellation because it admonishes motor vehicle drivers to show a little more consideration for the other fellow. It also points out that it seemed to be the disposition of drivers of electric vehicles to cling to the crown of the road whether going slow or fast, thereby impeding traffic, due to the idea that it is necessary to keep an electric vehicle on the level to prevent acid in the battery cells from spilling.

It further points out that there is no danger from that condition when driving on the very slight incline found at the side of any Chicago streets and that the obvious course of a slow-moving electric should be along the curb, leaving the center to those who wish to drive at a higher speed.

Corona 300-Mile Race Is Postponed Until Christmas

CORONA, CAL., Sept. 8—The Corona 300-mile road race, scheduled for Nov. 20, will not be held on that date, but very probably on Christmas Day.

The three main roads into Corona will be under reconstruction on Nov. 20 and also there is to be a 150-mile track race at Phoenix, Ariz., on that date, which the Corona boosters did not want to conflict with. Members of the racing committee which is to handle the Corona classic this year waited upon the members of the Corona Board of Trustees yesterday and were informed that that body would grant a permit for the race if enough stars of the racing game were gathered together to make the race a big league attraction; but it was positively stated that the roads would be in no condition for a great race on Nov. 20.

Contracts Out for K. C. Speedway

KANSAS CITY, MO., Sept. 10—Contracts are now being signed for the building of an automobile speedway at Overland Park, on the Strang Electric Interurban near Kansas City. The Mid-Continent Exposition Club, which was organized several months ago for the purpose of building clubhouses and exposition quarters at Overland, has confined its enterprise solely to the speedway for the present. Dates will be scheduled for June, and fall dates will be secured. The speedway will be ready by the last of May, 1916. Wm. Huttig, president of the National Reserve Bank; W. B. Strang, of the Interurban line, and Frank Ufer, wealthy oil man, are the leaders in the speedway project.

New Traffic Rule in Boston

BOSTON, MASS., Sept. 13—Boston motorists are now faced with another problem, that of stopping machines every time a street car stops. The Board of Street Commissioners got a notion that it would be a good thing to have an additional traffic regulation added to its rules and so it evolved one that says that every motor car approaching a street car that has stopped to take on or let off passengers must come to a stop.

Resta to Try for Record

Sheepshead Opening Will Mark Attempt at Own 10-Mile Mark of 5:45

NEW YORK CITY, Sept. 15—The formal opening of the Sheepshead Bay Speedway, which takes place Sept. 18, will mark an attempt by Resta in a Peugeot at his own 10-mile record of 5:45, an average of 104.35 m.p.h., made at Chicago on Aug. 12, 1915, in the challenge race which he won.

Resta's trial will come as the climax to the formal opening of practice on the speedway. Prior to the practice there will be an automobile parade starting from Columbus Circle and proceeding to the speedway.

Mercer Stars at Wilmington Fair

WILMINGTON, DEL., Sept. 10—The four automobile events staged on the dirt track at Wilmington, in connection with the Delaware State Fair, to-night, gave the laurels in each case to Roy Freck, who drove a Mercer. Other events were canceled owing to a serious accident to R. O. Bacon, whose Renault threw a tire and overturned in the 3-mile event. The summaries:

First event—One mile: Won by Roy Freck, Mercer; second, W. Craig, Regal; third, J. Whitaker, Detamble. Time, 1.15.

Second event—Trials, one mile: Won by Freck; second, Kuser, Renault. Time, 1.24 2-5.

Third event—Five miles, free-for-all: Won by Freck; second, Whitaker. Time, 8.52.

Fourth event—Pursuit race: Won by Freck. Time, 10.9 1-5. Time limit here was 15 min.

Brookmire Elected Treasurer of Pierce Oil Corp.

ST. LOUIS, MO., Sept. 11—Announcement was made here to-day that James H. Brookmire of this city has been elected treasurer of the Pierce Oil Corp. to succeed D. G. Boissevain of New York City. Mr. Brookmire will close his connections with a local brokerage firm of which he is a member as soon as possible and will establish an office under his new title in St. Louis.

Though not a member of the Board of Directors, he will be on the Operating Committee and will have virtual charge of the financial affairs of an oil corporation second in magnitude only to the Standard Oil Co. Mr. Brookmire has had the offer under advisement for two months and accepted the post during a recent visit to New York.

Federal Owners' Contest Closed

DETROIT, MICH., Sept. 13—The contest started some months ago by the Federal Motor Truck Co. of this city among the owners of Federal trucks for the fifteen

best answers to the question, Why I Bought a Federal has been brought to a close and the cash prizes of $300 paid, although the names of the winners have not as yet been announced. The requirements of a motor truck from the user's standpoint as brought out in the hundreds of answers received were as follows: Simplicity in design; economy, not cheapness, in initial price; economy in upkeep and repairs; the reputation of the truck in all lines of work and the stability of the truck manufacturing concern.

In addition to the $300 awarded in cash prizes, every owner who entered the contest was present with a gold-plated Federal watch chain.

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Milwaukee Independent Issue Price Classifications

MILWAUKEE, WIS., Sept. 10—Independent gasoline marketers in Milwaukee have taken cognizance of the necessity for new price classifications to accommodate large consumers as against motorists getting small supplies at filling stations for practically the same prices. Filling stations dot the city. While the new classification does not increase the price to the small consumer, the large consumer is benefited by a decided reduction. The new classification and quotations now prevailing are:

Gravity	Filling Station, Any Quantity	Tank Wagon Delivery	Tank Wagon Delivery, 100 Gal. or More
60.....	10.5c	9.6c	8.6c
65.....	14.0c	13.5c	12.5c
70.....	16.0c	15.5c	14.5c
72.....	18.0c	17.5c	16.5c

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Ford System Denounced at Milwaukee Convention

MILWAUKEE, WIS., Sept. 12—The Ford Motor Co.'s $5-a-day minimum wage plan was denounced at the third biennial convention of the International Wagon, Carriage and Automobile Workers' Union, held in Milwaukee, Sept. 7-11.

The convention went on record as opposing the piecework system and in favor of a strict 8-hr. day. The rule in the trades represented by the union is piecework and a 10-hr. day.

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Rumely Changes Name

LA PORTE, IND., Sept. 8.—Advance Rumely Co. is the name selected by the Rumely corporation for use under the reorganization according to an announcement.

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N. A. C. C. to Issue Handbook

NEW YORK CITY, Sept. 14—The annual hand book of the products of the ninety-seven companies holding membership in the National Automobile Chamber of Commerce, Inc., to cover the 1916 models will be issued at show time.

2-Mile Speedway for New Orleans

300 Acres 4 Miles from City Secured — $300,000 Board Track

CHICAGO, ILL., Sept. 14—New Orleans, La., is assured of a 2-mile board track and an option has been closed on 300 acres of land four miles from the heart of the city.

It is estimated that the plant will cost $300,000. The low cost is possible because wood native to Louisiana will be used. The track will be built of cypress and the stands and other buildings of yellow pine. The three men most interested in the project are R. Brennison, prominently identified with New Orleans horse racing; George Sarpy, a New Orleans insurance man; and C. J. Dunbar, a wealthy timber owner of Vancouver, B. C.

They probably will finance the undertaking. They have asked D. B. Reid, president, of the Chicago Speedway, to take the presidency of the Association and direct the construction of the plant.

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Olds Supplies Cold Weather Combination Top

LANSING, MICH., Sept. 11—As a substitute for the conventional winter limousine the Olds Motor Works are supplying dealers with a cold weather top which is so constructed that in the summer the side sills and windows can be removed, thus leaving the sides entirely open. The standard windshield remains in its place and serves as a rigid front support for the top. A glass shield is mounted on the front of the top above the windshield in such a way that it prevents the windshield from becoming coated with snow.

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Chalmers Employees Are Entertained by Humphrey

DETROIT, MICH., Sept. 11—Between 120 and 130 heads of departments, their assistants, foremen and others all employed by the Chalmers Motor Co. were entertained at a get-together dinner and entertainment at the Hotel Tuller, to-night, by S. H. Humphrey, vice-president and works manager of the Chalmers company.

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Denver Garage Bill Passed

DENVER, COL., Sept. 10—The bill requiring garages to pay a yearly license fee of $25 was passed at this week's meeting of the city council. There was no opposition from the garagemen after the Automobile Trades Association succeeded in having the amount of the fee reduced from $50 to $25. The new ordinance will affect sixty or more public garages.

A companion measure to permit garages to install curb pumps within certain districts by paying a license fee of $25 a year for each pump, was brought up for consideration but was referred to the city attorney for further advice. The bill is expected to pass.

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To Build Combination Air Compressor and Starter

BALTIMORE, MD., Sept. 11—A combination air compressor and starter has been invented in the shop of the Auto Air Appliance Co., Industrial Building, this city, by C. G. Eidson and Thomas Davis. The inventors say it has been tested thoroughly and is successful. It is to be put on the market later.

The compressor and starter are cast in one piece and a chain connects the clutch of the compressor with the crankshaft of the automobile. Upon pressing a small button the compressed air is released and starts the chain turning. This, in turn, starts the engine of the car. The air also can be used for pumping up the tires.

When 250 lb. pressure is reached a governor valve prevents the further compressure of air. When the pressure gets below 200 lb. the valve again regulates the compressure. The device is about 17 in. long and 9 in. high.

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Packard Grants Bonus to Employees in Military Service

DETROIT, MICH., Sept. 9—At a meeting of the board of directors of the Packard Motor Car Co. a resolution was passed to the effect that any one of the 9300 Packard employees shall be granted leave of absence at any time he is eligible to take part in any military instruction, national guard encampment or national reserve cruise. It was further provided that during the time of his absence the employee shall also be credited with his full pay and that the time for military instruction shall not be deducted from his regular vacation period.

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Lockout of Rutenber Founders

INDIANAPOLIS, IND., Sept. 11 — Hurry-up arrangements have been made by the Rutenber Motor Co., Marion, Ind. for Indianapolis foundries, including the American Foundry Co. to produce castings for Rutenber motors. At the Logansport, Ind., foundry of the Rutenber company, labor troubles have paralyzed the plant. Owing to disputes over piecework rates followed by a lockout of 200 coremakers and molders, the Logansport plant, which is devoted to castings entirely, had to be shut down. To keep the Marion machine, forging and assembly shops busy, outside help has been enlisted to supply castings.

Over 125,000 at Hoosier Fall Show

25 Per Cent of State Fair Visitors Attended Because of Car Exhibit

INDIANAPOLIS, IND., Sept. 14—The automobile show which closed here Saturday and which was held under the auspices of the Indianapolis Automobile Trade Association in connection with the State Fair, was the most successful of any automobile show or exhibit ever held in Indianapolis. Although no admission was charged, therefor, no system could be obtained that would give an actual check on the attendance, it was estimated that over 125,000 visitors attended the show, and that fully 25 per cent of the State Fair visitors attended particularly on account of the automobile display. That this year's attendance at the State Fair exceeded all previous years is directly attributed to the credit of the automobile show, according to State Fair officials.

Never before have so many State Fair visitors driven to Indianapolis in automobiles. This was evidenced by the large number of out-of-town cars seen on the streets each night.

Want Exhibit Building

Officials of the trade association believe that if an exhibit like the one just closed can be given with such tremendous success in a tent, that it is fair to assume that even better records can be made if the State Fair Association would provide a pavilion or building suitable and in keeping with the high character of an automobile display.

The value of the automobile exhibit totaled more than $130,000, and such a display, it has been argued, is entitled to a better setting than a canvas enclosure. Practically all the dealers in Indianapolis exhibited at the Fair, thus the show was a decided benefit to automobile buyers. It gave them an opportunity to see all the new cars—to compare values—to learn of the improvements that manufacturers have been making during the present year. Much business was done at the show both in the complete car and the accessory line.

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Twenty-Three Makes of Cars at Toledo Fair

TOLEDO, OHIO, Sept. 10—One of the features of the annual Lucas County Fair, held at Toledo the week of Sept. 6 was the display of both pleasure and commercial motor vehicles. The number of cars displayed was large and many of the makes were represented. The cars were displayed under a tent. The dealers taking part in the display were: Blevens Auto Sales Co., Studebaker; Cornelius-Browning Auto Co., Chalmers and Inter-State; Atwood Automobile Co., Overland; Abbott Motor Sales Co., Abbott and Allen; Roberts-Toledo Automobile Co., Ford; Lichtie Auto Co., Chandler; Paige-Toledo Co., Paige; Landman-Griffith Co., Maxwell; Gamble Motor Car Co., Hudson and Dort; Toledo-Saxon Co., Saxon; Bunnell Auto Sales Co., Chevrolet and Kissel; H. W. Lancashire, Dodge; United Garage Co., Reo; Auto Distributing Co., Regal; King Motor Sales Co., King; Elon Gauntlett, Buick; H. E. Throne, Mitchell; G. E. Grant Auto Sales Co., Oldsmobile and Argo.

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Eighteen Cars Exhibited at Worcester Show

WORCESTER, MASS., Sept. 11.—One of the most successful open air shows ever held in New England ended here when the New England fair closed this week. The exhibition was very well patronized, and it was a much better show than had ever been put on here, there being about forty-five vehicles displayed.

Those who exhibited comprised J. W. Sargent, Maxwell; Henshaw Motor Co., Dodge; O. P. Tyler, Stanley; Paige Motor Car Co., Paige-Detroit and Saxon; Harry J. Murch, Cadillac; Henley-Kimball Co., Hudson; F. S. Howard Motor Car Co., Chevrolet and Mitchell; F. H. Kenney, Chalmers; Harry Boland, Hupmobile; Metz Motor Car Co., Metz; Green & Hale, Jackson and Oakland; J. F. Brosnahan, Chandler; Thorvald Hanson, Cole; J. C. Harvey, Haynes; New England Truck Co., Netco truck.

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Louisville Trade Association Formed

LOUISVILLE, KY., Sept. 9—Articles of incorporation have been filed in the office of the Jefferson county clerk by the Automobile Trade Association. The object of the association is to bring together in social intercourse the members of the trade in Louisville, to promote betterment of trade conditions, the introduction of new methods in business, the correction of abuses and the conservation of the automobile trade. The corporation has no capital stock and is not authorized to incur any indebtedness, but is authorized to create a fund from membership fees. The incorporators and officers are: W. A. Thomas, president; R. E. Warner, vice-president; A. F. Wolke, secretary, and J. W. G. Hughes, treasurer.

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Error in Hollier Advertisement

NEW YORK CITY, Sept. 13.—In THE AUTOMOBILE for Sept. 9 appeared an advertisement of the Hollier eight made by the Lewis Spring & Axle Co., Detroit, Mich., which stated that the size of the motor is 3 by 3¼ in. This should have been 3 by 4¼ in. In a description of the Hollier eight roadster it was stated that the size of the tires was 33 by 3½ in. This should have been 32 by 3½ in.

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Daly and Beyerline Form Co.—To Act as Agents

DETROIT, MICH., Sept. 13—The firm of Daly & Co. has been formed by W. L. Daly and J. G. Beyerline, with headquarters in the Hammond building to act as manufacturers and distributors' agents, also as special automobile advisors on commercial matters. Mr. Beyerline has been in the automobile business for the past thirteen years, being president and general manager of the King Motor Car Co. during the last three years. Mr. Daly was sales manager of the King company.

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Export House Appoints New Heads of Far Eastern Division

NEW YORK CITY, Sept. 10.—Gaston, Williams & Wigmore, New York City, doing a large export business in automobiles and trucks, announces that its Far Eastern Division, organized and equipped to develop markets for America's industries, will hereafter be in charge of J. J. Keegan and H. J. Rosencrantz as its managing directors. These two men have been prominently identified with American trade development in that section of the world for the past sixteen years, representing American manufacturers.

F. J. Rown of Racine, Wis., former State manager of the Mitchell-Lewis Co. for Texas, also eastern district manager for the American Motor Car Co., sailed on the New York, Aug. 11 for Liverpool, to represent Gaston, Williams & Wigmore as managing director for their automobile department in the British Isles. His address will be Alexandria House, London.

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Five Electric Vehicles at Show

NEW YORK CITY, Sept. 13—Five electric vehicle manufacturers, of which three are makers of commercial models, will exhibit at the Electrical Exposition and Motor Show to be held at the Grand Central Palace here Oct. 6 to 16 and several makers of electric vehicle parts and accessories.

The U. S. Army will also exhibit field radio sets and one of its wireless telegraph gasoline tractors. Electric vehicle exhibitors so far alloted space follow:

Anderson Electric Car Co., General Vehicle Co., Baker-R. & L. Co., Ward Motor Vehicle Co. Accessory makers are: Philadelphia Storage Battery Co., Edison Storage Battery Co., Electric Storage Battery Co., Cooper Hewitt Electric Co., Westinghouse Electric & Mfg. Co., General Electric Co. and H. W. Johns-Manville Co.

Factory Miscellany

Waukesha Motor Adding—The Waukesha Motor Co., Waukesha, Wis., is adding. The former building will be remodeled for a machine shop.

Piston Ring Co. to Build—The Piston Ring Co., Muskegon Heights, Mich., has purchased adjoining property and will build an addition to its plant.

Foster Gear to Add—The Foster Gear Co., manufacturer of automobile steering gears, will build an addition to its plant on Kaiser Street, Columbus, Ohio.

Twin City Truck's Large Addition—The Twin City Four-Wheel Drive Co., Minneapolis, Minn., is having plans prepared for a plant to cost about $500,000.

Michigan Crown Fender in Ypsilanti.—The Michigan Crown Fender Co., maker of automobile fenders and metal stampings, is to locate at Ypsilanti, Mich., and will occupy a building 80 by 400 ft., to be erected for it.

Steerautomat Co. Doubles Capacity—The Steerautomat Co., Beloit, Wis., manufacturing auxiliary steering devices for Ford cars, is doubling the capacity of its shop established several months ago.

To Make Dimmers—The Shade-O-Lite Co., Indianapolis, has been incorporated with $25,000 capital stock to manufacture automobile searchlight dimming devices. The directors are F. W. Beauchamp. C. H. Thompson and R. F. Davidson.

To Make Fenders—The Clayton & Lambert Mfg. Co., Detroit, Mich., maker of plumbers' firepots, torches, etc., has added to its business a department for the production of automobile fenders, drip-pans and other stamped sheet metal work.

To Make License Tags—The Abbott Stamping Co., Detroit, has been organized by C. S. Abbott, B. B. Bennett and F. B. Borlean to manufacture automobile license tags. The new company has acquired a factory and has installed modern stamping and enameling equipment.

To Make Carbureters—The factory building at 314-316 East Water Street, Milwaukee, has been purchased by W. G. and E. R. Spence, officials of the Rundle-Spence Mfg. Co., Milwaukee, who recently incorporated the Turbo Motor Devices Co., to manufacture carbureters and other devices for internal combustion engines. The building will be remodeled for use at once.

Hayes Takes Over St. Johns Plant—The old plant of the St. Johns Table Co., St. Johns, Mich., has been taken over by the Hayes Wheel Co., Jackson, Mich., which is now installing machinery. Truck wheels will be made and from fifty to seventy-five men will be employed. H. J. Keller, formerly superintendent of the Auto Wheel Co., Lansing, is with the company in a similar position.

Hudson-Stuyvesant to Lease—The Hudson-Stuyvesant Motor Co., Frank Stuyvesant, president, 1914 Euclid Avenue, has increased its capital stock from $25,000 to $50,000 preparatory to taking a lease on two buildings to be erected at 2002 Euclid Avenue, Cleveland. The buildings will be three-story, brick and steel, 45 by 100 ft., and one-story, 45 by 89 ft., brick and steel. They will cost about $50,000.

Falls Making Plant Changes—The Falls Machine Co., Sheboygan Falls, Wis., manufacturing internal combustion engines and specializing in automobile motors, is making radical changes in its plant in addition to building a new assembling shop. The gray-iron foundry is being dismantled and converted into a machine shop. The company has taken contracts for delivering 12,000 engines by May 1 and as soon as changes and additions are completed, a night shift will be put on.

Milwaukee Die Casting Builds—The Milwaukee Die Casting Co., Home Building, Milwaukee, will soon take occupancy of permanent quarters of its own. A two-story brick factory and foundry is being erected for the concern on Fourth Street. It will be 60 by 60 ft. in size and equipped with the latest furnaces, molding machines and other up-to-date equipment. While the company is a large producer of die castings in aluminum, bronze, copper, brass and other metals, it devotes considerable attention to babbitt bearings for internal combustion engines.

Moon Australian Agent Visits Factory—George Duffy, agent for the Moon in Sidney, Australia, is spending a few weeks in the Moon factory in St. Louis.

The Automobile Calendar

Sept. 13-17.....Milwaukee, Wis., Show, Automobile Dealers' Assn.
Sept. 13-17.....Oakland, Cal., Pan-American Road Congress.
Sept. 17-18.....Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18.....Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Sept. 18-25.....Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Sept. 22.....New York City, Booster's Outing to Smithtown.
Sept. 22-25.....Rockford, Ill., Show.
Sept. 24.....Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 26-Oct. 10...Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Sept. 27-Oct. 2....Salem, Ore., Show, State Fair.
Oct.....Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2.....Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway 350-Mile Race.
Oct. 2.....Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9.....Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 4-10.....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6.....Columbus, O., Garage Owners Convention.
Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9.....Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14.....Chicago, S. A. E. Standards Committee Meeting.
Oct. 16.....Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 17.....Twin City Speedway Match Race.
Oct. 18-19.....Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Oct. 18-24.....Troy, N. Y., Show, State Armory, Troy Automobile Dealer's Assn.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 31.....New York City, Show; Grand Central Palace.
Jan. 8-15.....Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22, 1916.....Chicago, Ill., Show; Coliseum.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb.....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 19.....Newark, N. J., Show.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

New Beech Creek Plant—Beech Creek Auto Co., Beech Creek, Pa., G. H. Tibbons, secretary, has plans for a $25,000, two-story, automobile factory.

Mohawk Starts Third Annex—Before the masonry of the second addition this year to the plant of the Mohawk Rubber Co., Akron, Ohio, is scarcely above the ground, work has been started on a third annex.

Apperson Starts Addition—It is announced by the Apperson Bros. Automobile Co., Kokomo, Ind., that work on an addition to one of its plants has been started. This will give the company an additional 150,000 ft. floorspace.

Purair Tire Pump Co. Moves—The Hert Mfg. Co., Indianapolis, Ind., maker of the Purair tire pump, has removed from 150 South Delaware Street to its new building, corner Noble & Market Streets, where additional equipment has been installed and production capacity largely increased.

Remy Entertains Employees—One thousand five hundred employees of the Remy Electric Co., their families and friends, a total of nearly 5000 persons, were entertained with a lawn party and dance at the factory of the Remy company at Anderson, Ind., Friday night of last week. There was a continuous procession of persons passing through the factory, which was open for inspection.

Perfection Tire Plant Progressing—The plant of the Perfection Tire & Rubber Co., Fort Madison, Iowa, is progressing. The steel workers are now erecting the skeleton of the main factories and some smaller buildings have been completed. The labor required when the factory is in operation will approximate one man per tire. The company recently received a contract with an Eastern concern for 1000 tires per day for 5 years.

Dunlap Receivership Lifted—The receivership of the Dunlap Manufacturing Co., located at 1432 Parsons Avenue, Columbus, Ohio, maker of automobile parts, has been lifted and a new concern has been organized to run the business. For the time being the attention of the company will be devoted to the manufacture of machine tools. F. B. Chapman is president; H. N. Rose, secretary, and T. C. Dunlap, general manager. Howard Park was receiver.

Wheel Plant for Anderson—Negotiations were practically closed Saturday for locating in Anderson, Ind., an automobile wheel factory by the Hayes Bros., Jackson, Mich., who also have a factory in Michigan. The Anderson plant will occupy a two-story building owned by the Pioneer Pole & Shaft Co. and it was stated that the new factory will employ from 800 to 1200 men. The output of the factory, it is said, will be 25,000 sets of automobile wheels per month.

Equipping Syracuse Differential Plant—The Brown-Lipe-Chapin Co. is equipping the Lipe Model Works in Syracuse, N. Y., with special machinery for making M. & S. differential gears exclusively. In addition to taking care of the demand from the manufacturer, this plant will be used also for making the M. & S. differential special type for Ford cars, though the Ford replacement sales will continue to be handled by the M. & S. Gear Co., 1036 David Whitney Bldg., Detroit.

Sterling Wheel Erects Plant—The Sterling Wheel Co., 245 Oregon Street, Milwaukee, which recently changed its corporate style from T. S. Wheel & Mfg. Co., is erecting a plant of its own at Eighth and Oklahoma Avenues, Milwaukee, to be ready about Sept. 15 or Oct. 1. The company operates a large machine shop, specializing in parts for motor car and engine builders, in addition to building the Sterling steel wheel, a flexible device employing solid tires and suitable for all grades of pleasure cars as well as trucks.

Johns-Manville Moves General Offices—The H. W. Johns-Manville Co., Milwaukee, Wis., has moved its general offices from Milwaukee to Chicago because of the large growth of its business in the Middle West, which requires administrative facilities such as Chicago only can afford. The company operates two large works in Milwaukee, and the change will not affect these operations. T. T. Lyman, general manager, goes to Chicago, and the Milwaukee plants will temporarily be in charge of President C. B. Manville.

American Metal Products Busy—The American Metal Products Co., Milwaukee, Wis., which recently announced a new product called Ampco bronze, claimed to have the strength of steel, with much less weight, is producing the new metal in large quantities for high-speed bearings, particularly motor car engines. The company has appointed 25 Milwaukee garages and service stations as agents and is making bearings for connecting rods, crankshafts, transmissions and wherever plain bearings are used for general repair work.

Empire in New Plant—In the new factory of the Empire Automobile Co., Indianapolis, Ind., now are centered the administration and manufacturing interests of the company, the general offices having been moved to the new plant during the past week. At present the six-cylinder model is being built in the local plant. The type made its first public appearance at the State Fair Auto Show during the past week. The new quarters in addition to giving excellent car building facilities afford greatly enlarged accommodations for executive and sales offices.

To Build Electric Steel Plant—The demand from manufacturers of high-grade motor vehicles for electric steel and the growing use of this material in other lines has induced the Belle City Malleable Iron Co., Racine, Wis., to establish an electric steel plant in connection with its malleable foundries. Ground will be broken at once for a new foundry, 80 by 160 ft. in size and 30 ft. high, costing $125,000 with equipment. One of the furnaces alone will cost $25,000. The plant is to be ready by the end of the year and will employ 250 experts, giving the Belle City company a force of more than 600 workmen.

Rutenber's Four New Buildings—The Rutenber Motor Co., Marion, Ind., is just completing the construction of four new buildings at the main plant at Marion, which increases its floor space some 25,000 ft., this being about a 25 per cent increase of floor space over the original plant. It has added a large battery of automatic screw machines, multiple spindle drill presses, turret lathes, etc., to manufacture the smaller parts. The annual output has been increased from 12,000 to approximately 18,000 motors. The company has cancelled all European orders and has abandoned its London agency.

Firestone Makes Big Additions—Five additions to the factory of the Firestone Tire & Rubber Co. at Akron, Ohio, aggregating over 300,000 sq. ft., or 7 acres of floorspace, are at present well under way and will no doubt be completed before snow flies. These additions will be occupied by offices, tire-making machinery and by rooms for the many processes of the industry. Through these new additions the present output of 7500 tires daily will be increased to 12,000 per day, an increase of 60 per cent. Besides these extensive additions a commodious clubhouse for Firestone employees is being erected across the street from the factory. It will be ready for occupancy next spring.

New Steel Products Building—To accommodate an increase in production in its automobile springs department, the Detroit Steel Products Co., Detroit, Mich., will erect a new building, which will add approximately 15,000 sq. ft. to its present floor space. Work on the new building will start as soon as all the details of the plans are completed. This will be the third addition made to this department of the factory within a year. The building will conform in style to the type of the present buildings—sand-lime brick, concrete and steel construction with steel windows. The spring department has been rushed to capacity every month this year, three shifts of men having been employed even throughout the slack period a few months ago.

The Week in the Industry

Raynor with Herff-Brooks—R. B. Raynor has joined the Herff-Brooks Corp. to cover the Middle West, representing that company in Missouri, Illinois and Indiana.

Reason Adds Two Cars—George Reason, formerly manager of the local branch of the Cartercar Co. and who now operates the Reason Garage, 33 Charlotte Avenue, Detroit, Mich., has taken the agency for the Allen and Paterson cars.

P. E. Winslow Advanced—P. E. Winslow, who has been connected with the advertising department of the Hupp Motor Car Co. for the last eighteen months, has been appointed secretary to J. Walter Drake, president of the company.

Palmer Knight Tire Rep.—H. D. Palmer, formerly with the Globe Tire Co., Trenton, N. J., has been appointed district sales representative in New York State territory for the Knight Tire & Rubber Co. of New York, succeeding E. J. Coniff, resigned.

Moore Cleveland Mgr.—G. P. Moore, formerly prominently identified with the automobile industry in Pittsburgh, has been made manager of the Cleveland Motor Sales Co., 1628 Euclid Avenue, Cleveland, distributor for the Haynes and Hupmobile.

H. J. De Baer Has Assistant—M. C. Manship, who formerly made his headquarters at the Maxwell Motor Sales Corp. factory in Detroit, has been made assistant manager of the company's New York retail branch. He will assist H. J. De Baer, manager of the branch, in looking after local sales.

Lewis J. I. C. Mgr.—P. A. Lewis has been appointed manager of the Milwaukee branch of the J. I. Case T. M. Co., Racine, Wis. The branch, which devotes practically all of its attention to the sale of and service on Case cars, is located at 493 Broadway. Mr. Lewis was formerly associated with the Case branch at Madison, Wis.

Chase Takes Apperson—M. F. Chase, who has handled the Stutz in New England for some years until this season, has taken on the Apperson at retail and will market it from the former Stutz salesrooms on Boylston Street. This will not have any effect upon the selling of Appersons at wholesale in Boston by the Brown-Apperson Co.

Motor Men in New Roles

Stillson Portland Olds Mgr.—W. W. Stillson will manage the Oldsmobile Co. in Portland, Ore., with headquarters at 37-39 North Broadway.

de Catellane Sales Mgr.—A. de Catellane has been appointed sales manager of the Hainsworth Motor Co., Olds distributer at 1409-1413 Broadway, Seattle, Wash.

Coulson Baltimore Mgr.—A. D. Coulson will manage the recently formed Baltimore Buggy Top Co., Baltimore, Md., with quarters at 107 West Mount Royal Avenue.

Dant Heads Louisville Agency—G. W. Dant has been elected president of the Bywater-Ortner Motor Co., Louisville Studebaker dealer. N. W. Bywater is secretary.

Salman Hudson Export Rep.—The Hudson Motor Car Co., Detroit, Mich., is sending A. T. Salman as a special export representative to Australia, Asia and South Africa.

Aull Columbus Sales Mgr.—A. E. Aull has been appointed sales manager of the Central West Motor Car Co., Columbus, Ohio, handling the Oakland and Abbott-Detroit with offices at 80-82 Fourth Street. G. W. Carroll is general manager.

Sullivan Joins St. Louis Enger—J. J Sullivan, formerly of the Enger agency in the Chicago district, has been assigned to the Ottofy Motor Car Co., St. Louis, and will assist that firm in establishing subdealers for the Enger line in the St. Louis district.

Hazzard Hall Switch Mgr.—Besides being president of the Falcon Motor Truck Co., Detroit, Mich., A. B. Hazzard has also been appointed general works manager of the Hall Switch & Signal Co., Garwood, N. J. He will have charge of the manufacturing of parts for the Falcon and other companies.

Foote Joins St. Louis Co.—E. B. Foote, formerly with the Westinghouse company, has been appointed territory sales manager of the Newell Motor Car Co., St. Louis, which has just added the product of the Sun Motor Car Co. to its line. Mr. Foote will make his headquarteres at St. Louis and Memphis, Tenn.

Lindley Hardman Tire Branch Mgr.—H. P. Lindley, for four years a member of the Bart S. Adams Tire Co., St. Louis, has been appointed branch manager of the Chicago office of the Hardman Tire & Rubber Co., Belleville. E. J. Lindley will have charge of the sales in ten States. He will retain his interest in the Adams company.

Jackson Joins Maxwell Agency—C. G. Jackson, former manager of the United States Motor Co., Maxwell distributer in the St. Louis district, and previously zone supervisor for the Maxwell company, has joined the sales force of the George C. Brinkman Motor Car Co., which recently was given the Maxwell agency in the Missouri district.

Cosgrove Pullman Sales Mgr.—A. R. Cosgrove has been appointed sales manager of the Pullman Motor Car Co., York, Pa. Mr. Cosgrove has had wide experience in the selling of automobiles and accessories and up until his connection with the Pullman company was sales manager of the magnetic gear shift department of the Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Barthmaier Takes Agency—E. V. Barthmaier has resigned his position with O. S. Wilson, Studebaker dealer in Philadelphia, Pa., to take territory for the exclusive sale of that car at Norristown, Pa., and surrounding district. Temporary quarters have been established at 318 West Main Street during the construction of a salesroom and office building at Main and Chain Streets.

Clark Retires from Business—P. S. Clark, one of the veteran dealers at Providence, R. I., has retired from business and will devote his time to civil engineering and show matters. The Mitchell line that he has handled has gone to W. R. Richards, long associated with him as a salesman. Mr. Clark will have charge of the annual show of the Rhode Island Dealers' Assn., which takes place early in the winter.

Bull Assisting Crawford—A. A. Bull is an assistant to Charles S. Crawford, chief engineer of the Cole Motor Car Co., Indianapolis. Mr. Bull comes to the Cole company from the Northway Motor Manufacturing Co., Detroit, Mich. He had an extensive experience with the Humber, Ltd., of Great Britain. He was associated with the English branch of the Daimler company, the builders of the Mercedes car. In America he saw service with the Oldsmobile company, Lansing, and later the Northway organization, in Detroit. Mr. Bull is a graduate of the Institute of Automobile Engineers of Great Britain.

Enger in Bucyrus—F. J. Norton & Sons, Bucyrus, O., has taken the agency for the Enger car.

Gaulois Tires in Ottawa—The Ottawa Taxi & Auto Co., Ltd., Ottawa, Ont., represents the Gaulois tire in that city.

Little Rock Buick Builds—The Buick Auto Co., Little Rock, Ark., will construct a two-story garage at 1118 Main Street.

Beltzig a Manager—E. H. Beltzig has been appointed manager of the St. Louis branch of the Firestone Tire & Rubber Co., Akron, Ohio.

New Supply Co. for Utica—The Wood Auto Supply Co., Utica, N. Y., has been incorporated with a capital of $25,000, to deal in automobile accessories.

Smith in Charge—G. A. Smith has been appointed manager by the Ford Motor Co., of the service and repair departments of the Everyman's Car Co., Ottawa, Ont.

Gilmore Goes to New York—E. A. Gilmore, who had the Lewis and Allen cars in Boston for wholesale distribution in New England, has gone to New York to join the salesforce of the Carl H. Page Co.

Robinson in Charge—L. J. Robinson has been put in charge of the exchange department of the Union Garage Co., Chalmer agent in Washington, D. C. This department will act as a clearing house for used automobiles.

Knaus Portland Franklin Sales Mgr.—A. H. Knaus, who was southern California district sales manager of the Chalmers Motor Co., has become sales manager of the Braley Auto Co., Portland, Ore., handling Franklin cars.

Smith Joins Cleveland Co.—J. M. Smith, production expert, has joined the Cole-Cleveland Co., formerly the Richardson Motor Car Co., Cleveland, Ohio. He will inaugurate the new coupon service system.

Roberts Joins Edison—H. M. Roberts, until recently railroad representative of the General Lead Battery Co., has been appointed sales engineer of the railroad department of the Edison Storage Battery Co., Orange, N. J. Mr. Roberts' headquarters will be at the factory and main office at Orange, N. J.

Larson Heads Spokane Agency—D. N. Larson will manage the recently formed Foster-Larson Co., Spokane, Wash. This distributer will handle the Paige car. Newton Foster will continue to manage the Newton Foster Co., Seattle Paige distributor. Salesrooms and service station have been opened at 1218 Second Avenue, Spokane.

Wright Goes to Woods Electric—T. E. Wright, formerly in charge of agencies in extensive Western territory for the Anderson Electric Car Co., has accepted a position as special representative with the Woods Motor Vehicle Co. In his new work Mr. Wright will superintend the work of distributors for the Woods Electric in southern Illinois, Indiana and Ohio.

Williams Gets Detroit Studebaker—R. H. Williams, manager of the Indianapolis, Ind., branch of the Studebaker Corp. since January, has been appointed to the managership of the Studebaker branch at Detroit, controlling the entire State of Michigan and the Detroit retail branch. He is succeeded here by L. A. Tilley, special representative for the Studebaker corporation.

Semmes Heads Washington Co.—The Semmes Motor Co., Washington, D. C., has been formed by the amalgamation of the Congressional Garage Co., Semmes-Kneessi Co. and the Semmes Motor Line. The officers are: C. W. Semmes, president; H. G. Kneesi, first vice-president and treasurer, and Raphael Semmes, vice-president and secretary. The new company will continue to handle the Dodge, Hudson, Wilcox and Vim.

Barnett Retires—Ira S. Barnett has retired as president of the Kentucky Automobile Co., Louisville, Ky., agent for the Cadillac. He has been succeeded by Hubert Levy, who will be assisted by Charles New, who will hold the offices of secretary and treasurer. Mr. Levy formerly held those offices, while Mr. New has been a director without taking any active part in the management. A substantial amount of the stock which had been owned by Mr. Barnett has been purchased by those now comprising the management.

Doctor Uses X-Ray on Car—Dr. V. J. Capron of Friday Harbor, San Juan County, Wash., has what is known as his X-ray automobile power house. By using a bicycle rim clamped on to the hind wheel of his automobile and then bolting the transformer used on an X-ray machine to reduce direct to alternating current which was belted to the bicycle rim. Putting power upon the transformer converted it into a dynamo, out of one side of which he could get the necessary alternating current. When he found it necessary to take X-ray photographs of injuries he simply jacked up the hind wheel and started his engine, putting in the high, throttled down as closely as possible. The combination gives him 110 volts sufficient for X-ray photography or the illumination of a thirty-candle power lamp. The surgical advantage of this simple arrangement is that a physician can carry his whole apparatus with him conveniently, instead of requiring the patient to be brought to him. When on the road the doctor unclamps the bicycle rim from the hind wheel and stows it away.

Recent Incorporations in the Automobile Field

New York

NIAGARA FALLS—Lastic Air Mfg. Co.; $20,000; tire manufacturer. O. M. Mackie, E. M. Mackie, A. T. Stewart.

NORTH HEMPSTEAD—Collins Auto Renting Co.; $1,000; renting. H. M. Day, H. L. Collins, C. R. Collins, Great Neck Station, N. Y.

ROCHESTER—Rochester Vulcanizing Co.; tire repairing. F. E. Denley, J. M. Sill, A. C. Olp, 511 Wilder Bldg.

ROME—Bryant-Noonan Auto and Cycle Co., $5,000; dealer. A. S. Noonan, G. W. Bryant, A. J. O'Connor, all of Rome.

STAPLETON—Clifton Auto and Storage Co.; $5,000. W. L. Scott, F. Scott, J. Winfield Scott, 67 Harrison street, Stapleton.

SYRACUSE—Bell-Tuttle Storage Battery Co.; $3,000; manufacturer electrical goods, in particular for automobiles. F. G. Bell, B. H. Tuttle, A. S. Tuttle, all of Syracuse.

SYRACUSE—Cronin Garage Co.; $1,000. C. E. Brown, J. Crinnin, E. L. Moore.

SYRACUSE—Syracuse Motor Vehicle Trade Corp.; $2,000. F. Crosby, S. W. Munroe, G. W. Bartlett, all of Syracuse.

UTICA—National Auto Service Co.; $100,000. A. J. Seaton, F. J. Seaton, W. H. McCarry, Pittsfield, Mass.

UTICA—Utica Automobile Trade Assn.; $1,000. A. A. Ledermann, G. C. Donahue, W. F. Carroll.

YONKERS—Powers Rubber and Supply Co.; $3,000; dealer in rubber goods and tires. M. C. Powers, L. M. Powers, 749 Crotona Park North, New York City; W. A. Schenck.

New York City

Arena Automobile Co.; $3,000. Jacob Ballenberg, Olga Ballenberg, Joseph Ballenberg, all of 160 East 103d street.

W. H. Duncan Co.; $5,000; manufacturer materials for tops, waterproof cloths, etc. M. M. Duncan, W. H. Duncan, both of Rockaway Park, L. I., and J. N. MacLean, 629 Throop avenue, Brooklyn.

Carlened Co.; $2,000; gasoline dealer. E. M. Grossman, C. C. Siemon, Leonard Batt.

Solo Tire Co.; $100,000; manufacturer. J. W. Suling, Lavinia Leitch, E. F. Price, 489 East 8th street, Brooklyn.

Phillips Auto Seat Co.; $5,000; manufacturer. N. M. Lynn, C. A. Phillips, F. A. Phillips, 248 W. 49th street.

Reliable Touring Car Service; $10,000. C. L. Delehanty, Harry McGonigle, W. F. Byrnes.

Roller Lock Nut Co.; $900,000; to manufacture the Wegener roller lock nut. B. J. Green, 40 Richards street, Brooklyn; A. H. Wegener, 1105 Garden street, Hoboken, N. J.; H. L. C. Wenk.

Ohio

AKRON—Double Service Tire & Rubber Co.; $50,000; manufacturer. C. F. Geyer, M. S. Glover, David Bowlus, U. G. Welton, W. A. Nash.

ARCADIA—The Access Auto Co.; $25,000. C. R. Simkins, E. R. Struble, F. P. Conaway, C. Wheland, R. C. Willis.

CINCINNATI—Citizens Motor Car Co.; $150,000 to $200,000.

CLEVELAND—Auto Rescue Service Co.; $5,000; garage. J. Morgan, A. Cooper, P. W. Hill, Hugo Karman, N. W. Edwards.

CLEVELAND—Globe Accessories Co.; $10,000; dealer. J. F. Engle, F. C. Brew, R. Hendrickson, C. F. Saenger, V. B. Engle.

CLEVELAND—The Ohio Gear Grinding Co.; $10,000; machine shop. M. B. Noyes, F. J. Wing, Leo Ulmer, Max Efres, Irene Bollard.

COLUMBUS—Eureka Mechanical Starter Co.; $30,000. W. A. Ross, J. E. Matthews, C. E. Bonebrake, A. Bunford, C. E. Ross.

COLUMBUS—Vincent-Franz Automobile Co.; $5,000. Henry Franz, F. L. Vincent, K. W. Rittenhouse, W. B. Lover, F. F. Little.

ELYRIA—Coliseum Garage Co.; $5,000. Otto Niemeyer, C. F. Newman, T. P. Robson, J. E. Robson, I. M. Austin.

LANCASTER—Ohio-West Virginia Motor Club Co.; $20,000. B. F. Gayman, C. M. Trimmer, Palmer Howard, L. C. Silbach.

TOLEDO—Meyer Auto Repair Co.; $2,000. Carl Meyer, C. O. Queickke, E. J. Beeman, G. F. Hahn, T. Wooster.

Virginia

RICHMOND—M. D. Stone Motor Co.; $50,000; automobile business. M. D. Stone, Pres.; F. H. Dula, Secy. and Treas., both of Richmond.

Washington

SEATTLE—Metropolitan Garage; $2,000. J. F. Douglas, N. E. Felt, E. H. Sennett.

SEATTLE—Geo. W. Miller Co.; $25,000; general automobile business. George W. Miller and W. H. Sanders.

Recent Developments in Field of Dealer and Repairman

Remy's Atlanta Factory Branch—The Remy Electric Co. has established a factory branch at 14 West Harris Street, Atlanta, Ga.

Knight Tire in Spokane—The Automobile Tire Shop, Spokane, Wash., has secured the agency for the Knight line of tires for Spokane.

Dallas Haynes Moves—The Dallas branch of the Haynes Automobile Co. has moved into handsome new quarters at 2215-2217 Commerce Street.

Buick Agency Moves—The Buick agency at Providence, R. I., has moved to a new location on Broad Street, where it has better facilities for handling the line.

Baltimore Falls Tire Agent—G. E. Blaylock, 1817 Maryland Avenue, Baltimore, Md., has the local agency for the Falls tire manufactured at Cuyahoga Falls, Ohio.

Hercules Tire in Los Angeles—The Roddan-Latimer Sales Co., Los Angeles, has opened a tire house at 1046 South Olive Street with exclusive selling rights for Hercules tires.

Mohawk Tire in Louisville—The Southern Motors Co., 615 South Third Street, Louisville, Ky., has acquired the agency for Mohawk tires.

Handles Baltimore O'Neil Protector—A. P. Moessinger, 127 Richmond Street, Baltimore, Md., is the local distributor of the O'Neil outer tire made by the O'Neil Tire & Protector Co., Akron, Ohio.

Ever Ready Battery Agent—The Erner Electric Co., Cleveland, Ohio, has been appointed agent for the American Ever Ready storage battery. A service station has been established at 1268 Euclid Avenue.

Longuemare Carbureter Moves Salesroom—The Longuemare Carbureter Co. has moved its salesroom from 246 West Fifty-ninth Street, New York City, to new and larger quarters at the Motor Mart Bldg., 1876 Broadway.

Sewell Cushion Wheel in Buffalo—The Sewell Cushion Wheel Co. has opened a Buffalo branch with A. W. Sewell in charge. This is the eighth branch office the concern has established, and it is stated that another is to be opened in St. Louis.

N. Y. Swinehart Moves—The Swinehart Tire and Rubber Co., New York City, now at 1924 Broadway, will move to 41-43 West Sixty-third Street, the building formerly occupied by the Bryant Motor Service Corp. and the Knickerbocker Garage.

Two Federal Rubber Branches Now—The Federal Rubber Mfg. Co., Milwaukee, which recently established a direct factory branch and service station at 509 Broadway, Milwaukee, has established a second Milwaukee branch, to serve the South Side, at 361 Eleventh Avenue.

Kansas City Change—Russell H. Clark & Co. have succeeded to the business of the Simon Bros. Mfg. Co., 1529 Oak Street, Kansas City, Mo. Mr. Clark was for several years manager for the Simon company, which made automobile tops and handled small repairs.

Recent Louisville Trade News—The R. A. Thornton Auto Co. has opened a repair shop for Ford cars at 915½ South Third Street, Louisville. The Martin Motor Co., which has acquired the agency for the Velie, has opened an office and salesroom at 437 South Second Street. W. C. Martin of New York is head of the concern. The Two in One Tire Co. has opened a shop and office at 323 West Market Street, Louisville, Ky. This concern takes two old casings, cleans off the rough places, cements the two together, sews two or three rows of stitches around the edge, and turns out a tire which it is claimed is good for 2500 miles.

Kansas City Tire Co. Moves—The Tire Service Co., Kansas City, Mo., Henry Winter, manager, is moving from 1621 Grand Avenue to 1606 McGee Street into a one-story building now being completed, leased for five years. After two years a second story is to be added for the tire company. It is agent for the Pennsylvania tire in Kansas City and does a general tire-service business.

Recent N. Y. Leases—The Ford Commercial Body Co., New York City, has leased the store and basement at 10 West Sixtieth Street. The store and basement at 1674 Broadway, has been leased to the McAllister Tire Co. The Taxicab Assn. and the Town Taxicab Co. has leased the entire building at 243 West Sixty-fourth Street, New York City. Space at 1896 Broadway has been leased for the Oakland Motor Car Co.

Late Baltimore Trade News—The Poehlmann Automobile Co., Baltimore representative of the Chevrolet, is in its new building at Cathedral and Chase Streets. The new quarters are fireproof throughout, four stories high. The machine shop is on the fourth floor, where plenty of light may be had.

The Pneumatic Tire & Rubber Co., Baltimore representatives of the Racine tires, has entered its new place, 23 West North Avenue. The company is operated by F. J. Rowe and C. M. Green.

Late Hartford Trade Items—The U-Auto-Varnish Co., 2 American Row, Hartford, Conn., has established a service station in the rear of 1125 Main Street, East Hartford, Conn.

The Britton Co., 121 Allyn Street, Hartford, State distributor of the Stearns-Knight, has established the following sub-agencies: H. E. Bradford, Waterbury, Conn.; F. W. Roberts, Northampton, Mass., and R. H. Britt, Springfield, Mass.

F. L. Caulkins, Middletown (Conn.) Chalmers distributor, has taken on the Dodge in Middlesex County, operating under the Hartford Motor Car Co., 410 Main Street, Hartford.

The Hartford Auto Painting Co., now located in the Kingsley & Smith garage on Elm Street, has leased the top floor of the new Hartford Motor Car Co. building in the rear of the salesroom at 410 Main Street.

Recent Milwaukee Trade Notes—The Alben Co., Twenty-seventh and Wahl Avenues, Milwaukee, is marketing a new portable jack and crane for use in garages. The combination instrument lifts any car up to 5000 lb. to a height of 9 ft. and weighs only 300 lb.

The Racine Auto Tire Co., Racine, Wis., manufacturing the Racine Horseshoe tire and other rubber goods, has established a branch depot and distributing station at 140 Oneida Street. W. M. Smith of Milwaukee has been appointed manager. The branch will handle all Wisconsin business.

The Badger Tire Repair Co., State agent for the Kelly-Springfield tire, and operating a large tire-repair shop at 454-457 Jackson Street, Milwaukee, has moved to new and larger quarters at 142-144 Oneida Street.

The Dayton Rubber Sales Co., 290 Fifth Street, has moved to new and larger quarters at 415 Cedar Street. The concern is State distributer of the Dayton airless tire and Dayton pneumatic tire and operates a large repair shop.

A new supply and accessory store has been established at 427 Chestnut Street, Milwaukee, by L. Baum & Sons.

S. G. V. in New Home—The S. G. V. Co., Newark, N. J., formerly located on Lafayette Street, has moved into its new home, the Colyear Building, 500-504 Central Avenue. The company has leased the premises for a period of six years. The salesroom will occupy the first floor and on the second floor there will be a service station and machine shop. The third floor will be given over to an assembling department, and the body building department and paint shop will be on the fourth floor.

The company is now going through the process of incorporation under the laws of New Jersey. G. A. Grant, the manager of the company, says that the objects of the new company are to maintain the service of cars manufactured by the S. G. V. Co., Reading, Pa., and to build new cars under the new organization.

Royal Equipment Adding—The Royal Equipment Co., Bridgeport, Conn., will add a third story to its 60 by 200-ft. factory.

Whitfield Takes Stearns—N. B. Whitfield of New Haven, Conn., has just secured the agency for the Stearns car in that territory.

Rider Opens Office—Cleremont Rider, western distributor of the H. & D. shock absorber, has opened an office at 3667 Olive Street, St. Louis, Mo.

Polson's New Plant—The Polson Mfg. Co., Buffalo, N. Y., will build a two-story, 85 by 100-ft., reinforced concrete plant at Main Street and Lafayette Avenue.

Philadelphia Tire Co. Moves—The Kelly-Springfield Tire Co., Philadelphia, Pa., has removed from 208 North Broad Street to 257-259 North Broad Street.

Opens Battery Station—The Battery Service Co., St. Louis, Mo., has opened a station at Twenty-third and Locust Streets, where it will render all day and night service.

Chevrolet Assembling Plant Contemplated—The Chevrolet Motor Co., Los Angeles, Cal., contemplates building an assembling plant and machine shop near Los Angeles, Cal.

Interstate in Marion—F. D. Bentz has taken the agency for the Interstate in Marion, Ohio. After Sept. 15, the garage and salesrooms will be located at Main and Church Streets.

Opens in St. Louis—The Uniplex Construction Mfg. Co., St. Louis, Mo., has opened a salesroom at 2314 Locust Street. The company makes and retails the Uniplex knock-down garage.

Ten Broeck Agency Moves—The Ten Broeck Tyre Sales Co., Louisville, Ky., has closed its downtown store at 542 South Third Street and moved its salesroom to the factory at Twenty-sixth and Courtney Streets.

Los Angeles Pullman Moves—The Aston Motor Car Co., Los Angeles, Cal., southern California distributor of the Pullman, is located at 1310-12 South Grand Avenue in the large building formerly occupied by the Mission Motor Car Co.

Distribute from St. Louis—The Schoellhorn-Albrecht Machine Co., 416 North Main Street, St. Louis, Mo., has been appointed distributor for the Imperial and Marion in eastern Missouri and southern Illinois. The Jeffery Motor Sales Co. will handle both lines in St. Louis and will continue as distributor of the Jeffery lines.

Philadelphia Co. Takes on Oakland—The Baker-Bell Motor Co., 665-669 North Broad Street, Philadelphia, Pa., has taken over the local retail business and service department and the wholesale business for Bucks, Montgomery, Chester and Delaware Counties in Pennsylvania, and Camden County in New Jersey, of the Oakland Motor Co.

Hercules Tire in Ore.—Hercules Tire Sales Co., Portland, Ore., has been formed by Noah Frederick and H. J. Nielson and established themselves as distributors of Hercules tires for the entire State of Oregon. They have opened headquarters at 302 Oak Street.

New Haven White Adds Chalmers—The White Motors Co. of New Haven has recently been appointed Chalmers distributor for New Haven County, with the exception of Meriden. In addition to the Chalmers the White company handles White and Buick passenger and commercial cars. The company has engaged the service station operated by the W. A. Maynard Co., the former Chalmers agent.

Handling U. S. Tires in Nine Cities—The Quick Tire Co. is now operating in nine cities as follows: Dallas, San Antonio, Houston, El Paso, Fort Worth, Little Rock, Memphis, Louisville and Nashville. Dallas is the pioneer Texas city in which the concern established a business. It was recently incorporated and is handling United States tires exclusively. Its officers are: Thornton Newsum, president; R. B. Young, vice-president and treasurer, and H. L. Williford, secretary.

Late Columbus Trade Items—The Central West Motor Car Co., Columbus, Ohio, has been organized with G. W. Carroll, general manager, and A. E. Aull, manager of sales, to handle the Oakland and Abbott-Detroit in central Ohio territory. The concern occupied new salesrooms and offices at 80-82 North Fourth Street.

S. W. Schott & Co., central Ohio distributors for the Empire, has placed the sub-agency for Knox and Licking Counties with the Anderson Motor Sales Co., which will have headquarters probably at Newark, Ohio.

Anthony Appoints New Packard Agencies—The increased production of the Packard factory has enabled Earle C. Anthony, Inc., Packard distributors throughout southern California, to establish sub-agencies in the more important southern California centers. In the past practically all Packards sold in this end of the State were sold at retail by the Anthony organization, but with his increased allotment, Anthony has announced the following sub-agencies: Bakersfield, W. F. Gouty; Riverside, Riverside Motor Car Co.; Long Beach, Arthur E. Evans; Monrovia, A. T. Badillo; San Luis Obispo, C. H. Kamm; Ventura, R. M. Seeley; Santa Barbara, Oscar Fitch; Anaheim, Rockwell & Sidnam.

Denver Announcements—The Wilson Auto Co., 801 Broadway, Denver, Chandler distributor, has taken the State agency for the Empire and also the Denver agency for the National.

L. G. Palmer, Paige distributor for Colorado, has closed his salesroom at 1515 Cheyenne Place, and announces that he will retire from the automobile business. The Paige agency has not yet been taken by any other dealer.

L. M. Patrick, 533 Marion Street, has just taken the agency for the Lewis car.

Hoiser Bros. have taken the agency for the Velie, and have opened a salesroom at 1236 Broadway.

The Hupp Motor Sales Co., Colorado distributor of the Hupmobile and Locomobile, is moving from 220 Sixteenth Street, Denver, into its new building at 1260 Broadway.

The Auto Sales Co., a new $25,000 corporation, has opened a used car and rental business at 1840 Walton Street, and also a garage and a separate filling station. H. W. Curtis is manager.

Late St. Louis Trade News—The St. Louis branch of the L-Ty-To-Co., which handles a special preparation for the treatment of tires, has opened a salesroom at 1135 Locust Street, with G. R. Hutchings in charge. The company formerly had only offices here at 428 Frisco Bldg. The Koochook Rubber Co., handling automobile supplies, will move within the next few weeks from 3152 Locust Street to 1120 Pine Street.

The Best Service Truck Co., 1120 North Twelfth Street, has been appointed Southwestern sales representative of the Gramm-Bernstein Co. The St. Louis agency for Saxon cars has been transferred from the Page Automobile Co. to the Frye Motor Car Co., of 3333 Locust Street. This agency's territory includes the southern half of Illinois and the eastern half of Missouri. G. A. Root will supervise the country sales of Saxons and of Paige cars, for which the Frye company also has the local agency.

The United Sales Co. has been organized to handle the United States tires in St. Louis. The new concern is fitting up salesrooms at 3567 Lindell Avenue and will render a twenty-four-hour service. The officers are E. G. Niggeman, president; G. J. Breaker, treasurer, and F. C. D. Dobson, secretary and manager. The Paterson, formerly handled in the St. Louis district by the Bleeck Automobile Co., henceforth will be sold here by the Donovan Automobile Co. The latter recently discontinued the Interstate. The Brisk Blast Mfg. Co., maker of tire pumps, has opened a plant at 1515-1527 North Twenty-first Street.

The Tate-Gillham Motor Car Co. has opened a service station and salesroom in the Gorlock Bldg. at Webster Groves. The Commercial Auto Body Co., now at 3003 Locust Street, has leased a four-story building at the southwest corner of Sixteenth and Pine Streets for a number of years.

VOL. XXXIII. NEW YORK—THURSDAY, SEPTEMBER 23, 1915—CHICAGO No. 13

The AUTOMOBILE

Reasons for the Twelve

Valuable Discussion on Engineering Principles Brought Out by J. G. Vincent's Paper Read Before the Detroit Section of the S. A. E.

QUESTIONS of balance, vibration, displacement per foot of travel, and carburetion were the high spots brought out in the discussion which followed the presentation of the paper by J. G. Vincent, vice-president in charge of engineering of the Packard Motor Car Co., Detroit, Mich., on the twin six motor. Last week a large part of this paper was published in THE AUTOMOBILE and this week appear the remaining portions of the paper together with the diagrams and the discussion which followed. Mr. Vincent's remarks follow in part:

J. G. VINCENT

Unbalanced Forces Due to Inertia

In my report to Mr. Joy, I referred to the unbalanced forces due to inertia in a four or twin four motor, and explained that these forces were cancelled out in a properly designed single six or twin six motor. I believe that these forces are thoroughly understood by engineers generally, but I have thought it best to go into the matter briefly in this paper in order to make it more complete.

Fig. 1 shows a partial cross-section of a twin four motor of 3 7/16 in. bore by 5¾ in. stroke, or a total piston displacement for the motor of 424 cu. in.

This drawing is made primarily to show the rotating and reciprocating parts of the motor. I have considered that the center of gravity of each piston is located at the piston pin, and in order to locate the center of gravity of all four pistons in the right hand block when the pistons are at dead center, as shown on the drawing, it is only necessary to bisect the distance between the piston pins and we obtain the center of gravity of all four pistons, as indicated at *A*.

With the crankshaft in this position, it is very easy to locate the center of gravity in the left hand block, as in this position the pistons in the left hand block are all lined up. Or, in other words, the center of gravity is located at the piston pin, as indicated at *B*.

The drawing shows an arc struck from the center of the crankshaft and passing through the center of gravity of the pistons in the right hand block at *A*, and it will be noted that it does not pass through the center of gravity in the left hand block but instead, passes considerably above it. This result is, of course, due to angularity of the connecting-rods and it can be increased or decreased according to the ratio of connecting-rod length to stroke. The longer the rod ratio it is found possible to use, the less the error will be, and the shorter the rod the greater the error. With any permissible length of connecting-rod, however, this error cannot be cut below approximately ⅜ in. and it is apt to run considerably more than that amount.

A rough way to calculate the magnitude of this out-of-balance is to consider that the engine is equipped with one additional piston, whose weight is equal to the combined weight of all the pistons, and that this piston is reciprocated at twice the crankshaft speed through a stroke equal to the movement of the center of gravity of the pistons.

A Vertical Vibration

In a single four motor, this movement of the center of gravity, of course, causes a vertical vibration, but in a twin four motor, the conditions are somewhat altered, as the movement of the center of gravity in one four-cylinder motor cancels the movement in the other four-cylinder motor, so far as the vertical components of these forces are concerned, but add on to each other so far as the horizontal components are concerned.

Fig. 1 shows a line drawn between the two centers of gravity and this line is bisected at *C* to show the horizontal movement of the combined center of gravity to the right of the vertical center line with the crankshaft in the position shown. Revolving the crankshaft 90 deg. will, of course, move this combined center of gravity an equal amount to the opposite side of the vertical center line. It is the horizontal movement of this combined center of gravity that causes horizontal vibrations in a twin four motor.

Fig. 2 shows a partial cross section of a twin six motor of 3-in. bore by 5-in. stroke, or a total piston displacement of 424 cu. in. In other words, this figure shows a twin six motor of the same total piston displacement as the twin four

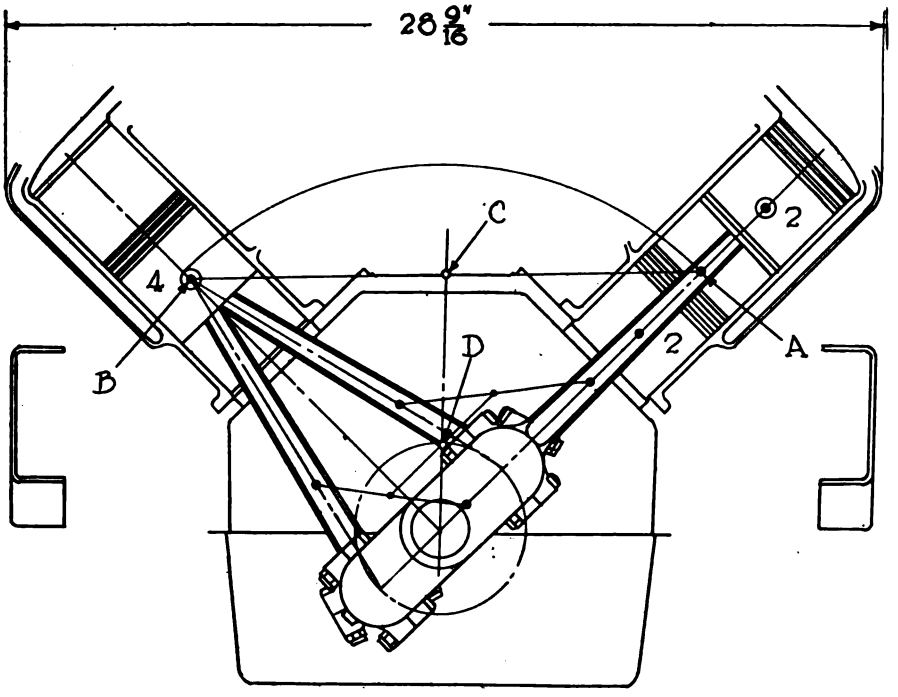


Fig. 1—Partial cross section of the twin four motor is 3 7-16 bore by 5 3-4 stroke, having 424 cu. in. displacement

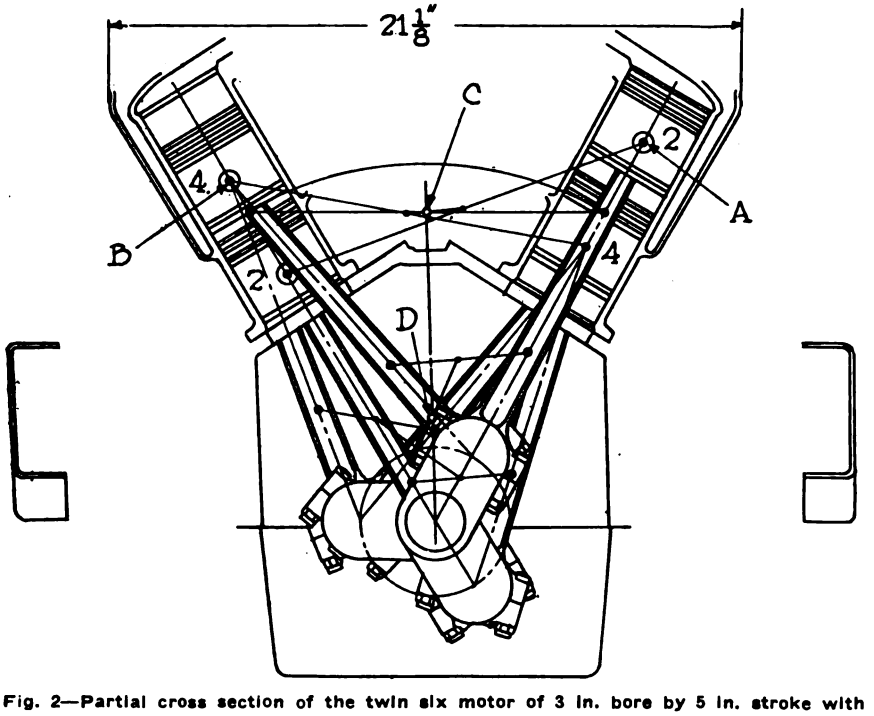


Fig. 2—Partial cross section of the twin six motor of 3 in. bore by 5 in. stroke with a total piston displacement of 424 cu. in.

motor shown in Fig. 1. Like Fig. 1, this drawing is made primarily to show the rotating and reciprocating parts of the motor. I have had the centers of gravity of the pistons in each block located on this drawing in the same manner as described above in connection with Fig. 1, but it will be noted that the arc struck from the center line of the crankshaft passes through the center of gravity in both blocks, and also that the combined center of gravity of all pistons falls exactly on the vertical center line instead of to one side, as in the case of the twin four motor.

The reference letters *A*, *B*, and *C* indicate the same points in this drawing as in Fig. 1.

This drawing, of course, shows the relationship of the parts at only one position of the crankshaft, but by plotting the parts in 360 different positions, in other words, at every degree of movement of the crankshaft, it will be found that the center of gravity does not move from a fixed point.

It will be noted that I have had the centers of gravity of all the connecting-rods plotted for both types of motor, and in the case of the twin four motor, this point moves off the center line, as indicated at *D* in Fig. 4, while it remains absolutely fixed on the center line in the twin six motor, as indicated at *D* in Fig. 2.

I believe that these drawings indicate clearly the difference in forces due to inertia of the two types of motors and prove conclusively the correctness of the six-cylinder principle. The real proof of the correctness of these arguments is, of course, that motors built according to this twin six layout are running absolutely smooth up to speeds as high as 3000 r.p.m.

Regarding Accessibility

Figs. 1 and 2 are made to the same scale, and it will be noted that I have had a section of a desirable width of frame shown in connection with each drawing, in order to give a good idea of the general layout of the two motors and the possibilities of locating equipment, etc.

Fig. 1 of the twin four motor shows clearly the difficulty of locating accessories in the usual place alongside of the crankcase, and between it and the frame, and also makes it clear that the steering gear in this twin four type of motor must be located to the rear of the cylinder blocks. On the other hand, Fig. 2 of the twin six motor shows the ease with which the accessories can be located alongside the crankcase, and between it and the frame, and also the additional room for the accommodation of the steering gear. This makes it possible to use a triangular drive and single chain for driving the camshaft, generator and water pump.

The water pump, located just back of the generator and driven by it, is really no more complicated than the ordinary six-cylinder water pump, and it is just as accessible. It has two impellors so placed that the end thrust is balanced, and one delivers directly to one-cylinder block, and the other to the opposite block. With this pump, it is only necessary to have a single stuffing box, which is very accessible for repacking.

The starting motor is located directly back of the water pump and it is arranged to crank the motor through compound gearing, acting on the flywheel the same as has been standard on our six-cylinder motors for some time past.

The air pump and oil pump are driven by small spiral gears at the rear end of the cam shaft, and the ignition timer unit is driven by a pair of small spiral gears located at the front end of the cam shaft. This makes a remarkably simple, light and quiet arrangement and, in fact, it is more simple and cheaper to manufacture than in the majority of four or six-cylinder motors. This arrangement makes it unnecessary to locate any equipment in the V between the cylinder blocks, with the exception of the carbureter, which is located high up, thus leaving every valve perfectly accessible for adjustment.

Considering this twin six motor as a complete unit, I believe it to be just as accessible as a well-designed single four or six-cylinder motor.

Turning Radius Longer

As stated above, Figs. 1 and 2 are drawn to the same scale and make it very clear that the bonnet and, therefore, the frame for a twin four motor must be considerably wider than for a twin six motor of the same piston displacement. It will be noted that the twin six motor is approximately 21⅛ in. wide over the cylinder blocks, while the twin four is 28 9/16 in. While it is, of course, true that the twin four motor would be a little shorter than the twin six, that is approximately 3 in., it is quite clear that the frame will have to be made enough wider so that the resultant turning radius will be larger with the twin four motor.

A single six-cylinder motor would, of course, assemble into the same width of frame as shown in Fig. 2, but a motor of this type of the same piston displacement would be some 5 in. longer than the twin six and this would, of course, necessitate a longer wheelbase and increase the turning radius. Of the three types of motor, the twin six, is therefore, the best, so far as turning radius is concerned.

Weight Saved in V Motors

As indicated in my report to Mr. Joy, I have weighed up a great many motors and have proved to my own satisfaction that of the three types, the six-cylinder will be the heaviest, and that the twin four and twin six will be just about a stand off, granting, of course, that all three types of motor are made up to a corresponding standard of engineering.

Continuity of Torque

As mentioned in my report to Mr. Joy, it is obvious that the character of the torque of the twin six is bound to be 50 per cent better than the twin four and 100 per cent better than the single six, and in order to show the characteristics of these three types of motor I have had Fig. 3 prepared.

The diagrams shown in this drawing cover 360 deg. of crankshaft rotation, or, in other words, one-half cycle. All three diagrams are made to the same scale and are all based on equal size motors; *i.e.*, 424 cu. in. of piston displacement.

It is, of course, obvious that the center diagram represents the power impulses of a twin six, the upper diagram a twin four, and the lower diagram a single six,

In each diagram the horizontal lines *O-O* represent zero, the solid line curves *B-B*, below the zero line, represent negative crank effort due to compression, while the solid line curves *C-C* represent crank efforts due to the working strokes. The dotted line curve *D* represents the net crank effort. This curve was plotted by taking the value of the crank effort curves above the zero line and subtracting the negative crank effort curves due to compression, as indicated below the line. These curves *D* show clearly the relative work to be accomplished by the flywheel in the three different types of motor. The uniformity of the torque of the twin six as shown by the curve *D* gives a fair idea of what this torque should be, and I can assure you that the actual performance of the motors is well up to what might be expected.

The frequency of the impulses and the small amount of difference in effort between the peak of one power stroke and the lowest point in between impulses absolutely do away with any indication of separate motor impulses.

I have driven a car equipped with one of these twin six motors down to speeds as low as 1 mile per hour, representing a motor speed of considerably less than 100 r.p.m. and under these conditions there is no sense of separate impulses whatever, even when accelerating quickly from this speed.

This continuity of torque, which makes for smoothness at low speed, coupled with the light, accurately machined reciprocating parts, plus the six-cylinder principle, which make for smoothness at high speed, result in a wide range of smooth ability which, when once experienced, is bound to be desired.

Fig. 4 shows the actual horsepower output of a Packard 338 single six-cylinder motor of 415 cu. in. of piston displacement and a Packard twin six motor of 424 cu. in. of piston displacement.

Discussion Along Varied Lines

C. C. Hinkley, chief engineer, Chalmers company: Isn't it true that in the Packard twin six, the crank is a 2-in. crank? Am I correct?

J. G. Vincent: That is correct.

C. C. Hinkley: For a 3 by 5 twin six; I believe we would call it common practice to use at least a 2-in. crank, in a single six engine with that displacement, with perfect propriety. In the type of engine that I noticed in the cut, Mr. Vincent uses a vibration damper. I would like to ask Mr. Vincent if he compensates for the lack of crank diameter by the vibration damper, or what is the function of the damper?

J. G. Vincent: In experimenting with this motor, we ran into the same thing we would have run into had we designed a single six high-speed motor. That is, the synchronized vibration due to the slight oscillation of the crankshaft. Now, that is not affected by the twin six design, but to a very limited degree. That is, the added rotative weight just mentioned has a very slight effect on the periodicity in the crankshaft. By that I mean that when the front throw of the crankshaft is slightly displaced by the impulse due to the piston working stroke, it will come back more slowly with a little added rotative weight, with the result that the impulses in the motor will get into step with it at slightly slower speed than if the rotative weight was lighter. To that extent, the V type of motor does affect crankshaft design. Now, we could have overcome the vibration, the periodic vibration, by making the crankshaft larger. That is, we could have overcome it at lower speeds, but it would have

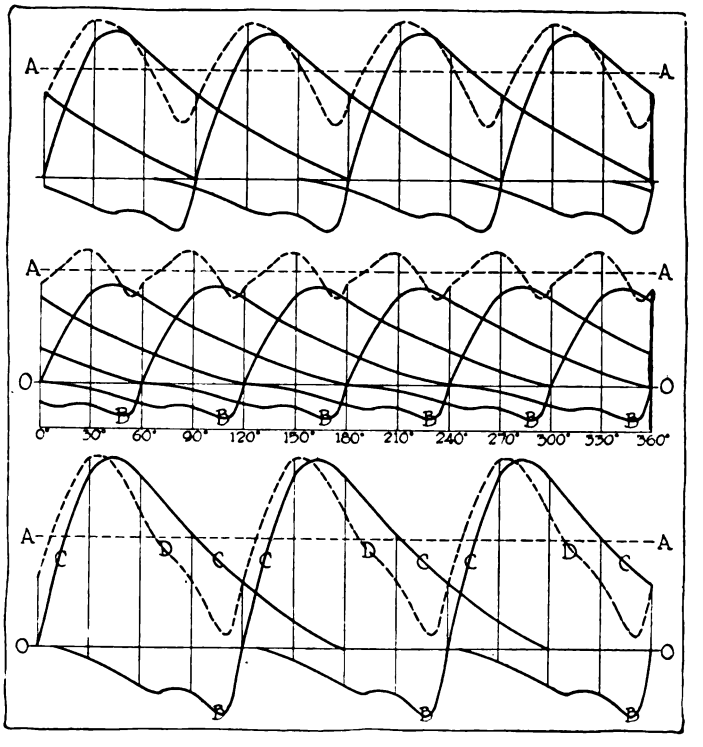


Fig. 3—Chart showing continuity of torque covering 360 deg. of crankshaft rotation, or, in other words, one-half cycle for three motors of 424 cu. in. piston displacement representing the power impulses of a twin six in the center diagram, a twin four in the upper diagram and a single six in the lower

been bound to come in at some speed. You cannot make a crankshaft, within reason, and make it strong enough so that it won't spring a little; in other words, the larger you make it, the faster will be its periodic pendulum action, and the faster the motor will have to run before the pistons get into step with it.

Periodic Vibration

Now, in reference to the pistons getting into step with it, it is just like stepping up to someone, swinging and pushing them at the right time as they come back each time, and you keep them going. The minute that you hit them a little too quick, or too light, they will begin to slow up. The same thing with a crankshaft. The period of vibration ordinarily does not last over a range of more than 1½, 2 or 3 miles. If it comes in, say at 40 m.p.h., it would come in with increased intensity at 80 m.p.h., were it possible to get that high. In other words, double the motor speed. We, of course, had the choice of going to an unusually large crankshaft, but still having the possibility of having slight vibration or disturbance at extremely high speed; or putting on the vibration damper. By putting on the vibration damper, we damped out that period without making any larger crankshaft, and we were, therefore, enabled to retain the smaller crankshaft, with its lower bearing speeds, which makes for efficiency, and we simply chose the vibration damper.

What Vibration Damper Does

Just a word as to what the vibration damper does. It is simply a brake on the swing; that is, if you put a board on each side of the swing, and bear up against the ropes, you would give the swing a push, it would probably go to the other end, but it would not come back very fast, and when it came back to the center, it would stop. The crankshaft oscillation is exactly the same thing. The vibration damper does not prevent the shaft from springing slightly, but it does prevent it from oscillating and setting other parts into synchronized vibrations. I might state that it seems to smooth the motor throughout its entire range; and it is very effective so far as damping out periodicity is concerned.

Displacement-Car Weight Ratio

A. Ludlow Clayden, THE AUTOMOBILE: I would like to introduce to the discussion a line of thought touched upon by Mr. Vincent but not followed very far, this being the proper proportion of piston displacement to the total weight of the automobile. We gain ability of performance in proportion as we increase the total volume of gas swept by all the pistons during a yard of travel and we can always get more ability by lowering the gear ratio or by increasing the size of the engine. There must be some limit to this procedure. For instance it would be absurd to put a Packard twin six engine in a Scripps-Booth chassis as it looks at present, equally ridiculous to suggest that the Packard ability could be obtained from a six-cylinder 3 by 5 geared nine to one on high. Possibly in the fullness of time we shall discover that neither of these extremes is absurd, but it is interesting to examine the figures for displacement per foot of travel for a few well known cars. This means nothing, however, without consideration of the weight of the cars; wind resistance counts for little or nothing as ability is appreciated and desired most at speeds below those at which the atmospheric friction begins to count.

Taking the following list we have these figures:

	Cu. In.	Gear	Ft. Wheel Circ.	Cu. In. Per Ft.	Weight	Cu in. Per 1000 Lb. Ft.
Packard ..	424	4.4	9.7	192	4,500	43
Cadillac ..	315	4.4	9.4	147	4,300	34
Hudson ..	288	3.7	8.9	132	3,000	44
Scripps ...	104	4	7.8	53	1,750	30
Ford	177	3.6	7.8	82	1,500	55

This method of figuring is only a very rough and ready way of making comparison, but it serves to show that ability can be increased greatly by reducing weight. Of course the weight is not a true measure of the resistance to motion but it is obtainable easily while drawbar pull is not. Mr. McCain has shown me a different way of estimating ability, based upon the tractive effort at the tire at different speeds. calculating from the known horsepower of the engine at the corresponding rate of revolution and I hope he will quote some of his figures. It is hardly possible for an outsider like myself to obtain such data from a sufficiently large number of plants to enable proper comparison to be made.

Twelve the Limit

Now the question is whether the eights and twelves and light sixes we have to-day provide sufficient ability, too much ability or not enough ability. It seems that the present consensus of opinion is that the ability of the twelve represents about the limit that the public is ever likely to ask but that smaller and cheaper cars than the very large ones will have to approximate the same figure of merit.

Road Performance

Taking my table it is obvious that the figure of merit of fifty-five for the Ford does not truly represent its ability as compared with the lower figure of forty-three for the Packard, but we know that the horsepower of the Packard is vastly greater than that for the Ford. Thus to convert my figures of merit into others which would show a truer comparison it would be necessary to know the horsepower for each engine. I am going to ask Mr. Vincent and Mr. McCall White if they can give the power developed per cubic inch piston displacement at 1000 r.p.m. This multiplied by my figure of merit ought to show a true comparison between the conditions of the two cars which we know represent about the limit of ability that has yet been reached in practical manufacture. Suppose that the result of this multiplication gave a figure of 300, which would be the Packard case at a rating of 1 hp. per 7 cu. in. approximately, then it seems to me that 300 might be taken as a constant to which other engineers could work. I am afraid I have not made this very

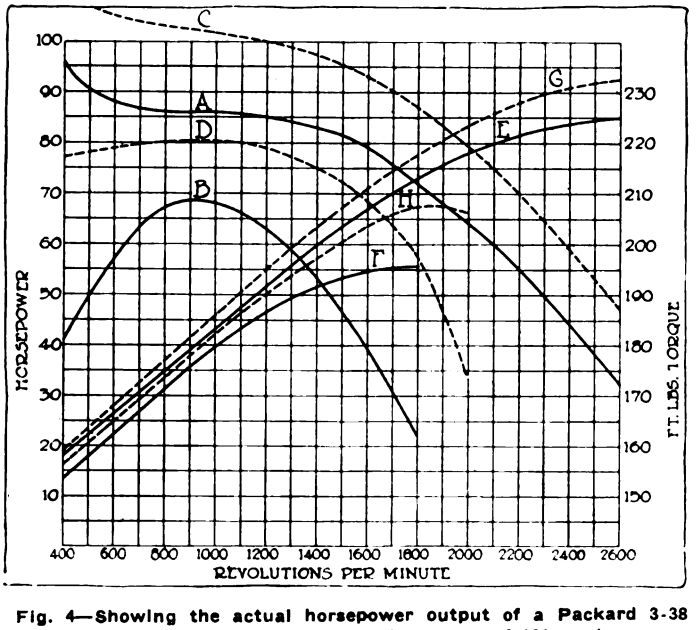


Fig. 4—Showing the actual horsepower output of a Packard 3-38 six of 415 cu. in. and a Packard twin six of 424 cu. in.

clear, but I mean that the ability, the road performance, of cars which can show the same figure of 300 say, ought always to be about the same. We see that the figure can be produced by weight reduction and is possible of attainment without phenomenally low gearing by a small four-cylinder automobile.

An Equation for Merit

I do not suggest that I have considered everything in this suggested equation, no doubt many holes can be picked in the argument, but I do think that it ought to be possible to develop an equation which would give us a true figure of merit and if this can be done it would be very useful to engineers.

Now I want to say a few words on the multi-cylindrical question. Mr. Vincent's paper is a splendid argument for the V motor principle and is almost equally favorable to eights as to twelves. The cheap eight is a better car by comparison with the expensive one than the cheap six of a couple of years ago was by comparison with the better class car. How small, then, is it going to pay to make a twelve?

Suppose we can find a possible ability equation and so design a car as to suit the desired figure of merit, what then is going to decide how we shall split up the necessary number of cubic inches per road wheel revolution? The choice offered is so immensely wide, ranging all the way from 2 to 1 down to 6 to 1 in gear ratio and from four to twelve cylinders.

Cylinder Size Main Factor

I have lately been told by many engineers that the cost of a motor of a given standard of workmanship is in proportion to its piston displacement and that the number of cylinders had little to do with it. The most remarkable statement is that the V twelve costs no more than a six of the same capacity. Thus it seems to me the ultimate deciding factor will be the individual size of cylinder that will give us the best horsepower. Mr. Vincent says that the volumetric efficiency increases as the cylinder size decreases, by virtue of increased compression which is possible with the smaller cylinder. With this view I am in accord within limits, but I am not convinced that the Packard twin has not cylinders that are already a little on the small side. There must be a comparatively narrow range of size which will give the highest horsepower combined with other qualities. If manufacturing conditions abroad were normal I would try to persuade the Sunbeam company to build an eight and a twelve of the same total size as their six and I sincerely trust that some live manufacturer will try what can be done with a 300 cu. in. racing car with eight and with twelve cylinders. Europe has always thought the four was the only possible racing engine and it will need a racing car with more cylinders to shake this view anywhere in the world. American genius has brought the multi-cylinder V engine into a position of such prominence that it is the absolute duty of American engineers to see this thing through to the limit, and the limiting test of an engine is the speedway. If a 300 cu. in. twelve can hold its own on the racing track the case for minute cylinders will be proved, but it seems impossible to prove it by any other method.

Ability Defined

C. T. Myers, engineer Timken-David Brown Co.: I would like to ask Mr. Vincent if he will give us the definition of "ability"; also the terms "smooth ability" and "range of ability."

J. G. Vincent: We, out at the Packard factory, use the term "ability" simply as a relative definition of a car. In other words, we take a car out, and test it for acceleration. The greater the range of speed that car will show on either drive, that is, from the lowest to the highest, is what we call that car's "range of ability." Now, supposing that the car would go from 1 or 2 m.p.h. to 70 m.p.h., on high gear, smoothly, and without vibration at any period, we would call that a large range of smooth ability. In other words, if you have two cars and start them off on high gear at the same speed, and one car pulls away from the other, we would say that the car that got away had the greatest ability. Now, it might not have the greatest ability over all ranges of speed, but it would have the greatest ability for that test. If it has the greatest ability all the way up the range, then it would have a larger range of ability than the other car.

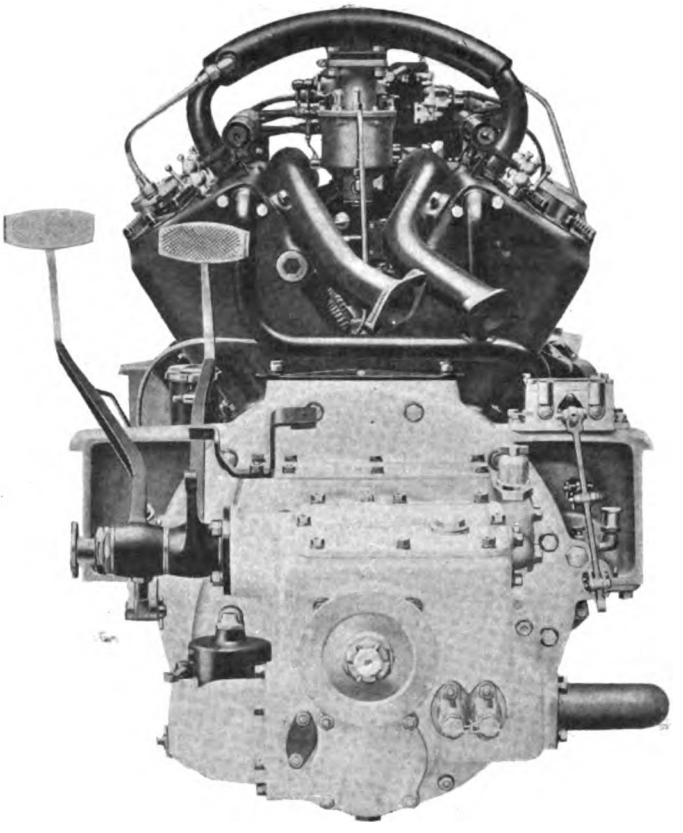


Fig. 5—End view of the Packard twin six motor

C. T. Myers: What is your definition of "ability" itself? What is the comparison?

J. G. Vincent: Generally speaking, acceleration—acceleration on a given gear ratio.

C. C. Hinkley: Is that a time element?

J. G. Vincent: Of course, acceleration would naturally mean a time element.

C. T. Myers: What would the acceleration be?

Testing the Car

J. G. Vincent: To make my point clear, I will try and do it this way. If we went to test a car for ability, we might take it out to-day, and if we are feeling pretty good, that car would feel about so to us. If we took it out next week, the car might feel better or worse to us; we might have changed, but the car might be just the same; so, in order not to fool ourselves, we adopted the scheme several years ago of using what we call acceleration curves. Later on, we have measured the ability with an accelerometer; but we still use the acceleration curves taken with a tested out speedometer, starting the car at a known speed, say, 5 m.p.h., and then taking a reading every 10 sec. up to 60 sec., and we get a very accurate acceleration picture of what that car's ability is. Now, we file that away. We will suppose that car accelerated from 5 to 30 m.p.h. in 10 sec., or from 5. Supposing we build a car next year that accelerates from 5 to 32 m.p.h. in the same time, then we would say we had increased the car's ability. Of course, we do some test work

for hill climbing, and so forth, but, generally speaking, acceleration curves are made on the level; and by the way, we take them in both directions and take the average, and it is a very good indication of what the car's hill climbing ability will be. In other words, to a certain extent the acceleration takes into account the weight of the car.

Smoothness of Motor

Smoothness, of course, the smooth part of the ability, simply refers to the action of the motor while it is performing that given work.

A. C. Woodbury, S. A. E. Standards Recorder: I have heard, in regard to the Packard Twin Six, the statement that carburetion trouble was very slight, and at very low speed. It has been the general experience that carburetion troubles have entered in at low speeds of engines, because of the gas speed in the inlet pipe being so small it would not carry the gasoline up the cylinder. I would like to inquire if there are any Packard secrets that we can learn in regard to that.

Carburetion Problem Easy

J. G. Vincent: I will admit that I was a little bit surprised myself, how very little trouble we had with the carburetion problem. We, of course, were very careful in designing the engine; very carefully proportioned capacities, to be as near right as our experience would dictate, and we very carefully took care of the heating of the gas. In other words, the individual header that goes into each cylinder block is surrounded by water on approximately three sides. Of course, as soon as the motor warms up, no condensation takes place. Then, of course, valve timing must be taken into consideration, and the inlet valve location with reference to the center of the opening into the block, and then the heating of the manifold above the carbureter. In designing that, we did not do anything more than use our information that we had gained through years of manufacturing six-cylinder motors. The carbureter used is exactly the same size as our last year's single six-cylinder. The carbureter and the parts are just the same, with the exception that the inside spring of the air valve which we found possible to make somewhat softer on account of the uniform suction of the motor. In other words, you all know, with an air valve carbureter, you get a certain amount of flooding on the four-cylinder motor, and you get less with a six, but still you get a little flooding, and the inside spring, commonly called a buffer spring, has to be made of strength that when you step on it quick, the flooding of the valve will not allow too much air in. In other words, to lean your mixture too much. We found the constant suction of the twin six motor allowed us to reduce the strength of that spring about one-third. That is absolutely the only change. Of course, the main part of the carbureter is not very high. It is 1¾ in. bore, same as for the single six, but where the manifold is divided, to go into each block, we naturally made it a little smaller and cut it to 1½ in., as I remember.

A Member: That is a single carbureter?

J. G. Vincent: That is a single carbureter; single jet. In other words, just exactly the same choke and jet that we use in the six-cylinder.

A Member: May I ask what acceleration test the Packard twin six gave in seconds, at, say, from 5 to 50 miles?

J. G. Vincent: From 5 to 50; of course, it varies, but under ideal conditions, I have done it in 24 sec.

William B. Stout, chief engineer, Scripps-Booth company: In the small bore multiple cylinder motor, and the ability to get the valves smaller, is there not an advantage worth going after in the overhead valve, in the multiple-cylinder type? I would like to get your opinion on that.

J. G. Vincent: That is the old story of a lot of considerations. I don't know. We do know the very wonderful all-around efficiency of the L-head motor, when well-built. You can throw the valves in and take them out pretty easily. Most anybody knows how to take care of them. Of course, within reasonable limits, you can get as much compression as you want with an L-head motor, anyway, and within reasonable limits, I agree with Mr. White, of the Cadillac, that you can get about all of the efficiency out of the L-head motor that you can out of the valve-in-the-head motor. You can get a little more out of the valve-in-the-head, I believe. Of course, at extreme speeds, I know you can get a whole lot more, but I have yet to see a valve-in-the-head motor that will really stay quiet over a long period of service, and there are usually some difficulties about grinding valves, and things of that kind. Of course, if I were going to design a racing motor, I would design a valve-in-the-head motor, naturally, because there is nothing but power which counts, but in building an automobile motor, you must take into consideration a lot of things; power is just one important item.

I don't expect any movement, or any great movement, toward valve-in-the-head motors, especially in the higher-priced cars.

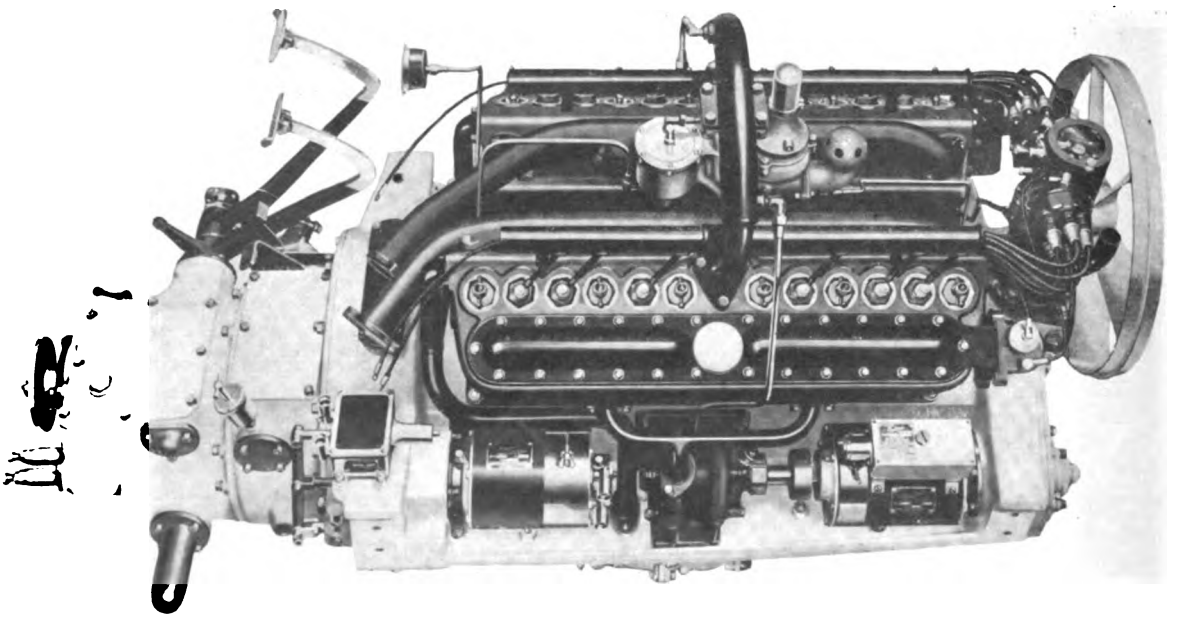
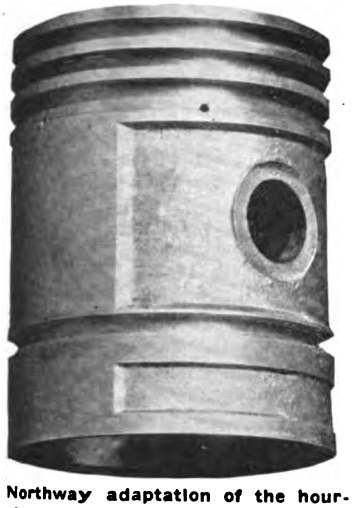
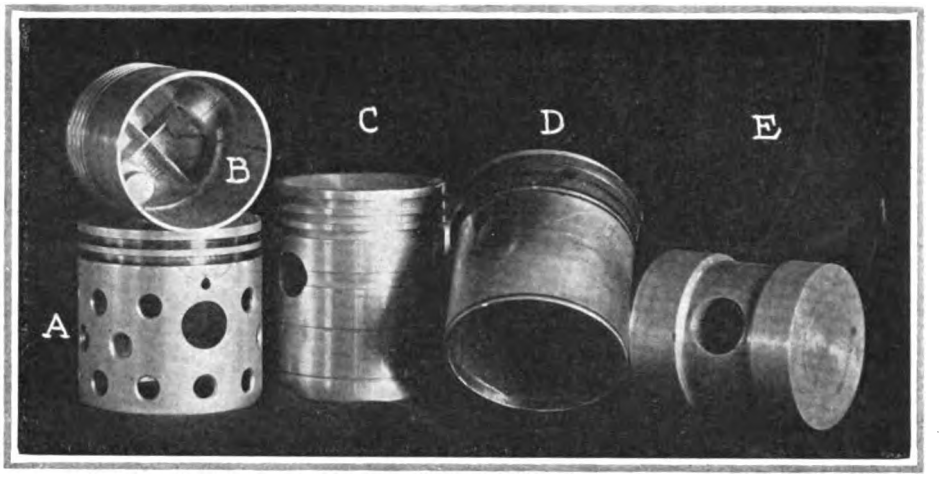


Fig. 6—Plan view showing the layout of the accessories in the Packard twin six motor



Northway adaptation of the hourglass type of aluminum alloy piston which fulfills the requirements for for this type of casting



A—Piston lightened for high-speed six-cylinder racing motor use. B—Showing exceedingly fine ribs possible of attainment with Cothias process. C—Piston used on Knight motor. D—Run for 490 consecutive hr. at 1300-1400 r.p.m. under full load. Equivalent to 18,000 miles at 35 m.p.h. Wear less than 0.00025 in. E—Hourglass type rapidly gaining favor

The Aluminum Alloy Piston

Some Points of Superiority—Increasing Bearing Life—LesseningVibration—Preventing Injury to the Cylinder Under Overheating Conditions—Few Defective Pistons

By James E. Diamond*

A FEATURE of the meeting of the Indiana Section of the Society of Automobile Engineers, in Indianapolis, Thursday evening, Sept. 23 was the paper by James E. Diamond, engineer of the Aluminum Castings Co., which was scheduled to follow J. G. Vincent's paper on the twelve-cylinder motor. Mr. Diamond's paper is given herewith in full:

It seems altogether fitting in a discussion of the twelve-cylinder motor, a type which has immediately commended itself to the automobile public, that the aluminum alloy piston, certainly a factor in this motor's greater success, should not be neglected. It is a happy circumstance that almost coincident with the advent of the V-type, multi-cylinder motor, one in which the reduction of the reciprocating mass to a minimum is an all-important desideratum, was the development of a successful aluminum piston alloy, successful from the standpoint of both maker and user.

It is my intention to comment on some points of superiority of the aluminum alloy piston, even though this undoubtedly involves a repetition of facts which are more or less familiar to you since this type of piston has been the subject of much discussion in recent months. Certain phases of piston design will also be considered later. The advantages of aluminum alloy pistons generally will first be touched upon, and I then shall endeavor to make clear the decided superiority of pistons made by the Cothias process, more commonly known as permanent mold pistons, to those cast in sand.

Weight of the Alloy

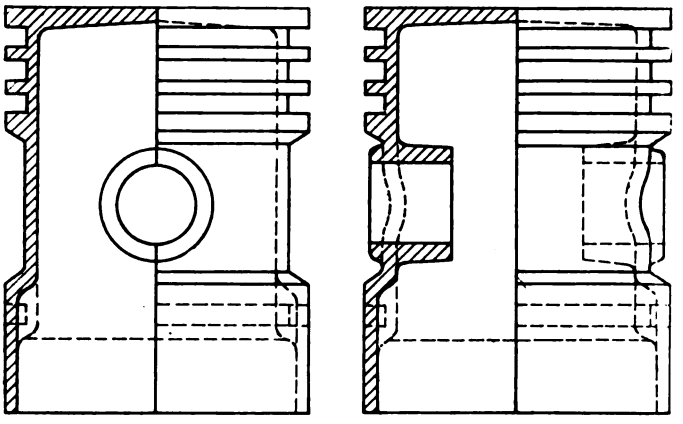
The weight of the aluminum alloy piston is, roughly speaking, but one-third that of an iron piston of the same design. It immediately follows that the inertia forces due to the purely reciprocating mass, that is, the piston itself, may be reduced approximately 67 per cent by its use. Again it follows that the vibration-producing forces attributable to inertia conditions are decreased to the same extent, by the vibratory force due to the lack of balance between opposed vertical forces present in vertical motors, or unbalanced horizontal forces, as in the V motor. Crosswise vibration is disagreeable if nothing more,—much more disagreeable than vertical vibration,—and the smaller these may be made, the more the likelihood the motor will be able to absorb this vibration within itself.

Increased Bearing Life

In reducing the inertia forces responsible for vibration, another very desirable object is being attained, namely the diminution of the bearing pressures, engendered by these self-same forces, this equivalent of course to increased bearing life—a consideration of no mean importance. It is easy to underestimate the magnitude of these forces, but with the present tendency toward the small bore, long-stroke, high-speed motor, more attention must be given this phase of motor design. It is quite safe to say that in some of the recent European racing products, these inertia forces are of greater magnitude than the working forces in the motor. Theoretically, this may be shown, and theory is supported by tangible evidence that this is so.

Incidental to these advantages it may be said for our own particular alloy, that its bearing qualities are excellent, its coefficient of friction being but approximately 50 per cent that of cast iron. A slight gain in mechanical efficiency should result, and possibly the reduced friction explains a decided decrease in the consumption of lubricating oil in several cases that have come under my observation at one time or another, where the iron pistons have been displaced by Lynite pistons. Doubtless, too, the much greater thermal

*Editor's Note—James E. Diamond is the engineer of the Aluminum Castings Co., Cleveland, O., manufacturer of Lynite pistons, and is an authority in this field.



Sectional drawings showing the construction of the hourglass type of piston

conductivity of the aluminum piston plays a part in this result. In any event, it seems reasonable to suppose that less friction would reflect itself in a smaller consumption of oil.

The greater thermal conductivity of this piston also explains why the carbon deposit on the head is so much less than experienced with iron pistons. As a rule the little carbon that collects is easily removed. In fact, under favorable lubricating conditions, no carbon is deposited.

In Case of Overheating

Another feature will commend this type of piston to you. Should a motor overheat and a piston seize, only in rare cases does harm to the latter result, and practically never is injury done the cylinder. On the other hand, if piston seizure occurs in an iron-pistoned motor reboring and regrinding are the usual order, frequently a new cylinder block being required.

Considering now the advantages that the piston made by the Cothias process has over the sand-cast one, we have found this permanent mold piston quite superior to the former in every respect. The point of superiority in which its pre-eminence is most marked and which has the greatest practical value is that its hardness is approximately 25 per cent greater, consequently its resistance to wear greater to the same degree. One of the troubles with aluminum pistons has been that they have been too soft. By this process pistons are being made that have a hardness not very much less than that of cast iron.

While the strength of the sand-cast piston is ordinarily sufficient for requirements, the increase of strength inherent to this Cothias process is, or should be, welcome, and the tensile strength will range between 25,000 and 30,000 lb. per square inch—quite a little higher than that of ordinary iron. As of passing interest, a case is recalled where some sand-cast pistons of scanty proportions failed a few hours after they had been put into a motor. Later pistons of identically the same design were produced by this process, and are running to-day, at last accounts, the mileage being considerably in excess of 10,000.

From the standpoint of manufacture, also, the permanent mold piston is a better and cheaper proposition. Usually pistons come from the molds with not more finish than may be ground off in one operation. The reference to grinding is made advisedly, for while it may be true that some aluminum alloy pistons cannot be satisfactorily ground, Lynite permanent mold pistons may be, and are being successfully ground in production.

Kerosene is a satisfactory grinding medium, and I also believe, turpentine will do very nicely.

The wristpin holes are cored and brought closely enough in size in some cases to require a reaming operation only.

An advantage also measured in dollars and cents is that the percentage of pistons found defective in the shop after machining operations have been performed upon them is very much less than that of sand-cast pistons found defective after a similar expenditure of time and labor. In this connection the superintendent of a plant manufacturing high grade motor cars,—the motors of which having had aluminum alloy pistons as standard equipment, for some time and Cothias process pistons for several months,—recently told me that their defective loss had dropped 90 per cent when this change was made. Foundry practice, respecting sand castings, it is doubtful, will ever be refined to a point where allowances for finish need not be as liberal as presently required. With the exercise of the greatest care piston sand castings will vary from one to another. This excess stock represents quite a bit of metal for which the foundry quite properly must be paid, and yet which not only usually represents a dead loss, but also in most cases represents an additional item of expense, in that additional operations for its removal are required.

The Use of Ribs

Relative to design, this may follow very closely that for the iron pistons. However, in my opinion it is advisable to rib the head, the better to carry away the heat from it, in this way eliminating the possibility even, that the continued subjection to high temperature result in a gradual deterioration of the metal. Whether one rib or two be employed if the rib in the plane of the bosses is dropped down to them, stiffness is given where stiffness is required and the ring-carrying portion of the piston more rigidly and strongly bound to the rest of the piston.

Oscillating the Pin in the Piston

There are as many advocates of the practice of oscillating the pin in the piston as there are of locking the pin in the piston and rocking the rod. While each has its advantages, the former construction is certainly the cheaper, and where used the results have been uniformly highly satisfactory. I have examined pistons of this type that have seen many thousands of miles service, in which the wear in the wristpin holes was not measurable.

Whenever it is possible, it is wise to increase the length of the piston, possibly 25 per cent. This of course, gives more bearing surface. It is also good practice to increase the width of the first land, also to fit the rings rather more tightly than is customary in fitting rings in iron pistons. The reason for this is self-evident.

The Question of Expansion

One question that invariably arises is relative to the greater expansion of aluminum, and the clearances required. No set rule can be laid down. The proper clearances must be determined by experiment for each particular type of motor. In many cases if the piston barrel is tapered, it is possible to eliminate entirely piston slap.

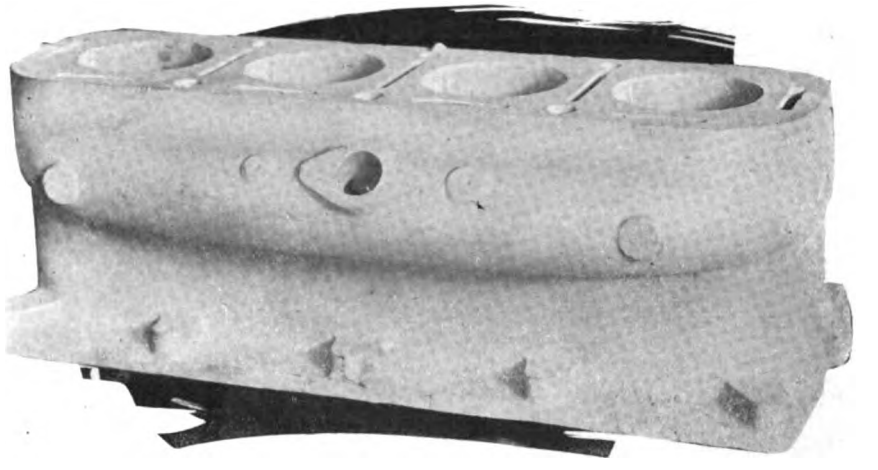
Hourglass Type Gains

At the present time, the manufacture by the Cothias process of pistons of a design providing for the employment of a so-called wiping ring at the bottom of the skirt is not a commercial proposition, where strict adherence to conventional design is insisted upon. However, as the process adapts itself to the manufacture of pistons of the "hour-glass" type, the same end may be attained. The prejudice against this type of piston is rapidly disappearing. Many who were skeptical six months ago are no longer so, and you will be interested to know that one of the largest manufacturers of motors in the country has standardized on Cothias process pistons of the general "hour-glass" type.

I believe it entirely proper to remark in conclusion that my company already has in hand orders aggregating a half-million pistons, pretty fair evidence that the aluminum alloy piston has arrived.

Lower Weight—Higher Efficiency

A. L. Clayden Answers F. R. Porter—Thinks Weight and Performance Will Be Sales Factors in Future



At the right is illustrated an aluminum casting for a Knight motor which will have no cylinder liners but will use cast iron valve sleeves and aluminum pistons. This is an experimental job, but if successful it is likely to be followed by regular production. The saving in weight is considerable. Aluminum cylinder heads have been used on Knight motors before with perfect results, but this is the first all-aluminum attempt

DETROIT, MICH.—Editor THE AUTOMOBILE:—In his letter published in THE AUTOMOBILE for Sept. 2, F. R. Porter states that he thinks the automobile of 1917 will have to carry seven passengers with a motor of not more than 200 cu. in. capacity and argues therefrom that every part of the engine will have to be made from the strongest possible material. Far be it from me to venture any prophecy in definite terms, for I know full well I should never have predicted the twin fours and sixes, and experience teaches that prediction in the automobile field is somewhat risky, but I am tempted to tilt a lance with Mr. Porter on this subject in the light of past experience.

Naturally, I am always a little liable to argue from European experience as a basis, but on the question of motor efficiency it is unobjectionable to do so because Europe has tried out engines with the maximum of volumetric efficiency possible to date. A year ago, when the British and French manufacturers were getting ready their 1915 designs that would have been seen last fall, had it not been for the war, it was quite noticeable that the tendency was distinctly toward a slight *reduction* in volumetric efficiency.

Efficiency Can Be Carried Too High

This was because the ultra high efficiency motor is ultra sensitive to any sort of derangement, is ultra costly to build and is ultra heavy for its power. In this connection it may be well to look at aeroplane engine development. It was thought in Europe in 1912 that the best possible engine for aeroplane work would be one following the ideas of the racing car motor, and I confess without shame to having supported this notion, finding myself in such good company as that of F. W. Lanchester and many other expert engineers. But actual trial showed that aeroplane engines of low volumetric efficiency gave better results in practice; that engines built with the sole idea of obtaining the most power from the least weight were altogether different from the high efficiency engines that the racing car had brought into being. Broadly, the explaining reason was that the racing car engine was so highly stressed that it had to be heavy if reasonable reliability was to be obtained.

Coming back to the car again, Mr. Porter has suggested 200 cu. in. as the ideal size. Now, in 1912 and 1913 one of the most popular sizes for European automobile engines for cars with a four- or five-passenger capacity was 3 liters or 183 cu. in. roughly, and many such motors developed a maximum power of from 45 hp. to 65 hp. at about 3000 r.p.m. which is 1 hp. for each 3 cu. in. approximately.

Use of these engines showed that poppet valves were troublesome, because the power fell off so fast if the tappet adjustment was a hairsbreadth out of true, if the ignition was not in perfect condition and if the carbureter was not highly tuned. With Knight motors the efficiency did not depend upon the valves, of course, but the very high-efficiency Knights had their troubles none the less.

As a consequence the 1914 engines were a trifle larger than the 1913. Several makers changed from a millimetric bore and stroke of 80 by 130 mm. to 80 by 150 mm. or even to 90 by 135 or 150 mm. Cars which had been regarded as wonders for their engine size were made better performers, between the 1913 and 1914 seasons, more by increased dimensions than by increased mean effective pressure or increased speed, and if the 1915 cars had appeared it would have been seen that this tendency had persisted.

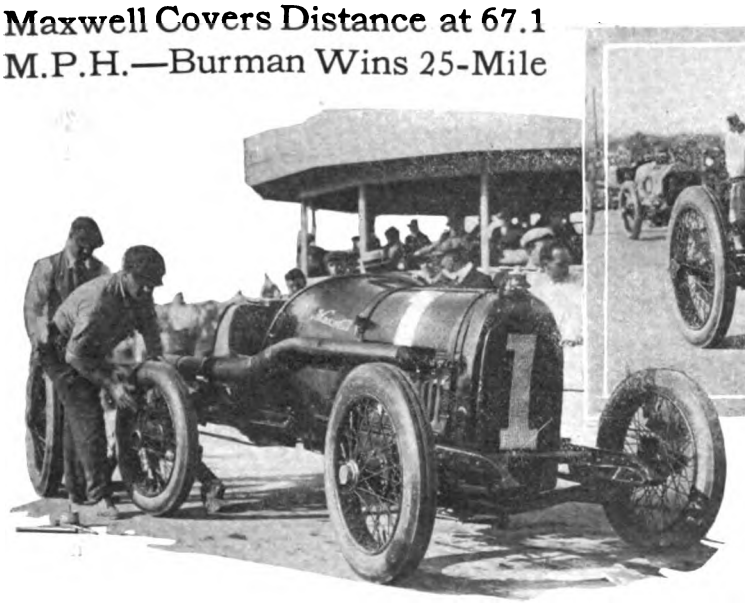
What Is Efficiency Limit?

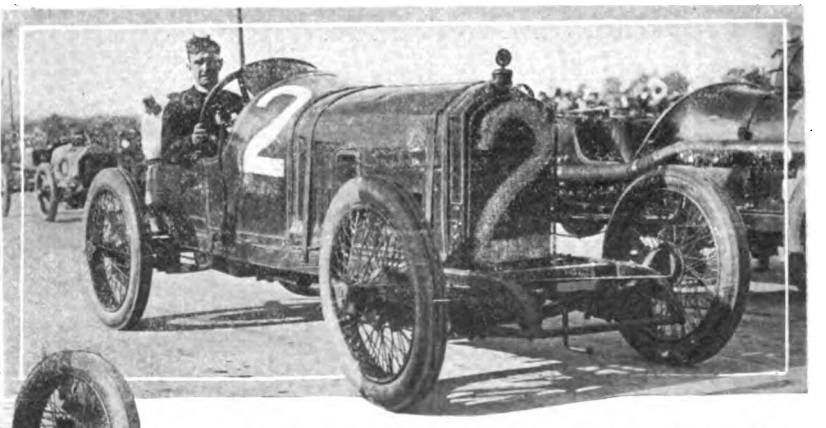
Whether we have reached the useful limit of horsepower yet remains to be seen, but it stands to reason that there must be a limit. There must be an explosion pressure beyond which it does not pay to go. The conditions of an automobile motor are so complicated, and an automobile engine has to do so many things no other kind of engine is asked to do. I do not for a moment say that higher mean effective pressures will not be used in the future, but I do think that we are near the limit unless the whole scheme of the motor undergoes some change. If there is a type of gasoline engine which has not yet been discovered, anything may happen, but with the present poppet valve or Knight motors I feel fairly confident that reliability will be difficult of attainment if we increase the pressures much above 1 hp. for each 3 cu. in. at maximum power, or if maximum power is developed at speeds much above 2800 r.p.m.

Again let me say that all sorts of things *may* happen, but confining attention to modern experience I think we have the limit of pressure for an internal combustion automobile engine well in sight—for commercial work that is, though perhaps not for racing. If this be agreed upon, then I think it is most probable that the free use of aluminum and the copying of aeroplane constructors' practice will help the automobile manufacturer and the motorist more than anything else. I think that we are nearing the day when nobody will care much how many cubic inches a motor has, but will regard only the weight and the ability. In other words, the performance on the road and the cost of that performance in fuel, oil and tires. It is emphatically the car that is light in weight by comparison with the passenger load it can carry which is going to come out on top.—A. LUDLOW CLAY[illegible]

Rickenbacher Wins Narragansett 100-Mile

Maxwell Covers Distance at 67.1 M.P.H.—Burman Wins 25-Mile





Above—Bob Burman in his Peugeot which won the 25-mile race on the Narragansett Park speedway last Saturday with an average speed of 69.76 m.p.h.

Left—Rickenbacher changing a tire on his Maxwell which won the 100-mile event at an average speed of 67.1 m.p.h.

By James T. Sullivan

PROVIDENCE, R. I., Sept. 18—Eddie Rickenbacher, in a Maxwell, won the most sensational automobile race ever seen in New England when he captured the 100-mile contest here to-day averaging 67.11 m.p.h. He came from behind and by sensational driving made up lost laps and then swept into the lead. His time for the 100 miles was 1 hr. 29 min., 24.75 sec., an average of 67.1 m.p.h. This is claimed to be a new record for the distance on a 1-mile track, the old record having been held by Tom Alley in a Duesenberg, made at Minneapolis in 1914 and which was 1 hr., 31 min. 30 sec., or 65.57 m.p.h. Another record claimed to have been made was that for 1 mile by Bob Burman before the race started when he circled the track in 45.73 sec., the 46.20 made by Louis Disbrow in St. Louis a year ago having been the best previous mile on a 1-mile track.

The races were staged on the new Narragansett Park speedway, an old horse track that has been asphalted. The curves are banked about 25 deg. and the track is 50 ft. wide. It was stated by F. E. Perkins, head of the Narragansett Park speedway organization, that there were 40,000 people present, there being 38,000 paid admissions.

The big race started shortly after 3.30 p. m. with fourteen cars lined up in two rows of five and one row of four, with about 10 yd. between each row. They were sent around for a flying start and they kept well together so that they got the flag on the first time around. Then the race was on in earnest. And from beginning to end of the 100 miles only four of the contestants did not stop, Burman, De Palma, Haupt and Jones. The asphalt seemed to wear the tires, particularly as they went around the banked curves where the cars bounded a bit, showing the track was somewhat rough. The weather was ideal for the race, cool and bracing, but it had been so hot previously during the tryouts of the previous days that the carbureters had to be adjusted.

Rickenbacher shot into the lead on the first lap, but was crowded back into third place before the second mile ended. There he held his place, watching the speed of the others and always within 50 ft. of the leader.

Rickenbacher Falls Behind

But he had to stop in the fifteenth lap with carbureter trouble. Before he got going the leaders had passed around three laps. Rickenbacher cut loose, however, and very soon it was apparent that the little car with 1 on its radiator was coming around very frequently. First it was noticed that it had regained the laps lost to the tailenders of the field. Then when 33 miles had been covered he had won back a lap, the leaders being 33 and Rickenbacher 31. Soon he was in third place. De Palma then started a spurt, whirling past Burman and trying to lengthen out the distance, but he could not get very far, for Burman was always within 10 yd. of him.

De Palma had the lead in the 37th mile and from that time to the 57th, or a distance of 30 miles, he kept in the van. But every time he and Burman made a mile in 54 or 55 sec., Rickenbacher did it about 50 or under. So he continued to cut down the lead. Before 50 miles had been reached he had circled all the others again and so they were then but 1 mile ahead of him.

Burman then began to show signs of speed, and to tear away from De Palma, having passed into first place on the 58th mile. And each mile while Burman was leaving De Palma behind, Rickenbacher was gaining on both. The spectators then began to sit up and shout. And the shouting encouraged Rickenbacher, for he smiled and let his car out a little faster.

When 60 miles had been reached he was swinging around the upper curve with an abandon that seemed reckless, for he appeared to be handling the car like a toy. It

How the Cars Finished

100-MILE EVENT

Driver	Car	Time	Prize
Eddie Rickenbacher	Maxwell	89:24.75	$4,000
Bob Burman	Peugeot	91:21.55	2,000
Willie Haupt	Duesenberg	91:24.25	1,000
Ralph De Palma	Stutz	91:42.70	700
Peter Henderson	Duesenberg	92:25.35	600
J A. Myers	National	93:42.50	400
Ira Vail	Mulford	95:36.25	300
J. Cleary	Bugatti	96:50.40	.....

Grant and Stricker still on track when race called off.

25-MILE EVENT

Bob Burman	Peugeot	21:29.96	$400
Ralph De Palma	Stutz	21:31.50	300
Willie Haupt	Duesenberg	22:01.45	200
Walter Jones	Peugeot	22:10.85	100

Speed Tabulation of 100-Mile Race, Held at Narragansett Park Speedway, Providence, R. I., Sept. 18

Car	Driver	Miles	10	20	30	40	50	60	70	80	90	100
Maxwell	Rickenbacher		9:04.05	20:44.66	28:39.80	37:53.25	46:20.80	54:55.25	63:22.95	71:43.70	80:10.45	89:24.75
Peugeot	Burman		9:02.95	18:10.75	27:18.15	36:22.73	46:11.75	55:07.15	63:59.25	72:45.35	81:46.75	91:21.55
Duesenberg	Haupt		9:27.60	18:43.80	27:54.65	36:52.40	45:54.65	56:11.25	65:09.25	74:06.95	82.58:25	91:24.25
Stutz	De Palma		9:02.20	18:09.10	27:17.75	36:19.25	46:10.45	55:10.70	64:11.60	73:23.30	82:26.90	91:42.70
Duesenberg	Henderson		9:05.60	18:11.35	27:19.35	36:28.10	46:06.65	54:54.65	64:07.05	73:15.75	82:23.95	92:25.35
National	Myers		9:17.95	18:15.95	28:41.60	37:41.53	46:40.30	57:57.60	66:56.35	75:57.20	84:44.60	93:42.50
Mulford	Vail		9:16.85	18:26.80	28:55.40	38:04.70	47:05.55	56:07.60	66:08.65	75:27.20	86:12.95	95:36.25

would whirl around and the rear wheels would start for the sky or the upper edge of the track only to get yanked back like an unruly horse that shied at a street car.

Then it would roar down the track with the driver laughing and nodding to his pit attendants, who held up blackboards telling him how fast he was going, his position, etc. Having evened up matters it was then his plan to get the lead. De Palma was the first he went after and when he had swung over the line on the 72d mile and the cars tore around the first quarter, Rickenbacher went into second place.

It was now Burman only that separated him from first place. Then the real race began. One hardly realized that the Maxwell had passed when it was around again. It came so fast that people mistook it for some other and they asked where it was, not knowing it passed.

When the cars came whirling down for the 73d mile it was seen that Rickenbacher was closing up on Burman. The latter passed over the line 5 sec. ahead. There was no question then of the outcome, it seemed. On the next lap they tore down side by side and it seemed as if Rickenbacher was playing with Burman. On the next mile they crossed the line with Burman 4 ft. in the lead. For two more laps they swung around side by side and then entering the 77th mile Rickenbacher seemed to infuse new life into his car and shot into first place. When he went over the line on that mile he was 9 sec. ahead of Burman.

Meanwhile De Palma seemed to have lost heart and was slowing up. As they went around on the 80th mile Rickenbacher was close to De Palma and on the next mile had passed him, giving Rickenbacher a full lap lead, thereby making up four laps in about 65 miles.

Meanwhile his lead over Burman increased and at 85 miles he was 27 sec. ahead, which was equal to a little more than ½ mile. The spectators began to expect him to lap Burman then. But when he had gone 90 miles and was about ¾ mile ahead he began to slow down and drive safely. Burman was trying to make up the lost distance, but could not do it.

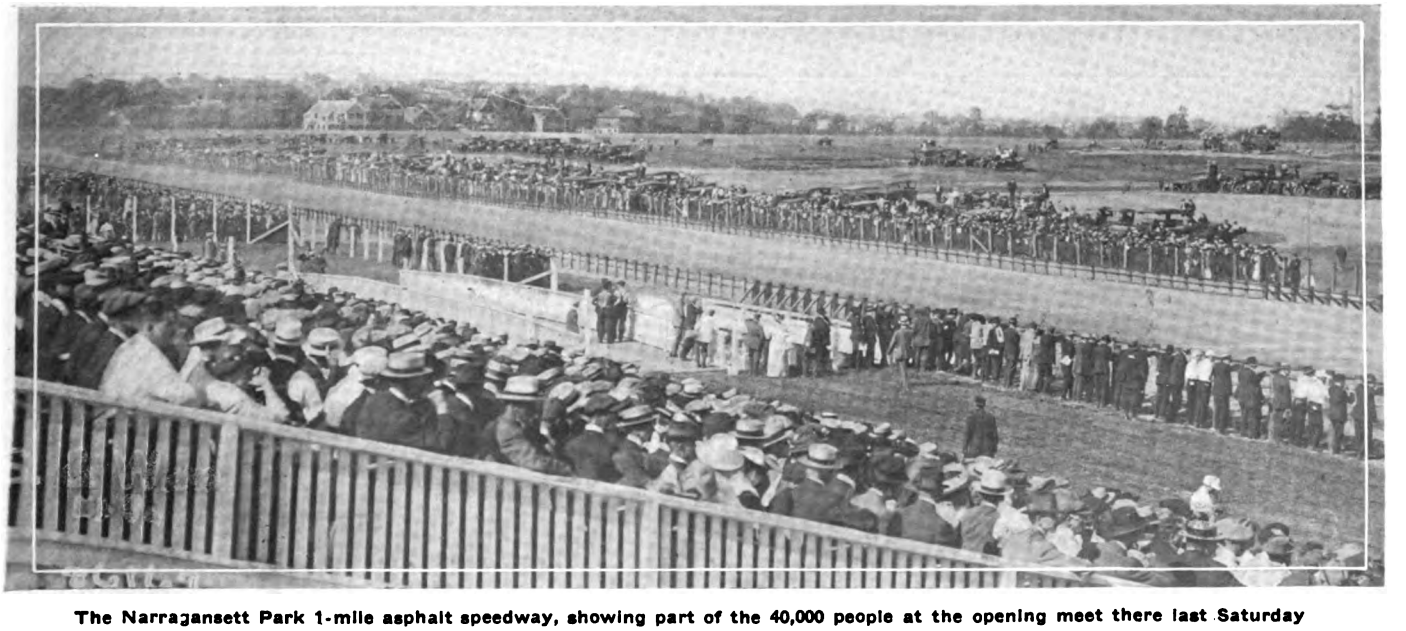
Willie Haupt then came along and passed De Palma. So as it neared the 100 miles everyone was resigned to Rickenbacher's win. And he crossed the line amid a great ovation, with 1 min. and 1 sec. to spare. Burman finished second, Haupt third and De Palma fourth.

Burman Wins 25-Mile Race

The 25-mile race was not very interesting. There were eight starters and it proved a jockeying match between Burman and De Palma, neither getting far in the lead at any time. Finally Burman shot over the line 50 ft. ahead of De Palma with Haupt third and Jones fourth. Burman's average was 69.76 m.p.h. for the race. Stops were unofficially given as follows:

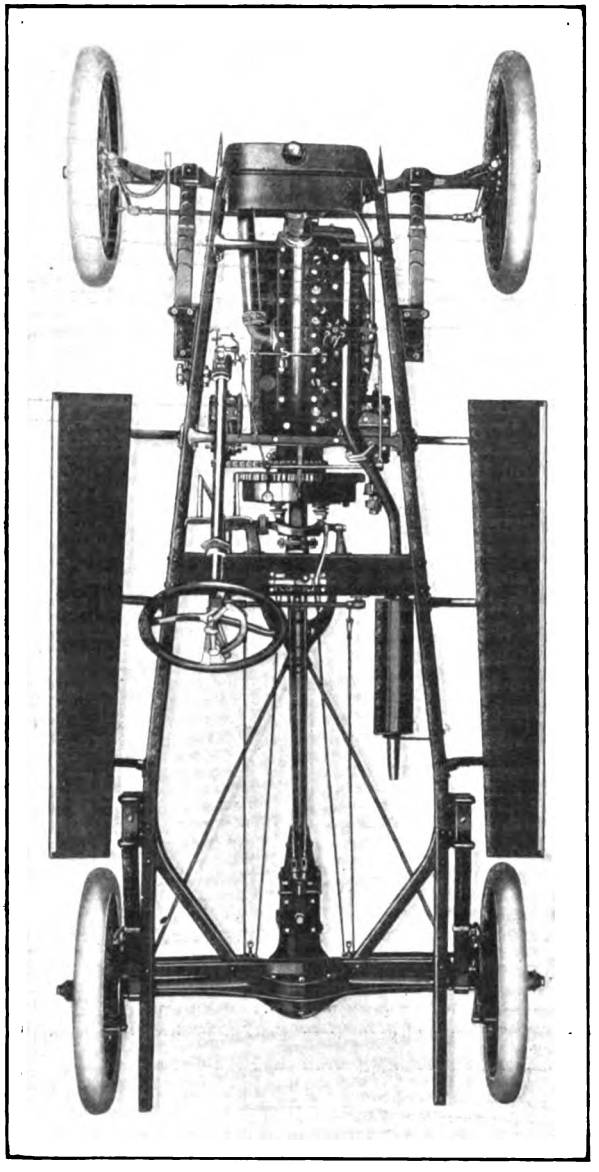
Richenbacher stopped in the 15th mile to adjust carbureter. Lost 2½ min.
Henderson, Duesenberg, 47th mile to change tires.
Vail, Mulford Spl, stopped on the 25th and 60 miles for tires.
LeCain, Pugh Bros. Spl, out in 15th mile with broken clutch.
Cleary, Bugatti, stopped in the 8th, 42, 50 and 75th miles for tires.
Dickenson, Stutz, stopped on 3d, 45th and 75th mile with steering gear trouble that finally put him out of race in last stop.
Myers, National, stopped in 25th and 45th mile for tires.
Stricker, Erwin, stopped in 32d mile for tires and 45th for carbureter trouble.
Grant, Sunbeam, stopped in 42d and 48th miles for spark plug trouble.
O'Donnell, Duesenberg, stopped on 4th and 13th miles for carbureter trouble that put him out of race on second stop.

Rickenbacher's winning Maxwell and Burman and Haupt's Peugeots used Oilzum throughout the race and practically all the cars except the Sunbeam used Boyce Motometers. Nearly all the cars were equipped with Goodrich Silvertown cord tires.



The Narragansett Park 1-mile asphalt speedway, showing part of the 40,000 people at the opening meet there last Saturday

Saxon Adds Roadster on Six Chassis



Plan view of the Saxon six chassis for 1916

Two-Unit Electric Starting and Lighting System Replaces Single-Unit Type on Six— Bodies of Both Four and Six Improved

THE new series Saxons of the Saxon Motor Car Co., Detroit, Mich., will cost the buyer just as much as they did before, but they have a number of improvements and refinements which really make the cars strikingly good values. The little Saxon roadster still commands a figure of $395, though it is fitted with a three-speed gearset instead of two speeds, and there are other differences such as a much more attractive body line which brings the cowl up to meet the windshield in neat fashion.

The six price is $785, and besides the touring car model, a very attractive roadster is fitted to the chassis at the same price. Perhaps the most important change in the six is the adoption of a new type of electric starting and lighting system of two-unit form which replaces the single-unit type of the previous series. Besides this, there are a number of body refinements and a few little changes in the mechanical end which lend to the greater efficiency of the vehicle.

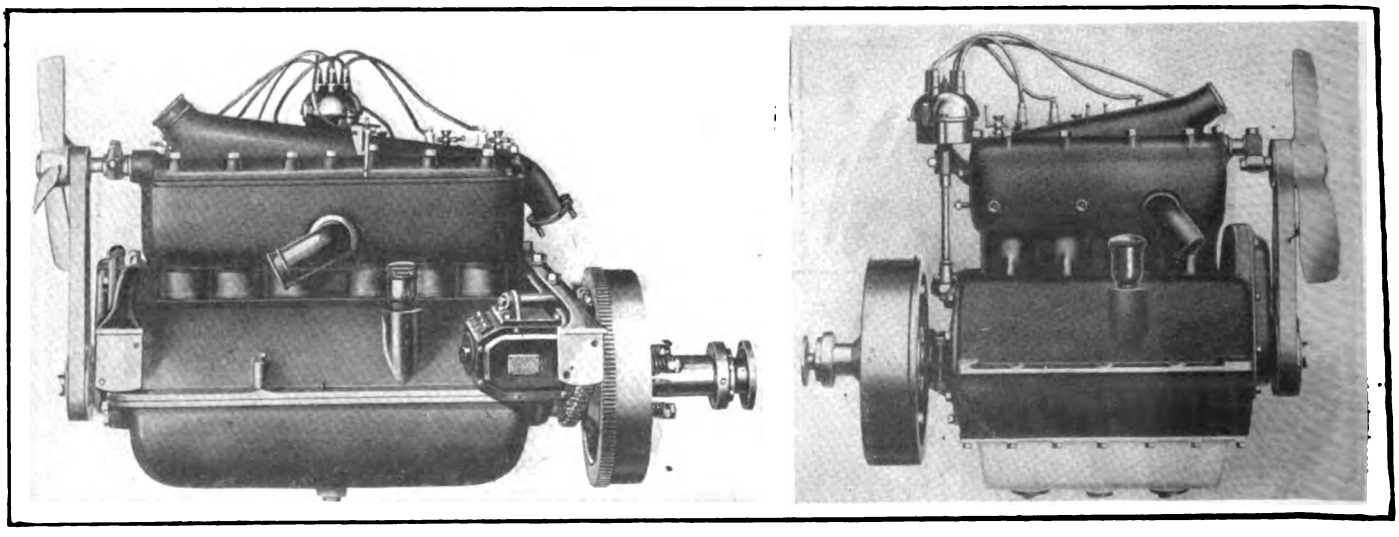
Briefly, the roadster specifications take in a 15-hp., 2¾ by 4-in. motor, a three-speed selective gearset in unit with the rear axle, dry-plate clutch, left steer with center control, wheelbase of 96 in., cantilever springs and 28 by 3 tires.

Reviewing the details of the six, one immediately sees that the characteristic appearance of the car is not changed. It still retains the high, narrow radiator and the nicely-shaped body. The motor has a bore of 2⅞ in. and a stroke of 4½ in., and the gearbox is also on the rear axle, which is a three-quarter floating construction. Cantilever springs, dry-disk clutch, wheelbase of 112 in. and 32 by 3½ tires are also among the specification features.

The Saxon Six

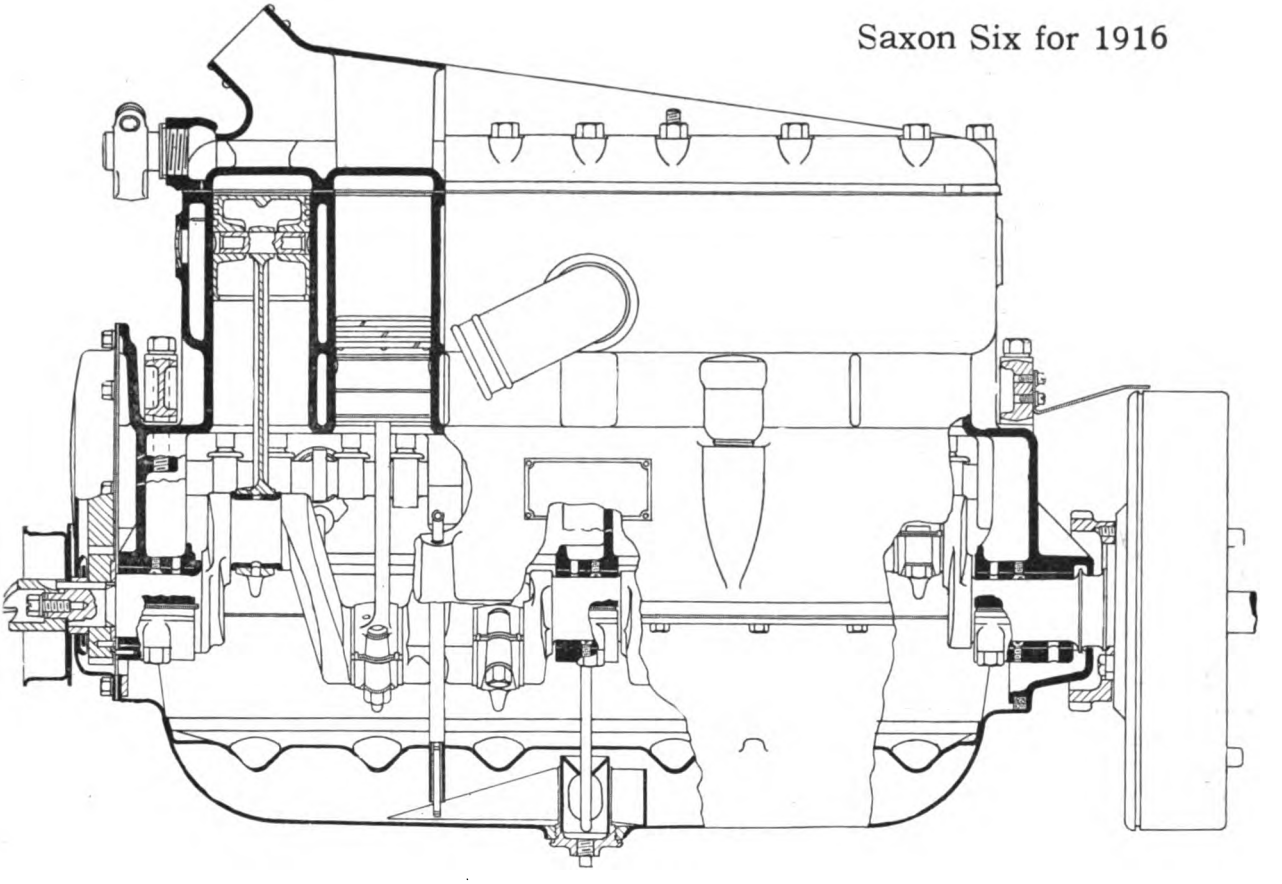
Taking up the six-cylinder car first, it should be said at the outset that the car enters its second year strikingly free from mechanical changes. This but reflects the soundness of the design in the first place, for it is not to be supposed that a company of the Saxon caliber would stand back for a minute if it were deemed advisable to make any constructional changes other than the minor ones that are to be mentioned in the new series.

In adding a roadster body to the six chassis, the Saxon company makes a wise move, for there is unquestionably a large field for roadsters of the lighter type, and the chassis adapts itself readily to this

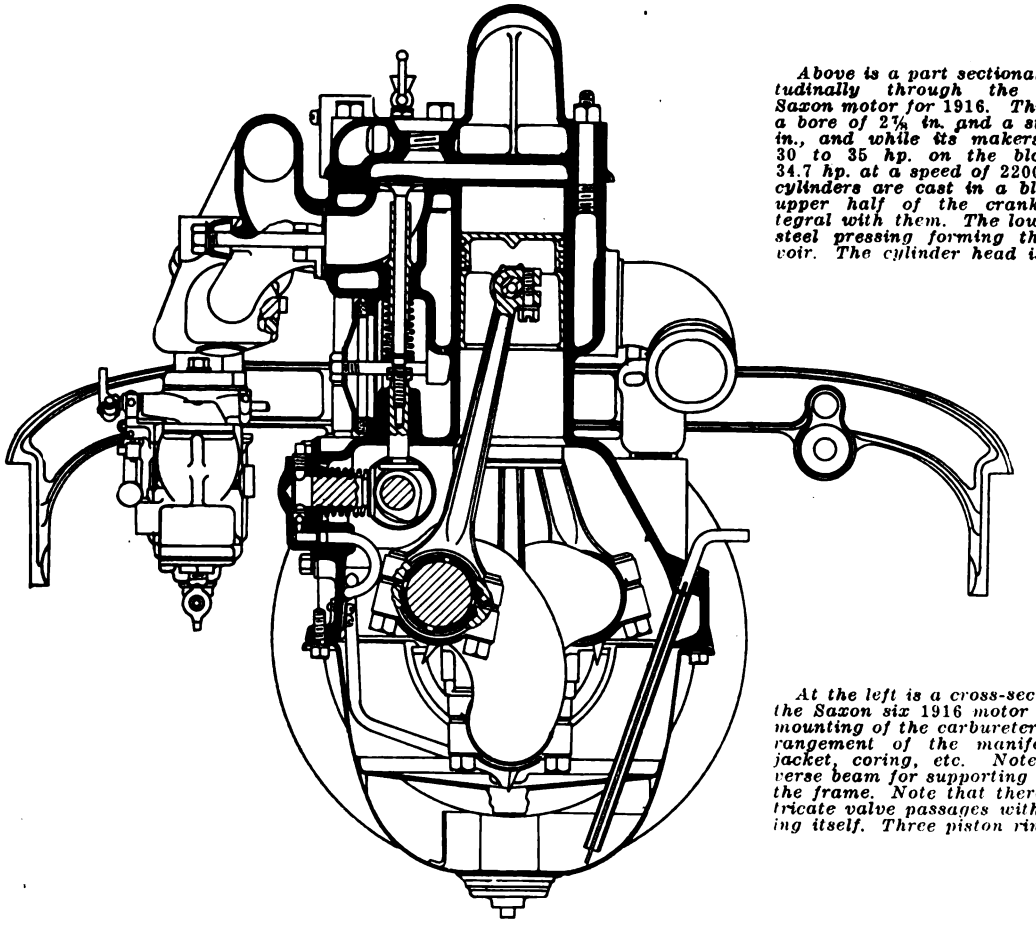


Left—Left side of Saxon six motor showing electric starter. Right—Right side of Saxon four motor

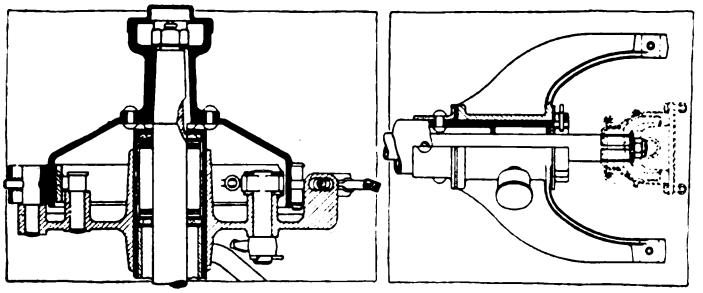
Saxon Six for 1916



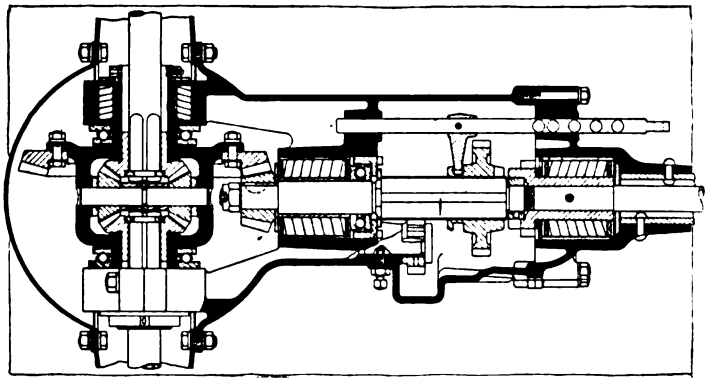
Above is a part sectional view longitudinally through the six-cylinder Saxon motor for 1916. This motor has a bore of 2⅞ in. and a stroke of 4½ in., and while its makers rate it at 30 to 35 hp. on the block it gives 34.7 hp. at a speed of 2200 r.p.m. The cylinders are cast in a block and the upper half of the crankcase is integral with them. The lower half is a steel pressing forming the oil reservoir. The cylinder head is detachable



At the left is a cross-section through the Saxon six 1916 motor showing the mounting of the carbureter and the arrangement of the manifolds, water-jacket, coring, etc. Note the transverse beam for supporting the motor in the frame. Note that there are no intricate valve passages within the casting itself. Three piston rings are used



Left—Characteristic hub of the 1916 Saxon. Right—Yoked front end of the driveshaft torsion tube which hinges to a frame cross member



Rear axle and gearbox in unit with it used on the Saxon four

body without change over the touring car type. A most attractive design of two seater has been evolved—one in which the rear deck is in good proportion to the hood, thus giving a well-balanced effect. Too often body designers make the mistake of dropping the rear deck too abruptly, giving the idea that they simply added a rear deck to cover the rear end of the frame. But Saxon has not made this mistake. The design, in fact, is such that the rear compartment will take a spare tire or two, so commodious is it.

Body sides of the touring car have been raised slightly by the addition of a piece of molding running all the way around the top edge of the body. This is known as a garnish strip, and it does much to add a finishing touch. Tonneau seats have come in for 1 in. of widening, this bringing them to 46½ in. and giving room for three reasonably large persons. To make riding more comfortable in the front seat, the seat back has been given a slightly less vertical position. It tilts to the rear 1 in. more than it did in the previous model. A point which adds to the general good looks is the use of plain upholstery without tufting. That is, the folds run straight instead of diverging to tufting buttons.

The new sixes will also appear in a different standard color. It is a very pleasing shade of olive green—a color known to the paint trade as Cadillac green. This seems to dress the six up in genteel style, and is a welcome relief to the somber deep blues and blacks that are all too prevalent in standard body colorings.

Two-Unit Electric System

The chief mechanical change, as already mentioned, is in the adoption of a two-unit electric system. This is the product of the Detroit Starter Co. and both motor and generator are compact and well mounted on the engine. The two units occupy positions on opposite sides at the rear. The starting motor is placed on the right and hangs from the rear motor supporting arm. It connects to the flywheel gear through the Bendix automatic shifting device. The reduction is 10 to 1 between engine and electric motor, and the latter is capable of turning a motor somewhere in the vicinity of 100 r.p.m.

Hung off the left rear motor supporting arm, the generator is chain driven from the crankshaft. This drive is just between the flywheel and the rear of the engine. To afford adjustment of the chain and to make a simple mounting of the electric unit, a trunnion construction is used. A plate on the top of the generator fits into a trunnion pin attached to the supporting arm, and the generator can be rocked closer to or away from the engine to give the required adjustment of the sprocket centers. Two set screws hold the generator in place. The generator runs at twice engine speed.

Charging regulation is obtained by the use of a Ward Leonard regulator which cuts in at 10 m.p.h., and holds the charging rate at a prescribed maximum regardless of the engine speed.

Saxon axle equipment is now made by the Timken company, and has been for several months. However, the present axles are of practically the same design as they were formerly, although a notable change made some time ago was the adoption of spiral-bevel gears in the rear axle. There is no longer any doubt of the efficiency or noise eliminating features of this very modern form of gearing, and further dilation upon it would be useless here.

34.7 Hp. at 2200 R.P.M.

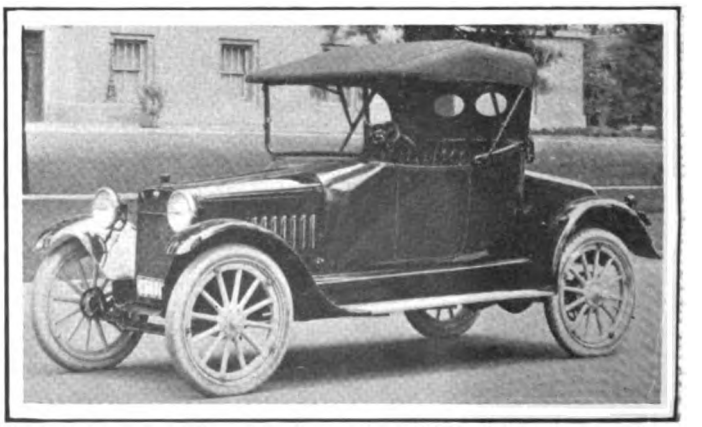
On the block the six-cylinder motor gives 34.7 hp. at a speed of 2200 r.p.m. Its advertised rating is from 30 to 35 hp., so that it does all that is claimed for it. At first glance, the most noticeable thing about this power unit is the compactness. The cylinders are cast in a block, and the upper half of the crankcase is integral with them. The lower half, which also forms the oil reservoir, is a steel pressing, which is light and smooth of form. The cylinder head is detachable, bolting by a number of heavy studs to the cylinders proper, and incorporating as an integral part the large water outlet connection to the radiator.

Valves are on the right, having the usual complete inclosure against dirt and noise. On this side are also both manifolds which are separate castings bolting to the block. A simple cylinder casting is therefore obtained, as there are no intricate valve passages within the casting itself. The Rayfield carbureter is positioned at about the center of this side of the engine so that it is readily accessible.

Interior features offer nothing out of the ordinary for good practice. Valves have nickel-steel heads welded to carbon steel stems. Pistons and rings are standard, and a slight change this year is the substitution of a Burd high-compression ring at the top of each piston for the former eccentric ring. The other two rings for each piston, however, remain of the eccentric type. Four bearings support the camshaft, the drive for which is by helical gearing, and there are three main bearings for the crankshaft. Bearing dimensions follow:

Front main	1 7-8 by 1 1-2
Center main	1 7-8 by 1 7-8
Rear main	1 7-8 by 3
Connecting-rod lower ends	1 7-8 by 1 1-2

(The first dimension is the diameter.)



New Saxon six roadster which lists at $785 with complete equipment

Atwater Kent distributer ignition is employed, and there is one slight change in connection with it. That is the moving of the spark plugs from over the exhaust valves and placing them over the intakes. This was done to give the plugs longer life and keep them cleaner. The exhaust gases sweeping by the plugs subject them to greater heat than they have to undergo over the intakes.

Splash lubrication finds good application in this motor. There are individual splash troughs under the rods, and circulation is maintained by a pump, with leads to the main bearings. Cooling is also very simple through the use of the thermo-syphon system in connection with a cellular-type radiator and belt-driven fan.

Rear-Axle Gearbox

Continuing back of the power unit, the car possesses a multiple dry-disk clutch, alternate disks being steel against Raybestos. This clutch is housed in the flywheel. There are two engagement springs, making for uniform action. Then, after passing through a universal, the drive shaft enters a torsion tube. This has the usual yoked front end, hinging to a substantial frame cross member. At its rear end the tube attaches to the front of the gearbox, and the latter in turn is a unit with the front part of the rear axle housing. Diagonal brace rods run from the outer ends of the axle housing to the front of the torsion tube.

In this design of attaching gearset to rear axle, a compact form of gearbox is used, this of the three-speed selective type. The shifting rods run along the top of the torsion tube from the gearshifting levers.

The Saxon company has been very successful with cantilever springs, these being used on both cars. They are constructed of vanadium steel, and are mounted outside of the frame rails on riveted brackets. These springs are 2 in. wide, 30 in. long in the rear and 27¾ in. in front on the six.

Of rather unusual form is the frame, which has a straight taper from a point a little forward of the rear axle. This is done to bring it to a narrow front and to offer a good support the entire length of the body.

The Saxon Four

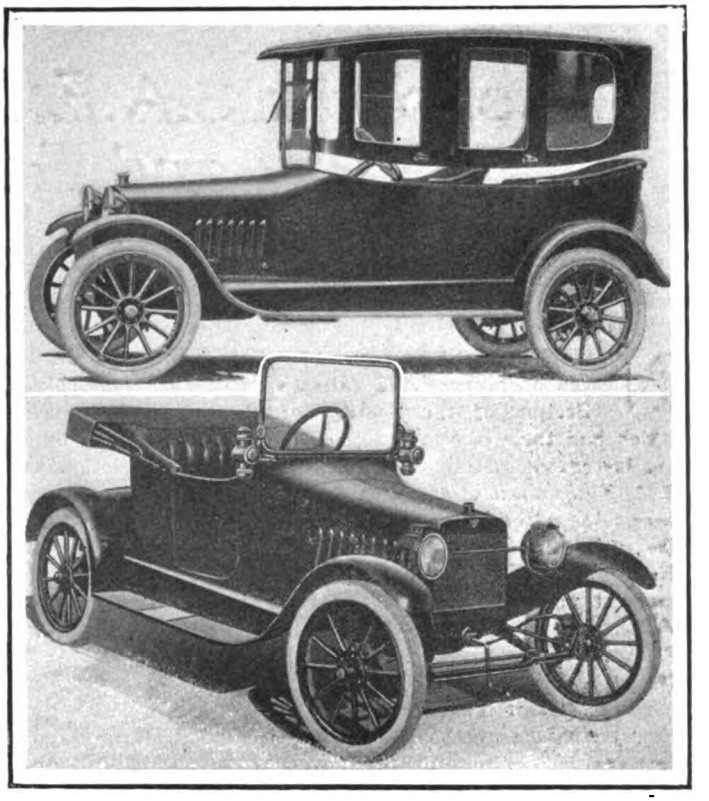
Flexibility of the little Saxon roadster and better ability for negotiating all sorts of going is given by the addition of the intermediate speed in the gearset. In the previous models, there was no speed between low and high, and the change will be appreciated.

The noticeable thing about the new roadster, however, is the change in the front part. The former windshield filler skirt has been entirely done away with. This was a piece of cloth used to bridge the gap between top of cowl and bottom of windshield. The new body cowl is brought up to meet the windshield without break, and it adds a nice touch. Along with this improvement, the windshield itself has been enlarged and made ventilating. That is, it is hinged to swing either way, and when the top is swung outward, there is some space below for air to sweep in.

Although electric starting and lighting are not standard on this car, the cost of equipping it with a single-unit Detroit Starter Co. system has been cut from $70 to $50 extra. This means that a full electric-equipped vehicle may be had for $445. However, instead of having only gas headlamps as the standard lighting equipment, oil side lamps have also been added, these in addition to the acetylene lights at the front of the radiator.

Another refinement is the fitting of adjustable clutch and brake pedals so that a driver of any height may be comfortably accommodated. The brakes have also been improved by making them 2 in. wide instead of 1½ in. This gives added braking power on the 8-in. drums.

As in the six, the axles are now made by Timken though of the same design as in the past, except that the front wheel spindles have been changed to a better steel. They are now a chrome-nickel steel, whereas they used to be constructed of 15-20 carbon steel.



Above—Saxon six touring car with detachable inclosed top which sells for $935, including the touring car top as well as the demountable type illustrated. This car sells for $785 without the demountable top. Below—The new Saxon four-cylinder roadster which, with three-speed transmission, larger body, adjustable pedals and other refinements, sells for $395

In the tire equipment, although the size remains the same as last year, the tires are really better for instead of using motorcycle tires, the Goodyear factory is furnishing a strictly automobile design of tire. The main difference between them is that the tread is heavier, this spelling longer wear.

Motor Similar to Six in Design

There are no motor changes other than the fitting of a Burd ring at the top of each piston instead of an eccentric ring, as is also done in the six. Though smaller, the motor is much the same in general design as the six. It is a block type with cylinders and upper crankcase in unit. The head is detachable and also carries a large water outlet for the thermo-syphon cooling system.

Ignition is by Atwater Kent, with the distributer vertically placed at the rear of the motor cylinders. A Mayer carbureter is used, the supply tank being in the cowl. Similar to the six, the engine is oiled by splash, with a pump supplying the troughs and the main bearings.

In the chassis, the design follows closely the recognized Saxon practice, with concentric torque tube inclosing the drive shaft, and with the gearset mounted as a unit with it and the rear axle. The latter is semi-floating, having a pressed steel housing.

Following the popular trend, Saxon has added detachable tops to its line. These are intended for fitting to either the four-cylinder roadster or the six-cylinder touring car. They virtually inclose the car against any kind of weather, and a good scheme of attachment by bolts and catches is employed. The front fits the side supports of the windshield snugly. For the touring car, this top costs $150 extra when bought with the car, and for the roadster the price is $60 additional.

Metropolitan S.A.E. Discusses Aeroplanes and Governors

Paper by Leon Goldmerstein Traces Development of Aeroplanes—Final Report of Research Committee on Governors

NEW YORK CITY, Sept. 17—Fine attendance marked the opening of the fall season of the Metropolitan Section of the Society of Automobile Engineers which had their meeting at the Engineering Society's building last night. More than 100 members of the section and S. A. E. members of the Metropolitan district were in attendance to hear the interesting program made up by a paper on the aeroplane by Leon Goldmerstein, M.A., M.E., and the final report of the Research Committee on Governors presented by chairman H. G. McComb, engineer of the General Vehicle Co. The other members of the committee are, C. W. Fletcher, vice-president Walter Motor Truck Co., and A. M. Wolf

The report of the Research Committee on Governors completely summed up the activities of this body and marked a very valuable study of the governor as applied to automobiles. The report completely classifies and discusses the various types and thoroughly covers the patent situation of this device. The paper on the aeroplane was one which was well calculated to interest the engineers as it completely treated of the development of this art up to its present stages.

Mr. Goldmerstein prefaced his lecture by pointing out the growing similarity in the aims and work of automobile and aeroplane engineers. He then gave figures to show the enormous progress of the aeroplane industry caused by the war in Europe. Up to the present time this progress had not been accompanied by as careful a study of aeronautics as a science as could be desired, especially in this country. In Europe, although the manufacturing resources are perhaps not so great as in America, much more laboratory work has been done. The war has shown that the most useful type of aeroplane was one capable of carrying a crew of two to six men and a large load of bombs for attack. The recently completed Canada aeroplane made by the Curtiss company for the Allied forces which carried a load of 1 ton and attained a speed of 95 m.p.h. was mentioned as a good example.

The theory of the aeroplane was then dealt with by Mr. Goldmerstein with the aid of diagrams and some mathematical formulae which the lecturer assured his audience were very simple. It was shown that a single flat plane is not stable owing to the non-coincidence of the center of gravity and the center of pressure, causing a turning moment which upsets the plane. In the aeroplane this is overcome by placing another plane, forming the tail plane, at some distance behind the front plane, the effect of which is to cause the machine as a whole to maintain a definite relation to the line of travel by providing a turning moment about the center of gravity of the aeroplane. If the tail tends to drop its lifting power is automatically increased and the resultant lift brings the main plane back into its most useful position, or angle of incidence.

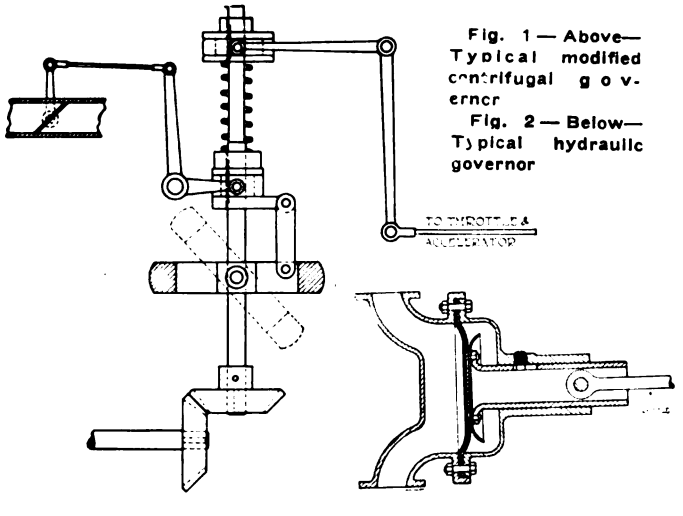


Fig. 1—Above—Typical modified centrifugal governor

Fig. 2—Below—Typical hydraulic governor

Report on Governors

The report of the Metropolitan Section Research Committee on Governors follows:

In considering the subject of governors for internal combustion engines, we might first mention the reason for their existence. Everyone to-day is familiar with characteristics of the internal combustion engine as applied to the automobile. One of these characteristics is that when the load is released from an engine the speed of the engine increases. This increase is limited practically by the size of the valves and other parts used in handling the fuel.

The governor reduces the maximum speed of the engine as limited by its valves and gas passages.

In the earlier days of the automobile the governor was much in vogue on pleasure car motors. To-day its use is ordinarily limited to the motor truck. This is, perhaps, due to two causes: the marked tendency to remove from the pleasure car every part that does not add to luxury, and the necessity, on account of maintenance costs, to limit the speed of the motor truck. It is also worthy of note that the pleasure car is usually driven by the owner, or in his presence, while the motor truck driver is usually outside of his direct control.

The governing of engines is an old art. Everyone is familiar with the flyball type of governor that limits the speed of the steam engine.

For the governing of the internal combustion engine various classes or types of governors have been employed. We may list these as follows:

(1) Hit or miss—Keeping inlet valve closed or exhaust open and so causing engine to miss one or more power strokes.
(2) Inlet valve control—Varying time of the opening or closing of the inlet valve.
(3) Ignition control—Omitting the ignition spark.
(4) Quality of fuel—Lean or rich charge.
(5) Quantity of fuel—Throttling the charge.

It is interesting to briefly consider the various types that are *not* used on automobile engines.

The hit or miss type probably came into existence on account of the low cost of construction of the governing mechanism. In this class the governor is usually nothing more than a pendulum provided with a trigger or catch that swings on the valve operating rod and hits or misses the end of the valve stem in accordance with engine speed.

The inlet valve control is a promising type but involves high cost and complication.

The ignition control type can be made cheaply but its use involves a waste of fuel in the unexploded charges, and the regulation, of course, is not close.

The quality of fuel control is too delicate a type for ordinary use.

This leaves us then only the quantity of fuel type for consideration in automobile practice. It should not be understood, however, that none of the other types are desirable, but simply that the quantity of fuel type has been the choice for development.

The quantity of fuel type controls by throttling the fuel supply after the fashion used on the cheaper steam engines in throttling the steam on its way to the engine. In the automobile this throttling is usually accomplished by a damper or other balanced valve placed in the intake pipe.

The function of the governor is to limit the motor to some determined and fixed speed.

Governor Limits

The governor may operate in relation either to
(1) The speed of the engine, or
(2) The speed of the vehicle.

In the engine speed limit type, racing of the engine is prevented. Its maximum speed is fixed. This naturally limits the horsepower output of the motor to that obtainable at the predetermined speed.

In the second type of governor where the speed of the vehicle determines the governed speed of the engine, the full output of horsepower of the engine may be obtained for low gear work when it is desirable, or even necessary, for the sake of expediency, that the engine be forced to do its utmost.

In one device on the market these two control methods have been combined.

In considering the variations of governors we come to a classification of types of quantity of fuel governors.

These governors may be subdivided into four classes, determined by the method of operation—these classes are:
(1) Centrifugal.
(2) Hydraulic.
(3) Inherent design.
(4) Gas velocity in intake.

The Centrifugal

The centrifugal governor, as generally used, consists of two oppositely disposed weights carried upon a revolving shaft, the speed of which bears a direct relation to the speed of the motor. These weights are mounted upon bell cranks, and, as the speed fluctuates, the bell cranks slide a splined sleeve axially along the revolving shaft against spring pressure. The motion of the splined sleeve is then communicated by suitable mechanism, to the throttle.

For the governor to be effective the throttle control mechanism must be arranged so that the driver is given only a limited control by means of the throttle lever, except in special cases where the governor is used only for holding the motor at *any* desired speed.

In all ordinary cases the governor has the master control, as it were. This is readily accomplished by a slotted link.

A typical flyball governor, with horizontal axis is shown in Fig. 3, while Fig. 7 shows the method of connecting the governor with the throttle. This is the governor used on the German Daimler truck.

The Hydraulic

In a modification of the typical centrifugal governor a steel ring, so supported that it can rock in relation to the shaft which drives it, is normally held at an angle with the shaft by a spring. As the shaft speeds up the governor ring tends to assume a position concentric with and at right angles to the axis of the shaft. Through the usual splined sleeve and trunnion the movement is conveyed to the throttle.

A typical governor of this kind is shown in Fig. 1, which is that used on the earlier Cadillacs.

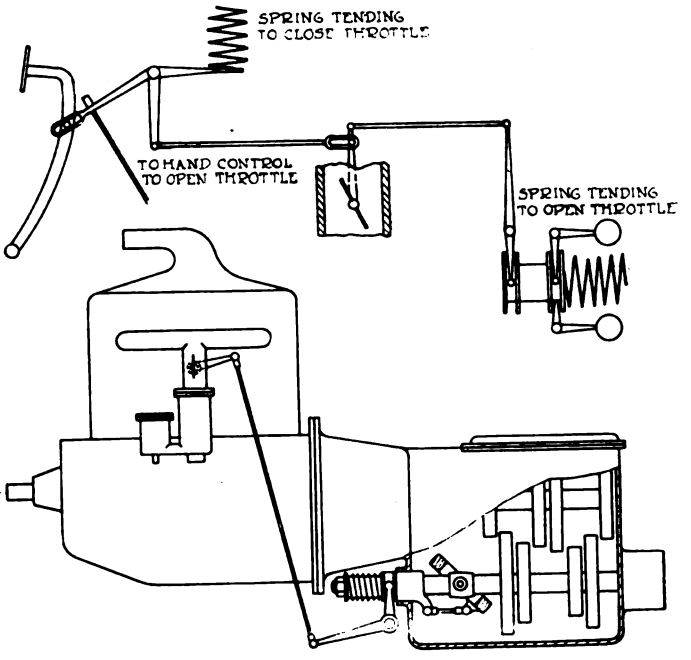


Fig. 3—Above—Flyball governor with horizontal axis
Fig. 4—Below—Governor drive from transmission shafting

The hydraulic type of governor utilizes fluid pressure from the water circulating or other system where the pressure is in relation to motor speed. The usual form consists of a large diaphragm, one side of which receives pressure from the pumped water of the cooling system, while a rod fixed in a washer or plate on the other side transmits the movement to the throttle. A typical hydraulic governor is shown in Fig. 2. This governor was, until recently, used by Packard, and has been a feature also of Panhard design.

Inherent Design

Since every motor has, from its inherent design, a limiting speed, it is apparent that this limiting speed can, by design, be made the governing speed desired. This is done, in its most simple form, by making the intake passages small.

As yet this means of motor control has not been utilized to any extent.

Gas Velocity

The kinetic energy of the gas in the inlet manifold is utilized to operate a type of governor that is extremely simple in its design and operation. An example of this type is marketed as the Kramer. In this governor a disk is placed in a funnel shaped section of the main gas passage. This disk is held in normal position by a spring. When the gas velocity reaches a predetermined speed the spring tension is such that the disk is drawn toward the small end of the funnel tube, and by suitable connections with the balanced throttle, the gas supply is limited.

Vehicle Speed Limit Type

We next shall pass to that type of governor where the motor speed limit is set by the speed of the vehicle. This method of control, as before mentioned, permits the engine to run at higher than the normally governed speed, when the vehicle is being operated on any of the gears but high. The reason for this is obvious; more power for the emergency pull on low gear. The governing means is essentially the same as designed for incorporating in the motor, but with the important difference that it receives its drive from the wheels or some part that runs in relation to car speed. In one form the governor drive is from the front wheels, Fig. 5, while in another the drive is from the transmission, Fig. 4.

It has been said that the governor might limit in proportion to engine speed or that it might limit in proportion to

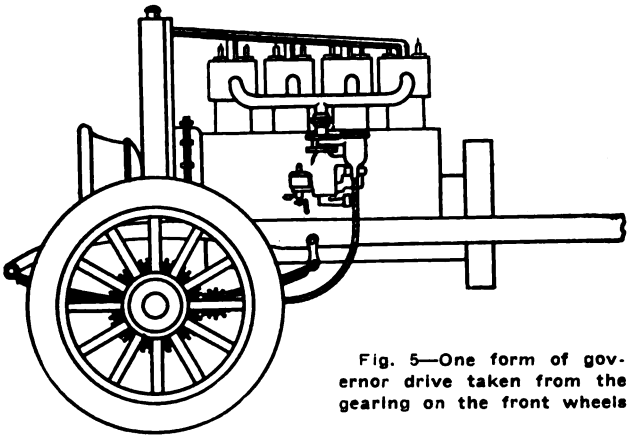


Fig. 5—One form of governor drive taken from the gearing on the front wheels

vehicle speed. One of the most interesting developments is the governor that limits in proportion to both.

In this ingeniously designed governor, shown in Fig. 8, there are two operating shafts. One of these shafts is driven by the motor and the other is driven from a part that rotates in proportion to vehicle speed, such, for example, as the propeller shaft. The shaft which is going at the higher speed, controls the motor, but the gear ratio between the engine and governor is so arranged that on direct drive the vehicle speed operates the governor connection from the motor. In other words, on direct drive, the ratio with the propeller shaft, for example, may be such that when the propeller shaft is going 800 r.p.m., the governor may be going 1000, and as it controls the motor at this point the motor is really governed to 800 r.p.m. However, the ratio between the motor and governor may be so arranged that the motor speed would have to be 1500 r.p.m. before the governor reached the critical speed of 1000 r.p.m.

It will be seen that through this method of governing, while the maximum speed of the car is limited on the top gear and the engine governed in proportion, should the driving become difficult on account of hills or heavy road resistance—in other words, should road conditions so change as to necessitate using some of the lower gears, the governed limit of the motor is raised so that the motor can be permitted to develop its full horsepower.

In this governor a grid type of throttle is used in which the openings are proportional to the angular movement of the throttle axis and in which only a small angular movement is necessary to completely close the throttle.

Another scheme to accomplish the same result forms the basis of a patent granted to H. Saurer. In this governor an auxiliary spring, operating in relation to the gear shift, augments the governor spring when the gear shift is in certain positions. This is shown very completely in the patent office drawing of the Saurer patent No. 13,348. The purpose of the Saurer scheme is to decrease the engine speed when the vehicle is traveling on its top gear, but to allow the engine speed to be increased when the lower gears are employed. This, it will be noted, is done by means of a cam fixed to the gear shift shaft. This cam also has provision for reducing the motor speed when gears are in neutral. This is one of the most interesting types of governing mechanism.

That the governor is, at present, deemed of importance for commercial vehicle work, is indicated by an examination of the Statistics of 1915 Commercial Cars, as issued in a booklet by *The Commercial Vehicle*. Here it is found that 74 per cent of the commercial vehicles are provided with governors, which leaves only 26 per cent ungoverned. Of 142 different makes of commercial cars, with 377 different models, 279 of these have governors as follows:

Of the centrifugal type	238
Of the hydraulic type	5
Of the inherent design type	5
Gas velocity in intake	34

Through the kind co-operation of the Institute of Automobile Engineers of England, information was secured relative to English practice. Here the proportion of non-governed to governed motors was more nearly even than in America. However, this is, perhaps, traceable to better disciplined truck drivers.

Without doubt, at the present, a consensus of opinion calls for governors on the engines of motor trucks.

Governor Drive, Etc.

In connection with this subject, it is interesting to note a few of the different types of drives that are used to communicate the movement of the rotating part to the governor mechanism. In some cases, particularly where the governor is to be applied to an engine made by the builders of vehicle units, but not applied as standard, the flexible cable is in vogue.

In those types of construction where the governor is built integral with the motor we find a sturdy and simple mechanism comprising suitable bell cranks, levers and rods connecting the sliding sleeve of the governor unit with the throttle.

The governor is usually so designed that it is impossible for the driver to tamper, in any way, with its operation.

An excellent example of sealed-in governor connections is the type used on the Packard.

If we refer again to Fig. 7, we will see how the governor is given the master control through the slotted link, which permits the driver to open up the motor without, however, taking it beyond the control of the governor, since it will be noted that the flying out of the governor weights exerts a positive control of the throttle lever, which is entirely beyond control by the driver, since the slot in the slotted link is made of sufficient length to give the governor full range and thereby full control.

Positions of Springs Interesting

In relation to other details, the position of governor springs is of interest. In some designs the governor spring is arranged so that it presses against the splined sleeve that operates the governor mechanism, the spring being arranged concentric with the shaft on which the splined sleeve is fitted. This is well illustrated in Fig. 3.

In other less used types of mechanism, the governor spring operates on the end of a lever connected with the trunnion carrying the governor weights. In the Kramer governor the spring is of the spiral or clock type.

In still another type the springs act directly on the governor weights. This is clearly shown in Fig. 6.

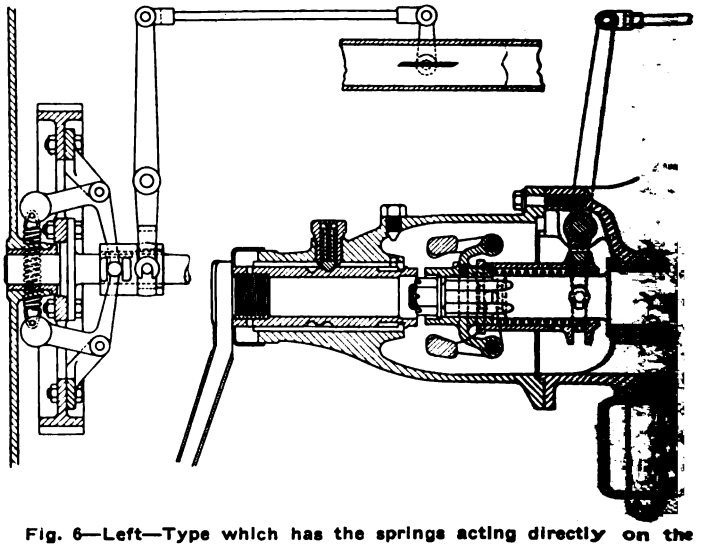


Fig. 6—Left—Type which has the springs acting directly on the governor weights

Fig. 7—Right—Method of connecting the governor with the throttle, as used on the German Daimler

In most of the commercial governers now on the market, the governor spring is made adjustable by means of a threaded sleeve and this sleeve is provided with a locking means, so that after the desired governor adjustment is obtained, the governor mechanism may be locked either by seal or padlock.

It is the usual practice to have the truck guarantee become void if governor seals have been tampered with.

In other forms of governors, like the German Daimler, the governor spring is housed in an extremely inaccessible box. To get the necessary adjustment, the governor spring is ground to length when the motor is tested. In this case the governed speed is fixed once and for all. Another interesting detail refers to various methods of connecting the governor and throttle. In automobile practice direct connections are used, but an examination of the patent art shows that besides the bell crank and rod methods of connection, or connections by flexible cable, electrical and pneumatic means may be used.

Patents

In connection with this report, a collection has been made of the United States Patents on the subject of governors. These patents will be found on file with this report.

Most of these, fortunately, do not touch the automobile.

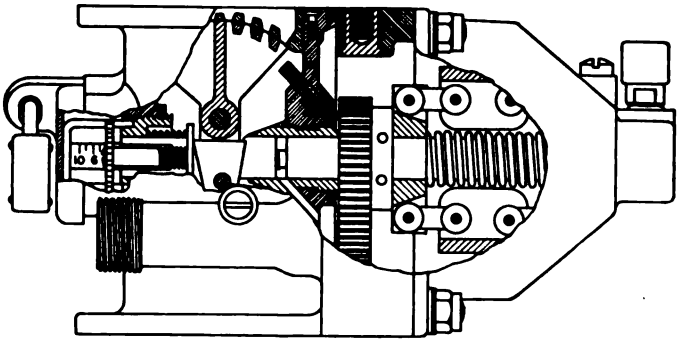


Fig. 8—Diagrammatic section of the governor with two operating shafts, one shaft being driven in proportion to the vehicle speed and the other by the motor

However, they are of interest in showing the work attempted on governor design. These patents are found under Class 123, in the United States Patent Office, and under this class we list various interesting patents under sub-classes.

In addition to United States patents, we have obtained, through the courtesy of August Riebe of the Riebe Ball Bearing Co. a list of German patents.

A complete list of United States and foreign patents then followed in the report.

Recent Court Decisions—Sale on Instalments

By George F. Kaiser

A MASSACHUSETTS contract to sell an automobile on instalments allowed title to the car to remain in the vendor. The seller also had the right to take possession of the car on default in any of the terms of the contract. A default was made, and 2 days afterwards a replevin action was started for possession of the car against a deputy sheriff, who had attached it.

The court decided that the seller was entitled to possession of the car as against the vendee creditors, who were claimants under the attachment, because the contract had been made, and was to be performed in Massachusetts, although the case was tried in Maine, and no Massachusetts statute had been put in evidence to show that in a case like this the seller was required to give notice to the attaching party before beginning suit, and one who relies on a foreign statute must prove it.

In this case on neglect to prove the Massachusetts statute, the common law rule applied, under which no notice was required.—*Franklin Motor Car Co. vs. Hamilton*, 92 *Atlantic* (*Maine*) 1001.

Allow Automobile to Pass

That an automobile, when overtaken from the rear, must allow the approaching automobile to pass, was recently decided in New York.

A suit was instituted for damages arising out of a collision between two automobiles. The party bringing the suit claiming that she had been driving her car on the extreme right of a public highway, 20 or 25 feet wide, at the rate of 15 miles per hour. That the left front hub of her car had been struck by the right rear wheel of another automobile coming up at the speed of 30 miles per hour without any warning. The other motorist claimed, however, that the first car was to the left of the center of the road; that for a considerable time he had been driving in its dust, and finally, desiring to go ahead, he sounded his horn when he was about 200 feet in the rear, and continued to sound it until he had overtaken the car in front; that there was barely room to pass even leaving the road and scraping the stone wall at the side.

That plaintiff, instead of yielding the road, edged over further beyond the center, and caused the collision.

The jury accepted the latter statement as regards the accident, and the court said that "if the position of the forward car in the center of the highway did not leave sufficient room for passage, upon request or equivalent notice, if practicable and safe, it should have been turned aside so as to leave sufficient room for passage. Relief was therefore denied the party bringing suit.—*Gautier vs. Lange*, 151 N. Y. *Supp.* (*N. Y.*) 902.

One Must Give Way

The decision in a recent New York case was that when each of two parties relies on the other's giving way both are guilty of contributory negligence and are barred from recovering for injuries resulting from a collision. Suit was brought by a motorist for damages claimed because of a collision between a trolley car and an automobile truck. The question of negligence and contributory negligence was emphasized by the court when it was found that neither the motorman nor the chauffeur attempted to stop his vehicle, the chauffeur and his helper testified that they had started the automobile truck on 133rd street, west of Madison avenue, and that they intended going south on the avenue. That when 7 or 8 yards from the crossing they saw a car approaching about 30 yards south of 134th street; that the helper put up his hand for the car to stop but the car struck the truck's front spring and scraped by in front of it; that they had blown their horn but did not slow down or stop until they saw that the motorman was not going to stop.

The court held that in view of the fact that neither party had right of way over the other, but that both had equal rights on the highway, it was as much the chauffeur's duty to avoid a collision as it was the duty of the man in charge of the trolley, and that therefore the trolley company was not responsible to the automobile truck owner for the damages.—*James Everard's Breweries vs. New York Railways Co.*, 151 *N. Y. Supp.* (*N. Y.*) 905.

Sheldon Makes Only Semi-Floating Axles

EDITOR THE AUTOMOBILE:—In your issue for September 9, beginning on page 472 was a story entitled Axle Design for Accessibility and Strength, in which illustrations were shown of various makes of axles including a panel of Sheldon rear axles. The illustrations of the Sheldon type of construction showed semi-floating, three-quarter floating and floating, giving the impression that the Sheldon Axle & Spring Co. is still producing three-quarter and floating types of axles.

The information concerning the Sheldon products and blueprints from which the illustrations were made were sent to you by the writer in answer to your request for information concerning typical methods of constructing these three types of axles and insofar as being illustrations of those three types is concerned the matter is accurate.

The illustrations of the three-quarter and floating types are illustrations purely of types that have not been manufactured in the Sheldon plant for some time. As you undoubtedly are aware, the Sheldon company is convinced of the unquestioned supremacy of the semi-floating type of axle as evidenced by the fact that no type other than the semi-floating is being manufactured by it. In view of the fact that we are convinced of the superiority of the semi-floating type and are true to our convictions to the extent of not manufacturing any other type we certainly will appreciate the publication of this communication so that there may be no confusion in the minds of your readers concerning our adherence exclusively to the semi-floating type of construction.

Wilkes-Barre, Pa. ARTHUR M. LAYCOCK,
Chief Engineer, Sheldon Axle & Spring Co.

—This article was in no way descriptive of the product of any manufacturer and must not be construed to mean that the axles shown are the present products of any of these. In fact, some of the illustrations were merely diagrammatic. The illustration showing the Timken, for instance, was of a diagrammatic nature and included a three-quarter floating type which this concern does not make.

Wants Owners' Fuel Consumption Tests

Editor THE AUTOMOBILE:—Some weeks ago you had an article in your magazine commenting on the unfair gasoline consumption tests as advertised by certain automobile manufacturing companies. You suggested some definite standard by which all tests might be made, but why not get actual road tests?

I have had my new Studebaker four-cylinder car now for some nine weeks, have traveled 2865 miles and consumed 148 gal. of gasoline. At 1408 miles I used 70 gal.; at 1800 miles just 90 gal. From that time on I began to go with a full car (five passengers) and consequently the average began to drop.

It seems to me such tests are of much more value to the average motorist than any track test by experts can possibly be.

The new 1916 cars are frequently reported as making certain mileages on special trips but no 3000-mile average can be staged by the average owner very often.

Would like to hear of tests similar to mine from different car owners.

Melrose, Mass. H. M.

Lost Motion in Pinion and Gear

Editor THE AUTOMOBILE:—Kindly explain by sketch and description the proper way to find out if there is any lost motion between the driving pinion and crown gear?

2—Between compensating gears and spider gears?

3—Kindly explain the proper way to find out if the driving pinion has sheered its key.

New York City. J. D.

—This can be explained better than illustrated. The best way is to remove the cover plate from the differential housing and clean off the gears so that the action in the assembly can be noted. Leave both wheels on the ground and place the gearshift lever in neutral. By means of a pipe wrench a firm hold should be taken on the propeller shaft and with the hand on the large crown gear, the propeller shaft moved backward and forward. Any lost motion between the shaft and the crown gear can then be readily noted.

2—Any play in the differential assembly at any point can be located by removing the assembly from the housing and examining the gears, by shaking them back and forth.

3—If the driving pinion has sheered its key this can be readily determined by the fact that with the gears in neutral, the propeller shaft can be rotated by means of a pipe wrench without moving the rear wheels or the differential.

Remedying Grinding in Differential

Editor THE AUTOMOBILE:—Kindly advise me how I can eliminate a grinding noise occurring in the differential on an Overland 1910 model 51.

Would like to know just how to adjust this so that I will not have to buy new gears.

Anna, Ohio. O. E. H.

—The grinding noise you speak of may be due to foreign matter which has accumulated in the differential gear housing. Before doing anything else, it would be well to flush this out with kerosene. The differential can then be packed with heavy grease and unless the noise is due to considerable wear, it should not bother you. The probabilities are that the wear occurs between the driving pinion and the crown gear. Any adjustments at this point should be made by a repairman who is expert in the work, as it is very delicate. On the Overland rear axle, the mesh between the bevel gear and drive pinion can be accomplished by removing the cover from the differential housing and taking off with a screwdriver the thrust bearing adjustment lock on the side toward which the differential is to be moved. The adjustment cup of the thrust bearing is then turned in the same direction. The two screws which hold the split differential adjusting collar are turned until the collar may be evenly moved in the desired direction. Moving the collar on one side of the differential makes it necessary to adjust the one on the opposite side accordingly. Both axle shaft ends have right threads.

When the proper mesh of the gears is obtained, both collars are tightened, and the thrust bearings brought close to the adjusting collars. All the screws are then tightened and the small locks which keep the cups from turning are replaced.

Carbureter Is Improperly Adjusted

Editor THE AUTOMOBILE:—What are some of the best carbureters for the Ford 1913? I have a Holley and am not geting sufficient power.

2—I would also like to know whether dry cells are practicable for lighting the Ford? I hesitate about running the lights from the magneto.

3—My motor runs well until I strike a steep hill and have to open the throttle wide, then the engine seems to choke, and skipping follows. The throttle is situated so that the engine idles smoothly when the throttle is closed. It is not a question of mixture, at least when the throttle is not opened much, for I have tried different adjustments of the mixture needle.

Hartford, Conn. H. H. B.

—The Holley carbureter should give you perfect satisfaction on the Ford car and if you are not getting sufficient power it is because the adjustment is not correct or because some part of the carbureter or motor is out of order. It is suggested that you have the carbon cleaned out and the valves ground if this has not been done for some time.

2—Dry cells are not practicable for lighting a Ford car as they would have to be renewed every time the current was consumed.

3—You are not getting enough air at full throttle opening and you should change the carbureter adjustment to correct this fault.

Forcing Apart Split Demountable Rims

Editor THE AUTOMOBILE:—I have found a jack and convenient rock a most efficient device for forcing the ends of a split demountable apart so that the retaining lock could be dropped over the pins. Anyone who has tried to put a tire on this type of rim when rust under the bead has increased the diameter will, I believe, appreciate the idea. See Fig. 1.

Manila, P. I. R. N. C.

A Device for Detecting Loose Bearings

Editor THE AUTOMOBILE:—The following is a description of a device, Fig. 2, which ought to interest all automobile repair men. Its purpose is to detect a loose crank bearing or piston pin bearing of a connecting-rod without removing the oil pan. It is also used for testing leaky piston rings. Take a foot pump and add a cup washer the reverse of the regular one so that one will act in each direction. Make a brass fitting to take the place of the base of the pump, the end of which is threaded to fit the spark plug hole. With the piston on upper center, screw the tool into the spark plug hole and by working the plunger up and down, the piston will be alternately raised and depressed and any slack in bearings detected, also by listening at breather hole, any leak by rings will be heard.

Detroit, Mich. C. R. S.

Advantages of Auxiliary Air Control

Editor THE AUTOMOBILE:—Would it be an advantage to have some hand control device attached to the intake manifold above the carbureter to make it possible to add an extra supply of air to the mixture when operating an automobile?

2—Could it be made to act as a scavenger and cylinder cooling agent?

3—Could it be used to increase the engine power?

4—Could it be used as an air brake?

5—Would it be useful to cut down gasoline consumption?

6—Would there be any other advantages that could be gained by applying such a device for controlling the air to a car, if any?

Easton, Pa. W. F. B.

—Many drivers are using such an attachment to great advantage. These extra air devices are open when running at fairly high rates of speed and cut down the fuel consumption.

2—They probably are not of great assistance in scavaging, but as a cylinder cooling agent when coasting down a hill with the ignition cut out, the clutch in and the device open wide, they might be of some slight assistance.

3—The engine power is probably not increased so much as the economy unless the mixture given by the carbureter is given incorrectly in the first place.

4—Not much more than the carbureter alone. The cylinders will probably be filled just as completely without the extra device.

5—Yes, it would probably be an aid in this direction.

6—The main advantage is in flexibility of control of the mixture.

Sign Your Letters For the Rostrum

The editor of the Rostrum is in receipt of several inquiries and communications which do not bear the signatures of the senders but instead are signed Reader, Subscriber, by initials or other noms des plume. While only the initials are published in THE AUTOMOBILE, *unless it is otherwise expressly desired, it is necessary that the letters bear the signature of the sender as an evidence of good faith.*

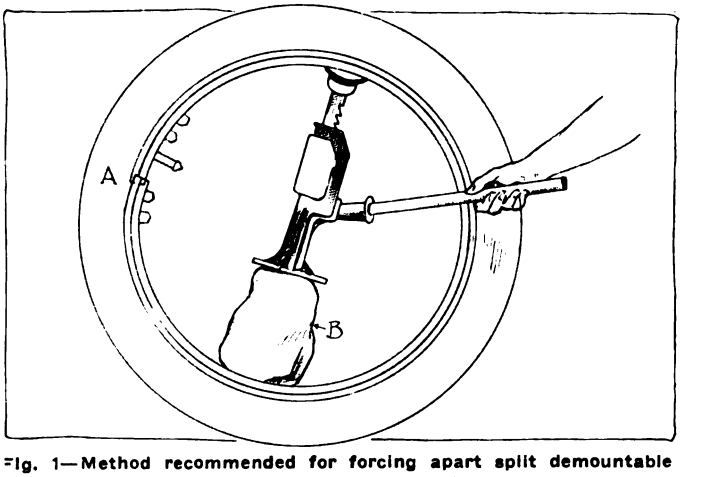


Fig. 1—Method recommended for forcing apart split demountable rims at A, by jack and rock B

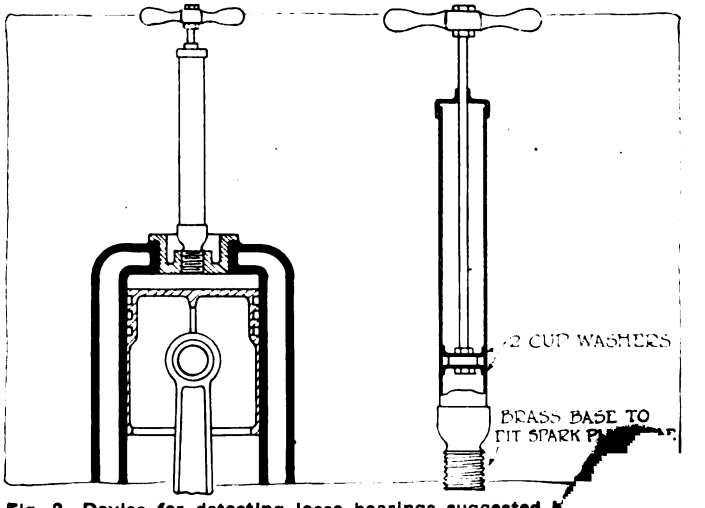
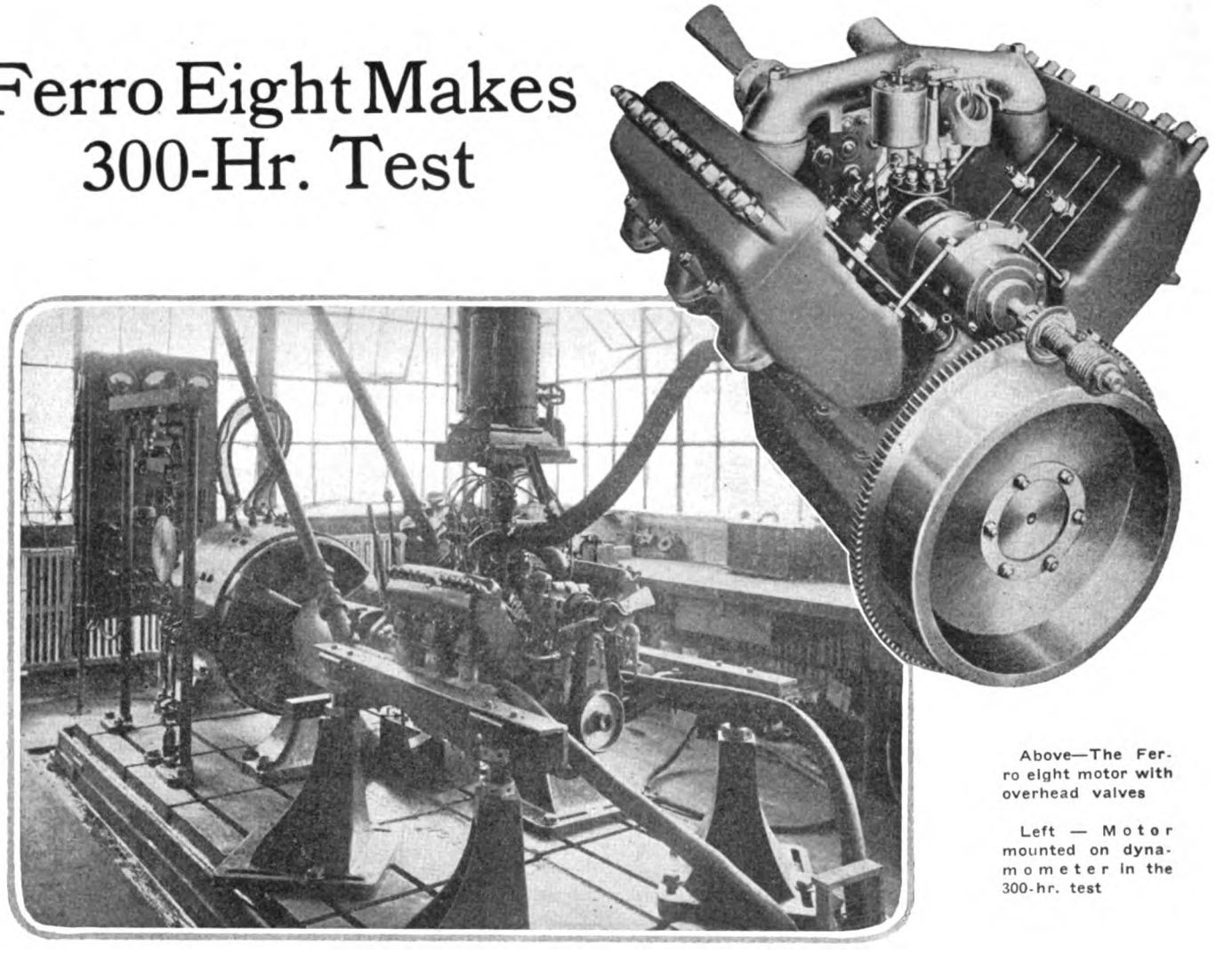


Fig. 2—Device for detecting loose bearings suggested by reader

Ferro Eight Makes 300-Hr. Test



Above—The Ferro eight motor with overhead valves

Left — Motor mounted on dynamometer in the 300-hr. test

FINAL reports on the 300-hr. endurance test of the Ferro eight-cylinder motor which extended from June 23 to July 7 this year, have just been made public. This test, which was reported briefly in THE AUTOMOBILE for July 15, was held under traveling conditions, making it approximately equivalent to the service done by a car traveling at a speed of 35 m.p.h. with a motor speed of 1500 r.p.m. for 11,000 miles. At the horsepower developed, namely 34.93, the work done equals that of climbing a grade of 8.5 per cent with a car weighing 3300 lb. Engineers will be interested in the final reports of this test due to the fact that the motor involved several features of construction which are unique in eight-cylinder practice. Among other elements of design found in the Ferro may be mentioned the overhead valves, the unit casting comprising the cylinders and upper half of the crankcase which is cored for valve passages, seats, etc., the sixteen camshaft and the firing order which proceeds directly from one side of the V block to the other, that is; the firing order is 1-1, 3-3, 4-4, 2-2.

Only Eleven Stops

While this test has not been officially conducted under the supervision of any of the automobile clubs, engineering societies or universities, it was a carefully-made factory test and is stated by the Ferro company to be authentic and supported by records on file at the Ferro offices which are open for inspection. The test was continued for 324½ hr. Of this time 12½ hr. were consumed in eleven different stops giving a total actual running time of 312 hr. The stops made were for various causes, all but three of which were due to troubles with accessories and had nothing to do with the design and construction of the Ferro motor itself. The other three were in each case due to broken valve springs and this, the Ferro concern states, is one of the most valuable points brought out by the test, inasmuch as the springs were purchased in the open market and should not have failed if they had been of proper quality for their strength and size. A repetition of this trouble can now be readily guarded against.

59 Hp. at 2250 R.p.m.

The tabulations appended herewith show the results of the test. These are numbered and by referring to numbers 1, 2 and 3 it will be noted that the maximum brake horsepower obtained before the run was 59 at 2250 r.p.m. The horsepower per cubic inch piston displacement and the maximum speeds are both of interest and both high as would be expected in a high efficiency, multi-cylinder motor. It will be noted that the average horsepower developed, the average horsepower per cubic inch of piston displacement and the average revolution per minute were all in excess of what would be expected by the S. A. E. rating. The gasoline and oil consumption, which figures are also given, are quite low.

Wear Very Slight

After the test the motor was torn down and an examination was made for wear on all the stressed parts. In every case the Ferro organization states that it was inappreciable and in no case enough to produce noise. This performance which more than equals the continuous run of 11,000 miles with a fairly heavy car is noteworthy. Clearance figures are also checked as well as possible. For example, refer-

ring to the name, bearing, the diameter of the shaft and the thickness of the shelves of the babbitt bearing was measured by a ball micrometer. The connecting-rod bearings were in excellent condition, the increase in clearance being 0.0008 on the inner as well as on the outer bearings. The main bearings showed an increase of but half that quantity, 0.0004 in.

Bearings Stand Up Well

The construction of these bearings has thus been shown to be reliable and is indicative of the soundness of general practice. The bearings are babbitt against the crankshaft; for the connecting-rod bearings and a hardened steel connecting-rod against phosphor bronze for the upper bearing of the connecting-rod. The smooth polished surface of the rod bearings indicated ample bearing surface and lubrication. The condition of the seats of the valves in the cylinder would seem to bear out the claim made for the overhead valve type of construction. There was no carbon that prevented the proper seating of the valves nor any pitting to cause leakage. The importance of this was demonstrated by the fact that the horsepower at the end of the run was greater than at the beginning.

No carbon deposit could be noted on the piston heads and this was probably due to the fact that the temperature at all times in the endurance run was quite high and prevented the collection of anything more than a small quantity of hard baked carbon. The combustion chambers were slightly carboned and no signs of scoring were noted in the cylinder barrels.

Overhead Valves Wear Well

Regarding the overhead valve operating mechanism, but little wear could be noted here. The spherical fulcrum of the valve rocker arm evidently helped to eliminate wear and noise and proved itself easy to lubricate while the unequal lengths of the rocker arm seem to bear out the prediction that the inertia would be reduced and consequently noise and wear. Little or no indication of any wear at the points of contact with the valve stem and pushrod was noted. The other parts of the valve operating mechanism such as the cam faces, valve tappets, guides and pushrods were also subjected to an examination and shown to be in good condition.

Some Ignition Troubles

Some ignition troubles were experienced during the run due to spark plugs and a worn distributer head and in the subsequent horsepower tests the condition of the distributer had some effect upon the performance of the motor at low speed. This disappeared at higher speeds.

Table No. 3 in the illustrations herewith showed the condition of the Ferro eight after the tests. The higher horsepower after the run, namely 61 at 2250 r.p.m. in spite of the worn distributer very clearly brings this out. The tabulations follow:

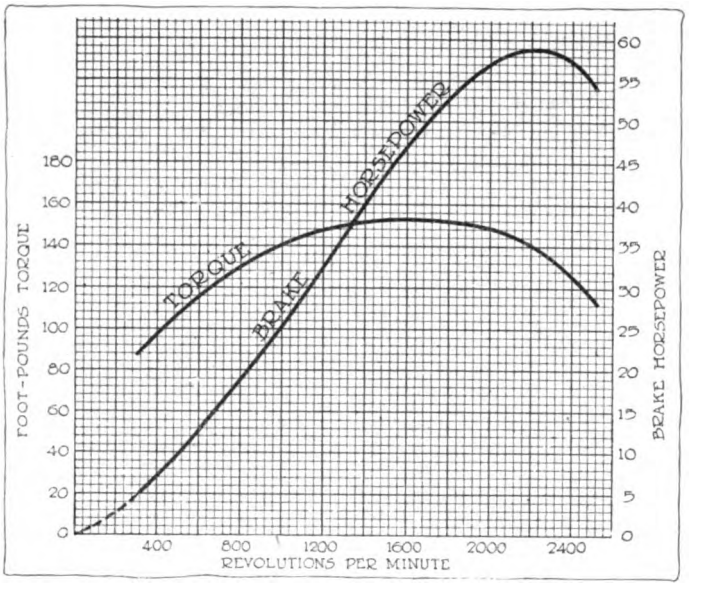
Specifications of Model 2 Ferro Eight in 300-Hr. Test

Number of cylinders	8
Bore and Stroke, in inches	3 1-4 x 4
S. A. E., Hp. Rating	33.8
R.p.m. at S. A. E. Rating	1500
Piston Displacement in Cu. In.	265.6
Weight of Motor in Pounds	585
Type of Cylinder	V Block
Type of Valve	Overhead
Lubrication	Pressure Feed
Carbureter	1-In. Double Zenith
Cooling	Thermo-syphon
Ignition	Delco
Spark Plugs	Bosch

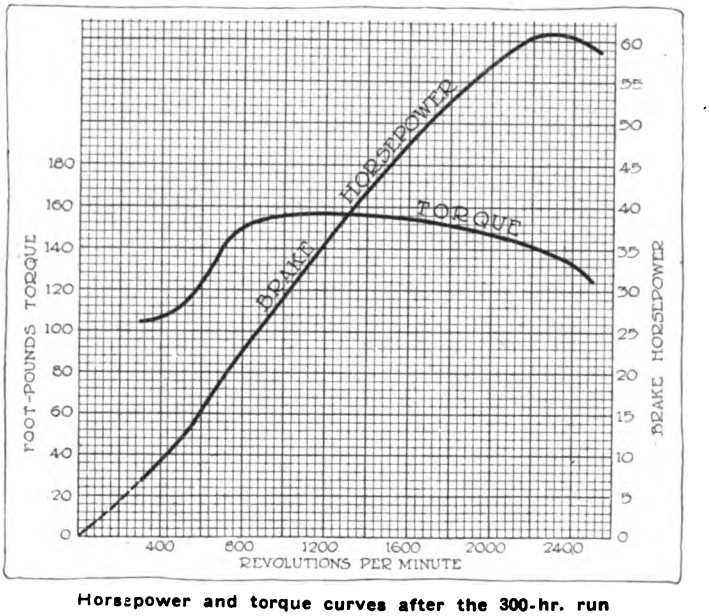
TABLE I

Hp. Tests Made Before 300-Hr. Run

Max. B. Hp. Obtained	59.0
Corresponding R.p.m.	2250
Hp. per Cu. In. Displacement	0.222
Max. Torque in Foot-Pounds	154
Corresponding R.p.m.	1500
Max. Speed Attained R.p.m.	2500
Corresponding B. Hp.	54.0



Horsepower and torque curves taken before 300-hr. run



Horsepower and torque curves after the 300-hr. run

TABLE II

300-Hr. Endurance Run

Dates of Endurance Runs	6-23-15, 7-7-15
Duration of Runs in Hr.	312
Average Hp. Developed	34.93
Referred to S. A. E. Rating in Hp.	1.13 more
Referred to S. A. E. Rating in Per Cent	3.24 more
Average Hp. Developed per Cu. In. Piston Displacement	0.132
Average R.p.m.	1522
Referred to S. A. E. Rating R.p.m.	22 more
Referred to S. A. E. Rating in Per Cent	1.47 more
Total Number of R.p.m.	28,492,000
Total Gasoline Consumption, Gal.	1160
Average Gasoline Consumption, Gal. per Hr.	3.72
Gasoline Consumption per Hp. Hr. in Lb.	0.6283
Total Oil Consumption, Gal.	50.50
Oil Consumption per Hr., Gal.	0.161

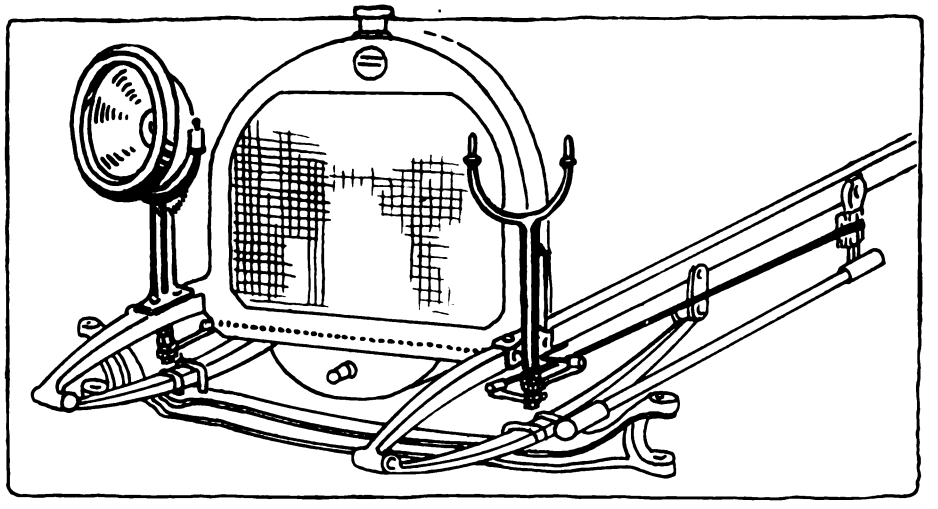
TABLE III

Hp. Test After Run

Average Temperature of Inlet Water Degrees Fahr.	71.6
Average Temperature of Outlet Water, Degrees Fahr.	139.3
Range of Temperature	57.7
Stops Due to Motor Troubles	3
Max. Hp. Obtained	60.75
Hp. per Cu. In. Piston Displacement	0.228
Increase of Hp. After Run in Hp.	1.75
Increase of Hp. After Run in Per Cent	2.88
Corresponding R.p.m.	2250
Max. Torque Ft.-Lb.	155.5
Corresponding R.p.m.	1400
Increase of Torque After Run in Ft.-Lb.	1.5
Increase of Torque After Run in Per cent	0.97

NOTE—No work done on motor before test. The valves were not ground.

ACCESSORIES



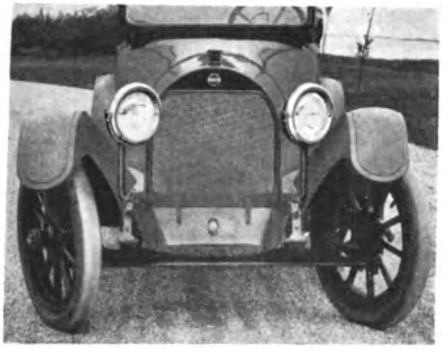
Sketch illustrating the operation of the Steer-Lite headlight bracket which automatically turns the headlights in the direction in which the front wheels are carrying the car

Steer-Lite Headlight Bracket

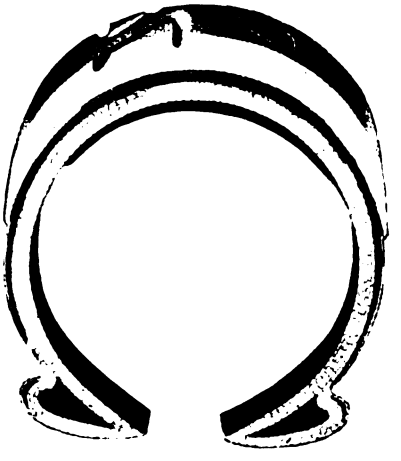
THE need for an arrangement whereby the headlights are turned in the direction of motion of the car has frequently been felt. The Steer-Lite device provides such an arrangement whereby the steering motion is duplicated and the headlights in all circumstances throw the light in the direction in which the front wheels are carrying the car. Due to the fact that the linkage for operating the movable brackets is connected directly to the steering drop arm, the amount that the headlights are turned from the center line is directly proportional to the amount that the wheels are turned. The result is that for a given deflection from a straight course in the direction of travel of the vehicle, there is a corresponding deflection of the headlights which will throw the light directly along the path of the vehicle.

With the powerful electric headlights now in use, the driver of a car is forced to turn his vehicle into an area which is practically cut off from all illuminations by the strong wall light thrown out by the parabolic reflectors. With the Steer-Lite bracket the roadway into which the vehicle is turning is illuminated before the turn is made, allowing the driver plenty of time to determine the safety of the intended course.

The construction of the device is shown in the accompanying illustration. The brackets for the lamps fit into two sleeves and rest on cone nuts, which take the load and hold the brackets rigid. The cone nuts are held in place by lock nuts providing a rigid bearing surface. There is a ball-jointed lever which is screwed to the base of each bracket and tie rods connect the two bell-crank levers on the bases of the brackets and also connect the steering arm to the base of one of the brackets so that when the steering arm is operated the motion is imparted to both brackets. Careful workmanship and good materials make this a rigid device which can be used for either gas or electric lamps. A special set for Ford cars sells for $12 and for other cars for $15.—Motor Products, Inc., Stamford, Conn.



How the Steer-Lite device acts on a car



Section through the Woodworth puncture-proof tire

Allwon goggles with two-color lenses

Woodworth Tire

A new puncture-proof tire called the Woodworth Puncture-Proof embodies the novel principle of employing a strip of chrome leather in place of the metal or other materials usually used in this type of tire. The leather is firmly incorporated in the structure of the tire, forming the innermost layer beneath the tread. The makers guarantee the tire against puncture for 5,000 miles, and to back up their guarantee offer to pay the cost in repairing tires in case they are punctured.

The tires are manufactured from combed Sea Island cotton, the chrome tanned leather being on the inside of the casing. The leather is light, therefore adding very little to the weight of the tire, and its flexibility is great enough to not materially stiffen the wall of the tire. It is stated that the leather is non-heating.—Leather Tire Goods Co., Niagara Falls, N. Y.

Allwon Motor Goggles

Motor goggles which have two-color lenses have been brought out for the purpose of—in the language of the manufacturer—absorbing optical shocks on the road. The two-color lens is not made of two pieces joined, but of a solid lens of one piece of glass. One is colored darkly enough for the brightest lights, and the other part is left light enough for ordinary use. The color is introduced into the glass, becoming part of it, although the surface of the lens is not disturbed and every part is clearly transparent. The prices for the two-color motor glasses are, for the medium size, $12; for the large size, $13.50 per doz. With side shields the regulation size sells for $13.50, and a larger size at $15 per doz.—Strauss & Buegeleisen, New York City.

Lawco Products for Fords

Pressed steel is used for the Lawco muffler for Fords, a number of perforated cups being nested and the aggregate area of the perforations is so large that back pressure is small. The makers state that tests made at the laboratory of the University of Michigan indicated an ability to carry heavy loads with no indication of capacity limit, and that the exhaust is silenced better than with the

regular type of muffler. Price, $2 each.

Lawco fenders are crowned and of attractive design and are made of twenty-gage steel and finished with hard baked enamel. They are interchangeable with the regulation fenders on model T roadsters and touring cars, but are not adaptable to the 1915 Ford sedan. The hood is of the same quality of material and is finished in the same way; it tapers back to the dash, where it is attached by means of a special head ledge. The fenders sell for $14 per set of four.—F. H. Lawson Co., Cincinnati, Ohio.

Weiss Disappearing Step

A folding step is attached to the under side of the running board and is operated by a pedal or lever manipulated by the driver. When extended the step provides an easy means of access to the car and prevents pulling on the door. When folded, the device is out of sight, and the makers state it cannot rattle. Price, $12. —The Weiss Co., Indianapolis, Ind.

Eclipse Steering Gear Bolt

The arms on the knuckles of the Ford front hubs are connected together by a rod, the joints being held by cylindrical bolts which in time become loose through wear. The Eclipse bolt replaces the originals and is adjustable. A split sleeve has a cylindrical exterior and a tapered interior and through it passes a correspondingly tapered bolt which can be inserted as far as is necessary to expand the sleeve until the hole is snugly fitted and locked in place by lock-nuts. Wear is taken up by inserting the tapered bolt further. The bolt is drilled and fitted with an oil cup. Only a wrench is required for application. Price, $1 per pair.—Eclipse Machine Co., Elmira, N. Y.

Triplexd Gasoline Hose

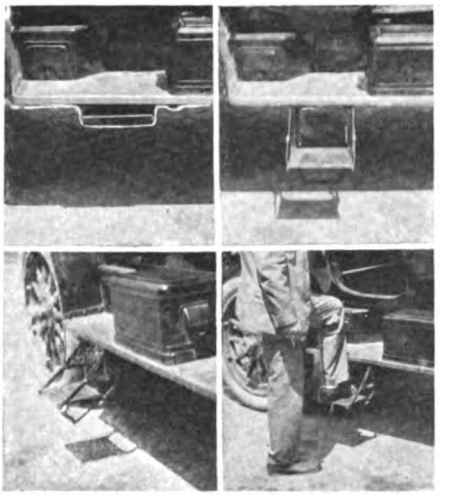
Triplexd hose is made in all sizes. The inner tube is of flexible metal construction, the second layer is of composition and the outer cover of loom woven jacketing. The makers state that it is more flexible than rubber-covered gasoline hose. Special types are made for steam, oil and air. Price ¾-in. size, 80 cents per foot. Couplings $1.50 per pair.—Metal Hose & Tubing Co., Brooklyn, N. Y.

Cushion Wheel

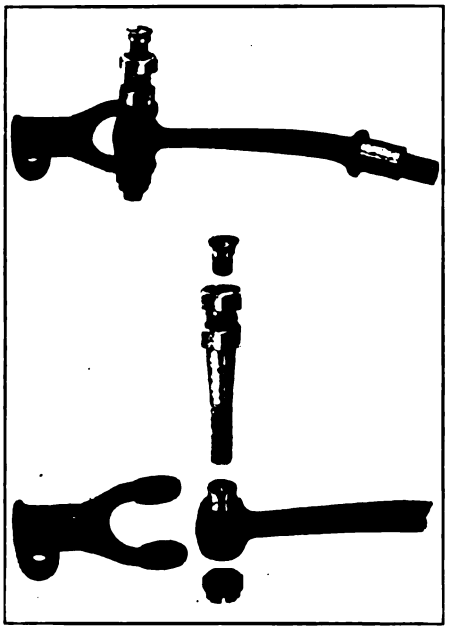
Sewell cushion wheels for motor trucks and passenger cars are made in two types, the single and the dual. In either type the inside wheel is carried on a series of trusses of rubber which occupy the space between the wheel and the outer felloe. Rubber side flanges encircle the wheel on both sides and connect the inner and outer felloes, making the space containing the rubber cushion proof against air, dust and grease.

These rubber flanges expand and contract between the inner and outer felloes as the cushion acts. There are two steel bands on each side of the wheel and they are bolted through, holding the side rubber flanges and the two wooden felloes in place. These bands expand partially over the rubber cushion from above and below, thus preventing lateral or side motions.

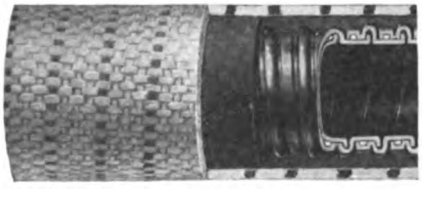
It can be noticed from the construction of these wheels that no connection occurs between wood and wood or wood and iron. The manufacturer claims that by using these cushion wheels the tire mileage is greatly increased and maintenance cost reduced. The axles are protected from shock and it is pointed out that the operating speeds may be increased without injury. —Sewell Cushion Wheel Co., Detroit, Mich.



Four views of the Weiss auxiliary step



Eclipse steering gear bolt for Fords



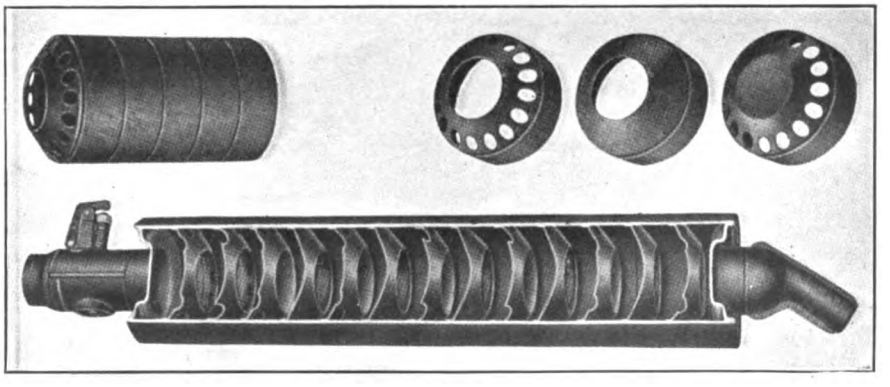
Triplexd gasoline hose, showing construction

Serco Horn Buttons

The Serco is a steering wheel rim in which are eight buttons for sounding the electric horn, the buttons being spaced around the wheel so that there is always one within easy reach, even if but one hand is being used for steering. Spring contact buttons are used, in composition casings, and the wire is sunk in a slot, 3/16 in. deep, in the rim, the slot being filled with wood over the wire, making a neat finish. The advantage claimed for the device is that the horn can be sounded at any time, even if one hand is engaged in shifting gears or other service; the hand that is on the wheel can always reach a button without difficulty. Price, $5 and $6.—Safety Electric Rim Co., Middletown, Ohio.

Kamlee Running-Board Trunk

A new type of running-board trunk has been put on the market which is just wide enough to utilize the full width of the board without protruding over the edge and low enough not to interfere with door operation. Two suit cases fit into the trunk, the lid of which is hinged at the edge so that it may be dropped over the edge of the running-board. This style trunk is made for any car. It is 49 in. long, 12 in. wide and 9 in. high and sells for $45.—The Kamlee Co., Milwaukee, Wis.



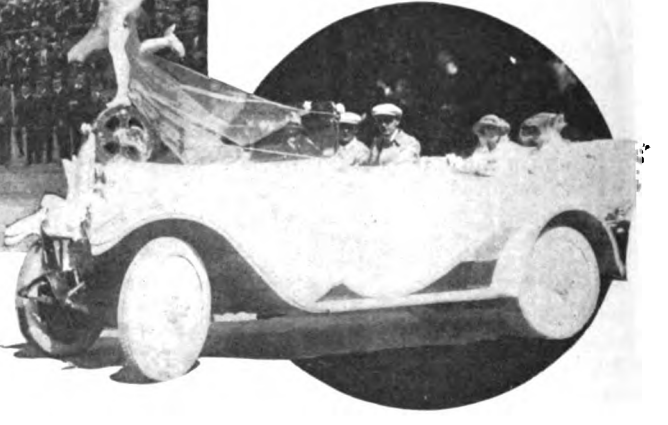
Lawco muffler for Ford cars, showing the method of nesting the pressed steel sections

Christen Sheepshead Bay Speedway

Resta Breaks 10-Mile Record

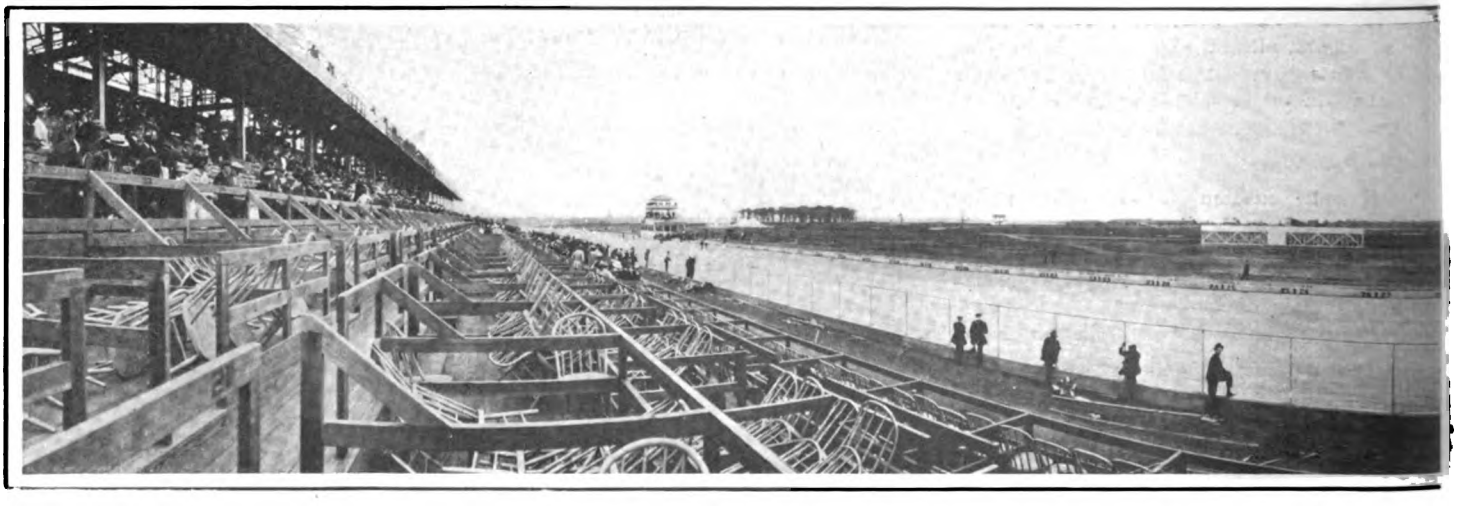
Above—At the right is Mrs. Orson Kilborn, daughter-in-law of Horace M. Kilborn of the speedway, christening the Sheepshead Bay motor speedway.

At the upper left is Resta getting the checkered flag at the finish of his recordbreaking 10-mi. time trial, which he made at 108.04 m.p.h.



Above at the left is a scene at the Sheepshead Bay motor speedway track during the opening ceremonies last Saturday. Over 12,000 people were in attendance

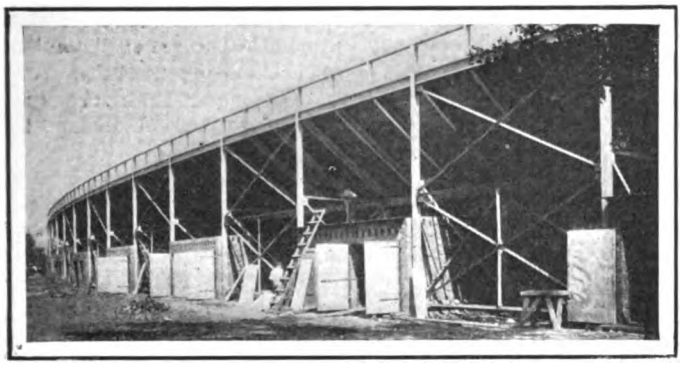
At the right is the Oldsmobile prize winner typifying speed in the parade of 2247 cars in celebration of the opening of the Sheepshead track

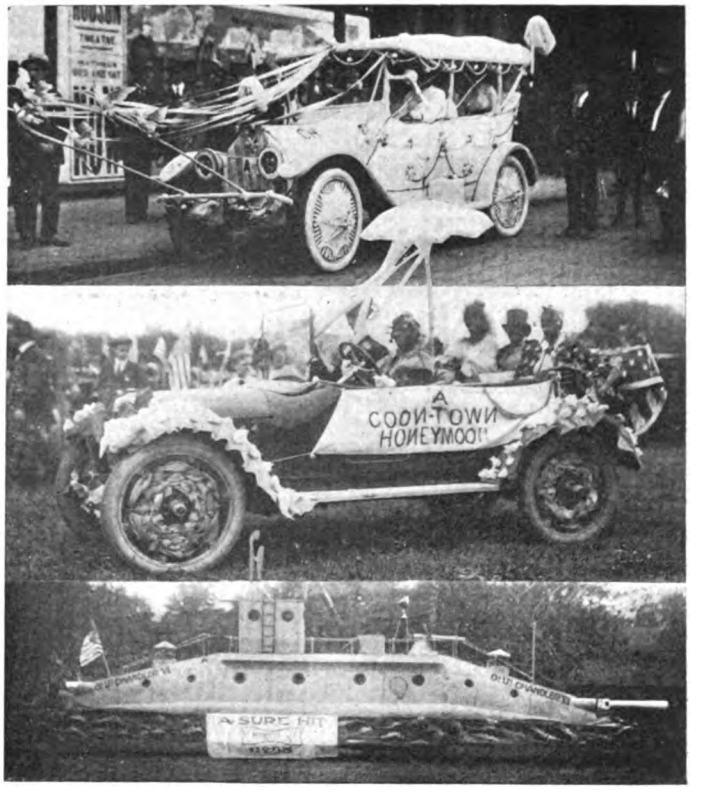


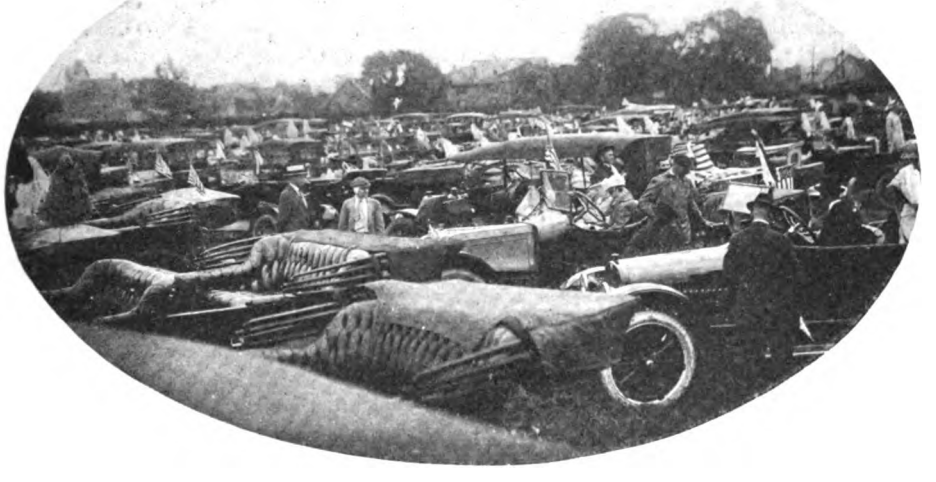
Panorama of the Sheepshead Bay motor speedway showing the completed course, judges' stand and the banking on the turns. Note the large that all previous speed

SOME idea of the merits of the paraboloid banked turns of the Sheepshead Bay Speedway as compared with the flat bank of the Chicago board track was revealed on Saturday when Dario Resta at the wheel of a Peugeot drove 10 miles in 5:32 4/5, a rate of 108.04 m.p.h.

Resta thus has succeeded in driving faster than anyone else for 10 miles, the best previous American record being held by George Robertson, who drove a much larger Simplex 10 miles on the Los Angeles Speedway on April 9, 1910, in 6:35.62. This is a speedway record regardless of class. The speedway record for cars in the same class as Resta's—231-300 cu. in—is held by De Palma, who drove the 10 miles in a Mercer at Los Angeles, May 5, 1912, in 7:27.33.



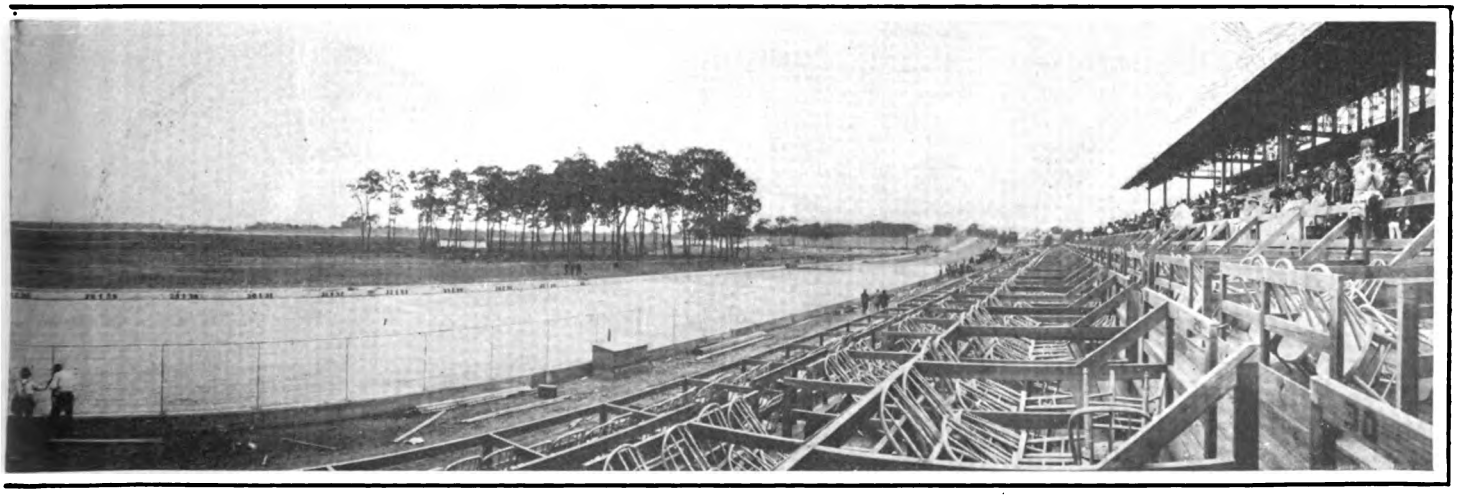




Above at the right are shown three of the prize winners in the parade comprising 2247 decorated and undecorated cars. That at the top is a Marathon, the middle is an Oldsmobile and the bottom one a Chandler

Above at the left is shown the rear of the Sheepshead Bay track on one of the turns where the banking gives an opportunity for locating compact garages for the accommodation of the racing cars

At the left is a scene in the parking space at the Sheepshead Bay motor speedway last Saturday showing some of the 2247 cars which participated in the parade to the track and giving an idea of the attendance at the opening ceremonies



number of boxes in front of the covered grandstands. Over this course will be held the 350-mile race on Saturday, Oct. 2, and it is expected records will be broken

Model W-5 Sheldon worm-gear axle for 5-ton trucks

5-Ton Sheldon Axle with Ball Bearing Worm

Rear Wheel Brakes a Feature

A NEW worm-gear axle for trucks of 5-ton capacity has been brought out by the Sheldon Axle & Spring Co., Wilkes-Barre, Pa., under the model number W-50. After putting this new model through tests for several months, it is now ready for delivery. The new W-50 worm axle has been designed and tested for a tire load of 18,000 lb., including the weight of the chassis, body and pay-load and like all other Sheldons is a semi-floating design arranged to secure the greatest possible capacity with low weight and few parts.

A feature of Sheldon axle practice which is carried out in the new design is the use of ball bearings to take both the radial and thrust loads in the worm-gear carrier. The thrust is taken by a self-contained double-acting thrust bearing and the radial load is taken by two single row annulars. The differential is mounted on single row annular bearings while the side thrust, differential and axle shaft are taken by separate thrust bearings. Either double row annular ball bearings or straight roller bearings may be used at the wheels.

Brakes on Rear Wheels

Sheldon practice has also been followed in the construction of the brakes. As in all other Sheldon worm gears, this is done at the rear wheel rather than on the propeller shaft as the driving strain is taken through the springs thereby eliminating strut rods and torsion tubes. The track is 74½ in. with maximum spring center distances of 49 in. with 4-in. springs. The housing and brake spiders are hydraulically pressed on nickel-steel tubing and then riveted. The axle shafts are tapered to give a structure of uniform strength at all sections of the shaft. The shaft diameter is 3¾ in. at the outer bearing and the taper runs from the bearing collars to the differential. This provides the best possible distribution of the material while the material itself for the shaft is drop-forged 3½ per cent chrome-nickel steel heat treated to give it the designed physical properties.

For hardness, every driveshaft is given a Brinnell test before going to the machine shop, and any shaft not coming up to the proper standard, is eliminated.

Double internal band brakes of what are known as the self-intensifying type are employed and are 3 in. in width and lined with Raybestos. They act on 24-in. cast steel drums, the bearing surface of which is machined to eliminate any high or wavy spots in the drums and thereby assure a perfect braking contact at all points.

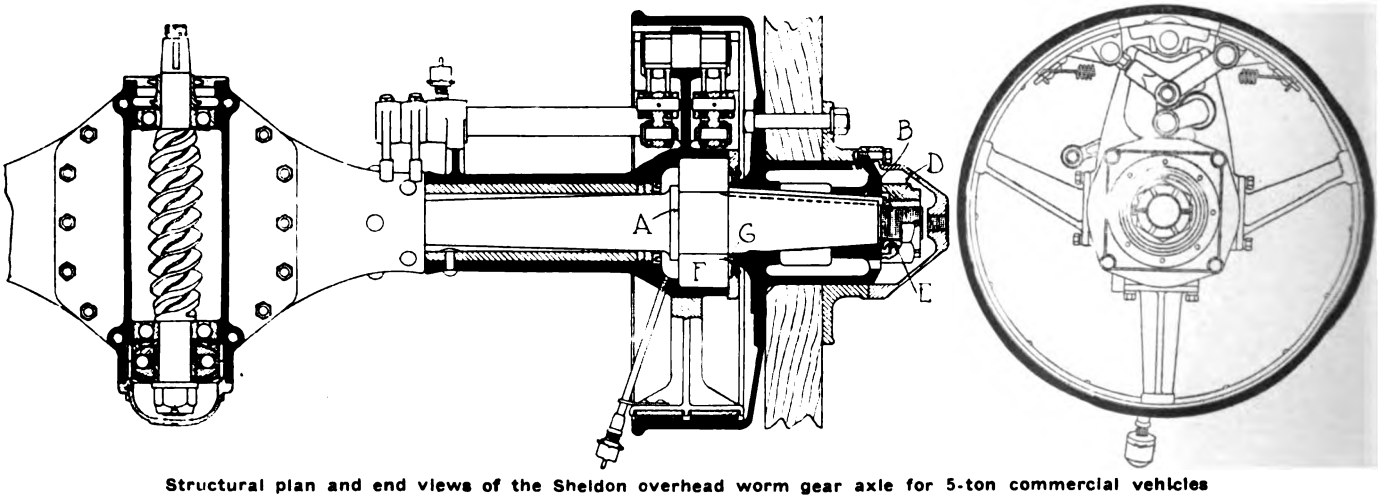
Steel against bronze, both metals being of the Sheldon private formulæ are used for the worm and wheel. This part of the axle receives the most minute inspection as regards accuracy. Every individual worm and wheel being tested in a precision measuring machine to 0.0001-in. for accuracy. These tests are made so complete that absolute interchangeability of all worms and wheels is assured.

The axle housing ends are bell-mouthed to resist distortion due to the hydraulic pressure when mounting the tube. Another safety precaution is in the flanging of the outer ends of the wheels where ribbing is placed to prevent damage in case the clutch is driven against the curb stone.

Bearings in Box Sections

A special feature which is noteworthy is in the construction of the wheel bearing housings which are made in box sections. Referring to the illustration, it will be noted that *D* and *E* are double nuts. The function of *E* is to take the key *B* against the bearing *F* and tighten it against the shoulder on the driveshaft *A*. This prevents the possibility of the bearing moving laterally on the driveshaft and producing a pounding action on rounding corners. The nut *D* is merely to tighten the hub on the conical part of the shaft. Both of these nuts are afterwards locked with cotter pins. The inside nut *E* which tightens the key is slotted and sometimes serves the purpose of a lock nut. This device eliminates any necessity for clearance between the bearing and hub as shown at *G*. This clearance is often allowed to permit the bearing *F* to float on the shaft. Repeated blows are apt to enlarge this clearance.

The W-50 model is also provided with a wheel puller attachment as indicated in the drawings herewith. The operation of demounting a wheel from this 5-ton axle consists simply in removing the hub cap, taking off the wheel retaining nut, replacing the hub cap, and giving a few turns to the wheel removing stud which accompanies the axle. The axle ends are so designed that when the wheel has been removed, the bearings remain undisturbed and protected in their housing upon the axle shaft. Tie rods and ribs are eliminated entirely in Sheldon construction, this concern maintaining that from experience they are satisfied that if the tie rod is tight enough to perform any function it tends to buckle the axle and if it is loose, enough so as not to endanger buckling it lets the axle down.



Structural plan and end views of the Sheldon overhead worm gear axle for 5-ton commercial vehicles

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, September 23, 1915 No. 13

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Research Committees

ONE of the most valuable works which a section of the Society of Automobile Engineers can perform is to appoint a committee on some pertinent topic and have them pursue this to its end, drawing up a report which covers the state of the art at the present time and thoroughly goes into the patent situation, thereby making up a record which cannot help but be of value to those who intend going further on the same subject.

The report of the Metropolitan Section Research Committee on governors is published in this week's issue. This report is a good example of what can be done in the way of setting down in concrete form the progress of development of a certain line of work. It cannot be doubted but that in the future any one who is carrying on research work in governors will take advantage of this report to familiarize himself with what has been done in the past and also on the status of the patent situation. Were it not for this report, those investigating the subject in the future would have to go through the many hours of labor spent by the committee which, owing to its official connection, has been enabled to secure co-operation not always possible for an individual.

Furthermore, the work of the committee becomes a matter of public record, while that of an individual is only private property and is valueless as regards the general advancement of exact information.

Aluminum Alloys

ONE of the things to be considered in the use of aluminum alloys is that rigidity is not only gained by the physical properties of the material, but also by its disposition. Hence, the question of ribbing, which is nothing more than placing the material as far from the neutral axis as possible in order to increase the section modulus, becomes of the highest importance.

With aluminum pistons, the ribs not only add to the stiffness of the design, but also act as a means of removing the heat from the piston head. Thus, the piston is preserved against disintegration in two ways by these ribs, first, by stiffening it and then by carrying the heat away so that the high temperature will not cause deterioration of the metal in the head.

With these objects in view, it is essential that designers of aluminum pistons carefully arrange disposition of material so as to provide a means of carrying away the heat of the piston head and also to give stiffness and rigidity to the castings.

Fall Duties

AUTUMN means either one of two things for the automobilist. It either brings a period of renewed activity or, on the other hand, it may mean the shelving of the faithful vehicle until the next summer season. In either case there are several duties that should be performed by the car owner if he wishes to do himself justice and secure the full return from the money he invested when the vehicle was purchased.

Old oil is often allowed to collect in the crankcase; the fall is the time to take it out. Storage batteries may have been somewhat neglected during the unpleasantly hot days; the fall is the time to bring out the hydrometer and see that the electrolyte is in good condition. The supply of air-tight inner tubes may have dropped so low that the driver is wondering what he should do in case he had a puncture on the road. Now is the time to go over the old tubes and bring them back into such condition that in case the season-old tires should be punctured it would not necessitate a hasty and most likely unsatisfactory repair on the road.

In a word the hundred and one duties that every automobilist knows should be done to put the car back into first class condition should now be performed. Deterioration is the worm that gnaws at the value of a car, and the fall cleaning and repairing will minimize the effects of the deterioration. If the car is to be put away for the fall and winter season it would be far better for the car and for the peace of mind of the owner if the car were put away in such condition that when the next summer comes it will only be necessary to dust it off and bring it out, ready for use.

If the car is to be stored, full direction for the proper method of procedure can be secured from the battery manufacturer, and these should be followed to the letter.

Packard Prices $150 to $200 Higher

Increased Wholesale Costs of Aluminum, Steel, Leather and Other Materials Responsible

DETROIT, MICH., Sept. 21—*Special Telegram*—The prices on all Packard twin six models have been increased $150 to $200. The 1-25 models, which are on the short wheelbase chassis, have all been raised $150, while the 1-35 types, on the long wheelbase chassis, are all increased uniformly $200. These increases will bring the prices of the 1-25 with open body to $2,750 and the 1-35 open models to $3,150.

The increases apply also to the closed car types, those mounted on the short wheelbase going up $150 and the others $200.

The price increases are ascribed to the increased cost of materials and the company states that it can show where every dollar of the rise comes from greater wholesale costs of aluminum, steel and leather, which, among other raw materials, have been largely responsible.

W. H. Gray Resigns from Gray & Davis

BOSTON, Sept. 21—W. H. Gray, general manager for Gray & Davis, has resigned from that company to take effect Oct. 15. A rumor to the effect that Alexander Churchward also had resigned has been officially denied by officers of the company. The W. H. Gray who has resigned is not William Gray, president and treasurer of the company. Gray & Davis have accepted a contract for war ammunition and while the company does not subscribe to the policy of accepting orders for war munitions to the detriment of its other business interests, changes in manufacturing processes have released much machinery which will be used in executing a large order for high explosive shells. A large heat-treating plant has recently been erected which adds to present facilities and this, with other improved manufacturing facilities and constructional alterations in its product, will permit of a considerably increased production of starting-lighting systems for the 1916 trade.

Edison Exhibits New Battery

WEST ORANGE, N. J., Sept. 20—Thomas A. Edison exhibited to-day the storage battery at which he has been at work for the last three years. At the same time he announced that arrangements have been completed to market the new battery in light delivery wagons which might be rented by merchants.

The new wagon which was displayed in the laboratory yard at the Edison has a carrying capacity of 750 lb. and a range of travel of 45 miles without recharging. The speed is 10 m.p.h. and is designed to be very simply operated by a single pedal.

Mr. Edison said the object of the car is to replace the horse-drawn delivery wagon of the small merchant. He claims that the cost of upkeep of delivery wagons, including current and storage, will equal only half the cost of feeding and stabling one horse, while the cost of tires would be less than shoeing one horse. Mr. Edison remarked that while the price of feed is increasing the price of electric current is decreasing so that the saving of money by the use of the small battery vehicle would increase proportionately.

L. P. C. Motor Co. Makes Voluntary Assignment

RACINE, WIS., Sept. 17—A voluntary assignment was made on Sept. 16 by the L. P. C. Motor Co., Racine, Wis., to F. Lee Norton, who represents the company's creditors as assignee. The action was taken as a means of conserving the assets and reorganizing the concern on a sound financial basis, operations continuing as usual in the meantime. In a statement issued by Capt. William Mitchell Lewis, president and chief stockholder, the voluntary assignment was made for the benefit of creditors and to enable the assignee to continue the business and thus avoid disposition of the assets at a great sacrifice. Inability to obtain funds in time to meet obligations maturing this month made such action necessary. Captain Lewis said further:

"There is a prospect of obtaining a large order which will make it necessary to operate the factory at its utmost capacity for the next twenty-four months. If this order is placed, the company will probably be able to obtain sufficient funds to continue the business at a large profit."

The L. P. C. Motor Co. was organized early in 1913 to manufacture the Lewis VI. Captain Lewis retired as president and general manager of the Mitchell-Lewis Motor Co. in the fall of 1912. Associated with him in the L. P. C. are Capt. Rene Petard, chief engineer, now at the front with the French army, and James M. Cram, formerly New York branch manager for the Mitchell. The name of the corporation is derived from the first letters of the names of the three principals.

F. Lee Norton, assignee, retired as vice-president and general manager of the J. I. Case T. M. Co., Racine, two weeks ago, as reported in THE AUTOMOBILE for Sept. 16.

Uniform Time for New Models

N. A. C. C. Committee to Meet Sept. 28 to Recommend Time for Announcements

NEW YORK CITY, Sept. 20—The committee of the National Automobile Chamber of Commerce, Inc., on a uniform time for announcing new models, will probably meet in Detroit either on Tuesday, Sept. 28, or Wednesday, Sept. 29. The committee has collected a large amount of data from manufacturers and dealers and it is said that its verdict will be in favor of announcing new models some time after September, in order not to disrupt the selling season as is now frequently the case.

The committee, of which Hugh Chalmers is chairman, consists of C. W. Nash, Buick; Alvan Macauley, Packard; A. L. Riker, Locomobile; John N. Willys, Willys-Overland; C. C. Hanch, Studebaker; and W. C. Leland, Cadillac.

Schmidt Pullman Pres.

YORK, PA., Sept. 20—J. C. Schmidt, of York, has been elected president of the Pullman Motor Car Co. Mr. Schmidt succeeds Edward Fox, who became the head of the Pullman company less than a year ago. Mr. Fox has been made the assistant secretary and assistant treasurer of the company. The new president is one of York's prominent business men, being the president of the Standard Chain Co., with headquarters in Pittsburgh.

Harris Mutual Motors V.-P.

JACKSON, MICH., Sept. 18—F. A. Harris of Detroit, who resigned as commercial manager of the Hupp Motor Car Co., has acquired a financial interest in the Mutual Motors Co., Jackson, Mich. At a meeting of the directors of the Mutual Motors Co. to-day, Mr. Harris was elected vice-president.

Chalfant Detroit Electric Eastern Sales Division Manager

DETROIT, MICH., Sept. 17—The Anderson Electric Car Co. has appointed E. P. Chalfant manager of the company's Eastern sales division, with headquarters in New York.

Draper, of Champion Plug, Dies

NEW YORK CITY, Sept. 20—C. F. Draper, who has represented the Champion Spark Plug Co., Toledo, Ohio, during the past year, died at his home in Brooklyn last week, following an illness which necessitated an operation performed in Dallas, Tex.

S. O. Raises Prices in St. Louis

Increase, Which Independents Have Been Waiting for, Amounts to 1 Cent

ST. LOUIS, MO., Sept. 17—Almost simultaneous with the announcement that independent dealers had complained to President Woodrow Wilson of alleged unfair tactics of the Standard Oil Co. of Indiana in its competition with smaller Missouri dealers comes the announcement from the local branch of the Standard that Red Crown gasoline would sell in Missouri for 9.9 cents a gal.—an increase of 1 cent per gal.

The independents had been waiting for this announcement ever since they raised the price of their No. 3 gasoline from 8.9 cents to 10 cents a gal. It was the Standard's failure to fall in with the independents' increase that evoked the protest to President Wilson.

Then a few hours after the Standard's announcement, the independents again raised the price of their product 1 cent, bringing the cost to the consumer to 11 cents a gal., if bought at the filling stations. On the other hand, the price of the same grade of gasoline when bought from the independents' tank wagons was cut one-tenth of a cent, bringing it down to 9.9 cents—the present Standard Oil price.

A. P. Robinson, manager of the Standard Oil branch here, at the time of the independents' first raise, said his company would ignore the independents. The independents now are waiting to meet their second boost in the price of gasoline and intimate that as soon as this happens the price of the independent product will go up again.

Flushed with what they term their "first victory" over the Standard, the independents are even predicting 20-cent gasoline for St. Louis. At the opening of the independents' office in the so-called war between them and the Standard the smaller men announced they would try to bring the price back to 17 cents, from which figure the Standard by 1-cent cuts had reduced the price to 8.9 cents. Now the independents see no reason why they should not get as much for gasoline as New York and other Eastern dealers.

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St. Louis Independent Files Complaint Against S. O.

ST. LOUIS, MO., Sept. 17—A protest against the methods of the Standard Oil Co. in Missouri was filed with President Woodrow Wilson this week by F. C. Bretsnyder, president of the Bell Oil Co. of St. Louis, one of the largest independent dealers.

In a letter addressed to the President Mr. Bretsnyder charges that the Standard Oil Co. "appears to be making an unprecedented effort to crush competition in Missouri by cutting the price of gasoline while it is advancing the price in states where competition is not so strong." This was done, he said, while the price of the crude product was rising steadily.

"In the Eastern states where there is but little competition," he wrote the President, "the Standard has advanced its price to correspond with advances in the crude oil. Even in our neighboring State of Nebraska these advances have been made while the Missouri price was forced down."

He points out that while gasoline is selling in New England, Kentucky and Texas for 13, 14 and 15 cents a gal. and in New York for 20 cents the Standard Oil is selling No. 3—the grade most used by motorists—for 8.9 cents a gal. in Missouri. He says that in the last few years strong competition against the Standard has developed in Missouri and that is why the Standard is making its greatest fight in this State.

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Pittsburgh Gasoline Price Raised

PITTSBURGH, PA., Sept. 20—The Atlantic Refining Co. has advanced the price of all grades of gasoline 1 cent a gallon, making bulk quotations as follows: Motor, 16 cents; 68-70, 18 cents, and 73-78, 20 cents.

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Denver Gasoline Up 1 Cent

DENVER, COL., Sept. 16—Gasoline took another jump of one cent to-day, and is now selling at 15 cents at all the filling stations. Some of the garages are selling at higher prices ranging as high as 18 cents. This increase is regarded as chiefly a part of the general advance throughout the country, and the price is still lower than it had been in this territory the greater part of the last four or five years. This has been the second advance of 1 cent in the last two weeks. The 13-cent price in force a few weeks recently was the lowest on record for this territory during the last fifteen years.

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Minneapolis Gasoline Price Advanced

MINNEAPOLIS, MINN., Sept. 20—Both Standard Oil and independent companies announce an advance in the price of gasoline of 1 cent. The advance to 11½ cents was made Sept. 15. This price has prevailed since June 11, 1915. Even at the present price gasoline is much lower than October, 1913, when the figure was set at 16½ cents. A reduction of 4½ cents followed in December, 1914, which continued until June this year. Lessened crude oil production in the mid-continent fields is the reason for the advance.

Five Owen Cars on Four-Day Tour

Makers of Electrically-Controlled Machines Give Successful Demonstration

GREAT BARRINGTON, MASS., Sept. 22—*Special Telegram*—Touring by the manufacturers received an invigorating stimulus this week when the Owen Magnetic Car Co., New York, conducted a four-day tour of 750 miles which went North through Albany, Lake George and Plattsburg and returned to New York City by way of Burlington, Manchester, Pittsfield and Poughkeepsie, the tour being entirely an invitation one for the technical and trade press of New York and Brooklyn for the purpose of demonstrating the Owen Magnetic car in which an electric magnetic system of transmission replaces the conventional gearset and clutch system.

Five Cars on Tour

Five Owen cars made up the tour, which embraced a trip through the heaviest grades of the Adirondacks, Green Mountains and Berkshires, the cars averaging over 200 miles per day with traveling averages well up to 25 m.p.h. in the mountain sections. All five cars behaved admirably in the hands of the newspaper men, several of whom drove them for 100-mile stretches. The Magnetic car has publicly demonstrated that it is not an experimental machine but a well tried out proven design that possesses several merits peculiar to itself. The performance of all five cars on the long mountain grades was a surprising feature to all and the effectiveness of the electric brake which holds the car at 15 m.p.h. on the longest and steepest grades adds a new pleasure to mountain touring.

Entz on the Run

Justus B. Entz, inventor of the electric transmission system used, was present on the run. One car was driven by its owner who has already driven it 7000 miles. Ray M. Owen, president of the Owen company, was host for the party of sixteen. The tour was not restricted by any schedules but was primarily to demonstrate the electric transmission system. One of the new features in driving the magnetic car is that when coasting, the car automatically overruns the engine and when the engine is speeded up at the foot of the decline it takes up the load automatically. The major control rests with a small controller lever on the steering wheel which gives the seven forward speed positions, in another position serves as electric starter and at still another position operates an effective electric brake.

Trade Review of the Week

Lack of Cars for Immediate Delivery Handicaps Dealers —Factories Are Busy

DETROIT, MICH., Sept. 21—The industry here showed little change last week over the previous period. Factories are rushed, and activity is everywhere, just as it has been right along.

In dealer quarters they are still feeling the effects of the Michigan State Fair which closed last week. This exposition brought in a good line of prospects which are now keeping the sales forces busy. There seems to be one drawback to the dealer activities, however. That is the lack of cars. It is becoming harder and harder to hold customers to deliveries which in many cases cannot be made for several months. The good days are rapidly going, and buyers want their cars to enjoy as long as they can before winter sets in. Thus they will sometimes go elsewhere when a dealer cannot get them a car within a reasonable time. This is all the more aggravated since many of the cars are about on a par as to value and many prospects do not care which of several that suit their pocketbook they take. Of course, this gets right back to the factories, which say that the trouble in supplying dealers' demands is not alone in Detroit but almost everywhere.

To Boom Export Trade

To stir up export trade, several of the big companies have already, or soon will, send representatives to foreign countries. Among these are Dodge, Hudson and Hupp. This does not mean Europe, but South America, Australia, etc.

In factory circles, last week's developments included the securing by the King Motor Car Co. of an additional four-story plant of 70,000 sq. ft. floorspace to take care of business growth. This is close to the main plant. The Hyatt Roller Bearing Co. also made Detroit its distribution point, and will have a new warehouse here. At the present time a carload of bearings is being received here daily from the plant at Newark, N. J.

On Sept. 16, Chalmers had the biggest shipping day in its history, 133 automobiles being shipped. Packard began delivery of its twin sixes also, and is working with utmost speed. It is expected that the Packard working force will soon be increased from its present total of 8800 to 10,000.

The Detroit Board of Commerce, always a very active institution, has taken another step which will help the manufacturers. It has opened a co-operative branch of its bureau of domestic and foreign commerce, the duty of which will be to work with the manufacturers to secure outside business, both domestic and foreign.

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New York Sales Normal

NEW YORK CITY, Sept. 22—Sales conditions during the last two weeks in the automobile trade were normal. The dealers are making many deliveries, and shipments from the factories are coming in regularly.

Now that the vacation period is over, and thousands of those who bought cars to tour in during the summer, are back in town, inquiries from that class of buyers, have fallen off. The dealers, however, are now busy preparing for the fall demand by getting in special bodies. At present there is a considerable demand for closed bodies for winter use. The high-priced cars, especially, are getting in many inquiries for them.

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Three New Dart Truck Models

WATERLOO, IOWA, Sept. 16—The annual meeting of the stockholders of the Dart Motor Truck Co., this city, was held Sept. 10. A 7 per cent cash dividend was declared on the preferred. An increase of about 30 per cent in business over last year, was reported.

The company also announced three new models. One was a small model of 750 lb. capacity, having a 1¼ by 4-in. motor, unit power plant, Disco electric starting and lighting system, 30 by 3½-in. pneumatic tires mounted on demountable rims, 106-in. wheelbase, selling with express body for $675. Also a ¾-ton worm-drive, using a Buda motor, 3½ by 5⅛-in. with unit power plant, 124-in. wheelbase, 36 by 3-in. front and 36 by 3½-in. rear solid tires or 36 by 4-in. front and 36 by 4½-in. rear pneumatic tires on demountable rims, optionally, at the same price, $1,300 for chassis alone. Also a 2 to 2½-ton worm-drive, 4⅛ by 5½-in. motor, unit power plant, 150-in. wheelbase, 36 by 4-in. front and 36 by 4-in. dual rear wheels and tires, using steel wheels, price $2,100.

A board of directors was elected, which in turn elected the following officers for the ensuing year: C. W. Hellen, president and general manager; W. A. Baxter, vice-president and sales manager; E. L. Stover, secretary, and C. C. Wolf, treasurer.

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17,523 Reo Cars and Trucks

LANSING, MICH., Sept. 18—The combined output of the Reo Motor Car Co. and the Reo Motor Truck Co. during the business year ending Sept. 15, was 17,523 passenger cars and trucks of which 16,023 were of the former class.

Texas Crops Promote Good Trade

Farmers Buy Many Cars—Trucks in Demand—Good Roads Influence Sales

AUSTIN, TEX., Sept 20—Several highly favorable factors are contributing largely to the unprecedented activity of the automobile trade in Texas at this time. Overshadowing all other incentives are the splendid crops and the good prices that have been and are being obtained for the different products. While it is true that the State's cotton yield will probably fall a few hundred thousand bales short of what it was last year it is bringing 3 or 4 cents a pound more than it was 12 months ago, while cotton-seed is selling for $10 to $15 per ton more than it was a year ago. The wheat yield of Texas was approximately 10,000,000 bushels more than it was in 1914. This season's corn crop was considerably larger than last year, notwithstanding the poor outlook for a good yield earlier in the growing period. The forage crops are by far the biggest ever known. Much of it is being placed in silos and converted into ensilage. Oats and other small grains were produced in abundance.

Dealers Behind Orders

The first beneficial effects of the splendid crop prospects began to be felt by automobile dealers several weeks ago. Following the increased demand for cars that came from farmers orders for cars began to pour in from merchants and other members of the business element of the different cities and towns. It is stated that there is hardly a dealer in the State that is not far behind in filling orders that he has received for cars.

It is also undoubtedly true that the summer car tourist season has had a great deal to do with the flourishing fall trade of cars. Many people learned for the first time the manifold enjoyments of automobile touring. Others discovered the big business benefits that were to be derived from the use of a car. There was more traveling over Texas in motor cars during the past summer by home people than ever before. Scores of people made tours of thousands of miles in this manner.

Another thing that serves as encouragement to automobile travel in this State is the wonderful improvement that has been made during the last year or two to the public highways. The good roads systems of the different counties have been greatly extended and extensive plans are on foot for further improvements of this character.

The truck and delivery vehicle trade

is keeping pace with that of pleasure cars, according to the reports of dealers of Austin, San Antonio, Houston, Fort Worth and other cities and towns of the State. More sales of trucks are now being made than at any time in the history of that branch of the trade. The motor delivery vehicles have almost entirely superseded the old horse-drawn type of wagons and carts.

One of the interesting features connected with the automobile trade in Texas is the improved appearance of sales rooms, garages and other adjuncts of the business over what they formerly were. Much attention to making these places attractive, convenient and comfortable for the employees as well as to visitors is now being given.

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Dann Self-Lubricating Bearing

CHICAGO, ILL., Sept. 20—A statement issued by the Dann Spring Insert Co., of this city, brings to light the fact that a bearing which will run without oil and a bushing which will lubricate without grease will soon be marketed. The name of the substance from which these bearings and bushings are manufactured is said to be Amalgamite and the company claims that with its use, a radical change in manufacture should take place due to the elimination of grease cups and even the oil reservoir in the crankcase.

Some of the claims made for Amalgamite are that it is indestructible, is unaffected by temperature conditions and shocks, and that with it scoring of cylinders is impossible because the piston rings can be made permanent lubricators while at the same time they are unbreakable.

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Jelley Master Carbureter Manager

DETROIT, MICH., Sept. 20—A. L. Jelley for a long time connected with the automobile industry of Kansas City, recently connected with the Master Carbureter Corp., as general manager. W. E. Burk, who formerly was vice-president and general manager, has returned to California.

The officers now in charge of the Detroit organization are as follows: A. L. Jelley, general manager; A. B. Walton, sales manager; E. T. Daniels, secretary and Jesse Cook, engineer.

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Leon Jaffess Assigns

NEW YORK CITY, Sept. 21—Leon Jaffess, dealer in second-hand rubber, tires, tubes, etc., at 252 West Fifty-sixth Street, this city, 902 North Avenue, Plainfield, N. J., 400 North Fifth Street, Harrison, N. J., 973 Woodward Avenue, Detroit, Mich., and 5019 Euclid Avenue, Cleveland, Ohio, has assigned for the benefit of creditors to Max Bieber.

He began business in 1909. In July last he bought a plant at Plainfield, N. J., for about $29,000.

18,771 Fords Sold in Canada

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Output for 1916 Expected to Be 30,000—Large Stock Dividend Expected

DETROIT, MICH., Sept. 21—In financial circles here the rumor has been current during the last two months that the Ford Motor Co. of Canada, Ltd., will declare before the end of the year an exceptional large stock dividend in addition to its regular cash dividend which amounts to 40 per cent annually.

Officials of the Canadian concern are not willing to say anything regarding the proposed dividend, but local brokers say that this stock dividend will be from 500 to 600 per cent. The par value of the shares of the company is $100; the most recent sale of the stock was made at $1,535 a share.

The business of the Canadian company has been very satisfactory since the beginning of the 1916 fiscal year, that is since Aug. 1, 1915. During that month sales made were 206 per cent ahead of those made in August, 1914. September thus far is also greatly ahead of last year in sales. Production is at the rate of over 100 cars per day.

The foreign business or export end of the general business which has always been a most important part of the Canadian company's affairs, is again increasing rapidly, and indications are, so said an official of the company, that it will keep up growing.

Sales in 1915 totaled 18,771 cars; in 1914 the cars sold totaled 15,657. In 1913 a total of 11,584 cars were disposed of while sales in 1912 numbered 6,388 cars.

The output for 1916 is expected to be 30,000 or more.

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21,456 Fords in Canada

FORD, ONT., Sept. 20—More than one-third of the total number of automobiles in all the Dominion of Canada are Ford cars, according to the complete registration figures for the year 1914. The exact figures are 21,456 Fords or 38.08 per cent of the total number of cars of all makes. These figures, however, have been materially increased in the present year, for since then 13,155 more Fords have been sold in Canada, and undoubtedly the proportion to other machines is still as great, if not greater.

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One of Timken's Additions Completed

DETROIT, MICH., Sept. 20—Of the several new buildings which will eventually double the present size of the Timken-Detroit Axle Co.'s plant, one of the biggest was recently completed and is now in full operation. This is the four-story structure on Clark Avenue, which is now entirely used as an assembly plant for worm drive commercial car axles.

The first floor is used for incoming stock and as general receiving room; the second and third floors are given over to machining axle parts, while the fourth floor is used for assembling the complete axle. The basement is used for stock.

The total floorspace of the building is about 100,000 sq. ft. and with its equipment of machines and machinery cost about $500,000.

Work is well under way on the new drop forge plant. All departments are working to their full capacity.

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S. A. August Imports $96,822

NEW YORK CITY, Sept. 20—Automobile exports from New York City to South America during August amounted to $96,822. Argentine led the other countries with $27,330. Venezuela was a close second with $25,901. Chile was third with $24,831 and Brazil fourth with $11,535. Colombia imported $1,044 worth of cars and the rest of the countries imported only $1,709 in cars.

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Burdick with New Era Co.

JOLIET, ILL., Sept. 20—W. J. Burdick has resigned as Western sales manager of the Sears-Cross Co., and hereafter will be connected with the New Era Engineering Co., this city, as secretary and purchasing agent.

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C. A. Gilbert, Gibney Sales Mgr.

CONSHOHOCKEN, PA., Sept. 20—C. A. Gilbert has been made general sales manager of the Gibney Tire & Rubber Co., this city. Formerly he was Pacific Coast general sales manager for the United States Rubber Co.

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McKee with Russel M. Seeds

INDIANAPOLIS, IND., Sept. 20—Homer McKee, formerly advertising manager of the Cole Motor Car Co., this city, and since that time Indianapolis representative of the Mahin Advertising Co., has become vice-president of the Russel M. Seeds Co., of Indianapolis.

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Bethlehem Plug Foreign Orders

NEW YORK CITY, Sept. 20—During the past 2 weeks, more than 100,000 Bethlehem five-point spark plugs have been shipped to the war departments of three of the European countries now at war.

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Halifax Man Wins Houck Contest

CHICAGO, Sept. 15—J. Mullane, Halifax, N. S., has been declared winner by the judges of the contest promoted by the Houk company, which contest consisted in describing a picture showing an automobile stopped to change a wheel when carrying dispatches in war.

Milwaukee Dealers Make Big Success of Fall Fair Show

Proper Methods Prove That When Well Conducted the Fair Show Means More Real Business Than Indoor Exhibition—30,000 See Cars in Week—Gate Receipts Alone $3,000—Cost $4,500

MILWAUKEE, WIS., Sept. 18—It has fallen to the lot of the Milwaukee Automobile dealers to tell the entire country how to conduct an automobile show at a fall fair. This has been fall fair week in Milwaukee, the State fair being held here all week. During the week the dealers of this city have staged one of the best shows ever held in the State from a business point and tonight the dealers instead of being dissatisfied with the fall fair as they were a year ago are happy, and so pleased with the fall fair as a place for a proper automobile show that if it were put to a vote whether to do without the January automobile show in the Auditorium in the city or the show at the fair grounds there would be a majority vote in favor of the fall fair show.

Show Well Conducted

And this is merely because the motor show at the fair grounds this week has been properly conducted. For nearly seven years the dealers have been exhibiting cars at the fall fair in a half-hearted manner, not very pleased and only exhibiting because, leaving out the city of Milwaukee, 85 per cent of the cars sold in the State of Wisconsin are sold to farmers. Farmers make up the majority of the attendance at the fall fair; then as the Milwaukee dealers reasoned, this fall fair should be the real place to exhibit 1916 cars, but it must be done properly. This was how it was done.

The fair grounds in Milwaukee are typical ones, located well outside of the limits of the city, so that if you go by trolley you pay 7 cents; if by jitney 25 cents, and by taxi, anything from $1 up. The Milwaukee dealers under the leadership of George W. Browne, chairman of the show committee, and Overland distributor for the State, made up their minds they would not have a show like previous ones of automobiles, in which they were under a cement roof about 20 ft. from the ground, with a manure spreader at one side of them, a traction engine in front of them and a hit-and-miss gasoline engine at their left, making it impossible to sensibly talk sales and cars to customers.

To get matters right Chairman Browne and the other members of the dealers, including President Edwards, Kissel and Dodge agent, went before the State Board of Agriculture and told them what had to be done for the motor exhibit at the fair.

What Was Needed

The cement roof, already referred to, covered a vacant floor 150 by 350 ft. If sides were added to this floor and the roof there would be an ideal inclosed building 150 by 350, offering over 50,000 sq. ft. of floorspace, the best in the state fair grounds, for an automobile show. The State Board of Agriculture agreed to erect the cement and glass walls at a cost of $6,000 and turn the building over entirely to the Milwaukee car dealers for $3,000, with the provision that the dealers should have absolute control over all automobile and accessory exhibits in the fair and further that they could charge the nominal fee of 10 cents to get into the motor car show, all other exhibit buildings in the fair grounds to be open to all. This was agreed upon, contracts were signed and dealers started to boost for a real motor car show.

Real Attraction of Fair

That they succeeded has been more than demonstrated by the interest in the show all week. Every day more than 40 per cent of those who paid to get into the show grounds have paid the extra 10 cents to get into the automobile show. The motor car show has been the real attraction of the fall fair. It has by long odds been the only real exhibit. Charging 10 cents for admission has been a success. It has kept the riff-raff out. Those really interested in motor cars, motor trucks and accessories have entered. The show has been as orderly and high-class as any winter show. There have been over sixty makes of gasoline and electric passenger cars; three or four makes of gasoline trucks and over twenty accessory exhibitors. Only 1916 gasoline passenger car models have been shown, and the decorations erected by the dealers, the music provided by two bands and all show regulations are on a par with those of the January show in this city customarily held in the big auditorium.

This week's show has been a real business show. Cars have been sold, many prospects have been discovered, and the business done in closed cars has been exceptional. Car sales have been made to scores of small towns throughout the State. Milwaukee distributors who have the control of the entire State have had from 50 to 100 dealers in. There have been dealers' dinners and dealers' talks. Many new dealers have been appointed, and best of all, these dealers have contracted for cars which are for immediate delivery. It has not been a case of the new dealers putting off the placing of actual orders for a month or two, as is the case in the January show. Now is a good time for the dealers throughout the State to make sales and deliveries. The farmers have finished harvesting. Some have sold their crops and got the money in the bank. They know how much they have to spend. There are three good months ahead of them in which they can use the new car. The slack season of the year is ahead of them. It is a good time to buy a car. In the spring they are very busy sowing the crops. The dealer has a much better chance with the farmer and small-town buyer in September and October than in February and March and April. If the dealer waits until spring the farmer will have spent a good part of his money in farm machinery, etc. To-day the dealer has an even chance with all of the farm implement agents and others who are looking for some of the crop money.

30,000 See Show in Week

And the Milwaukee dealers have made a little money out of the show. Members of the dealers' association will perhaps get the money returned that they paid for exhibit space. They charged 25 cents a square foot for space, the average dealer paying $110 for his space, those taking double space paying $220 and a few paying over $300 for large spaces in which a dozen cars were shown. Before the show opened the dealers had taken in over $1,600 for exhibit space. On Wednesday 6500 paid admission to the motor car exhibit, giving a revenue of $650 for the day, which

was 42 per cent of the paid attendance into the grounds of the fair. Thursday was Milwaukee day and the attendance went much higher. Approximately 30,000 visited the motor show during the week, giving a revenue of $3,000.

The total cost of staging the show was about $4,500. This was made up of $3,000 paid the fair association, and other money spent for advertising throughout the entire State and also to pay for the helpers in the building, such as ticket sellers, door men, sweepers, electrician, carpenter, etc.

The Advertising Tour

The advertising scheme of the dealers was a motor tour through the State which was carried out several weeks ago. In this tour over forty-two towns and cities were passed through and the dealers distributed literature on the fair and also on the motor show. They took a brass band on the tour. It played in every city, town and village. It was a grand advertising scheme. In addition the dealers had 300 bill boards advertising the fair and the automobile show. These were in every city, town and village. They cost $1,050, but proved a good investment.

With such a preparation and such a show is it any wonder that new life was injected into the show and is it any wonder that the dealers are smiling tonight, happy after a week of real good business in spite of the rainy weather that marred the attendance on several days? Organization and co-operation did it all.

What the Dealers Say

Hear what a few of the dealers think of the fall fair motor car show.

F. Edwards, Kissel and Dodge dealer and president of Milwaukee Dealers' Association—It is the best business proposition I have ever bumped into at a show. I did more business during the first two days of the show than in the whole week of the winter show. We are selling cars and getting prospects for the city and also for the entire State. Now is the best time of the year to catch the farmer. He is through with the crops and has plenty of money. Farmers and business men from small towns and cities around the State are buying now and want immediate deliveries. The demand for closed cars and those with detachable tops is heavier than ever before. Outside of Milwaukee 50 per cent of our business is to farmers. If it came to vote as to whether we dropped the winter show in January or the fall fair show I would vote with both hands to continue the fall fair show. The attendance this year is good. Next year it will be better. It has been an experiment this year, but show visitors will go home and tell about the motor show and will come back in considerably greater numbers a year hence.

N. E. Osmond, Jeffery—There are sixty-four Jeffery dealers from the State attending the show and many of them have brought prospects with them.

Demand for Winter Tops

Edgar Sanger, Hupmobile and Stearns—This show is away ahead of the January one in the Auditorium. We are getting prospects who want cars right now. The farmers all want quick deliveries and that will cause a little trouble with some concerns that cannot make them. The demand for closed cars is growing, in fact, the demand for the detachable top is unprecedented. A car without a winter top is to-day much the same as a person wearing an overcoat but without gloves. Seventy-five per cent of my retail sales are cars with detachable bodies. This is a much better season to place dealers than in January.

Farmers Buy in Fall

W. H. Hathaway, district representative, Cadillac—The fall is the best season of the year to sell the Wisconsin farmer. In the spring he is too busy sowing the grain and tilling the soil. This has been a particularly good year with the Wisconsin farmer as all crops excepting corn have been good. This is the best season of the year to sell closed cars, and the January show is entirely too late for closed car sales. October to January are the months for selling closed cars, and this year the closed car business is being worked in small towns around the State. We sell one-third of our cars in the State to farmers. One dealer in a town of 1500 has taken seven cars for 1916.

H. W. Bonnell, Mitchell—At present the country business around the State is ahead of the city business and the fall fair is the best place to round up this country trade. Over forty dealers from the State are at the show with prospects.

Mr. Crafter, Winton—Crops conditions have been good throughout the State and bankers and business men in towns of 1500 and over are in good humor and are buying better than ever before. There is a perceptible demand for cars with special colors, there being many evidences that brighter colors are going to replace the sombre black of the past few years. More limousines are being sold than ever before.

Many Truck Prospects

Mr. Millman, Stegeman Truck—We get three or four times more prospects at the fall fair than we do at the January show. We do not expect to sell trucks at this show, but we do get prospects. We are going to exhibit at one or two of the best county fairs in the State. The city markets are overcrowded and there is better business with the out-of-town people in the smaller places, when you meet at the fall fairs. Our sales throughout the State are three times what they were last year.

George W. Browne, Overland—We have a 600 per cent increase inclosed car business over last year and the fall fair comes at a time when this closed car business can be properly presented to the buyers. Our State dealers are all at the show, many of them with many prospects.

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Delaware Non-Reciprocal Law May Be Repealed

WILMINGTON, DEL., Sept. 20—An enactment of the last Legislature affecting motorists of other States is proving so obnoxious that the police of Wilmington have voluntarily stopped enforcing it.

Originally the Delaware law was wholly reciprocal, but because some business concerns in Pennsylvania were operating trucks in Delaware without paying a Delaware license, the last Legislature amended the law so as to prohibit motor vehicles owned by non-resident corporations being operated in Delaware without a Delaware license. As little was known of this change outside of the State, non-resident drivers were constantly falling into the trap, and the courts had no alternative but to fine them.

One result of this was to drive business away from Wilmington, though many concerns took out Delaware licenses in order to continue doing business here. For a time the traffic police were making arrests by the wholesale, but there was such a protest that now, instead of arresting a violator they take him to the nearest license agent and if he takes out a Delaware license he is allowed to proceed, but if he refuses he is prosecuted.

It is altogether probable that the next Legislature will repeal the obnoxious law early in the session. This amendment does not apply to cars owned by individuals, who can operate in Delaware with a license of their own State.

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Proposed New York Law Requires All Drivers Licensed

NEW YORK CITY, Sept. 20—The next Legislature will be asked to enact a law requiring that all automobile drivers be licensed after a qualifying examination. It is stated that more than one-half of the fatal automobile accidents in this city are probably due to the inefficiency of owners or members of the families of owners and in many cases the inefficiency is due to incurable physical defects or to practically unalterable psychological disqualifications.

G. M. C. 50 Per Cent Dividend

Company Earned $14,926,322 in Fiscal Year—Seventeen Directors on New Board

NEW YORK CITY, Sept. 18—The directors of the General Motors Co., at their meeting concluded Thursday night, declared a dividend of 50 per cent in cash, being $50 a share, on the $16,506,783 in common stock, payable Oct. 15 to shareholders of record on Sept. 30. The board recommended the inauguration of regular quarterly common dividends, the rate to be determined by the incoming board.

The regular semi-annual dividend of 3½ per cent has been declared on the preferred stock, payable Nov. 1 to stockholders of record Sept. 30.

During the 1915 fiscal year which ended July 31, the General Motors Co. earned 81.2 on the common stock outstanding, compared with 37.6 per cent in 1914.

The surplus available for the common stock amounted to $13,408,839, compared with $6,201,055 in the previous fiscal period.

The net income, after deducting manufacturing, selling and administration expenses and maintenance and depreciation amounted to $14,926,322 as compared with $7,947,412 in 1914. The total cash on hand July 31, of this year was $14,526,124 and the funded debt amounted to only $2,328,000, being the balance on the 6 per cent notes which mature Oct. 1. This will be paid off.

Gross Sales, $94,424,841

During its business year just ended, the company's gross sales totaled $94,424,841, the total number of automobiles sold being 76,068. In 1914 the company sold 58,987 and the gross sales amounted to $85,373,302.

From Aug. 1 to Sept. 14 of the 1916 fiscal year the value of the sales as compared with the same period of 1915 more than doubled, the amount being $16,176,761 as compared with $7,585,739 last year.

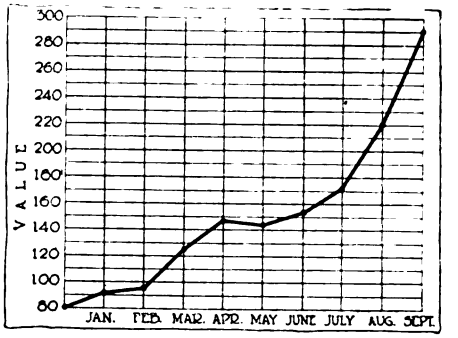
In view of the expiration of the voting trust on Oct. 1, the following proxy committee was agreed upon for the annual meeting Nov. 16; P. S. DuPont, W. C. Durant, L. G. Kaufman, C. W. Nash and J. J. Storrow, to vote for the following directors: Lammont Belin, director of the Aetna Explosives Co.; L. G. Kaufman, president of the Chatham & Phoenix National Bank; Pierre du Pont, S. F. Prior of the Union Metallic Cartridge and Remington Arms Co.; A. H. Wiggin, C. H. Sabin, J. A. Haskell, A. G. Bishop, E. W. Clark, W. C. Durant, H. J. McClement, C. S. Mott, C. W. Nash, Thomas Neal, J. J. Roskob, Albert Strauss and J. J. Storrow.

The new board of General Motors will consist of seventeen against fourteen in expiring board. The two boards are compared in the following list, the first eight names in each being identical:

NEW BOARD	OLD BOARD
E. W. Clark	E. W. Clark
J. H. McClement	J. H. McClement
Thomas Neal	Thomas Neal
C. S. Mott	C. S. Mott
C. W. Nash	C. W. Nash
J. J. Storrow	J. J. Storrow
Albert Strauss	Albert Strauss
W. C. Durant	W. C. Durant
Lammot Belin	Joseph Boyer
L. G. Kaufman	R. F. Herrick
Pierre du Pont	E. D. Metcalf
S. F. Prior	M. J. Murphy
A. H. Wiggin	M. L. Tilney
C. S. Sabin	Jacob Wertheim
J. A. Haskell	
A. G. Bishop	
J. J. Roskob	

Among the assets carried the past year are $1,001,000 in municipal securities, a post which was not carried on the balance sheet in former years.

In his statement to the stockholders of the company, President Charles W. Nash, says: "The common stock has never received a cash dividend since the company was organized Sept. 16, 1908. Your directors have followed the policy of building up the cash assets and the credit of the company and so have accumulated and held large cash balances



Showing phenomenal rise in value of General Motors common from first of year to Sept. 18, based on highest value reached each month

pending the maturity of the 6 per cent notes, the original issue of which was $15,000,000, and the last of which will be paid Oct. 1 next. During the past year, for the first time, it has not been necessary for the company to borrow money.

"Further marked improvements in manufacturing methods will be continued, but can hardly be expected in future to yield such large gains in output with such moderate expenditures on new buildings and machinery as have characterized the last five years. It is also true, in the opinion of your directors, in view of the strong financial posi-

General Motors Co. Income Account for Four Years

	1915	1914	1913	1912
Net profit sub. cos.	$14,926,322	$7,947,412	$8,284,140	$4,838,449
Gen'l Motor's share	14,794,190	7,819,968	8,184,053	4,746,757
Int. on notes	336,387	570,235	724,581	850,463
Surplus	$14,457,803	$7,249,734	$7,459,471	$3,896,293
Pf. dividend	1,048,964	1,048,679	1,048,534	1,040,211
Surplus	$13,408,839	$6,201,055	$6,410,937	$2,856,083

The profit and loss account follows:	1915	1914	1913	1912
Profit and loss surplus July 31, 1914..	$6,689,428	$2,945,379	$1,262,594	$1,240,175
Surplus for year ended July 31, 1915..	13,408,839	6,201,055	6,410,937	2,856,082
Total	$20,098,267	$9,146,434	$7,673,532	$3,639,259
Plants and equipment	113,107	2,457,007	4,728,153	2,376,665
Profit and loss surplus July 15, 1915..	$19,985,160	$6,689,427	$2,945,379	$1,262,594

Consolidated Balance Sheet of General Motors Co. and Subsidiary Companies, July 31, 1915

ASSETS.	1915	1914	1913
*Real est., plts., equip.	$15,819,852	$15,432,917	$16,845,949
Pat., agreements, etc	413,500	471,200	1,508,672
Misc. invest	367,185	352,735	367,063
Cash	14,526,124	13,452,663	6,236,251
Sec. of other corp., etc.	1,001,000	.....	.....
Notes and accts. rec.	3,944,681	3,358,791	3,449,335
Inventories	14,049,298	11,642,370	18,170,907
Prep'd exp.	533,586	387,578	412,756
Good-will	7,934,198	7,934,198	7,934,198
Total	$58,589,424	$59,114,600	$58,538,160
LIABILITIES.			
Pfd. stock	$14,985,200	$14,985,200	$14,985,200
Com. stock	16,506,783	16,501,783	16,501,783
Funded debt	2,328,000	7,852,000	10,935,000
Outstanding cap. stock	528,000	573,000	578,000
Sur. Sub. Cos.	454,423	431,142	409,252
Accts. payable	1,380,908	3,772,123	4,821,744
Liab. accrd., not due	1,270,302	1,000,247	1,048,970
Notes payable	.....	.....	300,000
Res. for pfd. div.	262,241	262,241	262,241
Res. for contingencies	888,406	965,288	2,162,276
Surplus	19,985,160	6,689,428	2,945,379
Total	$58,589,424	$59,114,600	$58,538,160

*After deducting depreciation reserve of $6,933,571 against $6,082,149 in 1914 and $3,613,029 in 1913.

tion your company now occupies, that the time is near when larger additions to plant, made necessary by the growth of the business should be made. Your board does not believe in running into debt, and it was partly because of these probable extensions, a portion of which have now been authorized, that your board voted to set aside the $1,000,000 referred elsewhere as invested in short time securities."

How General Motors common stock has ascended since the first of this year is shown in the accompanying table and illustration, which give the bid and asked prices at the beginning and the end of each month.

	Bid	Asked
January 5	81	82
January 26	90	91½
February 2	93	95
February 24	94	95
March 3	92	93½
March 31	124	125
April 6	126	128¾
April 26	145	147
May 1	143	145
May 31	135	136¼
June 7	151	153
June 28	152	154
July 5	156	157
July 27	179½	181
August 3	177	179
August 30	219	220½
Sept. 7	241	243
Sept. 18	280	288

In July, 1912, the stock was quoted at 32-33, while in July, 1913, at certain times there were bids at 26 to 32 asked. In September, 1913, the stock quoted 35-37 and at the end of December there was 36½ bid and 38 asked.

At the time of the start of the European war in 1914 the common was quoted at 82-84. Early in December of that year the stock was down to 68-72 but on Dec. 29 the records show that the quotations had again gone up, bid being at 76¼ and asked at 77½.

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New Ajax Tire Plant

TRENTON, N. J., Sept. 20—The annual meeting of the stockholders of the Ajax-Grieb Rubber Co., this city, was held last week, and a dividend of 7 per cent on the preferred and 24 per cent on the common was declared.

A new plant is to be built immediately which will be 200 by 35 ft., three stories, and adding 210,000 sq. ft. of floorspace. Foundations are to be capable of carrying three additional stories which will be added later. The extensions include a new power house, engine, dynamo and boiler units.

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500 Ross Eights for England

DETROIT, MICH., Sept. 20—The Ross Automobile Co., this city, has closed a contract for 500 cars for delivery this year, with Mann-Overton's Ltd., London, England. Arrangements have also been made for renewal contracts to cover three years and the exclusive representation in the United Kingdom, the Colonies and France.

Studebaker School for Employees

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Three-Year Commercial, Mechanical and Technical Courses with Savings

SOUTH BEND, IND., Sept. 20—The Studebaker Corp., of this city, has made announcement of the establishment of a training school for the purpose of assisting the young men employees of the corporation to avail themselves of an opportunity of taking a commercial, technical or mechanical course, extending over a period of three years. The conditions as set forth in the announcement are as follows: Regular students must be under seventeen years of age for the preparatory office course and under twenty for the apprentice training course. They must be physically sound and of good moral character. The course will be carried on for three years and will not interfere with the regular work of the student. The student will contribute 50 cents a week of his wages as a guarantee of good faith in continuing in one of the courses until same is finished, which sum will be forfeited to the corporation in case the student should be dismissed for incompetency, irregularity, or any reason other than sickness, or leaves of his own free will. This weekly contribution will be deposited in a savings bank to the credit of the student, the total sum with interest to be returned to the student when he has satisfactorily completed his course. The corporation will in recognition of this effort for self-development pay the student's membership in the Y. M. C. A., and arrange for the course under the supervision of the Y. M. C. A. and pay all expenses. In addition to the foregoing a bonus of $100, $50 and $25 for each student completing the course with an average percentage of 95, 90 and 85, respectively will be given.

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8-Hr. Day in Studebaker Plants

DETROIT, MICH., Sept. 20—The Studebaker Corp. announces an 8-hr. working day, effective Nov. 1.

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Detroit Makers Benefited by New Local Department

DETROIT, MICH., Sept. 17—Hereafter, Michigan manufacturers and exporters wishing information will not have to write to the Department of Commerce in Washington. The Detroit Board of Commerce has now completed arrangements for the opening of a co-operative branch of the bureau of foreign and domestic commerce and will thus be able to furnish those interested with reports made by the special agents from the department as well as other information the manufacturers may desire. With the growing domestic and export trade in the Detroit district it has been found advisable to give the manufacturers quicker service and the new branch will greatly facilitate and help in this connection.

—

British Makers Meet to Offset American Invasion

LONDON, ENGLAND, Sept. 1—Representatives of a number of leading British automobile manufacturers held a meeting in this city lately, Edward Manville, chairman of the Daimler Motor Co., presiding. The meeting was private, but in an official statement issued after the conclusion of the proceeding, it was stated that "these manufacturers contemplate taking steps to approach the government concerning the complete engagement of the great majority of British motor manufacturers on government work, and their inability, owing to the fact, to meet foreign competition on fair terms, so far as normal trade is concerned."

It was stated that there was still a considerable trade in private and commercial cars, which was being captured mainly by American makers.

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Transmission Ball Bearing Co. Formed

BUFFALO, N. Y., Sept. 16—The Transmission Ball Bearing Co., this city, has been incorporated with a capital of $100,000 to manufacture ball bearings for motors and trucks. The directors of the new company, which is the United States branch of the Chapman Double Ball Bearing Co. of Toronto, are W. J. Murray and J. P. Beatty of Toronto and W. M. Wilson of Buffalo. The office of the company is at 1407 West Avenue, this city.

—

Mitchell Co. After Confiscated Cars

RACINE, WIS., Sept. 20—The Mitchell-Lewis Motor Co., Racine, Wis., has taken steps to recover from the Imperial German Government the value of a cargo of Mitchell cars confiscated by the Germans at the siege of Antwerp more than a year ago. Shortly before the war broke out several carloads of cars were shipped to the Mitchell-Lewis branch at Antwerp. The cars arrived at destination safely, but when Antwerp was taken the Germans commandeered them as spoils of war. The Mitchell company has obtained a certificate from the secretary of state of Wisconsin to prove that it is a duly authorized corporation of Wisconsin, U. S. A., and not a company licensed by a country at war with Germany.

—

100 New Cars a Day

MINNEAPOLIS, MINN., Sept. 16—During the past eighteen days, 1857 new automobiles were registered in Minnesota, or more than 100 a day.

Billings & Spencer May Increase Stock

Directors Vote in Favor of New Organization with $500,000 Capital

HARTFORD, CONN., Sept. 20—In order that the new factory may be financed, the Billings & Spencer Co. proposes an increase in capital to $500,000. The directors of the company at a meeting late last week so voted and on Oct. 26, a meeting of the stockholders is scheduled to be held. It is the intention to have a new corporation, which will carry the same name as the old one, take over the business. It is explained by the directors that the capitalization of the company is small in comparison to its business and its assets. The Billings & Spencer Co. has almost completed removal to the remodeled plant at the corner of Park and Laurel Streets, formerly occupied by the Columbia Motor Car Co., and the scene of the earliest experiments in the United States on a commercial scale. The company has completely renovated the original quarters at great expense. The location is ideal. New buildings have been erected which include a power house on the bank of the Park River. The old plant on Lawrence, Russ and Broad Streets, will probably be on the market about Nov. 1.

—

Inter-State Adds

MUNCIE, IND., Sept. 18—The Inter-State Motor Co., this city, has broken ground for a new addition three stories high to building No. 2 of the plant. This addition will be 80 by 150 ft., constructed of brick and steel, giving 36,000 additional square feet of floor space. This will make a total of approximately over 200,000 sq. ft. of floorspace available for production. It is expected that the plant will be completed within 45 days after the material has been placed on the ground.

Changes are being made inside the present plant to increase each department. A large addition is being built in the form of a building inside of a building. The main bulding in which this new part will be housed is the largest single unit of the plant all on one floor, being 160 by 440 ft. The new building will be 34 by 230 ft., situated in the center of the main building.

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King to Add 70,000 Ft.

DETROIT, MICH., Sept. 18—The long contemplated enlargement of the King Motor Car Co. is now a fact, the company having secured a four-story plant with nearly 70,000 sq. ft. of floorspace at 1045 East Jefferson Avenue or only a few blocks from its main plant. The latter will become plant No. 1 and will house the chassis assembly, motor manufacturing department, dynamometer test, technical department, stock and shipping departments, while plant No. 2 will have the final assembly, inspection and shipping departments, also the road test department.

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Employees in Ohio Car and Tire Plants Paid $36,709,472

COLUMBUS, OHIO, Sept. 18—According to a report issued by the Ohio Industrial Commission the payroll of all automobile factories in the Buckeye State for the year 1914 amounted to $18,629,571. This included bodies and parts as well as automobile building proper.

The payrolls of all of the rubber goods factories in the State including automobile tire manufacturing amounted to $18,079,901.

—

Few Market Changes

NEW YORK CITY, Sept. 21—Markets this week were dull with few changes. Steel markets made no changes. Copper markets showed little increase in price. The producers report that the 18-cent price asked for is being rigidly maintained and that a number of good sales have been made to foreign account. Several good sized sales were also made to the domestic consumers. The copper situation appears to be playing into the hands of producers, for each day indicates that the situation is turning to the seller's favor. The aluminum market is much firmer, with demand continually increasing. The antimony market shows further weakness, holders offering spot at 27½ to 28½ cents. No new developments of importance occurred in the crude rubber situation last week either here or abroad. Locally a somewhat better inquiry was noted, but the demand was generally limited to small parcels for prompt use. The closing price for Up-River Para fine was 55½ cents, this being maintained throughout the week. The oil and lubricants markets this week were steady, no changes taking place. There were a number of good sales recorded on Tuesday of oils but this selling did not continue.

—

Fire in American High-Speed Chain Plant

INDIANAPOLIS, IND., Sept. 20—The factory of the American High Speed Chain Co., Indianapolis, Ind., caught fire early Wednesday morning, and damage estimated at about $50,000 was sustained. The fire, however, was confined principally to one floor, and arrangements have been completed whereby manufacturing will continue without interruption.

The company has been for years manufacturing noiseless chains, designed to drive small working parts of automobile motors. The business has grown so rapidly that they have been occupying all the space in the large building at the southeast corner of Illinois and South Streets.

—

Automobile Plant for New Orleans

NEW ORLEANS, LA., Sept. 16—This city is to get its first automobile plant. A tract of land twenty acres square, 7 miles from Canal Street, in St. Barnard parish, has been purchased by the Mohawk Motor Corp. of Delaware, whose local directorate is J. B. Davis, John Merkle and W. A. Francis. Work on the plant is to start within two months. The company is capitalized at $100,000 and plans to make two types of Mohawks, a five- and a seven-passenger.

—

Will Encourage Use of Wood in Bodies

MILWAUKEE, WIS., Sept. 21—"How can we induce motor car manufacturers to return to the use of wood for bodies?" was the principal topic of discussion at a special meeting of the Northern Hemlock & Hardwood Manufacturers Assn. held

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Changes Week's
Aluminum	.40	.45	.45	.45	.45	.45	+.05
Antimony	.28½	.26	.26	.27½	.27½	.27½	—.01
Beams & Channels, 100 lb.	1.51	1.51	1.51	1.51	1.51	1.51	..
Bessemer Steel, ton	24.00	24.00	24.00	24.00	24.00	24.00	..
Copper, Elec., lb.	.17¼	.17¾	.17¾	.17⅞	.17⅞	.17⅞	+.00⅝
Copper, Lake, lb.	17½	.17¾	.17¾	.18	.18	.18	+.01
Cottonseed Oil, bbl.	6.34	6.35	6.17	6.10	6.08	6.05	—.29
Cyanide, Potash, lb.	.23	.23	.23	.23	.23	.23	..
Fish Oil, Menhaden, Brown	.39	.39	.39	.39	.39	.39	..
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	..
Lard, Oil, prime	.85	.85	.85	.85	.85	.85	..
Lead, 100 lb.	4.45	4.45	4.45	4.45	4.45	4.45	..
Linseed Oil	.54	.54	.54	.54	.54	.54	..
Open-Hearth Steel, ton	25.00	25.00	25.00	25.00	25.00	25.00	..
Petroleum, bbl., Kan., crude	.80	.80	.80	.80	.80	.80	..
Petroleum, bbl., Pa., crude	1.65	1.65	1.65	1.65	1.65	1.65	..
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	..
Rubber, Fine Up-River, Para	.55½	.55½	.55½	.55½	.55½	.55½	..
Silk, raw, Ital.	3.90	..	3.95	..	..	4.05	+.15
Silk, raw, Japan	3.67½	..	6.00	..	..	3.55	—.12½
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	..
Tin, 100 lb.	33.37½	33.25	33.37½	33.00	33.00	33.00	—.37½
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	..

in Milwaukee Sept. 16 and 17. The meeting was called to discuss ways and means for stimulating the lumber trade, which has been in a state of lethargy for many months and shows a need for stimulation. It was decided to make a canvass of all makers of bodies and vehicles who have adopted sheet metal and aluminum for body-making, with a view to resuming the use of wood. The growing use of metal instead of wood has become a serious matter to lumbermen and they intend to use every means within their power to bring about a change in conditions.

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Manhattan Rubber Raises Wages

PASSAIC, N. J., Sept. 16—The Manhattan Rubber Mfg. Co., this city, maker of automobile tires and other accessories, will give all employees with the concern from six months to two years a 3 per cent increase in wages. Those who had worked from two to five years would receive 5 per cent increases, and all over five years a 7 per cent increase. The company employs about 750 hands.

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Dividends Declared

Yale & Towne Mfg. Co., New York City: 1¾ per cent for quarter out of past earnings, ending Sept. 30, to stockholders of record at close of business Sept. 25, and payable Oct. 1.

Vacuum Oil Co., Rochester, N. Y. 3 per cent, payable Oct. 30 to holders of record Oct. 14.

Electric Storage Battery Co., Philadelphia, Pa.: 1 per cent on common and preferred, payable Oct. 1 to stockholders of record Sept. 21.

General Motors Features Market

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Other Stocks Rise in Sympathy —General Trade Conditions Have Influencing Effect

NEW YORK CITY, Sept. 20—Automobile securities closed on Saturday with large gains, in sympathy with the General Motors dividend announcement. Conditions in the business world last week also had an influencing effect on industrial stocks. Certain barometers, such as the rise of sterling exchange, which is now quoted around $4.70, commercial paper rates and the New York bank surplus, and a better aspect of diplomatic affairs, were a stimulus for a very active market.

Markets Active

At the opening on Saturday, General Motors made a further extensive advance which it maintained throughout the day, closing at 286, a gain of 31 points for the week. Studebaker common was more active than ever before, and by closing at 128½, the price made a new high record. The Maxwell stocks also showed an increase of activity, and their prices increased moderately.

The automobile stocks' response to the General Motors dividend announcement was instantaneous, with a consequent large selling activity. Goodrich, especially, showed considerable buying strength last week. The directors of this company, it is said will take up the matter of common dividends at the next regular meeting of the board, which is scheduled within the next six weeks.

The majority of the stocks last week showed substantial gains, ranging from 1 to 31 points. Drops were few and small, ranging from 1 to 7 points.

In the automobile securities, General Motors and Studebaker were the feature and in the tire market, Goodrich, Goodyear and Portage, showed the best gains. Vacuum Oil rose 10 points.

Firestone common went down 5 points while that of the Peerless company dropped 7 points. Willys-Overland preferred dropped 2 points.

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New Edition of Used-Car Market Report Published

CHICAGO, ILL., Sept. 20—Following the publication of the revised edition of the pocket edition of the Chicago Automobile Trade Association National Used-Car Market Report, covering Zone 7, which centers in Chicago, an edition of the pocket book has been brought out for Zone 9, which centers in Minneapolis. This is in every respect the same as the pocket edition for Zone 7 except that it gives the appraised value for Zone 9. This zone includes Montana, North Dakota, South Dakota, Minnesota, Wisconsin and part of Michigan.

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U. S. Rubber Reports Semi-Annual

NEW YORK CITY, Sept. 18—Directors of the United States Rubber Co. have decided to issue semi-annual reports, beginning in the middle of 1916.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			102	..	..
J. I. Case pfd			78	84	+ 3
Chalmers Motor Company com			109	111	+ 4
Chalmers Motor Company pfd			96	99	+ 1
Electric Storage Battery Co			73	74½	+ 3
Firestone Tire & Rubber Co. com			525	535	— 5
Firestone Tire & Rubber Co. pfd			111	..	..
Garford Company pfd			..	..	..
General Motors Co. com			286	290	+31
General Motors Co. pfd			114	115	+ 1
B. F. Goodrich Co. com			65½	67	+ 4½
B. F. Goodrich Co. pfd			108	110	+ 2
Goodyear Tire & Rubber Co. com			295	300	+11
Goodyear Tire & Rubber Co. pfd			108½	109½	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			29	31	+ 2
International Motor Co. pfd			61	65	+ 5
Kelly-Springfield Tire Co. com			210	213	+ 6
Kelly-Springfield Tire Co. 1st pfd			88	90	— 1
Kelly-Springfield Tire Co., 2d pfd			208	220	+ 8
Paige-Detroit Motor Car Co			..	450	..
Maxwell Motor Co. com			45½	47	+ 3½
Maxwell Motor Co. 1st pfd			89	90	+ 3
Maxwell Motor Co. 2d pfd			37	38½	+ 1
Miller Rubber Co. com			190	195	..
Miller Rubber Co. pfd			107	109	— ½
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co com			120	130	..
Packard Motor Car Co pfd			100	..	..
Peerless Motor Car Co. com			120	135	— 7
Peerless Motor Car Co. pfd			93	94	..
Regal Motor Car Co. pfd			..	21	..
Portage Rubber Co. com			55	59	+ 9
Portage Rubber Co. pfd			93	94	..
*Reo Motor Truck Co			..	17½	..
*Reo Motor Car Co			33	34	+ 1
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp. com			66½	67½	+ 1½
Stewart-Warner Speed. Corp. pfd			105	107	..
Studebaker Corp. com			128½	130	+14½
Studebaker Corporation pfd			106	107	+ 1
Swinehart Tire & Rubber Co			86	90	+ 2
Texas Company			153	155	+ 3
U. S. Rubber Co. com			51½	53	+ 2¾
U. S. Rubber Company, pfd			104	106	+ ⅛
Vacuum Oil Co			218	222	+10
White Co. pfd			110	..	..
Willys-Overland Co. com			192	194	+ 5
Willys-Overland Co. pfd			105½	108	— 2

No quotations available on account of the war.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	97	110	115	+ 7
Chalmers Motor Co. pfd	..	..	97¼	99	+ 2¼
Continental Motor Co. com	155	180	..	295	— 5
Continental Motor Co. pfd	..	75	85	90	+ 1
General Motors Co. com	..	..	285	295	+29
General Motors Co. pfd	..	..	114	118	+ 2
Maxwell Motor Co. com	10	11¼	44	46	+ 2
Maxwell Motor Co. 1st pfd	29	31	88	90	+ 1½
Maxwell Motor Co. 2d pfd	..	..	36	39	..
Packard Motor Car Co com	..	..	120	130	..
Packard Motor Car Co. pfd	92	..	100	..	..
Paige-Detroit Motor Car Co	..	..	..	450	..
*Reo Motor Car Company	..	21¼	33¾	34¼	+ ¼
*Reo Motor Truck Co	10	11	16⅞	17⅜	+ ⅛
Studebaker Corp. com	..	..	120	125	+ 7½
Studebaker Corp. pfd	..	..	105	109	+ 1½

INACTIVE STOCKS

*Atlas Drop Forge Co	21	..	..	31	..
Ford Motor Co. of Canada	..	500	..	1535	+10
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	20¼	22	..
Regal Motor Car Co. pfd	25	..	..	21	..

*Par value $10; all others $100 par value.

Ford Tractor Plows 5 to 10 Acres Per Day at a Cost of $3.10—Life 2 Years

Tests and Experiments Still Under Way to Determine Form in Which Vehicle Will Be Put on the Market in About a Year

DETROIT, MICH., Sept. 20—The Ford tractor, which made its initial public appearance at the Michigan State Fair here recently, is now in a fairly advanced state of development, although the officials state that it is not likely that it will be placed upon the market for about a year, as it is intended to prove it absolutely before going ahead with it. Each day during the Fair the tractor was demonstrated to the visitors, and its ability for plowing and hauling shown.

Many Tests

Tests are being made with the vehicle repeatedly by the Ford company, and the experimenters will not say whether or not the present form of the tractor will be the final form, although it has worked out very well to date. To demonstrate the haulage ability of the vehicle, it was recently driven to Cleveland from Detroit over roads that are fairly good, making the 150-mile trip, pulling a 5-ton trailer, at the rate of 16 m.p.h. It has also made this trip with a 7-ton tow.

Plows 5 to 10 Acres Daily

As to its ability as a farm vehicle, the tractor is capable of doing from 5 to 10 acres of plowing a day, depending upon the depth of the furrow and the texture of the soil. It can pull either one plowshare 16 in. wide or two shares 12 in. wide. Equipped with the Holley kerosene carbureter, the tractor uses 10 gal. kerosene for 10 hr. work.

Cost $3.10 a Day

To figure the cost of operating, then, it should be considered that kerosene, in this locality, costs 6 cents a gal. in barrel lots, or 8 cents in small lots. This means a fuel cost of 60 cents per 10 hr. day. If the cost of the vehicle is to be $250, then on the basis that the tractor would last one year, which is very low, and also considering that the farm work for a year would not be over 100 days, the cost for amortization would be $2.50 per day. Adding this to the daily fuel cost, the vehicle figures to cost $3.10 per day, doing a minimum of 5 acres of plowing.

Low Fuel Cost

Now it costs at least $3 per acre to plow with two horses. A team cannot do more than 1½ to 1¾ acres per day, so that we arrive at the following comparison:

TRACTOR	TWO HORSES
Work per 10 hr. day—5 to 10 acres.	Work per 10 hr. day—1½ to 1¾ acres.
Cost per day—$3.10, figuring that the life of the tractor is only 100 days, which is very low.	Cost per day—$3.

The above is on the assumption that the farmer would need a new one each year. Even if he did, he would do the work in one-third the time, or save two-thirds for the same amount of work. It would probably be fairer to consider that the tractor would last at least two years. Supposing it was good for 250 days, the amortization cost per day would be $1.00. Then the daily cost, including fuel would not run over $1.60 to $1.75. Then the comparison with horses becomes more one-sided. Probably a tractor having good care would last much more than two years.

Uses Standard Ford Engine

The Ford tractor in its present form uses the Standard Ford engine as used in the passenger cars, and this is coupled up to a worm-driven rear axle. Instead of the regular Ford planetary transmission, the transmission is changed to have only one speed, and the band brake is enlarged. But there are two sets of spur gears back of the regular housing for the planetary gearing, which housing is a part of the crankcase and has the regular Ford engine form. These gears give two speeds.

The worm is over the worm wheel, and within a substantial housing which is also the housing of the rear axle unit. By the use of worm drive in connection with the planetary transmission and the two gears back of the latter, an enormous reduction between engine and wheels is obtained. On the highest speed, the reduction between engine and wheels is 32 to 1, while in second speed it is 77 to 1.

Two Sets of Wheels

Two sets of wheels are used with the tractor. One set is of the regular truck type. The rear pair are used with solid block rubber tires, and the fronts use solid continuous rubber tires, of artillery form. For plowing and field work where greater traction is required, tractor wheels are arranged to fit the same axles in place of the truck-type wheels. The tractor wheels are steel, the rear set having steel blocks around their circumference.

In its present form, the vehicle uses no form of body, having only a single seat for the driver on the left. The engine is inclosed under a hood, however.

At either side of the hood on brackets from the frame are large 10-gal. tanks. The one on the right carries the kerosene, while 10 gal. auxiliary water is held in the right tank. For tractor work, the cooling system must be adequate for the pulling is long and steady with heavy working of the engine—conditions which would heat the engine unduly without the auxiliary water circulation through the 10-gal. tank. It is stated that the cooling is held within reasonable limits by this added water supply method.

On the models shown the public, a stiff frame was used—not the regular Ford car frame.

Not in Final Form

Probably before the vehicle is finally ready for the market, other changes will be made, although the present construction may prove entirely satisfactory as it is. The Ford concern is experimenting with the vehicle right along and making it prove its ability under all kinds of severe conditions. The aim is to have a vehicle that will serve the farmer well, and until it has advanced to such a state of development that they are sure it will do its work, it will not be put on the market. From information that can be gained, it seems likely that the rural population will have to wait at least another twelve months before the Ford tractor will be a commercial reality.

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Jitney War on in Terre Haute

INDIANAPOLIS, IND., Sept. 15—War on the jitney bus at Terre Haute, Ind., was begun late last evening when suit was filed in the district court by the Fidelity Trust Co. of New York, bondholders for the T. H. I and E railway, who, in turn, are owners and operators of the street railway lines in Terre Haute.

Sixty defendants are named in the notice of the suit, the trust company stating the jitney bus in Terre Haute is being operated by individuals instead of organized companies. The suit is in the shape of a bill of equity, asking for a restraining order against the operators of such lines.

It is cited in the appeal for injunction, that the jitney bus drivers have organized what is known as the Jitney Bus Drivers' Union, No. 168, which is a trades union, recognized by the Central Labor Union of that city. Stress is laid on the contention that Central Labor Union started a boycott against the street car lines in January, 1915, and that since that time the decreases in the income of the street car line in the way of fares have been as follows:

February, $4,152.53; March, $4,916.99; April, $9,255.91; May, $11,777.62; June, $10,341.86; July, $16,834.54; August, $10,508.83.

It is cited that the railway company has already lost more than $75,000 on account of the boycott, whereas previous to January, 1915, the average monthly receipts were $37,000.

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N. E. Chalmers Dealers Meet in Boston

BOSTON, MASS., Sept. 18—More than 100 dealers who handle the Chalmers line in New England were guests of Harry Pyke, manager of the Boston Chalmers company on Sept. 17 on an outing at the Breaden Cheese Inn, Cohasset. During the meal addresses were made by factory representatives. Vice-President C. A. Pfeffer told of the sales being made during the present time, and how the production had jumped up to more than 120 shipments of cars a day. W. J. Drumplemann, eastern district representative, spoke about infringements and how the factory would protect dealers. J. M. Cuhelan spoke about advertising and publicity.

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Portland Jitneys Hurt by Decision

PORTLAND, ORE., Sept. 15—For the second time a Portland jitney ordinance has been given a body blow by the courts. Circuit Judge Bagley enjoined yesterday the enforcement of the second measure. He held the council exceeded its authority in affixing an emergency clause preventing the invocation of a referendum. He also declared illegal a provision requiring applicants for operators' licenses to get certificates from the commissioner of utilities.

The first ordinance was declared a violation of the initiative election law because it was prepared by the council itself before submission to the voters.

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$6,178,213 in Washington Cars

OLYMPIA, WASH., Sept. 15—Automobile salesmen are doing a big selling business, according to the personal property returns of the county assessors.

There were 15,223 automobiles in the State of Washington in 1914. There are 21,713 listed this year. The total value of the machines in 1914 reached $4,924,263, according to the assessors, and $6,178,213 in 1915.

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Newark Jitney Ordinance Vetoed

NEWARK, N. J., Sept. 16—Mayor T. L. Raymond to-day sent to the Board of Works his disapproval of the ordinance drawn by that body regulating jitney buses. The mayor said it contained features which may be unjust to the jitney owners.

P. O. Authorizes 500 Rural Routes

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288 in Operation—Finds Cost Per Mile Is 34 Cents on a 29-Mile Route

WASHINGTON, D. C., Sept. 18—The Post Office Department has announced that more than 500 automobile rural routes have been authorized and of these 288 are in operation. Their preliminary experience has convinced postal authorities that the new service will greatly improve the farmer's mail and express facilities. Time schedules are better maintained and routes more regularly served in all weather conditions by automobile than by horse-drawn vehicle. Forecasts, department officials say, that the automobiles could not do 50 to 60 miles a day upon regular schedule are not borne out.

A Kansas Carrier's Cost

A Kansas carrier gives his experience as to cost, as follows:

Set of tires (Average life 6000 miles)	$60
Gasoline—(1 gal. to 15 miles at 15 cents a gallon, though he is now paying 11 cents)	60
Oil—(1 gal. to every 150 miles at 45 cents a gal.)	18
Depreciation—(Based on 72,000 miles as the life of his car)	40
Repairs per 6000 miles	30
Cost of operation per 6000 miles	$208

$0 3466 per Mile

From the above, the cost of operation per mile comes to $0.3466. Applying this figure to his 29½-mile route, this carrier found this to be his outgo for running expenses:

To serve route 250 days by automobile at $1.02 per day	$255
To hire horse and conveyance at $1.50 a day for 57 days, or during the period in which he could not use the machine	85.50
Cost to serve route	$340.50

For a 55-Mile Route

Deducting $340.50 from his $1,200 salary, the carrier's net income now is $859.50. Applied to a 55-mile route, it works out thus:

To serve route 250 days	$477.50
To hire substitute at $3.33 a day to cover that part of route which the regular carrier could not do by horse-drawn conveyance during the period in which he could not use his machine, and to hire horse and conveyance at $1.50 a day to do the remaining half of the route for period of 57 days	270.50
Total cost of serving the long route	$758.00

Hence, this carrier, if he received $1,800 a year for covering 55 miles six days a week, figures that his net income would be $1,042—or $200 more than he is now getting.

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$64,000 for Postal Cars in St Louis

ST. LOUIS, MO., Sept. 18—Government-owned motor vehicles of a special design soon are to be installed in St. Louis to supplant the present system of wagon and street car delivery and collection of all mail, including parcel post. Similar service has been ordered installed in Chicago, it was learned here. In both these cities the mail is now being handled by conveyances operating under private contracts. It is said the excessive compensation demanded by these contractors has compelled the government to operate its own machines. The government has been experimenting with motor vehicles in Washington and Detroit and the order for their installation in St. Louis and Chicago is taken as acknowledgement of the success of the innovation.

It is planned to spend $64,000 for motor cars to handle the St. Louis mails. Their operation, it is estimated, will cost $112,000 a year. At that the government counts on saving $3,000 the first year as at present the government is paying $179,600 for the transportation of mail under the contract system in St. Louis. The motor service will be institutied here Jan. 1, 1916—it is announced in advices from Washington, D. C.

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Hudson Files Complaint Against Michigan Central Railroad

WASHINGTON, D. C., Sept. 18—The Hudson Motor Car Co., Detroit, has filed a complaint with the Interstate Commerce Commission against the Michigan Central railroad, for a refund of $527.50 being the freight charges on two automobiles which were shipped over that road to be delivered in Monterey, Mexico, but which were returned to Detroit.

The shipment was made, so the complainant claims, at a time there was an embargo on shipments by way of Laredo. The Hudson company claims that the shipment could and should have been made by way of Brownsville, Tex., but the road refused to divert the shipment promptly and an embargo was placed when it arrived in that city, from where the two cars were ordered returned to Detroit. It is the opinion of the Hudson company that the railroad company is at fault and should be compelled to refund the freight charges.

Two Racing Co.s Formed

Indianapolis Speedway Will Race 2 Peugeots—May Enter Other Fields

INDIANAPOLIS, IND., Sept. 15—The Indianapolis Motor Speedway and the Prest-O-Lite Co., this city, are to be represented with racing teams in all the important automobile races of the country. To this end the Indianapolis Speedway Racing Team Co. and the Prest-O-Lite Racing Team Co. filed articles of incorporation yesterday with the Secretary of State. Each company is incorporated at $20,000.

F. H. Wheeler, Carl G. Fisher, T. E. Myers, A. C. Newby and J. A. Allison are the incorporators of the Speedway Racing Team Co. and Carl G. Fisher, J. A. Allison and F. E. Sweet comprise the Prest-O-Lite Racing Team Co.

It was announced last evening that the Speedway Co. has purchased two Peugeot cars, which arrived in Indianapolis Saturday and that the Prest-O-Lite Co. will use Maxwell cars.

Howard Wilcox and John Aitken, two popular Indianapolis drivers, will comprise the racing team representing the Speedway. Their Peugeot cars probably will be shipped to New York for their first race Oct. 2. It was said last night that the drivers for the two Maxwell cars to represent the Prest-O-Lite have not been selected, but arrangements have been made for Eddie Rickenbacher to captain the team. The two companies, under their charter, may also enter airships and balloons in speed events, though their activities for the present will be confined to automobile racing.

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Syracuse Dealers Want Larger Show in 1917

SYRACUSE, N. Y., Sept. 18—The dealers of this city want a real automobile show in connection with the New York State fair which is held here every year. As yet they have not had one though they hope to have one in 1917 provided plans at present in embryo mature. The show this year is a small one and the results which have come from it to date are not all that the dealers could desire. About a dozen dealers exhibited in tents in various parts of the great fair grounds and two dealers, Buick and Overland, had spaces in one of the big buildings.

The feature of the show was an exhibit of used cars staged by secretary Harry Gardiner of the Syracuse Automobile Dealers' Assn. For his exhibit, Gardiner rented a tent 40 by 70, divided it into seventeen spaces and then divided the cost of the whole venture, including rent of the tent, cost of the space at 1 cent a square foot, which was the regular rate for space in the fair grounds, cost of advertising, etc., by the number of spaces. This brought the cost per space in the tent to $17. Members of the association were offered these spaces at this figure for the exhibition of used cars and every space was taken.

With regard to the value of an exhibit at any State fair, most of the dealers were agreed that it was good from an advertising point of view but that not a great deal of business results. The impression prevails that the value of such an exhibit to a dealer is almost directly proportional to the size of his territory; that a dealer with a large territory will benefit to a greater extent than a dealer with a small territory for the reason that the show draws from the whole State and therefore brings in many prospects which do not rightfully belong to the dealer with a small territory.

The following dealers exhibited: Reo Sales Co., Reo; Palmer-Moore Co., Palmer-Moore trucks; Brockway Motor Truck Co., Brockway trucks; Sanford Motor Truck Co., Sanford truck; Erie Trailer Mfg. Co., Erie trailer; Bartlett & Smith Motor Co., Studebaker; H. A. Gardner Stowell Motor Car Co., Packard, Hudson, Dodge; Chalmers-Syracuse Co., Chalmers; Overland-Syracuse Co., Overland; Buick-Syracuse Sales Co., Buick.

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Speedway Presidents to Meet Oct. 1

NEW YORK CITY, Sept. 20—Nine presidents of automobile speedways and dirt track courses throughout the country have been asked to attend a meeting in New York City, Oct. 1, to formulate a working agreement for the 1916 season.

At the meeting, called by Chairman Kennerdell of the contest board of the American Automobile Association, a schedule will be drafted so there will be no conflicting dates. The tracks that will be represented are: Chicago, Indianapolis, Sheepshead Bay Speedway, Minneapolis, Omaha, Sioux City, Des Moines, Providence and Tacoma.

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Overland Wins Philadelphia Sociability

PHILADELPHIA, PA., Sept. 18—One hundred and fifteen cars participated in the fifth annual run of the Lu Lu Temple Automobile Club to Atlantic City, N. J. The time of each car for the trip was taken at the finish and the total of all the times was divided by the number of cars checking in, to arrive at an official time. The result was 3 hr. 48 min. 58 sec. for the approximately 70 miles, and F. G. Roth, in an Overland, who finished in 3 hr. 48 min. 40 sec., captured first prize being but 18 sec. off.

Fords May Race at Indianapolis

$1,000 Prize Race Planned—Only Stock Models Eligible —50 Cars Required

INDIANAPOLIS, IND., Sept. 15—An exclusive Ford contest, for a cash purse of $1,000, is contemplated by the Indianapolis motor speedway management, as a preliminary event to the $10,000 invitational 100-mile match race at the speedway, Saturday, Oct. 9. Whether the contest will be held or not depends entirely upon the reception at the hands of Ford owners. If less than fifty cars are entered the race will not be run.

The terms of the contest, as outlined at present, are none but stock Ford roadsters or touring models fully equipped shall be eligible. All cars must be at least six months old. The race will run in five heats of 5 miles each and a final over the same distance. Ten cars will be entered in each heat, the winner of first and second of each heat being eligible for the final.

Winners of the first place in the heats will get $50 each, or $250 in all, the remainder of the purse, or $750, being reserved for the finals as follows: First $300; second $200; third $100; fourth $75; fifth $50; sixth $25.

The speedway management is launching the Ford contest to stimulate interest in small car performances. The Ford was selected to start over other makes of cars, because of its greater distribution. Should the race prove a success it is planned to hold meets for other cars as well.

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Drawbacks Granted by Treasury Department

WASHINGTON, D. C., Sept. 18—The regulations of the Treasury Department of March 4, 1915, providing for the payment of drawback on motor cars and parts of same, manufactured by the Buick Motor Co., Weston-Mott Co., Cadillac Motor Car Co., Northway Motor Mfg. Co., Oakland Motor Car Co., Cartercar Co., General Motors Truck Co. and the Olds Motor Works, have been amended to provide for the filing of supplemental sworn statements and schedules covering other styles and kinds of motor vehicles or parts of same, or showing changes in the quantities and kinds of imported materials manufactured with the use of imported materials, used. Upon verification of such supplemental statements and schedules, drawback may be allowed on articles covered thereby.

The Treasury Department has granted the Ericsson Mfg. Co., Buffalo, N. Y., a drawback of duties on magnetos manu-

factured by that company with the use of imported ball bearings or with the use of ball bearings manufactured by the Norma Co. of America, with the use of imported steel inner and outer rings, cages and balls.

The department has also granted the Driggs-Seabury Ordnance Corp., Sharon, Pa., a drawback of trucks and parts exported.

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Automobile Shipments to Denver Slow

DENVER, COL., Sept. 17—Automobile car sales in the Rocky Mountain territory are ahead of last year at this time, but many dealers declare that the general condition of the trade is quiet and considerably below what it ought to be. The blame is placed principally upon failure of the majority of manufacturers to supply cars fast enough to keep the trade in a healthy condition. General business conditions are only fair, but crops are good and the favorable reports on agriculture, stock-raising and mining, Colorado's leading industries, are favorable enough to justify the dealers in expecting better business, even at this season of the year. Dealers able to get cars feel that their orders are coming in too slowly, and believe that prospective buyers are holding back to see what develops in the trade in general.

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Eleven Cars Shown at Louisville

LOUISVILLE, KY., Sept. 17—One of the most interesting exhibits at the Kentucky State fair held here this week was the display of automobiles. This is the first time the farmers in this section of the country have had an opportunity to compare the new models collectively.

The automobile exhibits included the White, Velie, Saxon, Ford, Studebaker, Dodge, Hudson, Overland and the Indiana, Commerce and I. H. C. trucks.

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Galesburg Holds Show on Street

GALESBURG, ILL., Sept. 20—This city decided to experiment with the fall show proposition, the automobile dealers giving a public exhibition on Main Street from Seminary to the public square in connection with the annual style show, arranged by the dry goods merchants last Tuesday, Sept. 21. Traffic was prohibited on the street set aside for the exhibition.

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Victor Top in New Plant

ST. LOUIS, MO., Sept. 18—The Victor Buggy & Auto Top Co. formerly at 1545 North Broadway, St. Louis, Mo., is now installed in its new plant at 2215 Pestalozzi Street and has double the capacity of its old plant.

29 Sheepshead Entries

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Nine Foreign Cars and Four Countries Represented—Trials Begin Sept. 25

NEW YORK CITY, Sept. 21—Twenty-nine entries have been made to date for the 350-mile race at the Sheepshead Bay Speedway on Oct. 2. Of these, nine are foreign. According to the conditions the candidates must take part in eliminating trials on the speedway next Saturday and the following two days. To be eligible to start they must show in a one lap trial of 2 miles, an average speed of at least 85 m.p.h. The entries received are:

De Palma	Mercedes
Oldfield	Delage
H. S. Harkness	Delage
Earl Cooper	Stutz
Anderson	Stutz
Driver not named	Stutz
Driver not named	Stutz
Resta	Peugeot
Burman	Peugeot
Mulford	Peugeot
Aitken	Peugeot
Wilcox	Peugeot
Moore	Sunbeam
Pullen	Mercer
Ruckstell	Mercer
Rickenbacher	Maxwell
Driver not named	Maxwell
Porporato	F.R.P.
Driver not named	F.R.P.
Chevrolet	Car not named
O'Donnell	Duesenberg
Henderson	Duesenberg
Driver not named	Duesenberg
Vail	Mulford Special
Alley	Ogren
Ora Haibe	Sebring
Bergdoll	Erwin Special
Driver not named	Erwin Special
Le Cain	Pugh Special

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Buick Six Goes 27.5 M. P. G. with Stromberg Carbureter

CHICAGO, Sept. 16—An economy of 27.5 miles per gallon with the same carbureter setting that gave 56.2 m.p.h. is the showing made by a Buick small six fitted with Stromberg carbureter. The test was made by the Stromberg Motor Devices Co. on a car owned by a private user and was under sanction by the American Automobile Association and supervised by Chairman F. E. Edwards of the Chicago Automobile Club technical committee.

The car was a Buick five-passenger model D 45 which has a six-cylinder 3¼ by 5-in. motor with overhead valves, Delco ignition, lighting and starting. A Stromberg model H-1 1-in. carbureter was fitted with an exhaust air heater. The dash adjustment was disconnected so it could not be changed without lifting the hood. Silvertown tires 32 by 4 in. were used. The top and windshield were down and four passengers were carried. The economy run was over the Chicago boulevard system with the route arranged so the car went about an equal distance in all four directions. A strong wind and frequent showers probably cut down the mileage slightly. One gallon of gasoline was poured into a special tank attached to the windshield and which fed directly into the carbureter. The amount was determined by a gallon measure stamped by the city sealer. After running 27.5 miles on the measured gallon the car was taken to the speedway where tests for speed and acceleration were made. An officially timed test for one lap of the 2-mile speedway with the same load in the car and the same carbureter adjustment as during the economy run gave 2 min. 8 2/5 sec. for a lap, an average of 56.2 m.p.h. In the acceleration test under similar conditions the car accelerated from a standstill to 30 m.p.h. through all the gears in 11 1/5 sec. On high it accelerated from 5 miles to 25 m.p.h. in 12 2/5 sec. The car weighed with its load 3590 lb. and empty 2918 lb.

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New York and Chicago Show Plans Under Way

NEW YORK CITY, Sept. 20—Definite plans are well under way for the Sixteenth Annual National Automobile Show in New York next January, also the Sixteenth National Show in Chicago the same month. Application blanks and diagrams for these shows of 1916 have been sent by the National Automobile Chamber of Commerce to those manufacturers who have been invited to participate, with the announcement that those desiring space must apply not later than Oct. 2 to be considered in the first allotment, which will be made on Oct. 7. It is planned to stage the shows on an even greater scale than former efforts.

S. A. Miles, manager of the shows, has adopted a new rule this season which will afford protection against those companies that have been in the habit of applying for space in past years and then failing to exhibit. The new rule provides that applicants for space must make a deposit of 25 per cent on the value of the maximum quantity of space applied for. Under this plan companies will be protected against concerns which apply, doubtless with the intention of exhibiting, but which fail to comply with the contract requirements, thereby forcing other applicants into less desirable allotments and leading to confusion and changes which cannot always be made with perfect fairness. The change simply means that the deposit is payable 2 weeks earlier than it has been in the past.

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Bosch Prizes for Sheepshead

NEW YORK CITY, Sept. 20—The Bosch Magneto Co. is offering the following prizes for the Sheepshead Bay race on Oct. 2: First, $500 in gold; second, $300 in gold; third, $200 in gold. In addition to the above prizes, there will be an additional bonus of $100 for each place,

providing the winner makes a better average than the best time made in an American long distance contest, i.e., an average of 101.86 m.p.h., provided the second driver makes a better average than the best time made by a second place car, an average of 100.56 m.p.h., and provided the third driver makes a better average than 97.78 m.p.h. These drivers must employ Bosch magneto ignition during the entire race.

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Denver Distributors Divided on Exhibiting at State Fair

DENVER, COL., Sept. 17—Denver distributors seem about equally divided regarding the value of State fair and county fair exhibits for aiding automobile sales. Some dealers are assisting their sub-dealers financially in making such exhibits, and are also placing a salesman at the disposal of the sub-dealer and furnishing a demonstrating car for use outside the fair ground, even when the fair is many miles from Denver. Other distributors claim that they do not see enough good in these fair exhibits to justify giving their sub-dealers any financial aid, but nevertheless they are willing to furnish a salesman as an encouragement to sub-dealers eager to place exhibits at their local fairs.

The Arguments

Those favoring the fair exhibits urge that these events afford an excellent opportunity to show cars and stimulate trade, even if direct orders are not noticeable. Those holding that there is no benefit in such exhibits argue that the farmer attends the fair solely for enjoyment, and while he may be interested in cars even to the extent of being a prospective buyer, he is more interested in the displays of farm products, livestock and implements, and particularly in having a good time.

Along with all this diversity of opinion regarding different features of the fair exhibit question, however, the dealers practically all agree that a large share of these fair "prospects" are very likely live prospects before the show is held and would become buyers soon without the need of any extra expense to arouse their interest through a fair exhibit. Also, the attitude taken by the distributors is largely in accordance with the policy outlined by their respective manufacturers.

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Steenstrup Sails for S. A.

DETROIT, MICH., Sept. 18—Peter S. Steenstrup, South American representative for the Hupp Motor Car, Co. has sailed on an extensive business trip in the interest of the company. He will go to Panama, Peru, Chili, Argentina and Brazil and probably be away for three or four months.

Races Feature of Spokane Fair

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Two Track Records for Local Drivers Broken — Over 10,000 in Attendance

SPOKANE, WASH., Sept 17—The automobile races at the opening of the Spokane Interstate fair proved the big attraction, and upward of 10,000 were present.

Track records for local drivers twice went by the board when Harry Bohr headed the Plummer Special around the ½-mile dirt course making the 5 miles in 6:16 3/5 in the preliminary heat of the Inland Empire Class D race, and then drove the same car to victory in the finals of the same race in 6:09 2/5.

The 5-mile record for the track for local drivers has been 6:23, made by Herbert Alderson in 1911. The Plummer Special is a Stutz stock car.

Eleven cars entered the qualification test, a mile against time, four to qualify. In this test the Schneider Special of North Yakima (Kocher), the Parsons Special (Parsons), and the National (Mattison) turned in the three fastest miles in order. The Ford and Stutz Special tied for fourth place in 1:12. In the run-off the Stutz recorded a mile in 1:08¾, while the Ford could not equal its first time.

The Parsons, Schneider, National and Stutz entered the pursuit race, the cars being stationed 220 yd. apart at the four-eighth poles about the track. The Stutz was eliminated after a few laps, being challenged by Parsons. The National was unable to stand the pace. At the beginning of the eleventh lap Parsons held the lead, hotly pursued by the Schneider Special. At the thirteenth lap Parsons led by but 50 yd. and on the next Kocher cut this to about ten. On the twenty-fourth lap the Schneider car got its nose in front to the great delight of the crowd, but Kocher momentarily lost control of his steering gear, veering wildly, again giving Parsons the lead, but the plucky North Yakima lad came back strong and finished in the lead on the twenty-fifth.

Harry Hahn was a deeply disappointed lad when, 200 yd. in the lead in the Class D championship race, his engine froze, with the race half over and victory in sight.

Parsons and Stutz Duel

In the final race the Stutz Special had the pole with the National and Parsons Special and Schneider lining up as named. The Schneider was practically left with the fall of the starter's flag, Kocher having killed his engine. The early part of the race developed into a brisk contest between the Parsons and the Stutz. Parsons tried twice to slip inside the white Stutz at the turn. At the sixeenth lap both cars lapped the National and a moment later the Stutz rocketed through the fence at the south end. Mechanician R. L. Williams suffered the fracture of his skull and Oral Palmer, driver, escaped unhurt. This Stutz is the old No. 8, driven by Cooper in 1913, with which he won the Montamarathon at Tacoma.

The Parsons car was out of commission shortly afterward with a broken connecting-rod and the 15-mile race settled down into an easy victory for Kocher in the Schneider, with McGoldrick, National, taking second. The time was 17:28.

McGoldrick drew down four seconds during the racing and $280 in prize money. The 15-mile race was run at an average of 51.5 miles an hour. Two half miles were driven in 0.33.

Event No. 1—Qualifying heats for event No. 2, mile against time; flying start, four to qualify. Summary:

Car and Driver	Time	Fastest Lap
Schneider Spl. (Kocher)	1:07¼	.33
Parsons Spl. (Parsons)	1:08	.33
National (Mattison)	1:10	.35
Ford (Hahn)	1:12	.36
Stutz (Palmer)	1:12	.36
Stutz Spl. (Bohr)	1:13¼	.36½
National Spl. (McGoldrick)	1:14¾	.37
Lozier (Paulsen)	1:16 2/5	.38
Oakland (Carlton)	1:19½	.39
Croxton-Keeton (Penticoast)	1:20	.40

In run off of the tie, National 1:08¾ fastest lap .33¾ Ford 1:12¼.

Event No. 2 Australian pursuit race: won by Schneider Spl. (E. Kocher), which lapped last rival, Parsons Spl., in 25th lap. No time.

Event No. 3, five miles, local cars: Preliminary heat won by Plummer Special (H. Bohr), National Spl. (Ed. McGoldrick) second, Lozier (Ray Paulson) third. Time 6.16 3/5; Ford out fifth lap, oiling trouble.

Event No. 4, five miles, local cars: Won by Plummer Spl. (Harry Bohr), National Spl. (Ed. McGoldrick) second, Croxton-Keeton (Penticoast) third. Time 6:09 2/5. McGoldrick's time 6:10 (breaks track record).

Event No. 5, five miles, qualifying heat, two fastest in finals won by Stutz (Palmer), National Spl. (Ed. McGoldrick) second, Plummer Spl. (Alderson) third. Time 6:57.

Event No. 6, free for all, fifteen miles: won by Schneider Spl. (E. Kocher), National Spl. (Ed. McGoldrick) second. Only these two finished. Stutz (Palmer) through fence. Parsons Spl. (Parsons) did not finish.

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Farmers at Spokane Show

SPOKANE, WASH., Sept. 15—While the automobile dealers held a successful show in the Davenport Hotel, Spokane in May, they deemed it wise to avail themselves of the opportunity to show their 1916 models at the twenty-second annual Interstate fair Sept. 13 to 20. While fine results were obtained by the dealers from the spring show, the fall show at the fair grounds brought them into closer touch with the great majority of the farmers in the Inland Empire.

While but few cars were sold direct to the farmers, Spokane distributors have appointed many sub-agents recently and these new dealers were on hand to learn all they could of the new models, introduce their prospects to them, and many sales resulted.

D'Arcy Spring Adds—The D'Arcy Spring Co., Kalamazoo, Mich., manufacturer of automobile springs, will erect an addition to its plant.

Kalamazoo Co. Builds—Fuller & Son, Pitcher Street, Kalamazoo, Mich., are building a factory, four stories, 61 by 101 ft., for the manufacture of automobile parts.

Automobile Hardware Co. to Build—Crandal, Stone & Co., Binghamton, N. Y., manufacturers of automobile hardware, etc., have awarded contract for the erection of a four-story brick and steel factory, 40 by 100 ft., to cost about $20,000.

Colorado Tire's New Addition—The Colorado Tire & Leather Co., 999 South Broadway, Denver, is planning a $75,000 addition to its plant. The new building will have 25,000 sq. ft. of floor space, and will be equipped with a rubber mill.

Hayes Wheel Adds—In order to do away with night work the Hayes Wheel Co. in Albion, Mich., will put up an addition, 70 by 100 ft., to its plant which will enable it to increase its output about two-thirds. A total of 150 men will be employed.

Merrill Spring to Add—The E. R. Merrill Spring Co., 526 West Twenty-eighth Street, New York City, manufacturer of automobile and truck springs, is having plans prepared for alterations to two buildings and the erection of two other buildings.

Vacuum Oil Adds—The Vacuum Oil Co., Rochester, N. Y., will build another addition to the local plant. It will be a filter building and will cost $17,000. This will bring the company's expenditures for improvements this year up to $210,000. It plans to spend $500,000 in improvements in the next year.

Hyatt to Build Warehouse—The Hyatt Roller Bearing Co. will begin the erection of a large warehouse on the Michigan Central railroad, having decided to make Detroit, Mich., its distribution center, not only for the automobile end of the business but also for the tractor department. At the present time a carload of Hyatt bearings is received in Detroit daily, according to the officials of the company.

Seattle Ford to Extend—Extensions to the plant and equipment of the Ford Motor Co.'s assembling factory in Seattle are to be made within the next few months entailing the expenditure of approximately $100,000. An average of thirty-two cars is being turned out each day. When the contemplated addition is finished the production will be between sixty and sixty-five machines a day.

Winnipeg Ford Nearing Completion—Provided that favorable conditions prevail the new Ford building in Winnipeg, Man., will have its roof on by Nov. 20. The excavating work is rapidly being completed and already the supplies for the construction operations are being received at the site, corner of Portage Avenue and Wall Street. Business at the local Ford establishment continues brisk. From Aug. 1 to Sept. 2 deliveries of 259 cars were made in Manitoba.

To Make Starter—The Rock-Way Starter Co., Jonesville, Mich., is the name of the new concern which will start manufacturing the new starter invented by G. L Rock, proprietor of the Jonesville Garage. With him there will be associated his brothers, Alonzo and Darrell, the latter having been at one time superintendent of the service department of the Cadillac Motor Car Co. It is said that local people are interested financially and will provide the capital.

F. W. D. May Start Oct. 1—The Four-Wheel Drive Truck Co., Battle Creek, Mich., which is to make the truck designed by Maurice Bollstrom, a pioneer in this type of vehicle, will very likely be ready to start operation by Oct. 1. An option has been secured on a local plant and the organization work is said to have progressed in such a way that actual manufacturing will be started in October. One type chassis of ½-ton capacity will be made and will be furnished with a dozen types of bodies, such as express wagon, ambulance, hearse wagon, ordinary truck, U. S. mail wagon, etc.

Wayne Tank to Enlarge—Work will be started in a short time on two new factory buildings for the Wayne Oil Tank & Pump Works of Fort Wayne. The cost of the improvement will be about $40,000. The buildings will be constructed of steel and concrete and will be absolutely fireproof. A large amount of new machinery will be purchased for the buildings, which will be completed about the middle of December. The Wayne Oil Tank & Pump Works have been turning out more orders this year than ever before in their history, and the capacity of the present factory has been reached.

The Automobile Calendar

Sept. 18-25.....Los Angeles, Cal., Show, Shrine Auditorium.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Sept. 22-25.....Rockford, Ill., Show.
Sept. 24.....Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 26-Oct. 10...Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Sept. 27-Oct. 3....Salem, Ore., Show, State Fair.
Oct.....Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct. 18-25.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2.....Trenton, N. J., Track Races: Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway 350-Mile Race.
Oct. 2.....Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9.....Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 4-10.....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6.....Columbus, O., Garage Owners Convention.
Oct. 4-14.....Wichita, Kan., Show, Wichita Auto. Dealers' Assn.
Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9.....Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14.....Chicago, S. A. E. Standards Committee Meeting.
Oct. 16.....Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 17.....Twin City Speedway Match Race.
Oct. 18-19.....Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Oct. 18-24.....Troy, N. Y., Show, State Armory, Troy Automobile Dealer's Assn.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 31.....New York City, Show; Grand Central Palace.
Jan. 8-15.....Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22, 1916.....Chicago, Ill., Show; Coliseum.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb.....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19.....Newark, N. J., Show.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

The Week in  the Industry

Spalding St. Louis Packard Mgr.—H. W. Spalding has been appointed general manager of the Missouri Packard Co., St. Louis, Mo.

Bingham Promoted — B. S. Bingham has been appointed assistant general sales manager for the Reliance Automobile Co., San Francisco.

New Gotham Trailer Man — C. H. Quereaux has succeeded F. H. Greaney as manager of the New York City branch of the Troy Wagon Works Co., maker of Troy trailers. The New York office is at 30 Church Street.

Wells Moon's City Sales Mgr.—P. H. Wells has been appointed city sales manager of the Moon Motor Car Co.'s St. Louis branch, 2227 Locust Street, while E. J. Moon is in the East. Mr. Wells has been with the Moon company seven years.

Dealer

Gibney Tire in Louisville—The Dixie Auto Supply Co., 444 South Third Street, Louisville, Ky., has taken the agency for the Gibney tire.

Recent Canadian Studebaker Appointments—The Breen Motor Co. has appointed Clark & Cuthbert, Portage la Prairie; B. J. Thompson, Pense, Sask.; the Jackson Auto Agency, Saskatoon; U. R. Gordon, of Wilcox, Sask., and Morden & Graham, Pilot, as Studebaker agents.

J. M. Shock Absorber Moves Office—The main office of the J. M. Shock Absorber Co., 210 South Seventeenth Street, Philadelphia, Pa., has been moved to New York City to 250 West Fifty-first Street. The service station and sales office will be maintained at the original office in Philadelphia.

St. Paul Maxwell Moves—The Martin Motor Sales Co., distributer of Maxwell cars in the Twin Cities, has moved its St. Paul office from 344 North Exchange Street to the Kissel-Kar Building, 237 West Ninth Stret, under the management of W. F. Frei. A service station will be opened.

Recent Philadelphia Items—The Standard Eight, the product of the Standard Steel Car Co., Pittsburgh, Pa., has been introduced in Philadelphia, Pa., the Eastern Motors Corp. being special representative. Showrooms have been opened at 1634 Chestnut Street.

The Allen car is represented in Philadelphia by the Allen Motor Philadelphia Co., 150 North Broad Street.

Motor Men in New Roles

Reynolds Heads St. Louis Goodyear Department—The Goodyear Tire & Rubber Co., 1909 Locust Street, St. Louis, Mo., has inaugurated a mechanical-goods department. The department will be under the supervision of W. A. Reynolds.

Elliott Cadillac Sales Mgr.—R. S. Elliott, one of the veteran salesmen of the Don Lee organization in San Francisco and winner of the first prize for the number of Cadillac sales last season, has been made Cadillac sales manager for that territory.

Mooney Joins Advertising Co.—F. J. Mooney, formerly sales and advertising manager of the Hupp Motor Car Co., has joined the Taylor-Critchfield-Clague Co., Detroit, Mich., advertising agent, and will act as counsel in connection with automobile selling and copy plans.

Wells Takes on Stearns in Des Moines—H. R. Wells has taken on the Stearns Silent Knight for Des Moines, Iowa, and twenty-six Iowa counties. He will have headquarters here and is appointing many sub-agents. Business is opening up well for the Stearns car in Iowa, he states.

Hohenphal Joins Simms—E. H. Hohenphal has been appointed assistant sales manager and advertising manager of the Simms Magneto Co., East Orange, N. J. Mr. Hohenphal was formerly with the Bosch company and was manager of the automobile-supply department of Rubel & Co., Washington, D. C.

Kesler a Manager—S. W. Kesler, who recently resigned from the I. S. Remson Mfg. Co., Brooklyn, N. Y., Abbott-Detroit and Westcott dealer, to become affiliated with the Brooklyn branch of the Packard Motor Car Co., has been made manager of sales of a Brooklyn branch of the Kent Motors Co. His headquarters are at 1251 Bedford Avenue.

Schneider Heads Elco Agency — The Elco agency in the St. Louis district has been given by the Bimel Buggy Co., Sidney, Ohio, to the Motor Car Repair & Supply Co. at Missouri Avenue and Pestalozzi Street, St. Louis. This is the first time the Elco line has been sold in St. Louis. The local district includes eastern Missouri and southern Illinois. Officers of the local agency are Frank Schneider, president; Max Gapinski, manager, and William Hoag, secretary.

Sharpe Russian Transportation Mgr.—O. C. Sharpe, superintendent of the Stewart Taxi-Service Co., Baltimore, Md., is on his way to Russia, where he will have charge of the movement of the big American-built motor-truck fleet that the Czar's government has purchased for use in the war.

Mr. Sharpe's position will be that of transportation manager and it will be his duty to direct the movement of the cars and to see that repair stations are established and to also see that the machines are always in serviceable condition.

According to information Petrograd will be his base and he will have the handling and supervision of the drivers between the hospital and battle lines.

He started Sept. 15 for Montreal and will make his trip to Russia from Canada.

Dealer

To Make Tractors—The Reed Foundry & Machine Co., Kalamazoo, Mich., is one of the latest entries into the field of tractor manufacturers. The company has completed the building of a tractor which was tried out on a farm near Richland. The tractor easily pulled four 14-in. plows through the heavy soil.

De Kalb May Take McIntyre Plant—The De Kalb Mfg. Co., with headquarters at Auburn, Ind., if the proper negotiations can be made, will take over the property of W. H. McIntyre, automobile manufacturer of Auburn. A new organization will be formed. The De Kalb company has been incorporated for $150,000.

Grossman Opens Chicago Branch—The Emil Grossman Mfg. Co., Inc., New York City, has leased the top floor of the building formerly occupied by the Winton Motor Car Co., at the northeast corner of Michigan Avenue and Thirteenth Street, Chicago. Here will be located their western manufacturing and distributing branch. The space occupied is 6000 sq. ft. Rudolph Cory was appointed manager of the Chicago branch.

Almond Branch in Detroit—A branch office of the T. R. Almond Mfg. Co., Ashburnham, Mass., has been established at 1257 David Whitney Bldg., Detroit, from which point Don F. Kennedy, who has been appointed Michigan representative, will take care of its Michigan business which consists chiefly of flexible steel tubing for use on automobiles and trucks, and its line of drill chucks. Mr. Kennedy will also handle the business of the Sawyer Tool Mfg. Co., which is under the same management as the Almond Co., on its line of machinists' fine tools.

Recent Incorporations in the Automobile Field

Arkansas

LITTLE ROCK—Davenport Safety Tire Co.; $100,000. J. R. Alexander, W. H. McLaughlin.

Connecticut

STAMFORD—Motor Products Co.; $100,000. Allen Sheldon, R. K. Green, P. D. Whitton, F. B. Bertram, Elliott Savage.

Illinois

DANVILLE—Holmes Garage Co.; $21,000. W. C. Holmes, D. W. Beckwith, B. N. Custer.

Indiana

INDIANAPOLIS—Durnell Motor Sales Co.; $10,000. C. E. Durnell, E. E. Voyles, C. F. Voyles.

INDIANAPOLIS—Meridian Mfg. Co.; $75,000; automobiles. Elmer Hinshaw, E. W. Hughey, H. M. Callahan.

Maryland

FREDERICK—Mountain City Garage Co.; $25,000. M. E. Kefauver, J. H. Grove, D. P. Buckey.

New York City

NEW YORK CITY—Adams-Williams Mfg. Corp.; $100,000; top manufacturer. V. J. Stahl, K. G. Osborn, F. G. Schwab, 323 W. Seventy-seventh Street.

NEW YORK CITY—Bergen Carbureter Co.; $2,000; manufacturer. M. E. Harby, 31 Nassau Street; William A. Watson, A. S. Bergen.

NEW YORK CITY—Eastern Motor Sales Corp.; $10,000. F. S. Hannah, A. G. Keinath, C. M. Fleming, 540 Manhattan Avenue.

NEW YORK CITY—E. H. & F. Co.; $100,000; motor manufacturer. F. C. Royce, W. N. Frazer, T. P. Hyatt, 1169 Eighty-third Street, Brooklyn.

NEW YORK CITY—Empire State Sight-Seeing & Trucking Co.; $1,000; trucking and sight-seeing. C. F. Fuchs, Rudolph Pick, Walter Latzer, 989 Simpson Street.

NEW YORK CITY—Lewis Roller Bearing Co.; $10,000; manufacturer. Emil Auerbach, S. B. Levy, I. A. Cohen, 39 W. Thirty-fourth Street.

NEW YORK CITY—Lombard Auto Tractor-Truck Corp.; $25,000; manufacturer. J. S. Barron, 320 W. Seventy-seventh Street; J. T. Crowley, R. O. Eggleston.

NEW YORK CITY—Perfect Service Taxicab Co.; $500. A. H. Schweizer, R. G. Schweizer, Sam Klein.

NEW YORK CITY—Peugeot Automobile Racing Co.; $500. Leon Mintz, A. J. Hill, William Thierfelder, 433 E. Fifth Street.

NEW YORK CITY—Pullman Motor Car Co. Export Dept.; $10,000. J. C. Cameron, Albert Frankel, C. A. Doyle, 132 Ash Street, Flushing.

NEW YORK CITY—P. E. Remington; $500,000; automobile business. P. E. Remington, N. M. Kaplan, T. P. Wadleigh, 1790 Broadway.

NEW YORK CITY—Safety Steering Device Co.; $15,000. H. C. Miller, L. H. Tasker, Charles Blauvelt, 233 Broadway.

NEW YORK CITY—Standard Auto-Bus Corp.; $3,000. William Goldsmith, Louis Muschel, William Muschel, 519 W. 150th Street.

NEW YORK CITY—Standard Truck Corp. of N. Y.; $10,000. Florence Boldman, E. D. Boldman, H. W. Johnson.

NEW YORK CITY—Sterling Automobile Mfg. Co.; $100,000; manufacturer. Charles Chambers, 2 Rector Street; William Adelson, Adolph Hayman.

NEW YORK CITY—St. Paul Garage; $10,000. C. J. Brennan, J. J. Duffy, A. F. Moons.

New York

BROOKLYN—Bell Rubber Co.; $20,000; tires. W. O. Geisman, Anna Geisman, S. F. Schroeder.

BROOKLYN—Liberty Garage; $15,000. George Way, Fred. Smith, A. A. Russell.

BROOKLYN—J. J. Snyder & Son; $50,000; garage. J. J. Snyder, L. R. Snyder, P. A. Snyder.

BROOKLYN—Surplus Motor Parts Co.; $1,000; automobile machinery. S. S. Waldman, Harold Obst, Joseph Sokoloff.

BROOKLYN—Windsor Mahnud Co.; $10,000; garage. A. G. Welsh, William Gegenheimer, R. C. Corlett, 1500 E. Third Street.

BRONX—Intervale Garage and Auto Service; $5,000. A. B. Goodwin, F. J. Goodwin, A. J. Goodwin.

BRONX—Sundries Co.; $5,000. Charles Weishaupt, Hugo Liedtke, E. P. Butler, 533 Union Avenue.

BRONX—Uneeda Garage; $1,000. Pauline Feiner, N. E. Harcombe, S. B. Steinmetz.

BUFFALO—Nicholson & Stoll; $1,800; garage. Lance Nicholson, Amy Nicholson, Thomas Stoll.

BUFFALO—Transmission Ball Bearing Co.; $100,000; manufacturer. W. J. Murray, J. P. Beatty, W. M. Wilson, 35 Pearl Street.

ELMIRA—Interstate Pneumatic Valve Corp.; $5,000; manufacturer. C. H. Thayer, Fred Peck, H. B. Peck, 131 Cedar Street.

GLEN COVE—Pressed Bearing Co.; $3,000; bearing, tools, etc. Mortimer Schwager, F. S. King, A. M. Schmidt, 556 McDonough Street, Brooklyn.

HEMPSTEAD—Great Neck Garage & Repair Co.; $2,000. Henry Allendorf, F. L. Place, Erwin Giesman.

HUDSON FALLS—Adirondack Garage Co.; $50,000. F. C. Sherman, E. V. Bulow, G. N. Nay.

LAKE PLACID—McElroy-Prime Motor Co.; $50,000. J. H. McElroy, S. G. Prime, P. J. Hennessey.

OSSINING—Simplex Rubber Co. of America; $300,000; rubber goods of all kinds. N. A. Campbell, 31 Pine Street, New York City; E. Gwynne-Evans, A. C. Travis.

RICHMOND BOROUGH—Pegasus Garage Corp.; $3,000. C. P. Siemers, Arthur Wood, L. E. Manning.

SYRACUSE—Auto Supply and Tire Co.; $2,000. F. A. Samon, S. G. Schlachter, A. A. Schlachter.

Ohio

AKRON—McCrea Auto Service and Supply Co.; $5,000. George McCrea, E. A. McCrea, G. E. McCrea, R. T. Walsh, L. J. Myers.

CANTON—Auto Garage and Sales Co.; $10,000. J. M. Roose, E. C. Scheffler, F. N. Sweitzer, G. E. Halliwell, A. M. Hurst, H. J. Reeder.

CINCINNATI—Struebing Truck Co.; $5,000. W. J. Struebing and others.

CLEVELAND—Hudson-Stuyvesant Motor Co.; $25,000 to $50,000.

OTTAWA—Auto Products Co.; $250,000; automobiles. R. D. Bray, W. J. Halpin, P. J. Daly.

CLEVELAND—Victor Motor Car Co.; $12,000. A. F. Reed, C. M. White, V. C. Snyder, J. M. Lee, R. B. Curtiss.

DAYTON—Two-In-One Tire Co.; $10,000. George Inman, D. W. Marsh, T. J. Curran, W. B. Schaeffer, A. P. Smith.

RAVENNA—Mohawk Motor Truck Co.; $25,000. H. C. Bradley, E. J. Smith.

ST. CLAIRSVILLE—St. Clairsville Garage Co.; $5,000. J. E. Anderson, E. A. Caldwell, W. H. Caldwell, T. J. McNamee, Otto Rothmeier.

TOLEDO—Universal Motor Co.; $100,000. Howard Lewis, H. J. Keho, F. S. Lewis, H. Emery, P. W. Alexander, Frederick Gaines.

XENIA—Xenia Garage Co.; $2,500. J. B. Bice, F. Bice, C. W. Craig, M. H. Schmidt and Mrs. M. H. Schmidt.

Pennsylvania

HAZLETON—Power City Motor Car Co.; $5,000. H. M. Benjamin, W. C. M. Butler, C. J. Kirchman.

PHILADELPHIA—Speedwell Motor Service Co.; $5,000. W. P. Vees, F. W. Vees, S. K. Cissel.

SHAMOKIN—Stief Motor Co.; $10,000. M. C. Stief, J. W. Timmes, M. L. Conneon.

South Carolina

GAFFNEY—Gaffney Motor Co.; $5,000. E. M. DuPre, C. S. Monteith.

Texas

DALLAS—Dallas Hupmobile Co.; $5,000. F. A. Wynne, W. R. Wynne, E. O. Thackston.

SAN ANTONIO—Blumberg Motor Mfg. Co.; $25,000. H. G. Blumberg, H. D. Hierholzer, Joseph Hierholzer, Robert Butler.

Virginia

ASHLAND—Hanover Garage and Repair Co.; $10,000. Boxley Vaughan, F. W. Tucker.

GALAX—Twin County Auto Sales Corp.; $20,000. J. G. Davis, C. A. Collier.

Washington

SEATTLE—Jaquemin Auto Steel Wire Tire Co.; $100,000. Evan Gough, Eugene Jaquemin, J. R. Cabanne, H. M. Hill.

SEATTLE—Seattle Tire & Rubber Co.; $2,500. Arthur W. Hoppock, Harry H. Hazeltine and Mary C. Hoppock.

SEATTLE—The Washington Garage; $10,000. Walter T. Douglas, N. E. Felt, E. H. Sennolt.

SPOKANE—Northwest Auto Supply Co.; $5,000. Maurice Oppenheimer, Charles D. Bibbins.

SPOKANE—Washington Motor Car Finance Co.; $250,000. C. A. Plackett, M. L. Moe, Edw. V. Carter.

West Virginia

PARKERSBURG—Central Garage Co.; $5,000. O. D. Strader, H. D. Little, H. N. Kinler.

Wisconsin

CEDARBURG—Automatic Jack Co.; $25,000. J. R. Thill, E. J. Groth, M. N. Green.

In the Dealers' Field

New Duluth Garage—Formal opening has been made of the new John E. Ford garage and service station at 208 East Superior Street, Duluth. Mr. Ford will have a service station night and day for owners of Chevrolet and Winton cars and others. He represents the Firestone tire and will give service in that line in the second floor shop. The show and sales rooms occupy the ground floor.

Recent Seattle Changes—J. C. C. Morris, distributor of Moon automobiles in the Pacific Northwest has moved into new quarters at 907 East Pike Street, Seattle. G. G. Gunderson has been named city sales manager.

Pacific Auto Supply Co., Seattle, has enlarged its quarters at 801-3 Union Street. This concern is distributor for Waverly motor oils, Knight and Ajax tires.

Winnipeg Cadillac Moves—The Winnipeg, Man., branch of the Cadillac Motor Sales Co. will move at the beginning of October to the large building at 310 Carleton Street, which was formerly occupied by the Detroit Electric Service Station. In its new quarters it will have three floors at its disposal and practically three times the amount of room which is available in its present building. Both the Cadillac and Dodge cars will be handled from the new quarters.

New Tire Agencies in Wash.—The Child, Day & Churchill Co., Spokane, has secured the agency for the Norwalk tires in the Inland Empire territory.

The W. J. Ball Motors Co., Spokane, has moved into its new garage at 1116-18 Sprague Avenue, where it handles the Studebaker. Ajax tires will also be handled.

Kelly-Springfield tires are now being distributed in Tacoma by the Griffith Motor Company, which has put the Dodge car to the front in Southwest Washington.

New Automobile Row for Portland—Portland, Ore., has now practically a new automobile row at what is known as the Custom-house corner. The Oregon Motor Car Co., Studebaker representative, and the Pacific Kissel-Kar branch have announced the construction of two new homes near the Custom House corner on lower Broadway.

Recently the Overland distributer, J. W. Leavitt & Co., settled in a new home directly south of the Custom House, and the Fisk Rubber Co. of New York is completing a building on the southeast corner. Just one block north, at Couch and Broadway, the Oldsmobile has opened handsome new quarters. This gives a total of five automobile concerns in this new center.

Among the pioneer firms already located along Broadway are the H. L. Keats Co., the Northwest Auto Co., the wholesale accessory house of Ballou & Wright, the White Co., and the B. F. Goodrich Co.

Automobile Agencies Recently Established

Alabama

Birmingham	Paige	Paige Sales Co.

Arizona

Douglas	Maxwell	W. E. Tester
Globe	Maxwell	C. B. Brown
Kingman	Maxwell	M. G Warner
Tucson	Maxwell	J. H. Hankins
Willcox	Maxwell	S. N. Holman
Winslow	Maxwell	Old Trails Garage

Arkansas

Fort Smith	Paige	Gardner Auto Co.

Canada

Calgary, Alta	Hupmobile	H. H. Kerr & Co.

California

Anaheim	Packard	Rockwell & Sidnam
Alhambra	Maxwell	J. D. Meyer
Bishop	Maxwell	W. F. Muffleman
Bakersfield	Packard	W. F. Gouty
Del Mar	Case	George Dawson
El Centro	Maxwell	A. L Luce
Gardena	Maxwell	C. R. Young
Glendale	Maxwell	J. A. Pirtle
Hollywood	Maxwell	C. F. Little
Inglewood	Maxwell	W. S. Magee
Lompoc	Maxwell	Collis & Nicolis
Long Beach	Maxwell	Lawler & Begg
Long Beach	Packard	A. E. Evans
Los Angeles	Marmon	Carlton, Faulkner & Bowles
Los Angeles	Saxon	Saxon Motor Sales Co.
Los Angeles	Chalmers	Greer-Robins Co.
Monrovia	Packard	A. T. Badillo
Palms	Maxwell	J. McCool
Pasa Robles	Maxwell	R. E. Dalrymple
Pasadena	Maxwell	Grace Motor Car Co.
Pasadena	Oakland	Kay & Burbank
Pomona	Maxwell	E. E. Booth
Redlands	Maxwell	L. R. Ayers
Riverside	Maxwell	Riverside Motor Car Co.
San Bernardino	Maxwell	Walter & Griemsmann
San Francisco	Cole	Hartmann Motor Sales Agency
San Luis Obispo	Packard	C. H. Kamm
Santa Barbara	Packard	O. Fitch
Santa Ana	Maxwell	C. B. Perry
Santa Monica	Maxwell	G. C. Boehme
Santa Paula	Maxwell	I. B. Martin
Taft	Maxwell	Lierly & Son
Ventura	Packard	R. M. Seeley

Colorado

Blanca	Buick	Terrill & Weaver
Colorado Springs	Case	Huffman & Gilbert
Crested Butte	Buick	L. G. Espey
Denver	Empire	Wilson Auto Co.
Denver	Dort	J. S. Morrison Auto Co.
Denver	Lewis	J. M. Patrick
Denver	National	Wilson Auto Co.
Denver	Velie	Heiser Bros.
Denver	Scripps-Booth	J. A. Nisbet
Denver	Case	W. F. Blaine
Dolores	Buick	Dolores Motor Co.
Durango	Buick	William Phelan
Greeley	Chandler	Foster Bros.
Greeley	Chevrolet	Ledgerwood Bros.
Greeley	Monroe	Ledgerwood Bros.
Greeley	Oldsmobile	Straight & Son
Haxtum	Buick	Lindbloom Motor Co.
Hugo	Buick	Ed. Cobb
La Junta	Buick	La Junta Auto & Mch. Co.
Loveland	Buick	Bonnell Motor Co.
Meeker	Buick	White River Co.
Pagosa Spring	Buick	F. Catchpole
Rocky Ford	Buick	G. J. Lackey
Walsenburg	Buick	Walsenburg Novelty Works

Connecticut

Bantam	Hudson	Flynn & Doyle
New Haven	Stearns-Knight	N. B. Whitefield
South Manchester	Dodge	W. E. Luettgens

District of Columbia

Washington	Dort	Miller Bros. Auto & Supply House

Idaho

Kellogg	Paige	A. P. Hutton
Troy	Paige	C. A. Johnson

Illinois

Bloomington	Hupmobile	F. C. Iseminger
Chadwick	King	George Etnyre
Chicago	Dort	McDuffee Auto Co.
Rapatee	Case	Wood Bros.
Sheldon	King	W. L. McCloud

Indiana

Fort Wayne	Dort	Fuhrman Auto Co.
Indianapolis	Dort	Whitaker-Keeley Sales Co.
Indianapolis	Vim	Indianapolis Auto Sales Co.

Iowa

Des Moines	Moline-Knight	Stewart & Schooler
Des Moines	Dort	Holsman-Stevens Motor Car Co.

Kansas

Colby	Case	E. A Voison
Jetmore	Case	G. J. Hoff

Kentucky

Bagdad	Hupmobile	H. L. Harrison & Son
Auburn	Maxwell	J. D. Spears
Bowling Green	Maxwell	McElroy & Page
Caneyville	Maxwell	Guy Willis
Canmer	Hupmobile	Charles Bale
Cave City	Saxon	Duke & Ferris Co.
Clay	Hupmobile	Clay Motor Car Repair Co.
Danville	Maxwell	D. H. Prewitt
Elizabethtown	Saxon	Jenkins, Essex Co.
Elizabethtown	Hupmobile	J. H. Igleheart
Emnence	Saxon	Drance C. Bohannon
Eminence	Hupmobile	J. M. Miles & Son
Frankfort	Haynes	Central Garage
Frankfort	Maxwell	Nicol Garage
Georgetown	Hupmobile	J. W. McMeekin, Jr.
Glasgow	Maxwell	Glasgow Motor Co.
Greenville	Hupmobile	Martin & Morgan
Greenville	Hupmobile	Irvin & Gilman
Hartford	Hupmobile	Cooper & Co.
Hartford	Maxwell	Hartford Motor Co.
Hawesville	Maxwel	C. Haynes
Henderson	Hupmobile	White-King Motor Co.
Hopkinsville	Maxwell	F. A. Yost & Co.
Horse Cave	Hupmobile	Horse Cave Garage
Lancaster	Maxwell	W. D. Hammock
La Grange	Hupmobile	Yager Bros.
Lawrenceburg	Maxwell	J. P. McWilliams
Lebanon	Haynes	Iro Canary
Lexington	Haynes	E. R. Aker
Lexington	Maxwell	Dewhurst Garage
Madisonville	Maxwell	Neal Stivers
Marion	Maxwell	T. H. Cochran
Mayfield	Hupmobile	H. M. Cousins
Morganfield	King	W. C. Waggoner
Mount Sterling	Hupmobile	H C. McKee & Sons Co.
Midway	Maxwell	Cogar-Rumley Co.
Nicholasville	Hupmobile	R. M. Sparks
Owensboro	Paige	Haynes Gordon Auto Co.
Owensboro	Maxwell	J. W. Field
Owensboro	King	Rice Jesse
Paducah	King	Park Garage
Princeton	Maxwell	C. J. White & Sons
Richmond	Maxwell	Oldham & Harbor
Sadieville	Maxwell	E. S. Baldwin
Salvisa	Maxwell	G. L. Alford
Shelbyville	Hupmobile	C. S. Wells & Son
Simpsonville	Hupmobile	Farmers Supply Co.
Stanford	Maxwell	H. C. Carpenter
Standiford	King	W. B. McKinney
Sturgis	Maxwell	J. M. Stone & Sons
Taylorsville	Hupmobile	Taylorsville Garage
Versailles	Hupmobile	J. U. Field
Williamsburg	Overland	H. B. Mahan
Wilmore	Maxwell	H. E. Fisher

Louisiana

Echo	King	John Lacombe
Shreveport	Paige	Crawford, Jenkins & Booth

Maryland

Baltimore	Bell	Randall Mfg. Co.

Maine

Bangor	Dort	Utterback-Gleason Co.

Massachusetts

Boston	Dort	Wentworth-Fosdick Co.
Boston	Ford	Turner-Ring Co.
Milford	Ford	J. H. Stratton
Worcester	Reo	Worcester Reo Co.
Worcester	Dodge	Henshaw Motor Car Co.

Michigan

AuGres	Dort	W. H. Schaiberger
Battle Creek	Dort	United Motors Co.
Bay City	Dort	Hartill Sales Co.
Bay City	Studebaker	Farmers Auto & Machinery Co.
Beaverton	Dort	Ross & Heimelhoch
Beal City	Dort	J. Tilmann & Son
Boyne City	Ford	Hily Heaton
Charlevois	Haynes	A. L. Hart & Son
Charlotte	Oakland	Wilson-Oakland Co.
Crystal	Dort	O. A. Sanford
Evart	Dort	Sandberg & Allison
Farmington	Dodge	Park Garage
Fremont	Dort	R. F. Southard
Detroit	Allen	Reason Garage
Detroit	Paterson	Reason Garage
Detroit	Ford	A. A. Crumley Co.
Detroit	Scripps-Booth	Gordon Auto Sales Co.
Detroit	Dort	A. A. Crumley Co.
Escanaba	Dodge	J. E. Jackson
Grand Rapids	Cole	Oswald Motor Car & Supply Co.
Ionia	Dodge	Miller & Ashe
Jackson	Dort	R. S. Howland
Kalamazoo	Dort	W. O. Harlow
Lapeer	Hollier	S. W. Williams
Lennon	Dort	W. L. Coza
Litchfield	Overland	F. A. Sackett
McBain	Ford	E. D. McDonald
Marquette	Packard	Cloverland Auto Co.
Middleton	Dodge	Reynolds & Bolyard
Middleville	Dort	L. Mastenbrook
Morley	Dort	J. B. Pettie
Newaygo	Studebaker	C. & W. Christensen
New Lathrop	Dort	Poyer & Wood
Niles	Dort	A. Gregg
Orion	Ford	C. M. Howarth
Owosso	Dort	Owosso Auto Co.
Pigeon	Dort	Leipprandt Bros.
Port Austin	Ford	R. Cartwright
Portland	Dort	Barton Bros.
Reed City	Ford	S. T. Johnson
Rockland	Dort	G. W Stannard
Saginaw	Empire	W. F. Horning
Saginaw	Oldsmobile	Saginaw Cadillac Co.
Three Rivers	Dort	C. C. Dougherty
Unionville	Dort	D. C. Brady
Vassar	Dort	K. V. Mott
Vermontville	Ford	J. H. Gorham
Fostoria	Dort	N. Tompkins & Son
Freesoil	Dort	J. W. Bennett & Son
Grand Rapids	Dort	Oswald Motor Car Co.
Howell	Dort	W. T. Armstrong

Minnesota

Austin	King	Loeb Bros.
Gonvick	Ford	Leslie Reimer
Hayfield	Chevrolet	Louis Aarhus
Lanesboro	Dodge Bros.	Christianson & Lund
Parkers Prairie	Overland	Sparks & Liljegren
South Haven	Overland	South Haven Auto Co.
St. Cloud	King	M. Bisenius
St. Paul	Pathfinder	Pathfinder Sales Co.
Waseca	King	A. Guyer

Mississippi

Vicksburg	King	W. S. Shannon
Vicksburg	Paige	Wright Brothers

Missouri

Hannibal	Overland	L. G. Wilhelm
Leeton	Case	L. B. Epperson
Sedalia	Case	A. M. Hampton
St. Joseph	Vim	Howard Auto Co.
St. Louis	Denby	Denby Missouri Co.
St. Louis	Partin-Palmer	Auto Exchange

Montana

Corvalis	Saxon	W. R. Myers
Great Falls	Moline-Knight	A. P. Heaney

Nevada

Reno	Chalmers	Corecco Bros.

New Hampshire

Manchester	Packard	Packard Motor Car Co. of Boston

New Jersey

West New York	Bell	I. G. Miller

New York

Albany	Dort	Utterback-Gleason Co.
Binghamton	Dort	New York Sales Co.
Buffalo	Dort	A. F. Winegar
Elmira	Dort	Davis & Roberts
New York	Dort	E. J. Friedland
Watertown	Dort	G. H. Baltz

North Dakota

Donnybrook	Maxwell	Aurelia Hardware & Imple. Co.
Fullerton	Cornelian	F. W. Teichmann
Lisbon	King	Lisbon Auto Co.
Oakes	Buick	John Gronbeck

Ohio

Akron	Chandler	Boynon Motor Sales Co.
Athens	Franklin	C. H. Welch
Basil	Buick	B. C. Schride
Cleveland	Saxon	The Loveland Co.
Cleveland	Dort	Ris Motor Car Co.
Cleveland	Halladay	Stark Auto Co.
Columbus	Madison	Campbell-Fisher Sales Co.
Coshocton	Buick	J. W. Johnson
Mansfield	Metz	H. T. Manner
Groveport	Buick	Frank Powell
Grove City	Buick	Thomas & White
Hilliards	Buick	LeRoy Dobyns
Portsmouth	Case	J. D. Bridges
Spratt	Dort	G. H. Gillogly
Toledo	Dort	Gamble Motor Car Co
Westerville	Buick	C. J. McIntyre
Zanesville	Franklin	L. K. Brown

Pennsylvania

Ardmore	Vim	Keystone Garage
Butler	Dort	Citizens Motor Car Co
Dallastown	Bell	A. R. Smith
Easton	Vim	Keystone Motor Corp.
Fayette City	Dort	J. P. Sloterbock & Son
Harrisburgh	Bell	Harrisburgh A. S. & Dis. Co.
Littlestown	Bell	L. M. Alleman
Parke	Bell	C. P. Grove
Philadelphia	Bell	W. W. Gawthrop
Pottstown	Vim	High & Trout
Wilkes-Barre	Bell	Carey Ave. Garage
York	Dort	Snyder Auto Co.

South Dakota

Bristol	Ford	McAllen & Knott Bros.
Bristol	Overland	McAllen & Knott Bros.
Bristol	Studebaker	McAllen & Knott Bros.
Clark	King	Harry Hurlbut
Volga	Case	Lee & Lee
Watertown	Moore 30	Marvin & Ritz

Tennessee

Dickson	Maxwell	Standard Motor Co.
Franklin	Maxwell	Franklin Auto Co.
Hartsville	Maxwell	C. A. Hammond
Knoxville	Paige	Cadillac Sales Co.
Lawrenceburg	Maxwell	Lawrenceburg Motor Co.
Murfreesboro	Maxwell	Elam & McCollough
Nashville	Paige	Nashville Motor Car Co
Nashville	Vim	Imperial Motor Car Co
Portland	Maxwell	J. E. Kerley & Sons
Waverly	Maxwell	Middle Tennessee Auto Co.

Washington

Davenport	Paige	Field & Co.
Edwall	Paige	F. T. Larrable & Co.
Ritzville	Paige	M. Haight

Wisconsin

Baraboo	Studebaker	Baraboo Motor Car Co.
Beloit	Dort	J. F. McKearn
Campbellsport	Ford	Glenn Hio
Clinton	Chalmers	A. C. McCommon
Columbus	Chalmers	Lien Garage
Cuba City	Chalmers	Fiedler & Jaur

VOL. XXXIII. NEW YORK—THURSDAY, SEPTEMBER 30, 1915—CHICAGO No. 14

The AUTOMOBILE

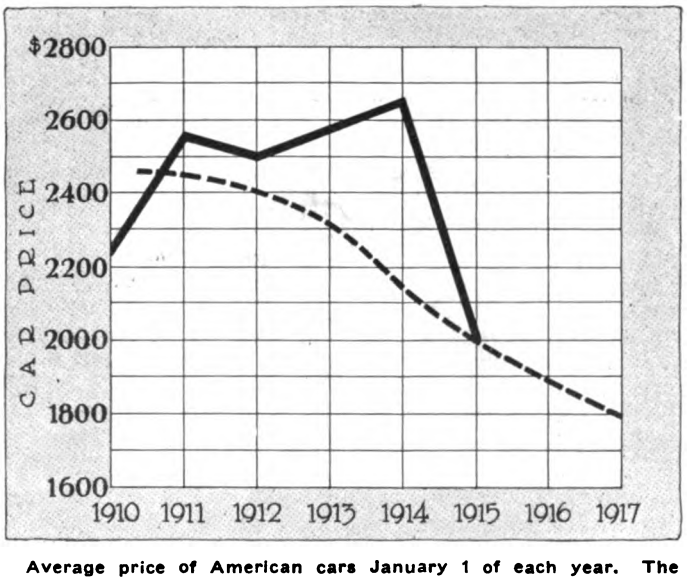
Why the 1916 Cars Are Cheaper

New Models Better Than Old Despite Price Reductions—Cleaner Design, Better Manufacturing and Lower Labor Costs Offset Rising Price of Materials

By A. Ludlow Clayden

MANY a motorist noticing the 1916 prices and specifications for automobiles is prone to wonder how it is done. Is the new car at a 20 per cent lower price as good as the old one? Has the quality been cut? These are the questions that naturally arise in the mind of a close observer of the 1916 trend.

It is possible to answer that never before has the value for money offered to the motorist approached the pinnacle upon which it now rests. The reason why is that the automobile industry has only just reached maturity. To make a human analogy, the youthful trade has passed through childhood, through school and college, has made its first essays in the world of trade. It has just, and only just, completed its period of probation; after twenty years of preparation it has commenced in business for itself and proved its right to take a man's place in world commerce. Now, just as the father has to pay for the education and the capitalization of his son's first essay in life, so has the the public had to father the young automobile industry. Of the money paid for automobiles by the users thereof, much went to the education of the industry and much more to the equipment; to the building of factories, the buying of tools.



Average price of American cars January 1 of each year. The full line shows actual averages from 1910 till 1915 and the dotted line represents an even downward progress from January, 1911. It cuts out the starter period with its accompanying price changes

Expenses Decrease

Of course in every trade something of the price paid by the consumer goes to the maintenance of equipment, to its expansion and improvement, but a new trade that is coming into being demands far more of its supporters than does an old business. The automobile industry is just shaking off the shackles of development that have bound it and is settling down into a form which it will probably retain for many years. Its future expansion will be less rapid than that of the past ten years, and thus we find the *expenses* of the industry as a whole are decreasing as the output increases and so the load the consumer has to carry is lessening every year.

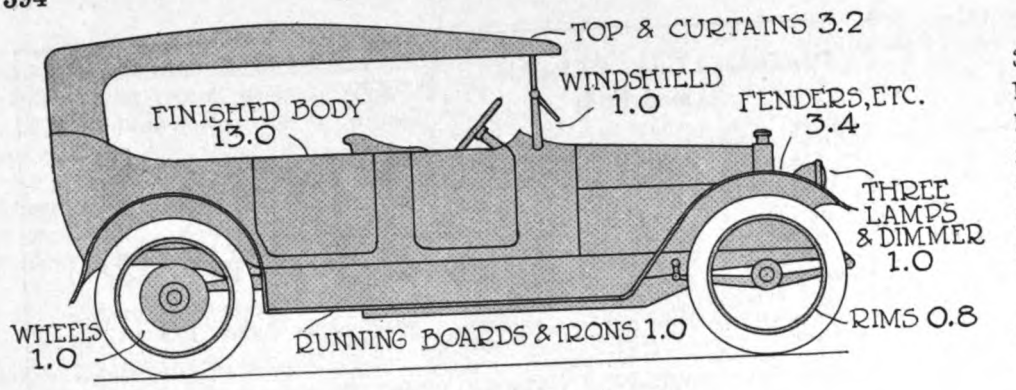
Examination in Detail

It is possible to explain the cheapening of automobiles much more accurately by a detail study of conditions although it is rarely possible to quote actual figures. First it should be explained that in splitting up the cost of a car into items it makes no difference whether the car be made throughout in one plant or assembled from parts made by specialists. The effect of the latter system is to spread overhead charges over several separate firms instead of over several departments of the same firm, but the general effect insofar as it concerns the consumer is the same in either case.

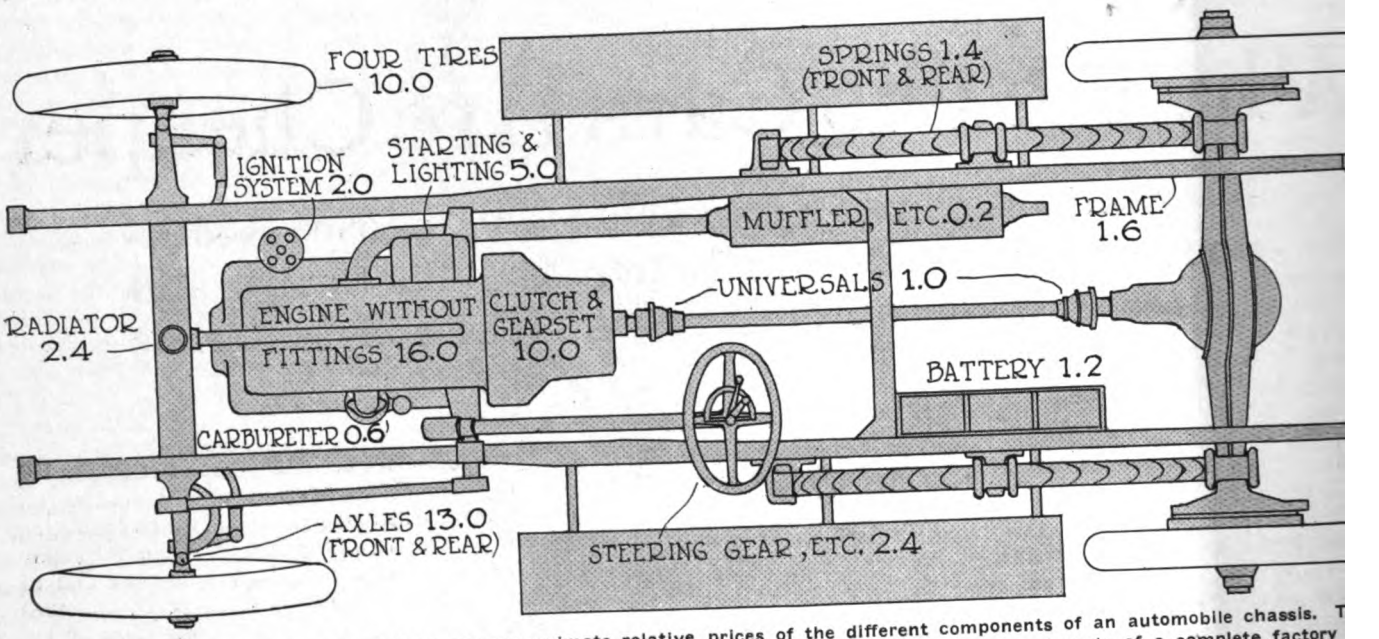
Cost of an automobile is made up from:

Material, including steel, other metals, wood, leather, rubber, paint, etc.

Labor, machinists, assemblers, tool makers, body builders, coppersmiths, etc., and the labor of the factory organization such as cost department, stockroom clerks, etc.



OTHER PARTS	
SPEEDOMETER	1.0
MATS & CARPET	0.4
FORGINGS, RODS, ETC.	1.0
STEEL CASTINGS	1.6
TOOLS & JACK	0.4
HORN & BUTTON	0.2
OTHER SUNDRIES	0.2
LABOR	
PAINTING CHASSIS	1.0
ASSEMBLING & FITTING	3.0



This drawing shows in graphical form the approximate relative prices of the different components of an automobile chassis. T represent the percentage costs of the components purchased by an assembly firm, or the department costs of a complete factory the overhead split up. The prices do not include anything for overhead on the assembling plant or the assembling portio the factory. Necessarily the figures represent broad averages only and are not derived from one special job

Overhead Labor. Engineers, salesmen, managers of departments, etc.

Capital investment in plant, machinery, etc.

Net Profit. The difference between all the above added up and the selling price.

Materials Cheaper and Dearer

The materials used in an automobile of 1916 cost less than before on the average, despite the fact that nearly all materials are more expensive. This apparently contradictory condition of affairs has been brought about by various causes, the main things being that materials are better chosen and better proportioned. Taking the case of steel, the price of common qualities from which the better qualities are made fluctuates all the time and whether it is up or down just now depends upon how far back one goes for the comparison. Steel is cheaper for many automobile parts because of the work of the Society of Automobile Engineers, and because of advances in design.

Not so long ago the steel used for automobile parts was largely a mystery, it was sold under fancy names like soaps or patent medicines. Each maker cried his special brand and a tremendous jargon of largely meaningless words was built up, shrouding the alloy steel business with a cloak of mystery. The S. A. E. steel standardization has made free to all the world the knowledge that steels made to definite formulæ have definite properties and that there is no mystery about it. The S. A. E. specifications enable a manufacturer to get competitive quotations for *the same steel* from all s of sources. He no longer has to worry with the *name* fancy brands.

The effect is that steels are being used for many a mobile parts which are just as good as those of four or years ago and cost anything up to 5 cents a pound less. is competition alone the cause of this for the simpler steels have been found to be not so terribly hard to m Some steels which used to be considered a crucible job been produced by the open hearth process in excellent qu More electrical refinement has enabled economies to be m so that the rise in price of pig that has occurred in the year has not been enough to offset the economies of the three or four years. Of course, this cannot last forever there are indications that next year may see a real shortage which will boost prices on all qualities, but if this does happen it will be but temporary. It is the ward tendency of price due to better steel making and usage that has enabled the 1916 automobile to be bu cheaply.

Design Economizes Material

As an example of the way in which design is helpin crankshaft may be taken. Not long ago it was though to make this of expensive steel which was hard and d to machine, but now we have found that vibration c eliminated only by the use of much larger shafts th demanded by consideration of strength only. So crank

of 1916 are made of cheaper qualities that are easy to handle in heat treatment and in machine shop and still make a better job. To use high tensile alloy steel for a modern 2½ in. crankshaft is rather like employing a steam hammer to break eggs; quite efficient but rather absurd.

Look, too, at what has disappeared. Look at the clean and simple chassis of to-day and think of the rods, tubes, pressings, links and brackets, castings, forgings, rollings, etc., that have vanished from the automobile and you see not only saved material but saved work. Before leaving materials, however, it should be added that three important metals are now high in price, these being aluminum, zinc and copper. Lead and tin, too, are up in price, so that brass parts have become costly. Very well, go carefully over an automobile of 1916 and see how much brass is to be discovered. Take off the switch from the dashboard and you will find the flange plate is enameled steel, just as strong and many times as cheap as the brass that would have been used till lately. No quality worth having is missing but off come several cents from the price. Look at the motor, where are the brass and copper water pipes, the heavy brass nuts and levers and handles. All gone and replaced by lighter, better steel forgings and stampings, all much lower in price.

Percentage Cost of Chassis Parts and Body

NOTE—All figures are expressed in percentage of factory cost less selling cost, etc. They apply well to cars costing retail from $650 to $1,250, but the proportional cost of motor and body rises a little as the price increases. The figures given are a broad average.

Part of Car	Per Cent Total Car Cost
Radiator	2.4
Engine Without Fittings	16.0
Clutch and Gearset	10.0
Carbureter	0.6
Ignition System	2.0
Starting and Lighting	5.0
Battery	1.2
Front and Rear Axles	13.0
Wheels	1.0
Rims with Spare	0.8
Four Tires	10.0
Springs	1.4
Finished Body	13.0
Top and Curtains	3.2
Windshield	1.0
Speedometer	1.0
Fenders, Etc.	3.4
Running Boards and Irons	1.0
Three Lamps and Dimmer	1.0
Mats and Carpet	0.4
Steering Gear, Etc.	2.4
Frame	1.6
Forgings, Rods, Etc	1.0
Steel Castings	1.6
Muffler, Etc.	0.2
Tools and Jack	0.4
Horn and Button	0.2
Universals	1.0
Other Sundries	0.2
Labor	Per Cent
Painting Chassis	1.0
Assembling and Testing	3.0
TOTAL	100.0

Come to the body. Comment on the better appearance of the smooth side includes the improvement caused partly by the absence of the big brass handles that used to decorate each door. Somewhere inside the door is a simpler, neater and more efficient little catch of a quarter the weight and twentieth the cost. Try the hub caps. They have become a light stamped part instead of a massive casting, just as effective for keeping in oil and excluding dirt and cheaper in material and in labor, all being factors which make for a lower manufacturing cost.

Take the radiator. Brass is very expensive, but this did not cause the one-piece construction to be dropped in favor of the enameled steel shell with the brass or copper radiator proper suspended within it. The steel shell makes the radiator a better appearing job, and a more durable and stronger part, while it saves brass, the expensive labor of the coppersmith and some time also in the chassis assembly and paint shops.

Summing up, there is *less* metal in the 1916 automobile. It is used in *simpler* forms. In a word there is less *waste*.

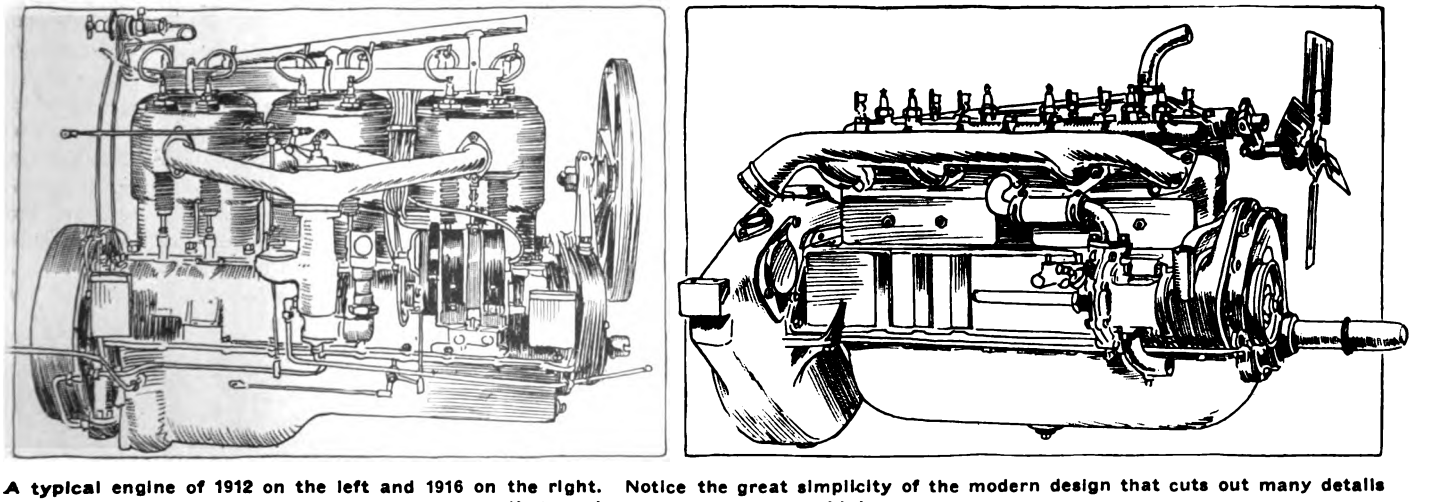
Cutting the Labor Cost

Better manufacturing has been the cry for three years past in almost every automobile plant. The automobile trade was just getting down to production when the self-starter upset everything. Having recovered from that disruption, having made the once troublesome accessory an integral part of the car, evolution has resumed a normal progress. Naturally manufacturers will not give definite figures for definite parts, the matter is too vital to the business, but it is safe to say that the average cost of producing a motor, an axle or some such unit assembly has dropped anything from 20 to 50 per cent *on labor alone.*

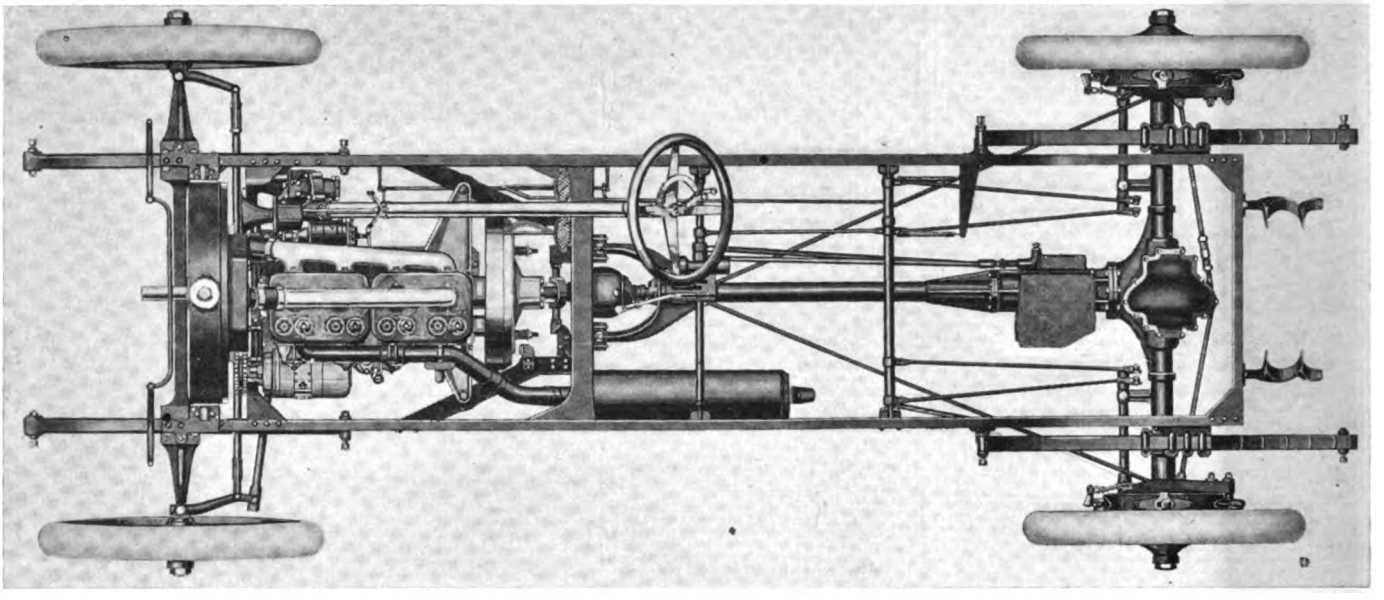
Why? Well, look at a motor of 1913 and a motor of 1916 side by side. Which looks as though there was most to do on it? A block motor eliminates the making of manifolds for gas and water, of casting, machining and fitting those manifolds. It eliminates two or three holding-down bolts and the manipulation thereof. Oilways cast integrally with the crankcase save copper pipe, the cutting, nipple fitting, testing and attaching of the pipes. The detachable cylinder head simplifies the casting, the machining, the valve fitting. It dispenses with valve caps, their machining and fitting and renders the motor assembly easier, in addition to rendering it much more accessible, thus benefiting the car owner.

The Simple Power Plant

Go to something bigger and take the unit power plant. Here we have, no lining up of one part with another, three points of frame attachment instead of six or eight, no clutch coupling shaft, one part to be handled instead of three, and



A typical engine of 1912 on the left and 1916 on the right. Notice the great simplicity of the modern design that cuts out many details that used to need separate machining



A typical chassis of 1912. Compare it with the chassis illustrated on the opposite page, one of the 1916 low-priced sixes

usually the elimination of two or three frame members, their making and attaching. Take the rear axle, spiral bevels eliminate the noise trouble to a great extent, they allow the axle to be brought to perfection with less time on adjustment. The axle case is commonly simpler in design with fewer parts. Take the brakes, having the pedal and the emergency lever on the power plant has done away with several frame attachments, has eliminated another lining up job. Finally look at the fenders and running boards; they look better, the domed fender is handsome, the graceful curve pleases the eye and also helps to make the fender more effective as a mud catcher, but look closer and you may notice that one piece of sheet steel, formed at one squeeze of a giant die has replaced a dozen strips of metal with bolts and rivets and screws which enabled the old style fender to be built up by one hand process after another. Bump comes the die, obedient to the hand of one man and as much work is done in a couple of seconds as was previously performed by half a dozen skilled men in an hour. Again a *better* article for a fraction of the cost.

There is no need to elaborate the picture further, enough has been said to indicate a line of thought that any man can follow for himself, but it is things like this that make up better manufacturing.

Capital and Labor Compromises

Now to look at another aspect of the labor question: We are led to that of capital investment. Too hurried an expenditure on plant piles up a debt that the efficient working of the machines cannot pay off within a reasonable time, but every time one machine is used that could be replaced by another to do better work there is waste going on. Suppose $3,000 will buy a fairly efficient machine for making some special part, and the best possible machine costs $9,000, as may easily happen. Then it becomes a point to decide whether the saving on the work of the more expensive tool will be enough to compensate for the heavy capital charge. Very often indeed the poorer tool is the better, figuring on a schedule of a couple of years output. This is simple horse sense and most automobile manufacturing concerns have gone slowly in the purchase of costly tools, starting in business with fairly good equipment and improving it as earned money gave them funds to spend. This is especially true of the big firms which form the backbone of the trade.

Economical, Efficient Painting

To give an example, many of these firms have installed during the summer, a new body finishing scheme. Here the body is passed through a sort of tunnel which is so heated that the paint dries in a much shorter time, so clearing the floor space more rapidly and easing the handling, as it reduces the number of half-finished bodies in the various operating rooms. This saves time, which is money, produces just as good work, even better some say, but the equipment is costly and it is only lately that the steadiness of large demand has made the outlay allowable.

Another thing of vast importance is the air brush painting system which does better painting in vastly less time and with less waste of paint. Mounted on a revolving stand six four-cylinder block castings can be air brush painted in 2 min. by one operator working carefully. Try looking at a cylinder block and think out how long it would take to paint it with a brush so as to give a perfectly even surface. Modern bodies have few beadings and few angles, which makes painting and rubbing down much easier and quicker. Upholstery does not roll over the edges of the panels but stops flush. So much the easier for the workman, for a metal bead and a leather strap vanish, the upper edge of the body is finished by the die that presses the panel instead of by the hand of the tack-hammer wielder.

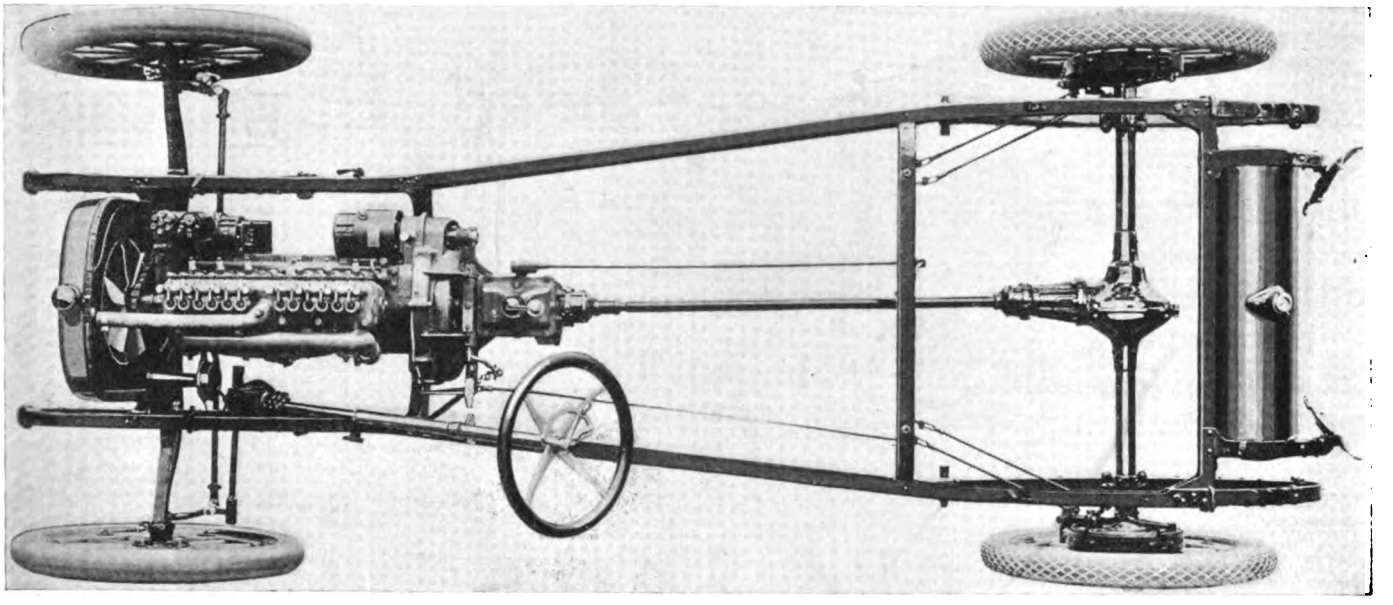
Saving the Profits

Big machine tools, new process equipment, such as the paint shop outfits just described, factory rail tracks and chain conveyors, all sorts of things to lessen labor in making and labor in handling are the things the automobile firms have spent a large part of their profits on during the past few years. Suppose the profit in 1913 were $200 per car, very likely half or more went to but equipment that would cut the factory cost, but we have now reached a stage where much of this equipment is bought and paid for. It is no longer a charge on the profits of the company, so in making at the old price they would be making double profit. Having the better plant, having the facilities for larger scale manufacture, it is better commercially to drop the price to the user, to take a smaller gross profit per car, sell a few more cars and have at least as much net profit at the year's end. In other words, the user is getting the benefit of the tools and equipment he has helped to pay for during years past.

Per Cent Cost of Components

The table of costs of different parts of an automobile figured in percentages and shown on page 595 is an interesting subject for analysis. Taking the items there given we find the following:

Radiator—Price about the same as improved methods of



Typical 1916 chassis. Note the simplicity of this design as compared with the 1912 chassis on the opposite page. Note how many parts have been eliminated

design and construction offset increased cost of materials. Labor especially is cut by use of loose steel shell so that the radiator actually fitted to the chassis may sometimes be a few per cent cheaper.

Power Plant—Materials are iron which is dearer, steel which is cheaper, aluminum and brass which are dearer. Labor is down anything up to 50 per cent on new designs by virtue of improved manufacturing. Thus motor and gearset cost anything from the same as last year to 40 per cent less according to how much the design and the making have been improved.

Ignition, Starting and Lighting—All material a little more expensive, but improved design gets the same effect with less wire and can save a few per cent on total cost. Elimination of waste material, especially brass, increased use of stampings and decrease of total weight have caused a considerable economy, probably up to 30 per cent.

Battery—This is one of the few parts of a car that have sometimes been cut in quality a little, but it is cheaper mainly by virtue of the fact that the battery makers have got into shape to meet the demands of a new field for their wares.

Axles, Springs and Wheels—Very slightly cheaper, from 0 to about 5 per cent. Mostly accounted for by increased quantities coming from each plant.

Tires—Approximately 15 per cent cheaper because of larger quantities, fewer sizes and better manufacturing.

Body—From 0 to 50 per cent cheaper. Savings made by simplified design, cheaper upholstery material instead of leather, cheaper quality of leather, more springs, less hair in stuffing. Greatest saving obtained by new finishing systems now in process of development, that save large proportion of labor.

Body Fittings—Cheaper by elimination of heavy brass parts, etc. Saving impossible to estimate accurately as this tendency has spread over several years.

Accessories—From 5 to 25 per cent cheaper by virtue of simplified construction and elimination of such parts as side lamps.

Steering Gear—Cheaper from 0 to about 5 per cent on account of larger orders. By comparison with several years ago, cheaper by simplified design perhaps nearly 50 per cent in some instances.

Frame, Forgings, Castings and Raw or Semi-Raw Materials—Mostly slightly more expensive than last year. These are common steels and feel fluctuations of steel market.

Of course these percentages do not represent the truth concerning every car. They are simply broad averages and the figures are deduced from confidential information gathered from all sorts of sources. Some cars which have had their price cut are costing just as much to make now as ever they did and the cut represents nothing but less profit for the manufacturer; but these instances are rare.

Normal Price Reduction 13 Per Cent

After all, has the cutting of price been so very large? Remember that a cut is only a true cut when the car as a whole remains much the same. A new design like the Oakland little six for example is not a cut for it is a new Oakland in every respect.

Take twenty cars and examine what has happened to them.

Car	1915 Price	1916 Price	Per Cent Cut
1. Briscoe 4	$785	$750	4.5
2. Buick Big 6	1,650	1,450	12.0
3. Cadillac 8	1,975	2,080	*plus* 4.8
4. Chalmers 6-40	1,400	1,275	9.0
5. Franklin 6	2,150	1,900	11.6
6. Hupp 4	1,200	1,085	9.6
7. Hudson Light 6	1,550	1,350	13.0
8. Imperial 4	1,085	995	8.3
9. Interstate 4	1,000	850	6.6
10. Jeffery 4	1,550	1,000	35.0*
11. Marmon 6	3,250	3,250	0.0
12. Maxwell 4	725	635	12.4
13. Mitchell 6	1,555	1,250	19.6
14. National 6	2,375	1,690	29.0
15. Oldsmobile 4	1,285	1,095	14.8
16. Oakland 4	1,150	1,050	8.7
17. Overland 4	1,075	725	32.5
18. Regal 4	1,085	985	9.2
19. Stearns 4	1,750	1,395	22.0
20. Studebaker 4	985	850	13.7

*This car is a new design to a greater extent than most of the others.

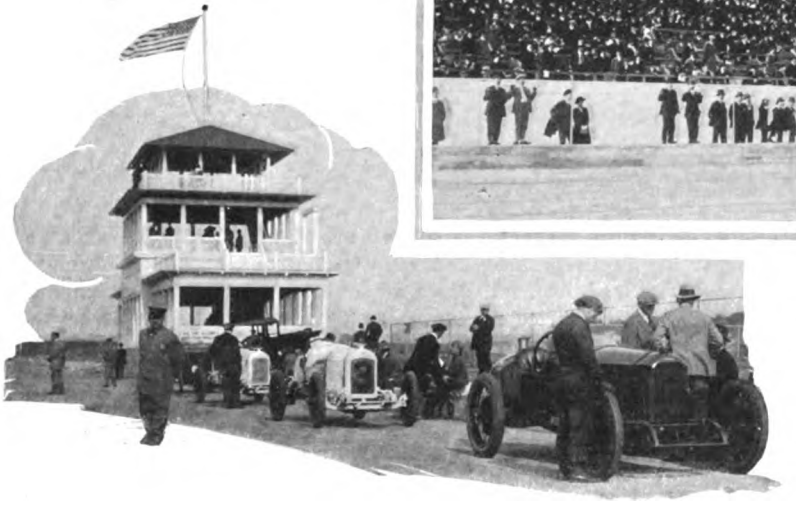
The average decrease in price for these twenty cars selected at random, is 13.3 per cent.

Now a drop of 13 per cent is perfectly explainable on the basis of better design and better manufacture. As enlarged upon in the previous pages, it is nothing to cause either question or alarm and it is merely a natural manufacturing development. In 1914 the average price of an automobile reached its zenith and there is no doubt that the price was forced up by the coming of the starter which was then hardly the integral part of the car it has since become. The starter cost a good deal to buy and much more by reason of the disorganization of design and assembly methods which were just settling down in 1912. The automobile would have come to its maturity sooner had the upheaval of the electrical equipment not come along quite so soon. Take the curve

(*Continued on page* 607)

16 Cars for Sheepshead Bay Race

Original Entry of 30 Reduced to This Figure by Unpreparedness, Lack of Drivers and Accidents



Above—View of the grandstand at the Sheepshead Bay motor speedway during the elimination trials. If the grandstand is entirely sold out for the race, it will bring $198,000

Left—In the foreground is one of the Peugeots, with two Stutzes in the rear lined up at the side of the track during the elimination trials

Speeds Made in Elimination Trials

Car.	Driver	Time	M.P.H.
Peugeot	Resta	1:08.2	106
Peugeot	Aitken	1:08.65	105
Peugeot	Burman	1:09.78	103
Delage	Oldfield	1:10.07	102.75
Stutz	Anderson	1:10.84	102
Stutz	Rooney	1:10.93	102
Peugeot	Wilcox	1:11.0	101.5
Stutz	Cooper	1:11.80	100.5
Maxwell	Unknown*	1:11.56	100
Duesenberg	O'Donnell	1:12	100
Maxwell	Rickenbacher	1:12.72	100
Mulford Special	Vail	1:16.5	94
Sebring	Haibe	1:19.29	91
Duesenberg	Haupt	1:20.05	90

*Qualified by Rickenbacher.

NEW YORK CITY, Sept. 28—Sixteen cars will start in the 350-mile race on the Sheepshead Bay Speedway on Saturday, Oct. 2, the original entry of thirty being reduced to this figure by some not being in running condition, others withdrawn for lack of drivers, and others eliminated due to accidents. The latest of these was the Maxwell, driven by Harry Grant, which took fire in Monday's practise when Grant was severely although not fatally burned, and the car badly damaged. The Mercers are out on account of lubrication trouble. The Peugeot which Ralph Mulford was to have driven is not ready. It will be impossible to get the Delage, entered by Harry S. Harkness, president of the speedway, ready in time. Other withdrawals are Bugatti, Sunbeam and one of the Stutz entries. It is uncertain whether the Erwin specials, generally known as the Bergdolls, will appear or not. Of course, there are a number of drivers who have not yet made their elimination trials so that the final list cannot be determined.

Hold Speed in Reserve

Elimination trials to determine the order of starting in Saturday's race are progressing slowly, thirteen cars having taken their trials the first two days. The trials will be continued to-day and to-morrow. So far none of the cars have had difficulty in setting an average of over 85 m.p.h. Resta's Peugeot holds the track record in these trials at 106 m.p.h. Higher speeds are possible but all drivers are holding themselves more or less in reserve.

Curved Bank Increases Distance

It is not certain whether elimination trials will be as fast as on the Chicago speedway, due to the fact that with the parabola banking, the drivers are forced to drive wider and higher on the track than they did at Chicago, where the straight banking is used. It has been calculated that in a lap of the 2-mile speedway here, a car travels 197 ft. further when averaging 100 m.p.h. This is equivalent to 1 3/5 sec. per lap, which equals about 4 m.p.h. On the Chicago track with its straight banking it was possible to make as high speeds close to the inner edge of the track as high on the banking.

Easy on Tires

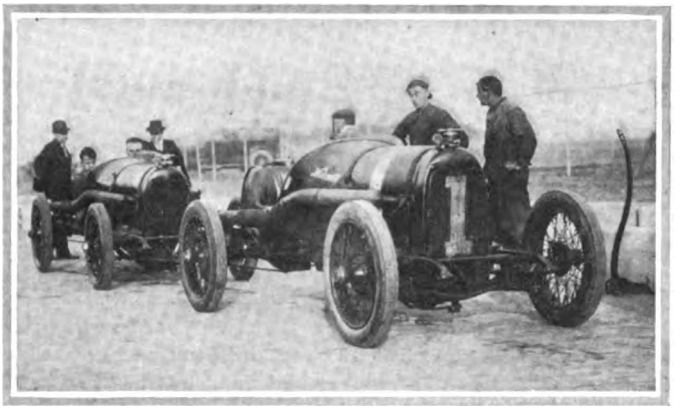
In practise the cars are running high on the steepest part of the curves at each end of the speedway, these curves being well banked on the surface. With the cars traveling at approximately 100 m.p.h. there is no tendency to skid but

rather the rear wheels tend to slide toward the inside of the track, indicating that the track is intended for considerably higher speeds than the cars are able to make. Because of this situation, the drivers believe that the track will be easier on tires than the Chicago one, where there is a tendency for the rear wheels to skid toward the outside of the track at speeds of 102 m.p.h. and over. It is estimated that on the New York track this skidding outward will not take place until speeds of 120 m.p.h. or higher are made and perhaps not then.

The track surface is quite black, the wood having been creosoted. This does not make it slippery but has just changed the color. Inside of the track is a broad safety apron which is brick along the homestretch but hard dirt around the rest of the track. Inside of this safety zone is a cement wall nearly 2 ft. high. Within the wall is a safety zone or neutral space, after which comes the fencing inclosing the infield, where the cars park.

William Schimpf, ex-chairman of the Contest Board of the American Automobile Association, has been chosen referee. The entire speedway is practically completed, the grandstand seating 39,000 was completed in time for Saturday's trials and the bleachers are now completed. The main entrance, at which fourteen rows of automobiles can enter abreast, is finished, the high wire fencing inclosing the reserved parking spaces inside the track is in place, in fact all details with a few minor exceptions are ready.

The Mercer and F. R. P. cars have not yet been on the track except for a few laps, and no gage of their speed possibilities has been obtained. The F. R. P. motor has been redesigned so that there is now a waterjacket between the piston and the inner sleeve, this jacket extending upwards from the base of the cylinder casting. This should result in getting the heat well away from the piston. There still remains a waterjacket outside of the outer sleeve so that the sleeves reciprocate between waterjackets. The cylinders are 3.88 by 6.125 in. Other details of the car are as they were at Indianapolis.



Two Maxwell cars at the side of the track at the elimination trials for the 350-mile race. Note jack at the right of the illustration, one of the greatest of time-savers in tire changing

Complete List of Possible Starters

Car	Driver
Mercedes	Ralph De Palma
Delage	Barney Oldfield
Stutz	Earle Cooper
Stutz	Gil Anderson
Stutz	Rooney
Peugeot	Dario Resta
Peugeot	Bob Burman
Peugeot	John Aitken
Peugeot	Howard Wilcox
Maxwell	E. Rickenbacher
F. R. P.	Jean Porporato
Duesenberg	E. O'Donnell
Duesenberg	Pete Henderson
Duesenberg	Haupt
Mulford Special	Ira Vail
Ogren	Tom Alley
Sebring	Ora Haibe
Pugh Special	Jack LeCain

Record Attendance Expected

The sale of tickets promises to reach $100,000 before the opening day of the race. If the grandstand is entirely sold out it will bring approximately $198,000. With good September weather prevailing, it is safe to assume that the attendance will be greater than at any other speedway race ever held in America.

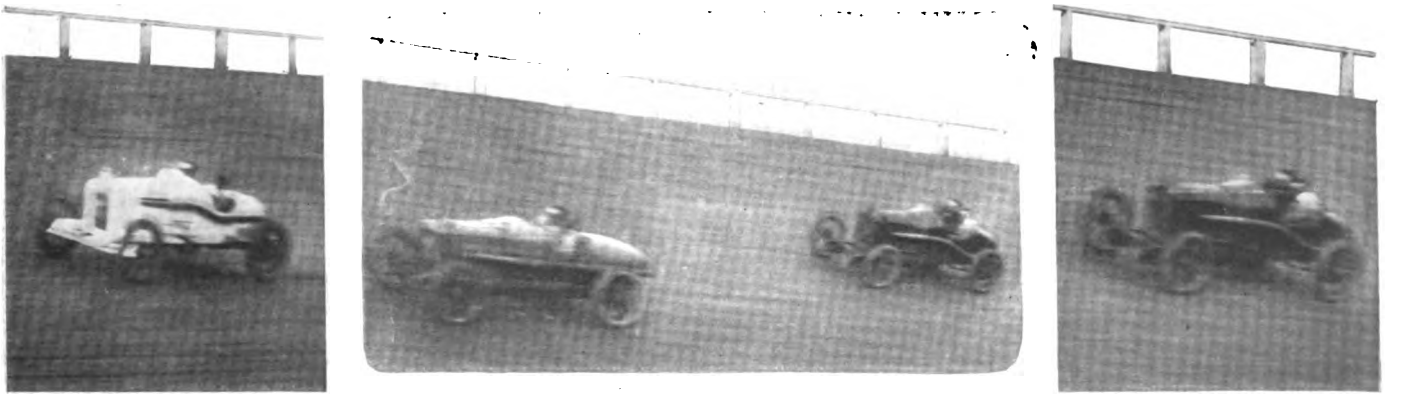
The accident to Harry F. Grant, twice winner of the Vanderbilt Cup race, occurred at the end of the elimination trials Monday, when he was practising on the track with Rickenbacher in the other Maxwell. Grant was traveling at high speed and soon after he passed the grandstand, flames were noticed under the car. By the time he reached the curve the rear end was enshrouded in flames. Grant tried to stop as quickly as possible and skidded fully 200 yd. on the track before he came to a standstill. Fortunately, workmen were at hand and soon extinguished the blaze but not before Grant was very severely burned from the waist downward. It will be several weeks before he will be out of the hospital.

Predict 100 M.P.H.

With good weather conditions prevailing on Saturday it is expected that an average speed of close to 100 m.p.h. will be maintained for the 350 miles. The race starts at 12 o'clock noon, this hour being selected to give out-of-town spectators a good opportunity of reaching the track without having to start before sunrise.

In the practise to-day Burman made a circuit of the 2-mile track at 103 m.p.h., this being the fastest for the day.

A simple way to time the cars is by figuring that it takes exactly 1 min., 12 sec. to circle the track at 100 m.p.h.



Left—Cooper in a Stutz during the elimination trials. Center—Oldfield in a Delage and Aitken in a Peugeot at high speed. Burman is at the left. Right—Grant in the Maxwell

Indiana S. A. E. Talks Twelves and Aluminum

Vigorous Discussion Follows Reading of Papers by J. G. Vincent and James E. Diamond at Opening Session

INDIANAPOLIS, IND., Sept. 25—Last night a crowded meeting of over 350 members and visitors attended the reading of the two papers scheduled for the opening meeting of the winter season of the Indiana section of the Society of Automobile Engineers. The papers presented by J. G. Vincent on the twelve-cylinder engine, and by James E. Diamond on the aluminum piston were published in THE AUTOMOBILE last week, Mr. Vincent's paper being identical with that read by him in Detroit on Sept. 16. At the previous meeting O. E. Hunt, chief engineer of the Packard Motor Car Co., read the paper for the author so as to leave him with an untired voice when discussion commenced, and this idea working out well it was repeated at Indianapolis.

A novel detail of procedure was the reading of Mr. Diamond's paper immediately after Mr. Hunt had finished, thus opening the discussion on both papers at once. The scheme worked out extremely well.

Business Report Is Good

The business report was read first and showed the section to be in excellent condition financially, many local manufacturers having given substantial donations to its funds. F. E. Moskovics was in the chair and spoke briefly on the section. He said that J. G. Vincent deserved the greatest possible credit for the way in which his tests on the Indianapolis speedway had been conducted with the utmost freedom and publicity. At Mr. Vincent's invitation other engineers had handled the Packard cars which had been tried out on the track for many days previous. These visitors had returned the compliment with their experimental chassis and it was an honor to belong to a section and to a society that could boast men so broad gaged as these engineers.

Coker F. Clarkson, general manager of the S. A. E., came from New York to attend the meeting and he spoke in similar strain, congratulating the section on its activity and good feeling. He also mentioned the automobile reserve which has been suggested as a matter of vital interest to the army authorities and a fit subject for the S. A. E. to consider. The society has no official action in immediate contemplation, but considers the subject one that ought to be discussed so that various schemes may be thought out. On the suggestion of W. G. Wall it was decided to appoint a small committee to consider the matter.

W. G. Wall Opens Discussion

After the papers had been read the discussion was immediately opened by W. G. Wall, who said:

W. G. Wall, vice-president and chief engineer, National Motor Vehicle Co.:—"I have heard with a great deal of interest Mr. Vincent's paper and also heard him discuss his very remarkable motor. I have seen this motor run and have seen what it will do. I can only say it will accomplish everything and probably more than is advertised for it by his company. I agree with most of the things Mr. Vincent has said. There are a few things, however, with which I differ slightly. I believe I am a little more liberal toward the eight than Mr. Vincent is.

"When we decided to build something which we thought was a more perfect motor than the six-cylinder motor, we went into the matter rather thoroughly and looked over the eight and saw that it had some advantages. We also saw that it had a number of disadvantages. We saw that the twelve had what we considered a great many more advantages than the eight so our idea was, which we endeavored to do, to extract the virtues of the eight and incorporate them with the many advantages of the twelve.

"We considered one of the troubles and one of the drawbacks of the eight, aside from the fact that the torque could never be the same as the twelve or that the vibration could never be reduced to the same extent as on the twelve, that one of the greatest disadvantages of the eight was the inaccessibility.

"The one trouble was getting to the valves. We found, however, that the eight did have some advantages and one of the principal advantages was the fact that the accessories were located in the center, between the cylinders, in what Mr. Vincent refers to in his paper as the 'valve-alley,' where they were entirely out of harm's way, and where weather and road conditions could not affect them, and in fact, you could go through deep water if necessary without any effect upon your accessories. Therefore, we decided it would be better if we built a twelve to locate the valves on the outside instead of on the inside. We did this and found there were other advantages besides accessibility. One of the things that has come up is the fact that even though aluminum pistons have very little carbon deposit, when you locate the valves on the outside, then loose bits of carbon can escape so that we have a practically carbonless engine.

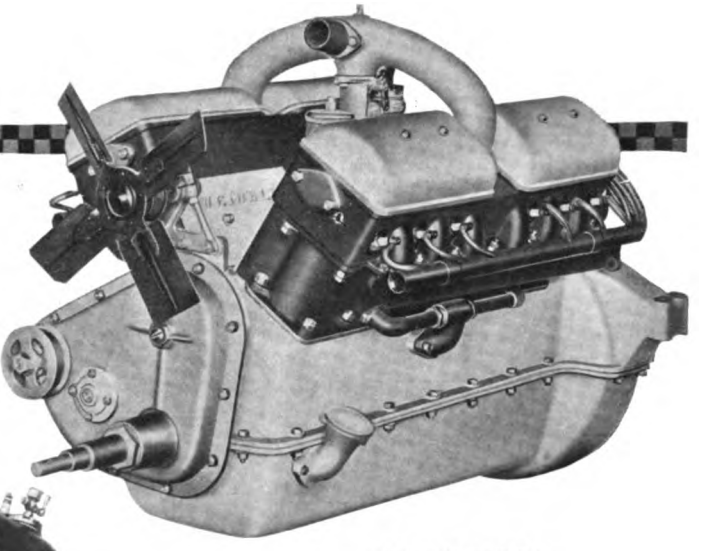
The Friction Factor

"There are several things I wish to ask Mr. Vincent, as he is certainly an authority on twelve-cylinder engines. One of these is his ratio of connecting-rod length to stroke, and another is whether he found any difference in the amount of water and therefore the temperature of the water in the two cylinder blocks, by using the double pump arrangement he has and putting water through the cylinders in multiple. In other words, whether the friction causes any difference. One more point, which is really more technical than of any great interest to the user—what is the horsepower required in driving twelve-cylinder camshafts? Is the horsepower necessary to turn this camshaft increased very materially with the weight of the springs? In other words, you can readily see that in a twelve-cylinder, as one valve lifter goes up the side of the cam, there is always another valve lifter coming down the side of another cam, so that the power required to run a camshaft is really decreased as you increase the number of the cylinders.

"There is a question I would like to ask Mr. Diamond also, and that is what he finds the difference in the co-efficient of friction between die cast and sand cast pistons."

J. G. Vincent replied that there were certainly advantages in favor of the eight and that he thought all types of engine had their place. All his paper was concerned with was the quite large engine of approximately 424 cu. in. As regards the location of valves, he had considered several types and had wooden patterns made of several designs. The wood pattern is a very useful method of comparison between sug-

SOME of the TWELVES



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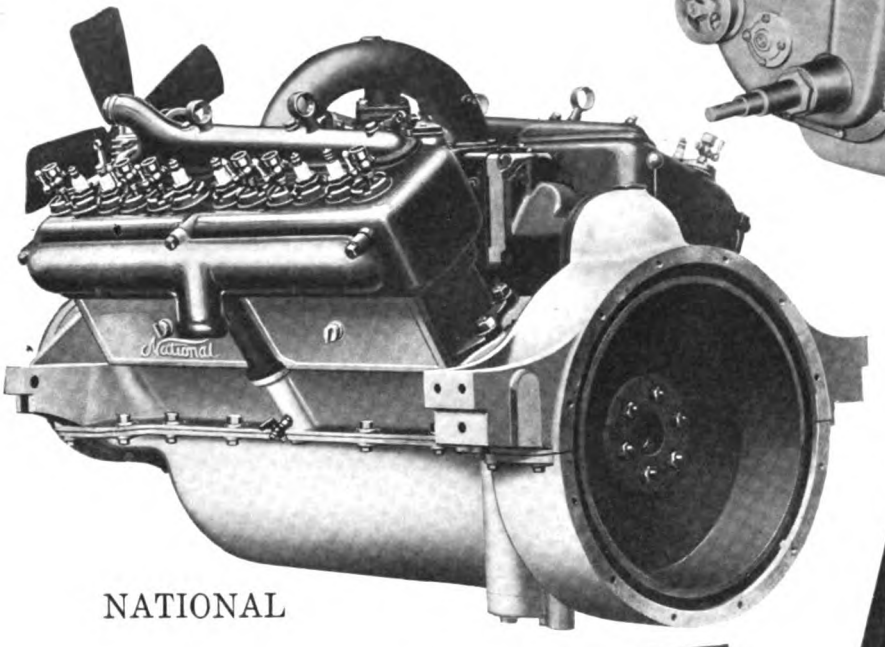

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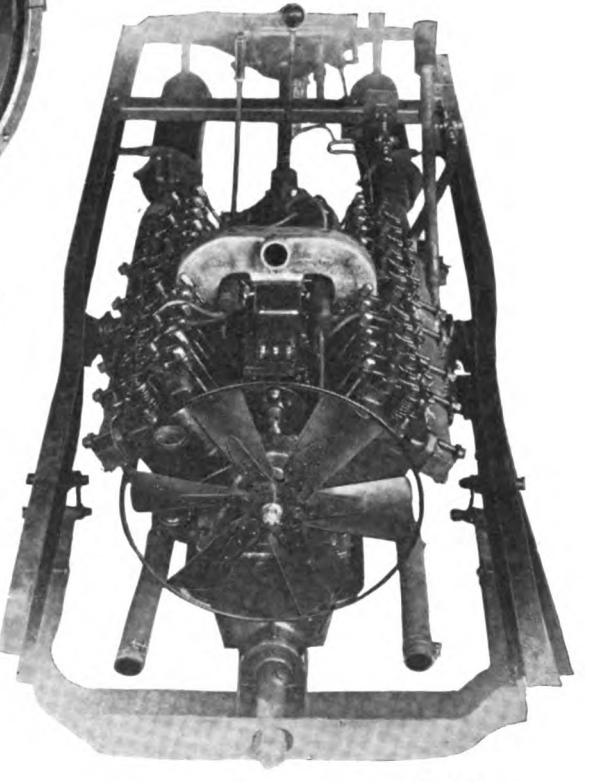
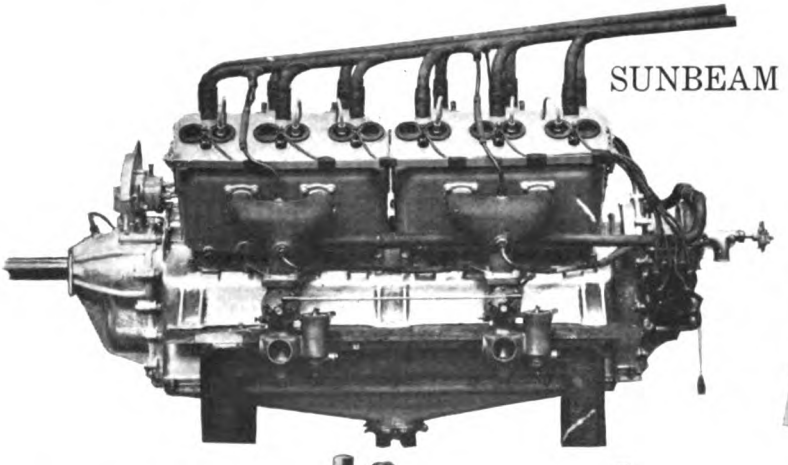
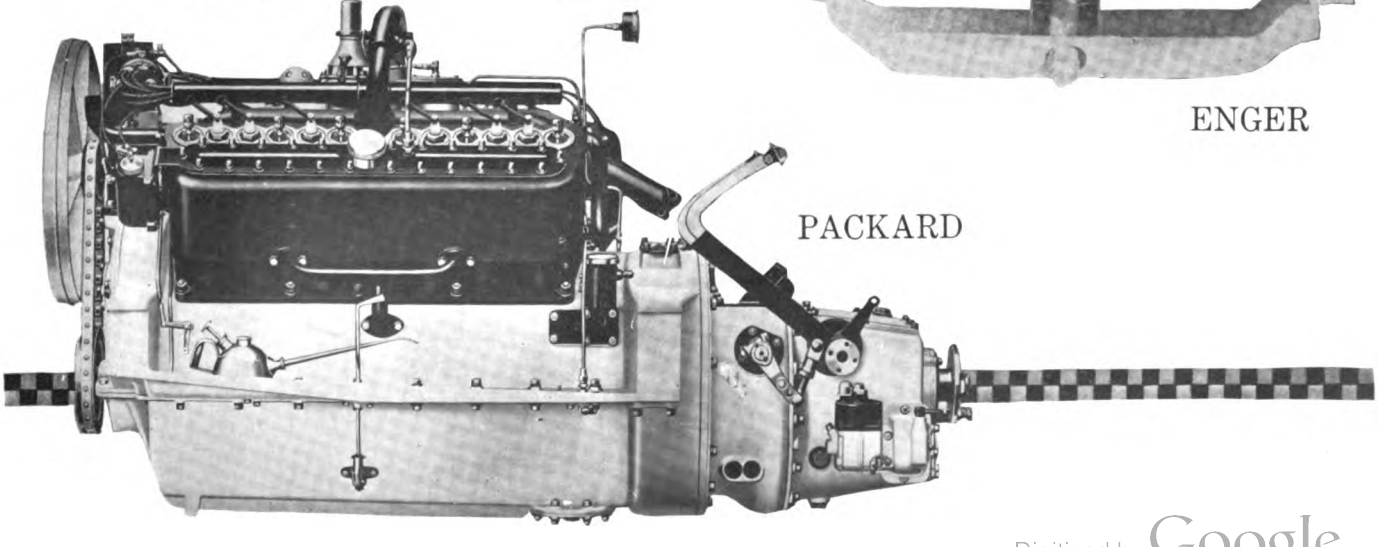


ENGER



SUNBEAM



PACKARD

gested designs because it is cheap and easy to make in a rough and ready way and gives a real idea of how a motor will look in the chassis. He found the Packard twin six with the valves outside would work out too wide and sit too low in the frame. Also for a motor of the dimensions under consideration the drive layout for the two camshafts, etc., became awkward.

He regretted he could not give the power required to drive the camshaft, but it was easy and light on the chain; he found the chain front end to stand up much better on the twelve than it did on the experimental six of the same total cylinder capacity. The springs used were 60 lb. as compared with 85 lb. on the six. Water temperature varied little, if at all, between the two cylinder blocks and the motor seemed easy to keep cool. Connecting-rod length used on the twin six was 12 in., giving a ratio of 12 to 5 but the length was chosen not so much on account of this proportion as to obtain a good length of valve and valve spring and plenty of bearing on the tappets. He considered the rod to be longer than necessary from the angularity viewpoint.

J. E. Diamond said in reply to W. G. Wall that he could not give comparative coefficients of friction between sand and permanent mold castings but thought the difference would be extremely small.

C. P. Grimes, experimental engineer for Wheeler & Schebler, asked if Mr. Diamond could explain the fact that an aluminum dashpot piston used in a trial carbureter seemed to swell and needed periodical turning down.

J. E. Diamond answered the only possible explanation was that some stress on the aluminum exceeded the elastic limit and so created a permanent set. The only time he had encountered similar trouble was in an aeroplane engine piston and it proved to be owing to the use of too high a compression, causing actual melting to take place.

C. S. Crawford, chief engineer of the Cole Motor Car Co., remarked he has observed several cars standing with the motors idling in the streets of Detroit and the Cadillac eight seemed to run more quietly in this condition than the Packard twin sixes.

Curbstone Quietness Vs. Efficiency

Mr. Vincent: "In this connection there is no question that any type motor can be made to run more quietly when made from an accurate set of tools. The only Packards we have had on the road have been made by hand until recently, when we have been making a few deliveries, and I think any engineer here this evening will bear me out when I say that when boring all new crankcases in a boring mill and depending upon a lathe hand to turn up all pistons and make all parts in this manner, you cannot get the quietness you would get from machine tools.

"It has been my experience that I have never been able to make a motor quiet enough in all its parts to make it absolutely quiet, but in building these experimental cars by hand, I was able to get more quiet results than ever before. There is nothing in absolute quietness. For a long time I have I have been an advocate of what I call commercial quietness. That is the motor which will go out and give you a ride every day in the week, which will not make the motor evident to the passengers, and not the motor that will give the most quiet demonstration at the curb. I can make any Packard six-cylinder motor absolutely quiet for curbstone idling but it is not practical for anything else, and that is the reason I have set the valve clearances and every other clearance so it can go out and give proper smoothness and the greatest range of ability on the road. The engineering department too many times allows the sales department to get them into trouble by making a motor "curbstone" quiet. It is only a question of the clearances the engineer sets. There is no question but what smaller valves, lighter springs and quiet cams can make the motor quiet. There is no question, either, about piston clearances. It depends altogether on what results you want to obtain. I have had some experience with eight-cylinder motors. They can give absolute quietness, but they make better motors if they are set to give a little more life at the expense of a little quietness in curbstone idling."

At the request of Mr. Vincent, C. P. Grimes then gave some figures relating to the acceleration of the Packard twin six tending to show that the results obtained on the speedway had been identical with magneto and battery ignition. With a gear ratio of an amount giving 25 m.p.h. at 900 r.p.m. of the engine the Packard accelerated from 10 to 50 m.p.h. in 22.4 sec., this result being the average of several tests made by Howard Marmon.

With magneto ignition the result was the same figure within 0.28, the acceleration shown being from 10 to 50 m.p.h. in 22.68 sec. The maximum speed shown was about 74 m.p.h. in both cases.

Two Carbureters or One?

C. P. Grimes then said: "It just occurs to me that Mr. Vincent has developed a very fine twelve-cylinder motor and has been using a single carbureter, which seemed to work first rate. I would like to bring up a question at this time. A number of people are using two carbureters on a smaller number of cylinders than twelve. A few years ago, when the six first came out, it had many carbureters, and I believe the twelve is going to give excellent results with a single carbureter, but just at the present time I am not satisfied in my mind whether it is due to the range of the carbureter in general or whether it is the lack of a well to accelerate from, that so many single carbureters do not give very good results on multiple cylinder motors.

"Some of our men have been experimenting with an eight-cylinder Knight motor and have found two carbureters on that car would go over a certain hill at probably 30 per cent better speed and with more life to the motor than with a single carbureter.

"Another question I would like to ask is the mileage Mr. Vincent obtained. He speaks of increased compression in the motor and I am very much interested in finding out the compression pressure he uses and the mileage per gallon of gasoline he obtains with his cars and his idea on the carbureter end of it."

Mr. Vincent replied as follows: "We found that at any ordinary speed, a single carbureter is adequate. There is no question in my mind, however, but that you can get more power at extremely high speeds with a double carbureter. An interesting thing in this connection is that the valve timing is more important and more variable than it is ordinarily given credit for. Setting the valve timing at a point where the exhaust opens at 50 deg. early and the intake closes at 50 deg. late, which is more or less conventional L-head racing timing, we found we did not get any increased horsepower from a single carbureter, at the high speeds, over the horsepower obtained with the timing set for touring, but by putting on a double type carbureter (in this case I think we used a Zenith), we got quite an increase. That is we got 117 hp. at 3200 r.p.m. I do not believe the extra horsepower that was obtained is of any particular advantage in touring car practice but it might be at some future time.

Economy Vs. Maximum Power

"As to economy, running the motors with the conventional valve timing, we made a test the same day with a double carbureter which had been adjusted to an economy setting rather than the highest horsepower setting and the double carbureter did not show nearly so well, in fact, it gave, if I remember correctly, 8 miles to the gallon as compared to 11, which is entirely too large an item to be neglected. I believe

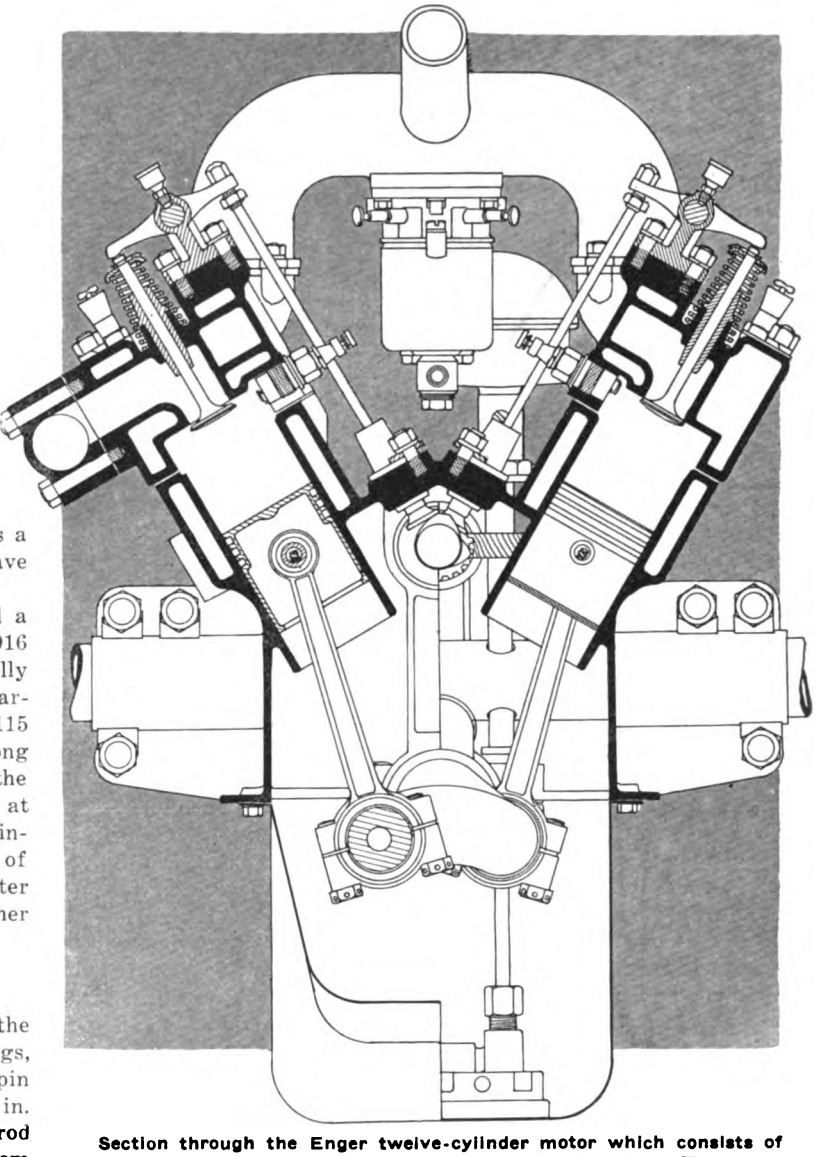
(*Continued on page* 620)

Individual Valve Cams in Enger Twelve

Oil Is Fed Through Chain-Driven Hollow Camshaft with Twenty-Four Cams— 60 Deg. V Motor 2⅝ by 3½— Lists at $1,095

THE Enger Motor Car Co., Cincinnati, Ohio, has placed on the market a twelve-cylinder car to sell for $1,095. Demonstrators have already been shipped and the factory in Cincinnati, Ohio, has now busily turned their attention to the production of this car which is the lowest price attained by a twelve-cylinder model and marks a step in the industry which two years ago would have been considered unbelievable.

The Enger company in the 1915 season marketed a six-cylinder car. This has given place for the 1916 season to the twin six, which will be built practically entirely in the Cincinnati factory. In general appearance the car is low and long, having a wheelbase of 115 in. and a straight-line body design which gives a long appearance. The small bore and stroke have given the designers an opportunity to keep the parts light and at the same time produce a compact engine. The cylinders, which are 2⅝ by 3½, are cast in two blocks of six and placed at an angle of 60 deg. from the center line of one-cylinder block to the center line of the other in the planes of the axes.



Section through the Enger twelve-cylinder motor which consists of two blocks of six cylinders each set at an angle of 60 deg. There is a separate cam for each of the overhead valves, or twenty-four cams in all, mounted on a single hollow chain-driven camshaft in the center of the V, where are also mounted the carbureter and the ignition unit. Note the mounting of spark plugs on inner sides of cylinder block and the large water outlet manifold

Light Reciprocating Parts

Light weight reciprocating parts are a feature of the motor, the pistons reciprocating weight including rings, bushings, upper half of connecting-rod and wristpin total but 25.9 oz. The length of the piston is 2⅞ in. and the number of rings, three. The connecting-rod length is 7½ in., and the rods are drop-forged from carbon steel. These light weights should provide the motor with smooth running qualities at high speed and the bearing areas are ample to take care of the small unit pressures existing in a power plant of this kind. The connecting-rod bearings are 1⅛ in. in length and 1⅝ in. diameter and the crankshaft bearings are 1¾ in. diameter and 2¼ in. length. The material of the crankshaft is 0.40 carbon steel. This is a heat-treated drop forging.

Although following the dictates of twelve-cylinder design the lessons learned of motors of four cylinders have not been forgotten. Following the practice which is rapidly becoming general throughout the entire field the cylinder heads are removable, making the motor readily accessible for inspection and cleaning. In the particular overhead valve construction used in the Enger the detachable cylinder head also provides an easy adjustment for the valve tappets, a point which is quite necessary to consider in a twelve-cylinder motor which has twenty-four of these tappets requiring attention if the full efficiency of the motor is to be secured at all times and under all conditions.

One of the interesting features of this design is the arrangement for valve drive. Each valve is operated by an independent cam, giving twenty-four cams in all. The camshaft is hollow, providing rigidity which is naturally essential in a unit of this nature. With the material massed at a distance from the neutral axis of the camshaft this rigidity is secured, while at the same time the bearing speeds, due to the increased diameter, are not high enough to be detrimental to the bushings. At the same time the hollow camshaft provides a method of lubrication which is very efficient for motors of this type as it allows the oil to be fed under pressure through the camshaft.

Chain drive is employed for the camshaft which is not of constant section throughout its length. It is carried on three bearings which have respectively diameters of 1¼, 2 and 2 1/16 in. respectively. This design is worked out to give practically a constant strength throughout the entire length of the shaft allowing sufficient material to take the stresses developed at any point along the length of the shaft.

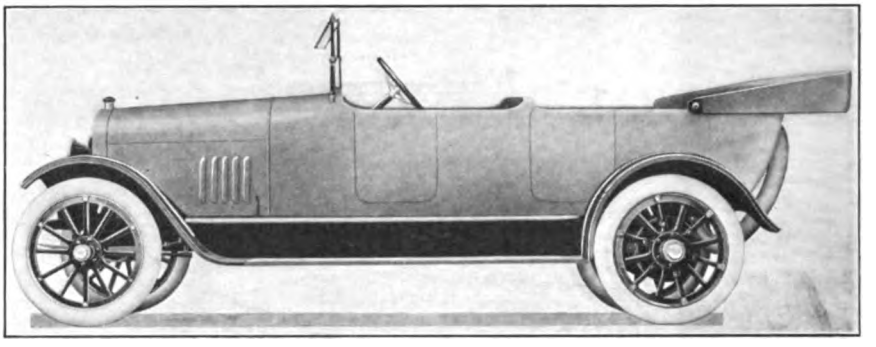
With practically the entire valve mechanism exposed and practically under the eye of the operator no fear for the possibility of weak explosions in one of the units of the twelve-cylinder assembly need be felt. The rocker arms are carried as shown in the illustration along a common axis provided with grease cups between each pair of arms, all of this being accessible by merely lifting the hood.

The water cooling arrangement is interesting, there being two outlets from the radiator to the waterjacket intake. The water enters the cylinders on the outside of the V at about half the length and from this point is carried and baffled so as to thoroughly cool the jackets for the full length of the motor. The water outlet from the cylinders is carried upward at the center through a common header and thence by rubber hose connections to the radiator. This arrangement provides a single inlet and a double outlet and thus allows the water to utilize all the available area of the radiator without danger of having two separate streams with a pocket in the center.

The ignition drive is directly from the camshaft and provides either automatic or hand advance as desired. It operates in connection with a battery system and a timer distributer is mounted at the rear of the engine with the wires carried through hose leads which prevent chafing against the water connections or the tops of the cylinders.

An interesting point in the design, and showing the characteristic rigidity, is the mounting of the fan bracket. This is carried on a platform at the forward end of the motor with the fan shaft projecting through the housing giving a firm support on both sides of the camshaft in taking the drive.

One of the places in which weight is saved on a motor of this type is in the flywheel. This has a diameter of 14 in. and a weight of 40 lb. The clutch is mounted in the flywheel and the bell housing is continued back from the crankcase. This gives a rigid support for the forward end of the gearbox. Three speeds are provided by the gearset which is made up of 3½ per cent nickel steel gears. The center control lever is mounted on the cover of the gearbox and, as will be noted from the illustration, this is a compact unit of small size.



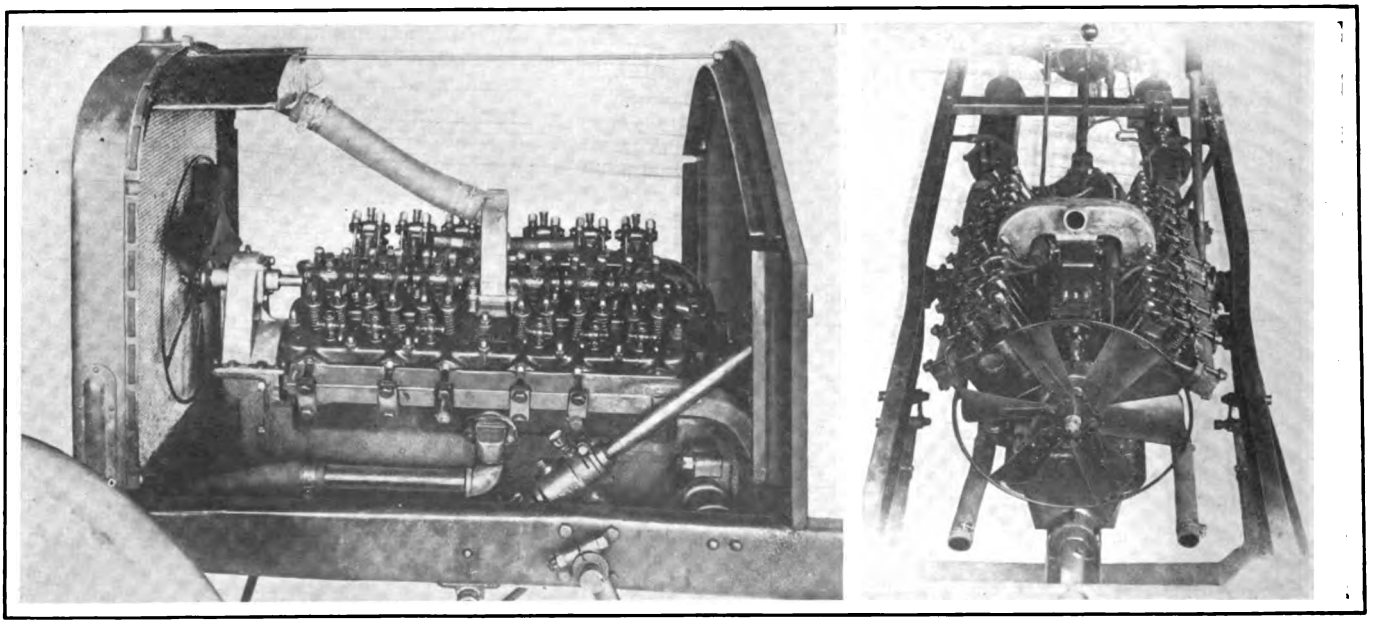
The Enger twelve-cylinder five-passenger touring car for 1916 which sells for $1,095. Note the smooth body lines and long appearance

The drive is through two universals of the Hartford type to a Hess rear axle. The differential gears are spiral bevel and are carried on Gurney ball bearings. The hubs are provided with Bower roller bearings and the torque is taken care of by a torque arm mounted on the axle housing and carried to the rear cross member. The propulsive thrust is transmitted through the cantilever rear springs to the frame side members. The cantilever rear springs are long, extending forward to a point well up along the frame and giving a frame which should have an easy action on rebounds.

Two Independent Mufflers

Other features about the chassis which should be mentioned include the mounting of the twin exhaust line with two independent mufflers which are swung between cross members and which provide independent outlets for the exhaust gases of each set of six cylinders. The frame is bottlenecked, allowing a narrow turning radius. The starting and lighting systems are accessibly mounted, the starting motor meshing directly with the flywheel and the generator being directly driven by chain at the forward end of the motor.

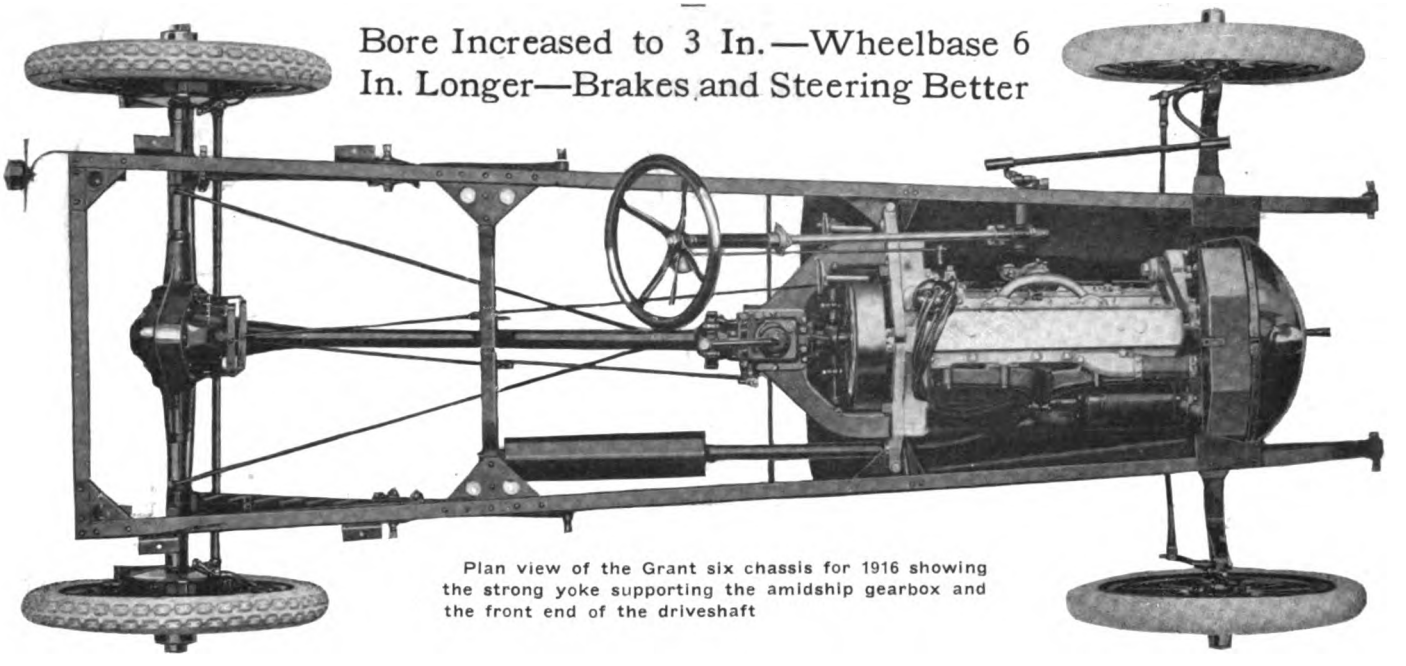
Standard equipment includes a five-passenger body with slanting windshield, Gemmer steering gear, gasoline tank in the cowl, Atwater Kent ignition and a full line of accessories and tools. In its finished condition the car gives a handsome appearance, being provided with real leather upholstery over hair cushions. The body is roomy and attractive, being thoroughly up-to-date in design and providing all the seating capacity necessary.



Left—Enger twelve motor mounted in chassis. Note the high narrow radiator and the accessibility of the motor due to its low mounting in the frame. Right—Front view of Enger twelve power plant as it appears with the radiator removed from the frame of the chassis. Note separate water intake for the two blocks of six cylinders and the large single outlet manifold at the top of the V

Larger Motor in 1916 Grant Six

Bore Increased to 3 In.—Wheelbase 6 In. Longer—Brakes and Steering Better



Plan view of the Grant six chassis for 1916 showing the strong yoke supporting the amidship gearbox and the front end of the driveshaft

NOW entering its second year, the Grant six, product of the Grant Motor Co., Findlay, Ohio, is a larger car with a motor of increased power due to enlargement of the cylinder diameter from 2⅞ to 3 in. The wheelbase has been lengthened a full 6 in., making it now 112 in., and this has permitted of much lengthening of the body and a better proportioning throughout. Coupled with these more important differences, the new Grant has also been considerably refined in a number of details which, though they do not show on the surface, help to make the car a better vehicle mechanically. For instance, the brake size has been enlarged to give greater ability to stop in a short distance; there has been a steering gear improvement, a slight added feature to the clutch, and the front axle has been increased in size. Though from these facts it is quite evident that the 1916 Grant is a bigger value than it was before, the price has been retained at $795 with complete equipment, this being possible, it is said, due to greater factory economies, and better manufacturing prices made possible by greatly increased production.

New Body Lines

The new body lines are the first thing to be noticed when inspecting the car. The popular trend has been carried out, and a modification of what is known as the boat-line design is used. The sides of the body have been somewhat raised, and the cowl is also brought up higher, with very little difference between the slope of hood and front of car. The hood is also higher to conform, and though the radiator retains the characteristic Grant round form, it is larger and more smoothly built.

In the rear, full three passenger seating capacity is attained by the length of the seat. To accomplish this, the body extends out over the wheels somewhat, and the fenders are set into the wheel houses. This not only gives a substantial construction, but adds to appearance.

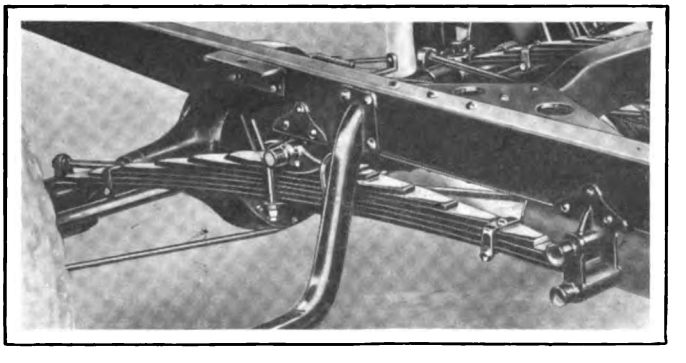
Mechanically, the Grant six employs the design wherein the power plant unit takes in clutch and gearset, and the rear axle unit incorporates a torsion tube surrounding the driveshaft. The engine is now 3 by 4¼, the gearset has three selective speeds, and the clutch is a cone type. Other specifications include Atwater Kent ignition, Allis-Chalmers lighting and starting, floating rear axle, and cantilever rear springs.

In increasing the motor bore from 2⅞ to 3 in., the Grant concern steps up the S. A. E. horsepower rating from 20 to 21.6, and increases the piston displacement from 165.5 cu. in. to 180.2. Thus, while the increase in horsepower does not show up materially in the rating, the displacement gives some idea of what the bore increase means. The engine, in fact, ought to give fully 10 per cent more power.

Overhead Valves

The Grant motor is an overhead valve design, with the valve rods running up from the left side. The valve rocker mechanism is completely housed by a cover plate at the top of the motor, so that when it is in position all that is visible of the valve mechanism is a portion of the rods. The head, carrying valves and rockers, water outlet connection and manifolds, is detachable from the main cylinder block, which is in unit with the upper part of the crankcase. The exhaust manifold is a separate casting bolting to the right side of the headpiece, but on the right there are two openings running to a two-branch manifold to take care of the incoming gases. The distribution passages are cored within the head casting.

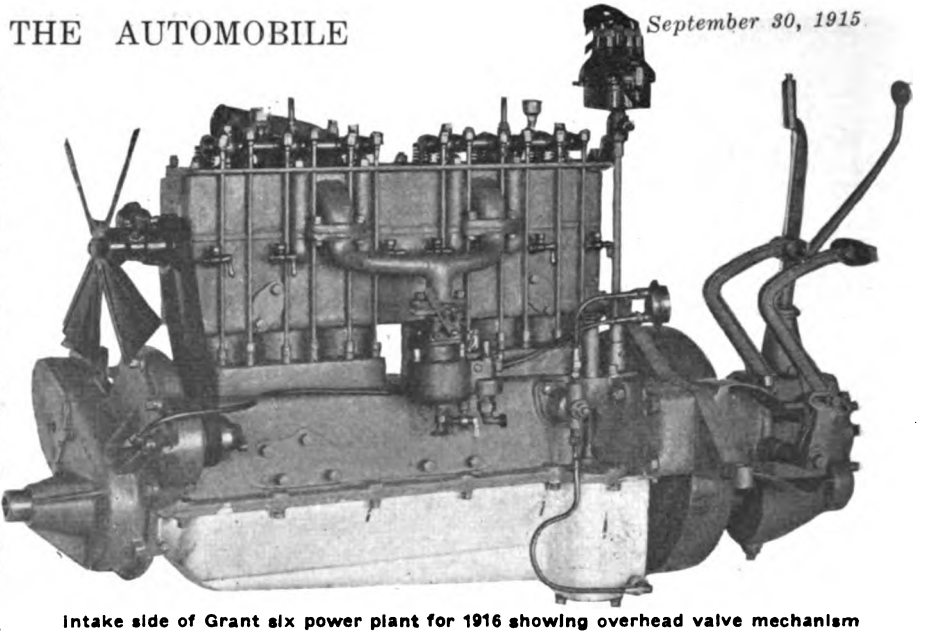
Instead of using the former mushroom type of valve tappets, the new form is of the roller design. The cams



Ingenious method of pivoting rear cantilevers under the frame

now come in contact with the rollers and thus the side thrust component is eliminated, this making for less wear and also tending to reduce noise. Then the method of assembling the tappets into the crankcase has been changed so that they can now be removed without disturbing the camshaft—a feature which will be appreciated if the owner ever has to take one of them out. The tappets have also been bushed, and there is no chance for oil leakage past them.

Standard practice prevails throughout the internal mechanism of the motor, and notable smoothness is attained through a good running balance to the reciprocating parts, coupled with rigidity of the crankshaft. This may partly be ascribed to the proportions of the three-bearing shaft and partially to the casting of the upper part of the crankcase in unit with the cylinders.



Intake side of Grant six power plant for 1916 showing overhead valve mechanism

In its application of the Allis-Chalmers single-unit starting and lighting system, Grant places the motor-generator on the right forward side of the engine base, bolting the head to the housing of the silent chain that drives it, and supporting the rear end on a bracket. This makes a very substantial mounting, which is one of the essentials of electric units of this kind. Between the head of the starter and the housing there is interposed an eccentric, drilled with a number of holes. Shifting of this eccentric, after the cap screws have been loosened, takes care of the chain adjustment. The storage battery is an 80 amp.-hr. type, and it is carried in a special steel basket concealed under the front of the right running board splasher. The electric system operates on 6 volts and is of the single-wire type with grounded return.

In the thermo-syphon cooling system the radiator is the only change. This is of an entirely new design for Grant, having a double construction. The outer shell attaches to the frame of the car and supports the inner core. Thus any weaving of the frame or other stresses to which the radiator might be subjected are absorbed by the shell and are not communicated to the core, which is thus made more efficient because there is less chance for seams to be sprung or leaks otherwise to develop.

Two gallons have been added to the capacity of the gasoline tank under the cowl, this feeding by gravity to the Rayfield carbureter which is fairly high on the left, and which is fitted with a waterjacketed manifold. No change has been made in the oiling, which is by a splash system with circulating pump feed and gage on the cowl board.

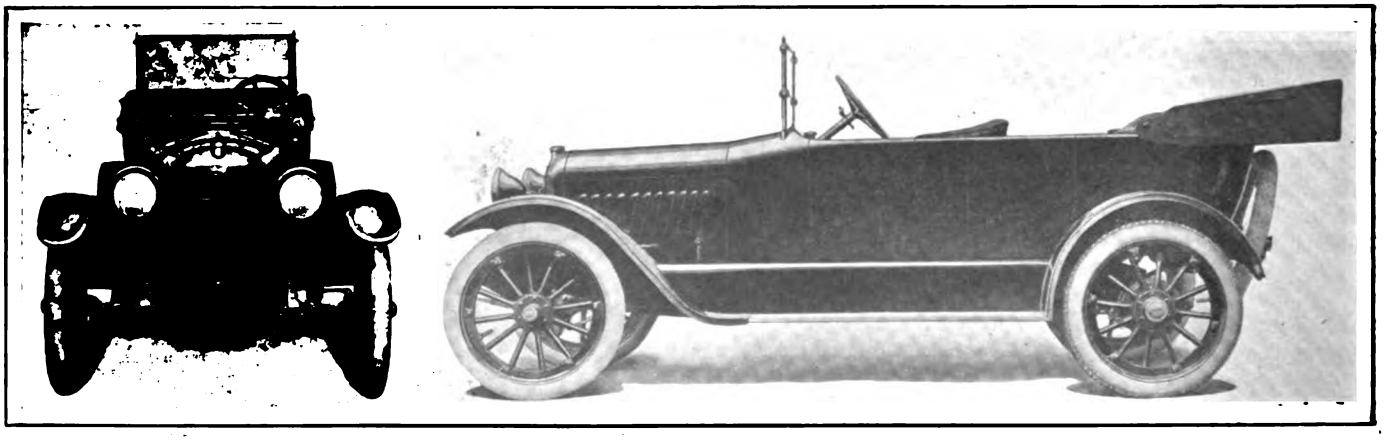
The Atwater Kent ignition distributer device now has a polarity switch, so called. This serves to prevent the fusing or corroding of the timer, and should tend to make the ignition even more reliable and permanent. The distributer unit is at the left rear side of the engine, driven by a vertical shaft which is itself operated by gear connection with the end of the camshaft.

The Transmission System

Construction of the driving mechanism back of the engine is quite conventional. The gearbox is bolted to the rear of the crankcase by a yoke construction. The flywheel is uninclosed, and the arms of the yoke pass around it to bolt to the rear of the supporting portion of the back end of the power plant. The yoke leaves plenty of room for the cone clutch and its operating mechanism. There is a refinement in the clutch to the extent of putting in a ball-bearing design of throw-out mechanism, making it easier to operate and at the same time lessening wear and reducing the problem of properly lubricating the bearing surfaces. Adjustment for the amount of tension of the engagement springs is quite simple.

Annular ball bearings carry the gearset shafting, which is very compactly arranged. Center control with a swivel lever is used, and the shifting mechanism is all assembled with the top plate that covers the gears. The torsion tube which incloses the propeller shaft finds a good front end mounting back of the universal joint, and has brace rods running diagonally back to the outer ends of the axle tubes.

In the back axle there is no change. It is a floating type, adjustable, and having differential and pinions on one carrier as is common practice. Ball and roller bearings carry the shafting, and there is an unusually large plate at the rear to get at the differential. With a gear ratio of 4½ to



Left—Front view of Grant six for 1916 which sells for $795. Right—Side view, showing smooth lines of Grant five-passenger body

1, this axle is well fitted to take care of the power it receives. In the braking system there has been a widening of the bands to give increased braking surface. The brake equalizers are mounted on the forward side of the axle housing at the middle, this method of positioning them calling for the use of but one brake rod forward to each brake control.

Cantilever Rear Springs

The rear cantilever spring suspension is nicely laid out for free action. The springs are of the full cantilever form, with the center trunnioned to the under side of the frame rail and the front end shackled to it. A considerable taper is given the frame from rear to front in order to make an easy turning radius and to offer good support to the sloping body along its entire extent. This construction of the frame is commendable, for while roominess of body has been accomplished, it nevertheless is not done by sacrificing the strength of the car as a whole. Frame cross bracing is also ample, for there is an intermediate member gusseted to the side rails in addition to the front and rear cross arms.

There have been some additions to equipment, each making for greater general satisfaction of the driver. The windshield, for instance, is of a new type with curved base and attached directly to the cowl with no filler board. On the rear wheels, non-skid tires are now fitted instead of plain treads, and besides this, Firestone demountable rims are now used. The tires are still 32 by 3½. Dimmers have been fitted to the lights, which will add to the comforts of city driving. On the cowl board, the electric instruments have been nicely grouped and a dash lamp added to illuminate them. In this electric unit group there are the polarity switch, ammeter, the electric regulator and the fuses. Bringing all the electric apparatus to one central point is a feature of the construction of the modern car's electric system which has developed along with greater reliability and general efficiency of the outfit.

An outward noticeable alteration in the new Grant is the standard body color. This has been changed from black to a Brewster green for the body. The fenders, hood and running gear are still black, however.

Why the 1916 Cars Are Cheaper

(*Continued from page* 597)

of price and cut off the peak of 1914 and then the decline to 1916 does not look so alarming.

What really has caused the excitement is not so much the cuts in the prices of known cars, but the advent of so many new ones. We have long been accustomed to cars selling at prices from $500 to $800 and we know about what to expect in the way of body comfort, appearance and finish as well as in road performance and chassis durability.

The fact that a good many more manufacturers have entered the field with cars in the $750 class does not affect the class of the $750 cars. Just like their more expensive brethren they are better cars for the money than we have had before, and for the same reasons precisely, but it is absurd to pretend that a little six at $750 or thereabouts is as good an automobile as the average of the $1,000 sixes of last season. Of course they cannot possibly be. Size has a good deal to do with it as a motor costs more or less according to its total piston displacement rather than according to the number of cylinders. When all the cylinder machining operations are done simultaneously on one block of cast iron a small six of 250 cu. in. size will be actually cheaper to machine than a larger four also of 250 cu. in., since all six bores are cut together more rapidly than all four of the larger size could be.

Considering new jobs which appear to be wonderfully low priced, one outstanding example has a six-cylinder motor of 249 cu. in., which model replaces a 165 cu. in. four made last year. The engine design of the new six is simplified by comparison with the old four and the new motor actually costs a little less than the four did. The rest of the chassis has been altered but little, because any transmission and chassis strong enough for a 165 cu. in. four is plenty strong enough for a 249 cu. in. six with its more even torque. Thus the new six is really no more costly to make than the old four.

Another instance is the appearance of a six bearing the name of a medium class manufacturer of good repute at less than $800. In this case examination shows a new motor for which the engine manufacturing concern has equipped, in conjunction with the class of gearset and axle components used in previous years for $800 to $950 fours. There is a considerable falling off in the body quality by comparison with the $1,200 job the same concern was making last season, but cheapness is secured by the use of a simpler outline as well as by cheaper fittings and cheaper upholstery.

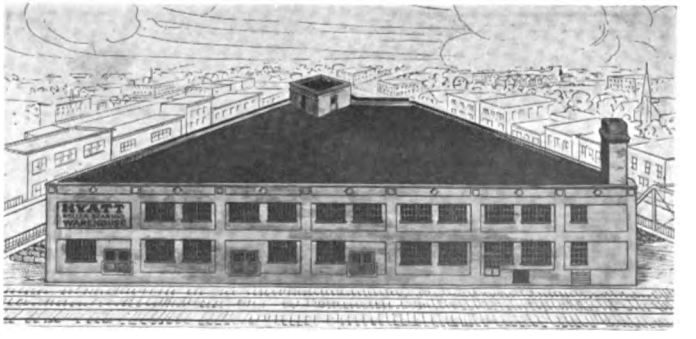
Another important body feature is the space, though there is some reason to think that this is being overdone on some of the light sixes. Some idea of this is obtained by wheelbase comparisons which are found to show only a very few inches increase, and where a new light six replaces a four, the added length is seldom much more than that accounted for by the extra pair of cylinders. Many of the new bodies appear much greater in length than they are in actual fact, by virtue of the straight lines of the design.

In the absence of any proper record of weights it is difficult to compare tire equipment, but as most of the new designs are lighter than those cars which they replace it appears that the 1916 automobile is rather better supplied with tire section than the car of 1915; certainly there is no falling off in this respect.

Conclusion Is Better Value Everywhere

It is instructive to observe, by the report of the N. A. C. C. given out recently that during the past year the total number of cars made by members of the association has increased 36 per cent, while the value of the total has increased only 10 per cent, and these figures give a fairly good idea of the real truth of the price drop; it is not so enormous. The outstanding fact remains that more car for less dollars can be bought to-day than ever before and more car service also. Take any price car from $500 to $5,000 and it will be a better one than could be had for the same sum last year.

Hyatt Bearing's Detroit Warehouse



The warehouse to be built by the Hyatt Roller Bearing Company on the Michigan Central R. R. in Detroit, Mich., will have a frontage of 225 ft. and will contain 20,000 sq. ft. in its two stories. The first floor will be on a level with the floors of the freight cars and the second floor will be on the street level. Freight will move in only one direction, Detroit freight going to the second floor while that for other points remains on the first

The Engineers' Forum

Art in High-Speed Motor Design—Quietness, Absence of Vibration and Power at Low Speeds Imperative

By W. B. Stout
Chief Engineer, Scripps-Booth Co.

DETROIT, MICH.—Editor THE AUTOMOBILE:—Mr. Gerster's series on the design of high-speed motors appearing in several issues of THE AUTOMOBILE last spring very thoroughly covered those technical engineering problems which are related to a motor's performance as a machine, and, as such, are not to be criticised.

A large part of modern automobile engineering, however, consists of the fitting of this technical engineering to the mind of the public in such a way as to make this engineering commercial, and a proposition of the least sales resistance. In this psychological branch of engineering, there are rules just as definite and mental formulas just as important as are the relation of valve lift to diameter, or heat-treatment to crankshaft material.

It is the ignoring of these items which very often condemns otherwise masterly engineering so that before laying down the high-speed motor for an actual production and sales proposition, these psychological items must be taken as part of the business and profession of the modern engineer.

Performance and Appearance

In order to sell, a motor must satisfy the mind of the buyer in appearance and performance. It must satisfy in appearance before he will give it an open mind on the standpoint of performance. In other words, it must satisfy his eye first. This makes the design—after the technical engineering is taken care of—a problem of art, and art rules which are just as definite as mathematical-engineering rules may be applied to the exterior of the motor even outside of its finish, which will gain the favor of the buyer through his eye, and thus instill in his mind the desire to see it work. A beautiful machine is beautiful because of its following of art principles, but a beautiful machine is always more attractive when performing the function for which it is designed. Hence, a motor in action is the next desired step to a prospective purchaser.

Lack of Vibration

The eye satisfied, the ear is the next mental stage to be appealed to. This is where the greatest problem of the high-speed motor comes to the designer of this type of American use, for quietness and lack of vibration is the first requisite in a really high class car.

The motor must sound right and must not give an impression of laboring nor of shaking itself out of the frame. This means abnormally light reciprocating parts on a gear ratio not abnormally low, and if the gear ratio is not abnormally low, where is the value of the high-speed motor?

The reason for the high-speed motor I have indicated in Fig. 1, showing a car with a 300-in. motor on a 2 to 1 gear ratio. This car will give a certain performance of pulling power and speed, but its greatest necessity is power at low speeds. An electric automobile of 2500 or 3000 lb. weight is generally fitted with a motor of 4 or 5 hp. This motor, however, delivers this 4 or 5 hp. at practically any speed, and with a 100 per cent overload possibility for continued periods. The gasoline motor to give an equal performance on a car of equal weight, must develop this 4 hp. at the slower speeds, and from this, must be able to carry the car up to a maximum of say 45 m.p.h. Forty-five miles per hour is all that the average public requires of speed.

Power at Low Speeds

Practically every owner makes this statement, but at the same time while boasting that his car will do 60 m.p.h., and saying that he never uses it, makes the statement "but I want that power at low speeds."

This power at low speeds—which is the most necessary power of all—is a question of gear ratio. The average owner in his touring, driving and his city work runs between 20 and 30 m.p.h., rarely exceeding this and very often running under it in average. This being the case, it is only reasonable that the motor of a car should develop its best power at these speeds.

If a high-speed motor is designed to run at 2500 r.p.m. normally with a maximum of say 3500 and the speed at the 2500 mark is 30 m.p.h., this would require a gear ratio of about 8 to 1 on 32-in. wheels. On a gear ratio of 4 to 1 on 32-in. wheels, this car would be doing about 38 m.p.h. at the best speed of the motor—2500 r.p.m.

Maximum Torque at Low Speeds

This is figuring from the horsepower standpoint, but the torque curve is the one which counts in this power item. An engine should show its maximum torque or twist at a fairly low speed and carry this along a straight line clear up to its highest revolution per minute. A motor showing its greatest horsepower or peak at 2500 may show its maximum torque at around 800. Figuring from this speed, on a 3½ to 1 gear ratio on 32-in. wheels, the car would be doing about 21 m.p.h. The problem in the high-speed motor however, is to have a torque curve which is at a maximum at as low a revolution per minute as is necessary, as many high-speed motors of the racing type do not show this torque maximum below 1000 r.p.m., which means on a 4 to 1 gear ratio about 32 m.p.h. in the average car.

Going back to Fig. 1, one can see why a high-speed motor on a low gear ratio is a wonderful advantage, for in Fig. 2 is shown a 100-in. motor on the same dimension chassis as in Fig. 1 with a 6 to 1 gear ratio at the rear. This arrangement will give every performance of the 300-in. motor except maximum speed, but the 100-in. motor will give well within the range of 45 m.p.h., and show below that point every power advantage of the 300-in. motor, and at some points even better performance. The 100-in. car can be made of one half the weight of the 300-in. car or even less, while the motor should weigh less than one fourth what the 300-in. motor weighs. This gives the 100-in. car every advantage in soft road, for the ability to pull through sand and mud depends on road resistance related to torque, and the resistance

on soft roads varies as the square of the weight. This is why a light car will go through mud and sand where the heavy car sinks in and fails, even with more horsepower per pound.

Fig. 2 thus gives the reason for the high-speed motor giving more power per pound of chassis weight, with the same motor car performance in half the motor car weight.

The limitation of the high-speed motor at present in America is not so much the engineering difficulty of building the motor, but rather of making a low gear rear axle which will be quiet and cheap enough for production. This is from the engineering standpoint.

From the psychological standpoint, the problem is to so balance the high-speed motor that the one riding in the car may not get the impression of a car always on second gear—a thing which the average driver will not like until he gets used to it, and in a sales period one cannot get used to these things. A high speed motor must therefore be wonderfully balanced and made with minimum weight in the reciprocating parts—an indication of the eventual arrival of multi-cylinder motors for all high-speed types.

Americans Dislike Gearshifting

One brings up the point that the Europeans do not gear their high-speed motors much higher than their lower speed motors, using the difference for speed alone. This is very true in most cases, but remember that the foreigner is allowed on these roads unlimited speeds, both by law and by road surface. Also, the foreigner likes to shift gears. When his motor runs to 1000 r.p.m. he shifts to second and takes pleasure in doing so. The American is annoyed if he has to shift gears to go up the side of a mountain, feeling that by racing his motor on second gear, he must make up for the speed he has lost in shifting from high. On this account, if the high-speed motor is to give the same performance below the American's maximum touring speed, a lower gear ratio must be fitted. The problem of the high-speed motor in America, therefore, first resolves itself not into a technical problem alone, for this practice is very well understood by now in America, but the difficulty lies in fitting high speed practice to those more or less distorted ideas which have been put into the minds of the American public, concerning motor performance on high gear. The engineer who can build a car with a high-speed motor on a low gear ratio, having the business-like appearance and the psychological sound and feel of right construction the first time you ride in it will first make a success of high-speed motor car construction in America.

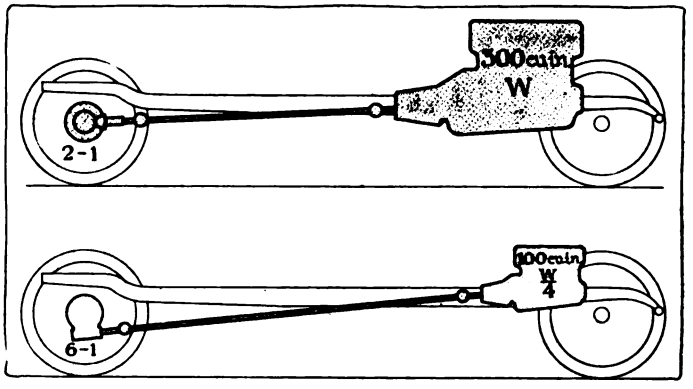


Fig. 1—300-in. motor, 2 to 1 ratio, car weight W. 1200 r.p.m. at 60 m.p.h. Maximum torque at about 40 m.p.h.

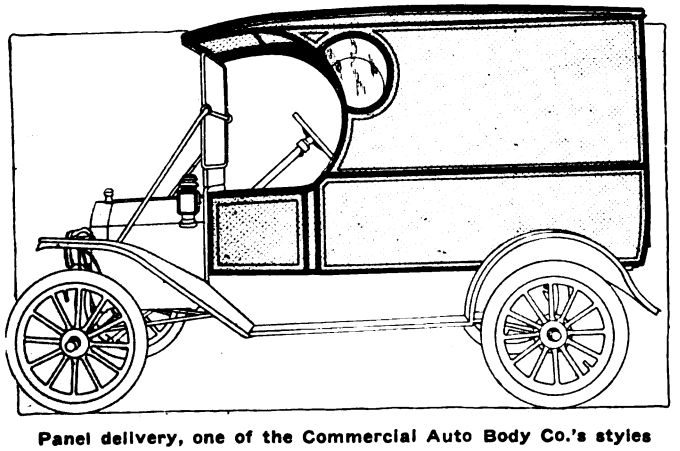
Fig. 2—100-in. motor, 6 to 1 ratio, car weight about $\frac{W}{4}$, 45 m.p.h. maximum at 3000 r.p.m. Maximum torque at 17 m.p.h.

An Eventual Type

As efficiency is always the basis of growth and development, and as better things are always an advantage to everyone connected, we have an indication that the high-speed ultra-refined motor is an eventual type, and it would be well if salesmen as well as engineers would follow the new development that they may make no mistakes in statements concerning their big motors which cannot be substantiated by the authoritative analytical engineering of Mr. Gerster's article.—W. B. Stout, Chief Engineer, Scripps-Booth Co.

Commercial Line of Delivery Bodies

The Commercial Auto Body Co., St. Louis, Mo., is putting out a complete line of bodies for delivery service and kindred commercial purposes which can be fitted to any chassis. These bodies are built with seasoned ash sills, ash frames with floors running lengthwise, reinforced hardwood floors with strips of steel, and durable trimming material. Leatherette is used in the cushions instead of cheap enameled drill, the cushions being one piece, open bottom spring design, locked in position so as to prevent them from springing forward and backward. All the roofs are full slatted, covered with heavy oil duck and on express bodies the curtains are of the same material.

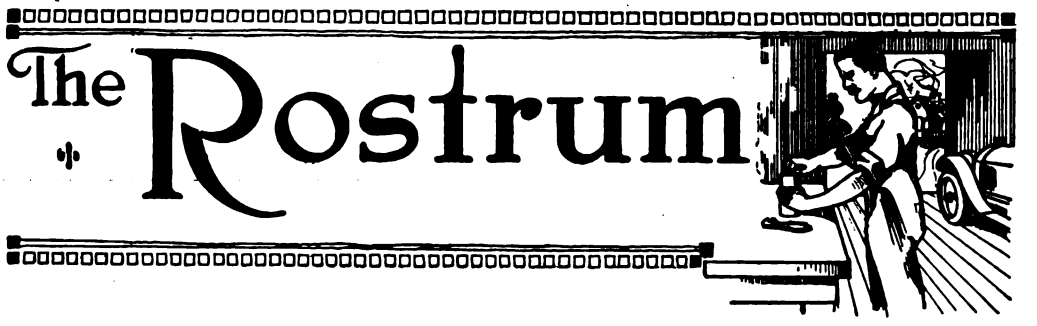


Panel delivery, one of the Commercial Auto Body Co.'s styles

Among the bodies which are made by this concern to fit any chassis, are the open express, full panel delivery, light-weight express top with screen sides, light-weight canopy style top with flareboards, suburban canopy style for station work, flareboard delivery, demountable flareboard box and general utility box inclosed with double doors.

These bodies sell complete for $100 with the exception of the light-weight canopy design with flareboards which is $90 and the flareboard delivery which is $60. The demountable flareboard box which fits on the back platform of a Ford roadster, or other type of roadster, is $14.50 for the Ford, and $19.75 for others. The general utility box is $25 complete, and can be made to fit snugly on the platform of a Ford roadster.

A special line of delivery bodies for Ford cars made to be placed either on the Model T roadster or touring chassis, is of special interest. This includes the following types: A panel side delivery body, 56-in. long and 53-in. wide with double doors, for $110; a panel delivery body of the same dimensions, with double doors having oval glass in the upper panels and drop sash windows at the side of the seats for $115, an all steel panel body for $120, an all steel delivery for $100, duck curtain delivery for $75, light panel side delivery for $82.50, and demountable slip on body for $95. In addition to these there are other bodies at corresponding prices.



Correct Slot-Size for Piston Rings

EDITOR THE AUTOMOBILE:—What is the proper width, or opening of the slot in a diagonally cut piston ring? Does it vary with the size or is it standard for different cylinder diameters?

2—Can a magneto, without disassembling, be tested on a shop bench to ascertain if magnets are weak without using special equipment? If so, how?

3—What clearance is allowed aluminum pistons in relation to the bore of the cylinders?

4—What is the factory rating of cylinder compression in pounds of the White 30, 45 and 60 hp. cars?

San Francisco, Cal. C. S.

—The size of the slot in a diagonally cut eccentric ring does not only vary with the diameter of the ring but also varies with the different manufacturers. Some only take out the width of the cutter, which will be approximately 0.015 in. Others make a practice of taking out as much as ¼ in. in all sizes. The latter is true especially for two-cycle motors of the marine type.

2—The magneto can be removed from the car and driven by belt at various speeds. If the magnets are weak, it can be detected by the weakness of the spark at low speed. If you will write the manufacturer of the magneto he will tell you the width of the gap that the magneto spark should jump under atmospheric pressure at different speeds.

3—This is a quantity which has not as yet been worked down to standard practice and varies in the different alloys and also varies for different manufacturers.

4—Compression in the cylinders of the White motor is 90 lb. for all the models mentioned.

Valve Diagram for a Model 19 Buick

Editor THE AUTOMOBILE:—Kindly give me a valve diagram for a Buick model 19 and also the gear ratio of this car in the three speeds.

Barberton, Ohio. F. S.

—The valve diagram for the Buick 19 is given in Fig. 2. The timing of this model is: Exhaust closes 1/16 in. after upper dead center and the inlet opens 3/32 in. after the upper dead center. The back lash is .005-in.

The gear ratios on the first, second, third and reverse speeds and also on the rear axle are as follows:

Speed	Reduction	Speed	Reduction
First	3.36 to 1	Reverse	4.32 to 1
Second	1.5 to 1	Rear axle	3.5 to 1
Third	Direct		

Valve Lifts of Various Motors

Editor THE AUTOMOBILE:—Do the valves of the Model T Ford open ¼ in.?

2—What is the diameter of the valves used on the Pierce-Arrow, Packard and four-cylinder Stutz?

3—Do the valves of the above named cars open an inch?

New York City. T. K.

—The valve opening is 1¼ in. and the lift 3/16 in.

2—The diameter of the valves on the Packard twin six is 1½ in. and the lift 5/16 in. On the Pierce there have been slight changes from time to time, but these points have not been varied to any great extent. The present models which this concern is building began to appear in June, 1914, and will continue until Jan. 1, 1916. They are known as the series 3 cars and the approximate valve diameters are 1 15/16 in. for the 38 hp., 2⅛ in. for the 48 hp. and 2½ for the 66 hp. The dimensions given are those for the smallest diameter of the valve as shown at *C*, Fig. 1. These are practically the same as the diameter at *A*, which is the passage immediately below the seat. The lift of the valve is measured by the distance *d* which is the eccentricity of the cam and is very closely 11/32-in. for the 38 hp., ⅜ in. for the 48 hp. and 7/16 in. for the 66 hp. on the exhaust side and a trifle less than this on the inlet.

On the Stutz the valve diameter is 3 in. and the lift 5/16.

3—This is answered under question 2.

Trouble Not Due to Magneto Setting

Editor THE AUTOMOBILE:—Would you please tell us how we could get at the gears of the National K-4 magneto on the Reo car so that we may set them because the spark is too late?

Manitau Beach, Mich. C. M. R.

—It seems quite certain that your trouble is not in your magneto. If the spark is late as you state, it is no doubt due to an improper adjustment of the breaker points, or it may be possible that the magneto has shifted slightly from its original position, which would have a tendency to affect the accuracy of the timing.

The instructions for the care and adjustment of National magnetos as issued by the National Coil Co., state that in setting the timing No. 1 cylinder should be placed in firing position at full retard and then the magneto should be set so that the traveling arrow on the timing dial is opposite to line No. 1. The coupling is fastened in this position and the magneto is then timed. The plug wires are then connected to the distributer terminals to correspond with the numbers on the timing dial.

Displacement Not Only Motor Criterion

Editor THE AUTOMOBILE:—On page 466 of THE AUTOMOBILE for Sept. 9 the following statement is made: "Another argument which is frequently advanced in favor of the long stroke motor is that for a given displacement per minute the piston speed is less." This is true only when the bores of the short stroke and long stroke motors are the same or nearly so. Then the long stroke motor has a greater piston displacement than the short stroke. Then most certainly the long stroke motor would pull better on hills. It is a bigger motor. It would then have a slower piston speed for a given displacement per minute.

Do you realize how absolutely absurd it is to compare long

and short stroke motors when they are not of the same piston displacements? Do you suppose that a 3 by 6 motor is more powerful than a 3 by 3 motor merely because the former is a long stroke motor? It is entirely impossible to make any fair comparison of the performance or qualities of long versus short stroke motors unless, first of all, they have the same piston displacements.

For several years, unscrupulous advertising managers and salesmen have been talking long-stroke nonsense. THE AUTOMOBILE is no place for such. A 3¾ by 5¾ single cylinder has 63.51 cu. in. piston displacement and not 97.5 as stated in the first column at the bottom of page 467. Why was it not stated that the compression pressure of 60 lb., 75 lb. and 90 lb. per square inch are the absolute pressures? How was F. E. B. to know from the answer given him that the pressures were absolute and not gage pressures?

Chicago, Ill. R. E. C.

—Very probably a good part of the discussion on long stroke motors has been due to the fact that there has been no absolute definition of long stroke. The average stroke bore ratio of American cars has been rising steadily since 1911. At that time the average motor was practically square with the ratio 1.01 to 1. The average stroke bore ratio of the 1915 car was very close to 1.33 to 1. Whether or not a motor with a 1.33 to 1 ratio can be called a long stroke motor is only a matter of opinion.

Regarding the matter of piston speed, it is of course a self-evident fact that piston speed is a direct function of length of stroke and with any two motors having the same displacement, the motor with the longer stroke has the higher piston speed for a given revolutions per minute since the piston must travel further in the same length of time. It is quite possible, however, to compare the efficiencies of motors which have not the same piston displacement because revolutions per minute is as much of a factor in calculating horsepower as is piston displacement. We may have two motors capable of developing the same horsepower with widely different displacements. The case you cite of a 3 by 3 as compared with a 3 by 6 is of course an extreme one and hardly likely to be other than self-evident, but on the other hand, consider the two motors as cited in the paper by J. G. Vincent on twelve-cylinder motors. In a part of this paper read before the Detroit section of the Society of Automobile Engineers, Mr. Vincent remarks that before bringing out the twin six a single six-cylinder motor known as the 28 was developed which contained practically 100 cu. in. less piston displacement than the 3-38 while it developed a horsepower practically equal to the latter. In line with this, he says, "I became more and more convinced that the small bore high-speed motor is going to be the final answer in this country as it has been in Europe."

While no direct reference is made to the length of stroke it is quite certain that a motor which had a ratio approximately equal to that in the twelve was meant. This motor has a bore of 3 in. and a stroke of 5 in., a ratio of 1.66.

The engine characteristics in other words, have had as much to do with the problem as mere displacement. If this were not true, the 300-in. cars could not have held their own with those of almost double the piston displacement on the race course.

The displacement you give is the correct figure and the compression pressures as you state are in absolute reading and not gage.

Dimensions of Buick Light Six

Editor THE AUTOMOBILE:—Kindly answer the following questions:

1—What is the bore and stroke of the new Buick light six, and what is the official record of miles per gallon of gasoline and the speed limit?

2—What is the speed limit of a stock Ford?

3—What is the highest speed ever obtained from a National stock car?

4—What car manufacturing company, if any, has adopted the new Weidely twelve-cylinder motor, announced in THE AUTOMOBILE for Aug. 19.

5—Is the fourth speed of 1911 four-cylinder White direct drive, or above, and if possible give illustration of how these gears shift. I do not know the exact factory model of this car but it is about 40 hp. and about 114 in. wheelbase, five-passenger car.

6—Is it still possible to secure a Shanhouse motor suit from the firm of this name of Rockford, Ill.? This is a one-piece garment used by motorists instead of an overall suit.

Norfolk, Va. I. A. S.

—The new Buick small six has a 3¼ by 5 motor. On page 587 of THE AUTOMOBILE for Sept. 23 appears an account of an official fuel and speed test made with this model in Chicago.

2—Speed limit of the Ford is between 45 and 50 m.p.h.

3—The National stock car won the Indianapolis Race with Joe Dawson driving in 1912, the average speed for the 500 miles being 78.7 m.p.h. Whether this is the highest speed ever obtained from a National stock car or not cannot be stated. This however, is an official record and represents the time over a 500-mile course.

4—The Weidely twelve motor has only recently been announced, and up to the present time THE AUTOMOBILE has no record of any one having adopted it as stock equipment.

5—The fourth speed is above direct and should only be used when the car has obtained a speed of 20 m.p.h. or better. Shifting is shown in Fig. 3.

6—Yes. This concern is still actively engaged.

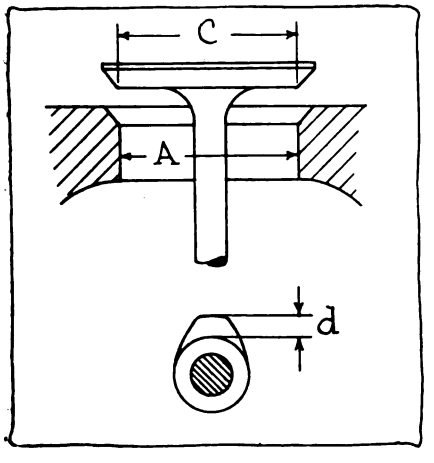


Fig. 1—Pierce valve dimensions, see letter

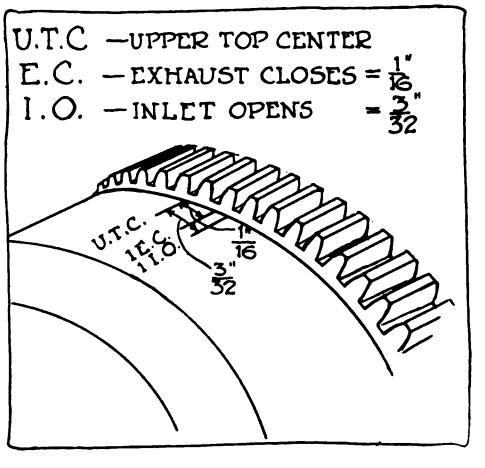


Fig. 2—Timing of Model 19 Buick

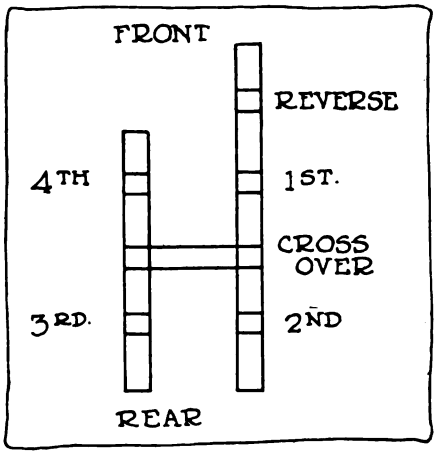


Fig. 3—Shifting order in White 1911

The Car That Stays Young

By M. C. K.

(*Continued from September 16, page 519*)

MUCH like a complicated character in fiction, the idea of The Car That Stays Young does not crystallize perfectly until it has been viewed from many different angles. The car is not the same when it can be expensive as when it must be cheap. No definition fits it exactly. It is not the car with minimum depreciation, because that quality may have been secured at a cost of production which is too high for what is gained or at the expense of efficiency or economy in service. It is not necessarily the same for one owner as for another, since city and country, mountains and plains, rough high-speed service and easy low-speed service require different construction features to afford equal values. Even the term "value," meaning the sum of desirability divided by the total cost, does not represent an idea which is quite parallel, since value may be found to exist through a lucky chance, as where radical construction features turn out well though insufficiently tried. A judicious conservatism marks The Car That Stays Young, but there is evidently a point where it must be more satisfactory to accept the risk of a promising innovation rather than the admitted and proved shortcomings of that whose place it takes, and in such cases the criterion may be: Whether it is quite clear that the innovation cannot react detrimentally in some unexpected manner upon other features in the car's construction or operation, and whether a mistake might be corrected inexpensively. Left side drive was, for example, at one time an innovation which had to be accepted cautiously, as it affected motor arrangements and, once adopted, could not be changed. Whatever influence it had on durability and the continuance of attractive appearance was not obvious, but such an effect might be traced to a better chance for avoiding side swipes in the traffic and to a certain simplification in style due to the removal of levers and quadrant from the outside of the vehicle. The elegance of The Car That Stays Young must usually depend on simplicity in lines.

Data Kept in Obscurity

Some current phrases throw a rather illuminative sidelight on the true character of The Car That Stays Young, as when the manufacturer frequently summarizes his claim for having done the utmost that his selling price allows him to do for his customers in the way of value and durability under the blanket guarantee of "careful attention to details," while it may be perfectly understood, and even agreed upon, that he first of all "gives the public what the public wants." All important progress in the durability of cars and in reducing the cost of car values has come by the opposite process of producing what the public ought to want and marketing it as fast as the public can be persuaded to want it.

In the gap between the car which the public is supposed to demand at some given price—presumably judging its desires from its past purchases—and The Car That Stays Young and can be sold at the same price, in each instance, there must be a considerable mass of data receiving scarcely any publicity, as they relate to those things which the public according to the evidence of the market does not expect or demand and among which each manufacturer cannot afford to champion more than one, if it is conspicuous, or two or three, if they are of a minor sort and can be slipped into the ensemble of an otherwise orthodox vehicle without too brazenly braving the public's supposed preferences. Where durability is the main point in the issue the publicity needed for making the public perceive its own best interests suffers further from the unexciting nature of this property which can be demonstrated only in the tamest terms and figures and rarely can be illustrated except by showing the lack of durability of something else—which would be "knocking" and is justly tabooed as an ungracious method of conveying information outside of confidential communications.

Although the subject is somewhat elusive when referred to in generalities, it may perhaps have been made clear that "careful attention to details" mainly concerned in "what the public wants" produces a deadlock against substantial progress and in favor of appearances; that is, in favor of making a $1,000 car look like a $1,500 car, a $1,500 car like a $2,000 car and so on throughout the scale of prices, with the inevitable result of forcing into relative obscurity the efforts and improvements which the public would appreciate if it knew or studied the facts but which under the circumstances can be made only piecemeal here and there and must make their way to recognition against the resistance of the industrial trend at large. Masters in the arts of publicity manage, to be sure, to demolish some of the fortifications of *status quo* where important innovations in engineering are concerned, as one such can justify an expensive publicity campaign and confers a profitable prestige if it "gets over", but with regard to the minor things whose importance lies in their aggregate and which are not aggregated in any one car but scattered among many, it does not seem possible to doubt that they must suffer where the tendency to "give the public what the public wants" prevails, and that there is occasion, therefore, to coddle them by gathering them in one fold as the attributes of The Car That Stays Young and according them a special publicity in one place. From this viewpoint The Car That Stays Young is revealed as the car which no manufacturer can afford to build in all its eventual completeness and variety—until it has become better known.

In the midst of a gigantic but unorganized industrial and commercial activity for producing and selling motor vehicles of all sorts, there should be room for one co-operative effort in favor of all the inconspicuous, and therefore neglected, virtues which it may be found possible to instil into a car, independently of the supposed momentary expectations of the public. It might also be found that these expectations are now usually diagnosed too cynically and that both home and export trade would respond heartily to a special cult of The Car That Stays Young—a cult which depends upon publicity collected in one place and the volunteering of detailed information to build up the Technology of Durability in Motor Vehicles.

A page will be kept open in THE AUTOMOBILE specially for data of this nature, under the caption: The Car That Stays Young, and contributions to these studies of durability are invited.

Remarks made in the two previous instalments with regard to fenders and running-boards, radiators and the means for their protection, mufflers, exhaust pipes and running-

board aprons, motor hoods and the positions of wheels have indicated some of the more important features with regard to which the public's expectations seem to clash with the substantial interests of everybody. For the present there remain only to be mentioned briefly a number of features in which early aging is often observed, while fairly numerous exceptions seem to prove that there are ways to avoid this result without sacrificing style or efficiency or increasing the cost of production perceptibly or at all.

Footboards and Pedals

Rusty pedals and pedal slots bear witness of thinly galvanized cast iron in the pedals and slot linings, and footboards showing wear from the foot soles in spots indicate the error of using a mere surface coating for the boards in a place where wear is unavoidable. Even linoleum is not as a rule of uniform texture and coloration all through, and the wear is therefore plainly visible. In taxicabs the boards are often only painted black and the slots are unlined, but there can be little objection to this economy for public cabs, as the systematic maintenance provides a new coat of paint when needed. For private cars the very general practice of employing single-color fiber sheets with brass fastenings and slot linings leaves perhaps little to be desired for cars with front doors and with cowls over the dash, in which the more or less tarnished brass trimmings are not conspicuous, but bronze suggests itself as more tasty and suitable under other circumstances and for higher-priced cars, and probably something better than galvanized iron could be devised for cheap ones. Rusty pedals, as well as crumpled fenders and running-board aprons cracked wide open in their front and rear seams, must eventually get into the same category as frayed trousers in the popular estimation and will then be held as evidence of sloth in people who can afford automobiles.

Public opinion has moved faster in Europe, in this respect, than here and even begins to hold dusty highways of the old kind against the counties which still tolerate them, especially in England. The automobile is no longer in itself an acceptable excuse for neglected appearances, and competition in providing the means for maintaining them is getting correspondingly keener—or was showing this tendency before the war interrupted the flow of minor industrial ideas in the European countries.

Motors and Their Mounting

With reference to types of motors, the inclosing of their organs, their relations to the clutch and gears and to the fan and radiator, their suspension in the frame, the material of the crankcasing, the drip pan or its omission, the type of clutch and a host of detail features in the whole power plant, it is evident that the questions of durability and of noises and troubles due to wear are too numerous and complicated to be considered under the caption of The Car That Stays Young, since most of them are still subject to technical discussion and inseparable from the motor design in connection with which they arise. On the other hand, while the motor organization in its decisive features must be worked out by the manufacturer on purely technical grounds, the public taking it or leaving it mainly upon faith and reputation, it is noticed that recently questions of durability and silence of the power plant have been publicly discussed on an equality with efficiency and power—as advantages, for example, in worm gears and valveless motors—but that little is yet done to explain those relatively simple and untechnical expedients by which one power plant is made to give more lasting and regular service to the car owner than another which from all the principal engineering viewpoints is of the same kind.

Taking the motor, clutch, gear and driving system for granted, with brief characterization of it in each case, what has been done to make the repairs simple and inexpensive and to have the whole plant work as well five years hence as to-day? An answer to this question separated from all considerations of efficiency, power, strength and convenience in operation would throw light on The Car That Stays Young if repeated with reference to a number of different power plants of each general type. The public cannot tell if a part is made of alloy steel or a bearing member has been casehardened or how well it has been hardened and polished. Assurances on these points count for little. But it can appreciate if bearings are bushed and if the bushings can be easily replaced. It cannot judge safely as to whether a multiple oilduct system, supposed to take care of a number of bearings, is really dependable, but it can be induced to look for an oil filter and other protection against dust and grit (without which safeguards a shaft running in a bushed bearing might be worn down more rapidly than the bushing), and it can appreciate having only a few oiling places to watch and keep time on. It may not be able to see trouble ahead where shearing strains on rivets are aggravated by frame weaving—as they may be through the manner of mounting a motor—but it can be made to guess the value of visible precautions in this respect if they are pointed out; the public being always understood as including the sales agents who in most cases act somewhat as the guardians of their patrons.

It seems probable to the writer that a great many valuable data on the durability of the power plant and its organs—from the radiator to the brakes—could be brought to the surface for public appreciation, if those most closely associated with designing and testing would present their experiences and information on this subject with a minimum of reference to the engineering data which are usually in the foreground and occupy the space but with distinct relation to cost of production. No doubt, some surprises might crop out in the way of showing the simpler, cheaper and perhaps lighter construction more durable than a more pretentious one, but more often the data would probably tend to demonstrate that The Car That Stays Young in its power plant must be designed with a large number of special and more or less costly provisions against wear and deterioration. The most interesting point of all is in reality that nobody can tell in advance what such data will show, as they have never been separately gathered and compared, and they might furnish strong clues to improvements. It may be found true that the power plant by virtue of replacements of parts is the most durable portion of a cheap car in one sense of the word and must be so, because no marked deterioration can be tolerated, and there may be suggested ways to extend the replacement system to those portions of a car which are now usually permitted to go on aging to the end like a suit of clothes.

Wire and Wood Wheels

If there is a decisive difference in the merits of wire and wood wheels it probably depends on climate, type of car and construction details in both the wire wheel and the wood wheel. A moist and hot climate and a fast car used roughly seem to predicate the wire wheel, while for other conditions the choice at present becomes mostly a matter of taste and style—with the questions of manufacturing facilities and finality in construction looming up large in the background as determining for car producers. The wire wheel has not yet been back in the American market long enough to establish a comparison on an equal footing, but the department of The Car That Stays Young will afford an opportunity for illustrating the public's experience with it, so far as durability, economy and appearances are concerned. Some very interesting data and opinions should be forthcoming bearing on the competition between demountable wire wheels and wood wheels with demountable rims. With reference to a

durability choice at the present moment, it can scarcely be in the first line of importance, as the writer has not for a number of years seen a car in operation that was disgraced by its wood wheels or one that was disabled by its wire wheels. A wobble is practically always in the spindle or axle or in the steering.

Steering Linkage

According to generally accepted practice the joints in the steering linkage should be as few as possible, to reduce the aggregate wear and play with the resulting noise and wobbling, each of them should be lubricated, those of the steering rod should be cushioned and held tight with buffer springs whose size and tension should correspond to the weight and speed of the car, those at the ends of the tie rod should be arranged so as never to give any perceptible play, either by means of adjustment or strong buffer springs, the tie rod should be capable of yielding enough—when wheels get wedged between ruts, for example—to avoid buckling the rod. Formerly tubular steering rod and tie rod of ample diameter and gage were considered indispensable for combining rigidity and light weight, and tube stock is still preferred for the steering rod, but now tie rods are usually solid and shaped with bends that permit a yield, especially when located behind the axle.

The durability of steering linkage varies notoriously and, as the above mentioned forms of practice leave room for a number of variations, it may be found possible by comparing notes to account for shortcomings without theorizing about the causes.

Seats, Seat Springs and Upholstering

A very large factor in the average car owner's satisfaction or dissatisfaction with his vehicle after its first six months of service comes under the head of seats, seat springs and upholstering, and no other features depend so completely on the public's common sense in adjusting their demands to the price which they are willing to pay. In a general way, the more movement and conforming are demanded of a seat the more rapidly it will become shabby and uncomfortable and the more art and money's worth will be required in its construction to make it last. And the more the movements of springs, stuffing and covers are localized the smaller is the chance for durability. Seat makers have not yet been accustomed to give technical consideration to specific pressures—pressures per square inch—elastic limits, permanent sets and fatigue or stretch of the materials with which they operate. They build to price with the old data of their art which were mainly based on stationary seats rather than seats required to work hard most of the time while in use. Recourse to real leather and real horsehair is neither sufficient nor economically available, and near-leather fabrics, being much improved here and much cheapened there, are uncertain materials so far as the public can tell. Discriminating engineering in co-ordinating the spring elements, if it exists in notable degree at all, needs a public airing, not only for the sake of developing it but to make clear the reasons for variations in the cost.

In front seats which are reclining and high under the knees, yet 12 inches deep in upholstery, the springs at the rear which support almost the entire weight of the driver, or his companion, are nearly always broken down, which is so much more natural as they are even required to work obliquely, and front seats of this description are not for The Car That Stays Young. The remedies are mostly obvious, however, awaiting only the public's insistence on having them applied. Probably almost any style of seat could be produced by rational compromises in the matters of economy, durability and permanent appearance. But for this purpose the free and public exchange of data seems again to be what is mostly wanted. For example, does anybody know of a deeply upholstered seat in a $700 car that remains presentable and comfortable after one year of average service? A description of its construction and materials with approximate cost of production would be valuable.

Doors and Hinges

Something about doors and the way they are hung proclaims class, but the subject is passed up here as too subtle. Still, the old and common solution consisting in making low-priced cars slab-sided and the doors flat does not seem final for a pleasure vehicle in which some grace of lines is expected. To make a car homely to have it Stay Young is soon found too much of a sacrifice when the eye gets tired of the homeliness.

Paints and Colors

To pick out of the intricate technical subject dealing with paints, enamels and varnishes something which we can all fully understand and apply in the purchase of a car or in estimating its probable durability, is probably beyond the possibilities as well as unnecessary. The chemistry of paints is advancing; the micro-physics likewise and it is possible to "cover" a metallic surface now in any one of several different tints and have the coating exceedingly thin, adherent, hard and attractive, so that baked enameling can be more and more dispensed with. Chemical coloration, including gun metal finish (which is scarcely rustproof, however) is also being industrialized for large-scale work. Expensive cars are seen in ever growing number on which there is no baked enamel or varnished paint in many slow-drying layers and which can be groomed without the caretaker going to school first with the old-time coachmakers. The art is developing satisfactorily, in other words, for car owners and for The Car That Stays Young. Only in the finish of close cars are the traditions still dominant though gradually giving way to the practical needs for a vehicle that is much more exposed to hard usage, dust and mud than were even the stage coaches of old—and they were simply painted.

What seems mostly to be required in the data on paints and colors for The Car That Stays Young, whose equipment or finish cannot be of speculative value, is a separation between the actual and the supposed requirements, between the actual means at command for producing a suitable, durable and renewable finish and those still frequently employed solely to "please the public." The public is already showing its willingness to do the rest.

Leather and Its Substitutes; Cloths

When material is tufted which is not adapted for tufting, and which is not recommended for tufted upholstery by its makers, one must expect to find the folds worn threadbare in short order, and of all the avoidable features which make a car prematurely old in value as a luxury a threadbare leather substitute is among the commonest. In some foreign markets, such as those of South America, it is reputed to be fatal to the continuance of trade.

Cloths, being by nature flexible and showing little difference in texture and colors whether new or worn, would probably be uniformly preferred were not the question of waterproofing in the way. This one problem, for which a number of more or less satisfactory solutions can be imagined offhand, may be singled out for the attention of the best informed, in the belief that it already HAS BEEN SOLVED in a manner more acceptable than the use of materials can possibly be which get old and grimy by a few months of exposure to wear, dust and sunshine. For the completion of The Car That Stays Young though not expensive, data on this point seem indispensable.

Lines of Wear

When a car has been handled much in public garages, and perhaps under other circumstances not so easily traced,

certain lines of wear make their gradual appearance, not always in the same places in different cars but apparently according to the chances for receiving bumps or abrasions or the imposition of oily hands. The question seems to be one of maximum exposure for certain portions of the car. If there is a remedy and it is simple it ought to be known.

With this mere outline of obvious ideas for The Car That Stays Young the writer hands over the subject to all those who are in possession of useful detailed data on Durability and Its Relation to Cost and Style.

Weak Spots Brought Out in German Trucks

DURING the German campaign in Russia last spring not only the soft roads were found impassable for heavy loads but highways which were apparently macadamized were revealed as merely thick layers of broken stone in many places laid on a miry foundation which the thaw released from its frozen bondage. The war trucks constantly broke through this undulating stone carpet, and their construction was sorely tried. A German engineer who made it a point to look up the troubles arising from this cause reports on the subject in *Automobil-Rundschau* for July with the avowed object of enabling the manufacturers to correct the weaknesses discovered. Mentioning firm names only if their records were found especially favorable, he makes in substance the following statements:

It was soon proved that the wagons of each and every firm have a special weakness. The commonest effect of the Russian roads was spring fractures. Practically none but front springs were broken, however, and these only in two characteristic places; namely, close to the front pivot exactly at the end of the first leaf adjacent to the single or double main leaf and, secondly, a few centimeters in front of the clip—rarely at the hole between the clips. Notably few fractures occurred in Daimler springs, which appear to be ground with unusual care. It happened that the spring forging at the front end of the frame was forced deeply into the road when a fracture took place.

Solid rubber tires of the most reputable makes gave out rapidly, but this was expected, being ascribed to the rubber famine.

Fractures of front axles occurred only with bent axles and only at the bends.

The manner of securing spring pivots and shackles to the frame was not always found substantial. In the case of one firm the lug carrying the rear spring shackle came loose regularly. It was joined to the lower frame flange by six rivets, and the rivet heads came off.

Ball bearings gave little trouble, excepting that neglected lubrication frequently caused abrasions in the ball bearings of front wheels in personal cars. In a few instances ball bearings in the gearbox were broken and caused great damage. A seized ball in a rear-axle gear ground pretty concentric rings into both bevel wheels.

Damage to radiators by collision is largely warded off by a fender rod in front of it. Nevertheless the radiators received innumerable injuries from diverse causes, including bullets and shrapnel of course. The field repair consists in soldering with tin, but pounds of tin are sometimes needed for reaching a small hole. In Büssing trucks flat brass tubes, vertical, take the place of the cellular system, and they have considerable strength and can be easily replaced when damaged. Only a few firms use similar construction.

Long-stroke motors were generally found preferable. One firm has placed the upper piston ring too close to the top of the piston, and the edge of the piston was often broken. Melting of crankshaft and connecting-rod bushings was too frequent; also ovalizing of crankshafts in their bearings. The melting of bushings was ascribed by some technicians to lack of viscosity in the lubricating oils, whose quality has suffered under the war conditions for lack of the usual supplies. But another explanation lies in the strong vibrations of the shaft which occur with long-stroke motors of high speed unless each crankpin is balanced by counterweights in its own transverse plane. This is too seldom done.

In motors with valves controlled from the top, which were found desirable in general, a considerable advantage was noted if the valves were vertical, as those operating at an angle frequently had to be taken out and cleaned.

Complaints of drivers had seldom any other object than the carbureter. One repair unit met them by ordering one hundred Pallas carbureters and regularly installing them in the place of those found faulty. These were uniformly designed and made by the car manufacturer. The specialists do better. The aviators, whose lives are staked upon the correct functioning of the carbureter, show marked aversion to one aeroplane in which this accessory is unreliable.

A truck whose rear-suspended fuel tank has no dents is a rarity. Many of them have a road clearance of only 25 to 30 centimeters. A strike against a stone frequently finishes them. The reduction valve is often clogged, and the need of keeping the tank and its tubular connections airtight, coupled with the introduction of impurities in the fuel from the exhaust gases, does not increase the popularity of the pressure-feed system.

An improvement in new two-wheel trailers, each for the transportation of three wounded where the roads permit, consists in replacing the ordinary hook-and-eye coupling, which allows too much lost motion and therefore too many sharp jerks, by a ball-joint device supplemented by a hinged brace.

Two views, showing part of one shipment of American trucks sold to Great Britain for war purposes. The trucks are of three makes, Locomobile, Packard and Peerless. The photographs were taken "Somewhere in England"

Demonstrating the

Five Cars Make 800-Mile Ru

Three of the Owen cars on the run traversing one of the typical mountain roads in Massachusetts

THE first public long-distance demonstration of the Owen magnetic car was made last week when the company made a tour of over 800 miles from New York City north through Albany, Lake George and Plattsburg, around the northern end of Lake Champlain, and back to New York by way of Burlington, Rutland, Manchester and Pittsfield. Five cars made the trip, these carrying press representatives from New York City. The tour was expressly for the purpose of showing what the Owen car, with its electric transmission instead of the conventional clutch and gearset, will do on all kinds of roads.

Typical Touring Route

The trip was over a typical route which led through the heart of the Adirondack mountains and also through the Green mountains and the Berkshires. There were long, steep mountain grades, and long descents. One day of heavy rains was encountered. The trip incorporated typical touring conditions so far as weather and roads were concerned.

The five Owen cars gave as good a demonstration as could be wished; in fact, there was nothing that savored of unfavorable performance in the entire 4000 miles total covered by the five cars. The cars were driven nearly half of the distance by press representatives in order that they might get a correct gage on their performance. These representatives invariably handled them through the mountain sections where difficulties would be most likely to arise if such were to occur.

Circle—Steep climb over a creek bank, the road through the field being overgrown with grass. This gives an idea of the kind of going to which the cars on the run were subjected

Below—Instrument board on Owen magnetic car. The two center dials are ammeters, the left showing the rate of battery charge and the right the torque of the gasoline engine of the car in amperes

Features of Driving

In driving a magnetic car there are many entirely different conditions met with, all of which are highly favorable to the electric type of transmission. Foremost come the pleasant coasting qualities. When descending a hill the car can over-run the motor at will, the same as in a conventional car with a gearset when the clutch is released; but in the magnetic this coasting occurs automatically, the driver not having to do anything. When the driver wishes to bring the motor again into use when the coasting is nearly finished there is nothing to do but press the accelerator and the car moves on without the slightest jerking.

Another pleasant feature of driving is the electric brake in which the braking is accomplished by the electric motor on the propeller shaft, this motor being converted into an electric generator which produces electric current when the brake is applied. This brake is applied by the small controller handle above the steering wheel which gives the different speed ratios of the electric transmission system. It is only necessary to move this lever, which is little larger than the throttle or spark lever on the conventional car, to what is called the neutral position, to apply the electric brake, which very rapidly reduces the speed of the car to 15 m.p.h. on the steepest grade and holds it there. In one descent over a mile long in the Adirondacks this brake demonstrated its effectiveness perfectly. An excellent feature in connection with using it is that when it is applied the power of the engine is automatically cut off and immediately the brake is taken off the controller lever cuts into the forward

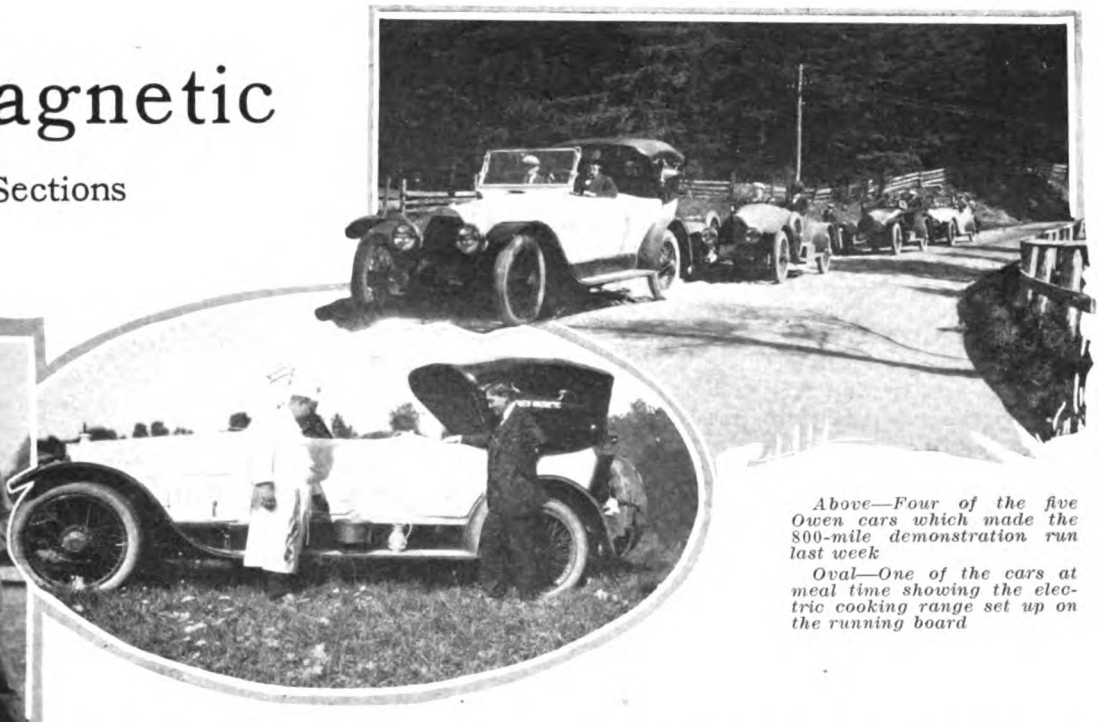
no
es on with.

Owen Magnetic

through Mountain Sections

R. M. OWEN RALPH OWEN

The Owen brothers, makers of the Magnetic car. R. M. Owen is president of the company and a heavy stockholder. Ralph Owen looks after the manufacture of the cars



Above—Four of the five Owen cars which made the 800-mile demonstration run last week

Oval—One of the cars at meal time showing the electric cooking range set up on the running board

speeds as needed. This gives a smooth, uniform change to acceleration.

Seven Forward Speeds

The car is provided with seven forward speeds through the electric transmission, all of these being obtained through the small controller lever referred to. There is no neutral position between these speeds, but you pass along from one to the other progressively. What is known as high speed is used for all ordinary running, and it is only on steep grades that lower speeds are used. In the lower speeds an electric motor on the propeller shaft assists in driving the car, this motor receiving its electric current direct from the generator which corresponds with the clutch, a storage battery not being necessary to supply the current. There is a direct drive on all speeds, the only difference between the high and lower speeds being that there is greater slippage between the fields and armature of the electric motor on lower gears than on high. On high the slippage is approximately 40 r.p.m. when the gasoline engine is operating at 1000 r.p.m. In other words, on a level road the gasoline engine works at 1000 r.p.m., let us say, and the propeller shaft is revolving at 950 r.p.m. In this speed the electric motor on the propeller shaft is not assisting in driving the car. On the lower speeds there is greater slippage between the gasoline engine and the propeller shaft, but on these speeds the electric motor is assisting the gasoline engine in driving. These changes are all taken care of automatically, the only work the driver has to do is to merely move the controller handle and regulate the throttle of the gasoline engine.

Emergency Low-Gear Ratio

The cars are provided with an emergency low-gear ratio between the gasoline engine and the rear axle, which is controlled by a lever. This lower ratio was not needed on the entire trip, which demonstrated that it is practically unnecessary for ordinary touring, although there might be conditions, such as long stretches of deep mud or heavy sand, where this would be used. It is not necessary for hill-climbing. On the tour there were long detours in the mountain sections of the Berkshires which led over the worst roads ordinarily encountered on touring, and on these the emergency gear was not necessary for the steepest grades.

Acceleration of the Owen car is particularly rapid, and is accomplished without the noise of going through gears. The controller lever is merely moved through an arc of slightly over 90 deg. There is no pause between adjacent speeds, excepting when high is reached, there is a slight forward impulse.

Most Hills Climbed on High

Nearly all of the hills were climbed on high, the driver only having to give a wider opening of the throttle. When lower speed ratios are used, the greater slippage in the generator corresponding with the clutch and flywheel generates electric current which is consumed by the electric motor on the propeller shaft, this motor then aiding in driving the car.

When driving the magnetic car more or less attention is given to one of the two ammeters shown on the instrument board on the opposite page, namely, that one immediately left of the speedometer dial. The reading of this ammeter is a good indication of the engine torque used in driving a car. When coasting down grade the ammeter dial stands at zero; when pulling on the level road at speeds of 30 or 40 m.p.h. it indicates between 50 and 70 amp., and when the engine is pulling its hardest on long hills on high ratio, it reads at 125 to 150. This ammeter is a fair indication of whether the engine is pulling its maximum. With a missing cylinder the ammeter may not show over 100 amp., which is immediate notification to the driver that everything is not working properly with the gasoline engine.

The ability of the Owen car to operate without a useful battery of any capacity was well demonstrated on the run when old Betsy, the second car built by the company, did not have sufficient battery to crank the motor, yet there was no difference in the operation of the car, the electric system working as if the battery were in a complete state of charge. This demonstrated the company's contention that the battery is only necessary for starting and lighting and not an essential in the electric transmission system.

ACCESSORIES

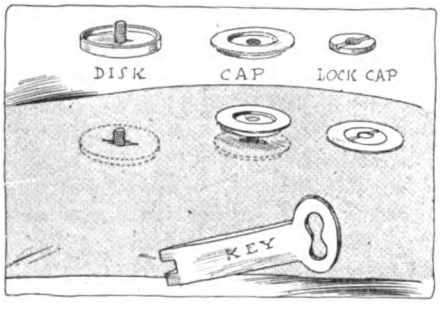
Warner Electric Clock

A CLOCK with a seven-jeweled movement is made electrically self-winding, current being supplied by one dry cell or, if so desired, by the electric lighting system of the car. When a dry cell is used it will keep the clock going for six months, and can be changed without handling any wires, the cell making its own connections when pushed into place. The dial is 3 in. in diameter and the figures, which are white on a black ground, are etched in metal. Setting and regulating can be effected without removing the clock from its place. Two models are made, one being of the flush type for dashboard installation and the other for mounting anywhere on the car, but not flush. Both sell for the same price, $15.—Stewart-Warner Speedometer Corp., Chicago, Ill.

Warner electric clock, showing dry cell attached

Spitler Puncture Plug

This device is designed to effect a permanent repair of punctures and small blowouts without the use of cement, or patches and without vulcanizing or soiling the hands. They consist of a disk with a threaded projection which is slipped into the puncture or blowout on its edge and which covers the under side of the tube or shoe where the puncture or blowout occurs; then, a cap is placed over the threaded projection of the disk so that it covers the outside of the tube or shoe; a lock cap then screws onto the threaded projection, holding the cap in place and being tightened by a key so that it is impossible for the tube to leak. The manufacturers claim that there is no friction between the plugs and the shoe, and that they cannot injure the fabric of the shoe nor the inner tube on this account. There is no pressure on the edges of the plug, they claim, so the latter cannot cut the inner tube. The plugs are made of brass and sell for $1 per set of four.—Spitler Puncture Plug Co., Inc., New York City.



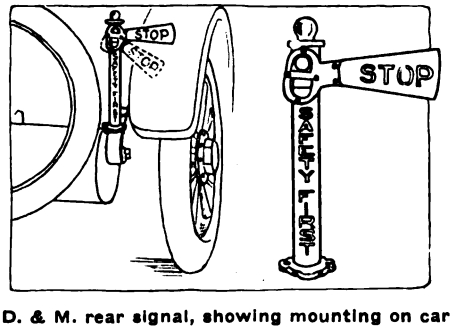
Illustrating use of Spitler puncture plugs

Wonder-Mist for Polishing

To replace harmful soaps, water or anything containing lye, lime, soda or potash which when dried carries with it the moisture of the varnish, Wonder-Mist has been put on the market. This is a transparent liquid containing no acid, gum or alkali. The oil which it contains is free from fats and is blended by a private process which, according to the makers, is a food for varnish and keeps it elastic.

This fluid is supplied with a sprayer and is distributed evenly over the surface in a fine mist, the process being to have this oily mist come directly in contact with the dirt loosening it and absorbing it so that where it is removed with dry cheese cloth it leaves the finish clean. About 10 sq. ft. can be cleaned and polished with one teaspoonful of the liquid. The makers claim that this is a large gain since when the polish is poured on the cloth about two-thirds is lost by absorption. Also they state that variations in the amount of moisture in the cloth give unequal distribution of the liquid.

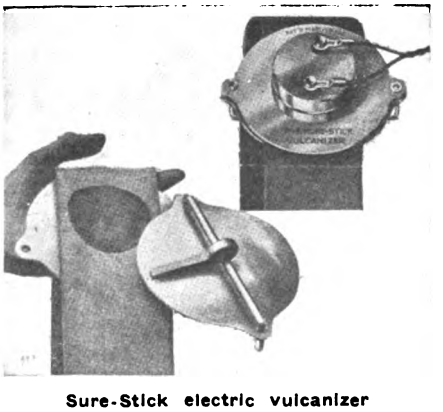
In removing the dirt it is claimed that the fluid introduces a film of oil between the dirt and the finish, allowing it to be readily removed without destroying the polish. It is claimed that transmission grease or engine oil to ¼-in. thickness can be removed, and road tar is also said to succumb to the Wonder-Mist. The price is $3 a gal., $2 for ½ gal., and $1.25 per qt., with sprayer free. —Wonder-Mist Co., New York City.



D. & M. rear signal, showing mounting on car

D. & M. Rear Signal

This signal is designed to render unnecessary signaling by hand the driver's intention to stop, being a simple mechanical device automatically acting on the semaphore principle when the brake is applied, through connection with the brake pedal. The signal clamps on the rear spring, no drilling of holes being required. Working parts are all inclosed and at night the device is electrically lighted. The makers fully guarantee its operation. The signal sells for $7.50.—Drabold & Mott Mfg. Co., Detroit, Mich.



Sure-Stick electric vulcanizer

Sure-Stick Electric Vulcanizer

The Sure-stick vulcanizer is heated by current from any 6-volt storage battery, a special clip and cable being supplied for making the connection quickly. It will vulcanize tube patches and small casing cuts; the makers state that it can be used on tube work while the car is running, saving time in putting spare tubes in order. The clamp can be released and the patch inspected while being vulcanized, and the vulcanizer replaced if the work is not sufficiently cured. Weight, 2 lb. The outfit includes the usual vulcanizing materials, and sells for $3.—Sackett & Ogden, Columbus, Ohio.

United Camp Cooking Outfit

This camp cooking outfit is especially for the use of automobile parties, the special features of which are the compactness with which the various utensils can be stowed away and the grid on which the pots and pans are arranged, with space below for charcoal or other fire.

The camping outfit, which should appeal particularly to automobilists off for a day's outing, consists of one 8-qt. aluminum cooking pot with cover, one

7-qt. aluminum percolator coffee pot, one aluminum frying pan with detachable handle, one tin-plated steel meat broiler and toaster, and one tin-plated cam grid and charcoal grate. These things all fold and fit together so that they really take a surprisingly small space when their bulk in unpacked condition is considered. In addition, special canvas cases are provided for carrying them. The cooking pot being the larger, the other utensils all nest nicely in it. The price of this complete outfit is $7.50.

The United company also sells several styles and sizes of grids separate from the complete outfits. These are arranged to fold flat, with the standards pointed to stick into the ground. With a charcoal grate below the grid, the article is priced at 75 cents in aluminized finish and 95 cents in tin-plated finish. This is the 10 by 14-in. size. There is a larger size, 13 by 21½ in., this selling at $1.10 and $1.35 for the two finishes. Then there is the type without the underneath grate, which comes at 50 and 75 cents for the aluminized and tin-plated finishes respectively in the 10 by 14 size. This same thing in the larger dimensions is 75 cents and $1.—United Steel & Wire Co., Battle Creek, Mich.

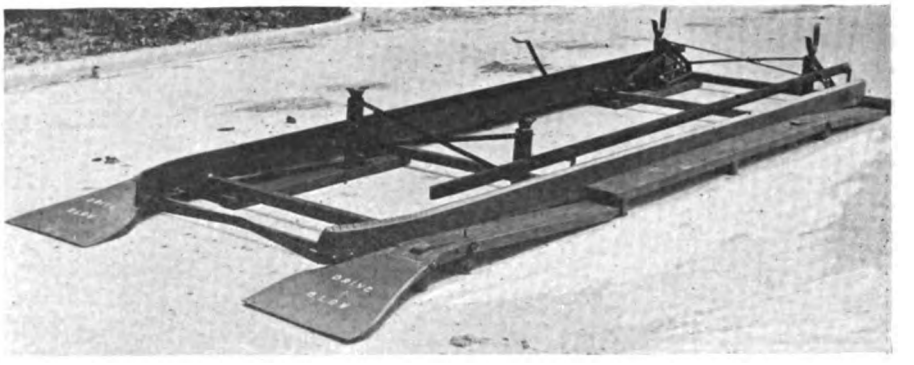
Su-Dig Series Ignition Plug

The Su-Dig spark plug is designed for use with two-spark ignition systems where there are two plugs in each cylinder sparking simultaneously, irrespective of whether the source of current is battery or magneto. The plug is intended to be placed between the magneto or coil and the second plug which may be of the conventional type. Preferably the series plug is placed over the intake valve and the other in the center of the cylinder head, or, if the motor is a T-head design, over the exhaust valve, though this is a matter of union.

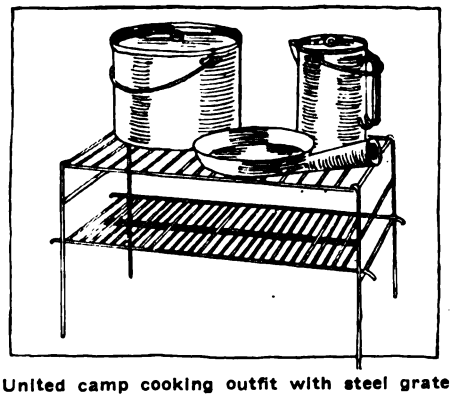
The insulation is of heavy porcelain, and there are two insulated electrodes with two outside binding nuts, the wire from the source of current being attached to one while the other is connected to the second plug which is grounded in the conventional manner. The Su-Dig plugs sell for $1.50 each.—Superior Motor Specialty Co., Philadelphia, Pa.

Lennon Light Protector

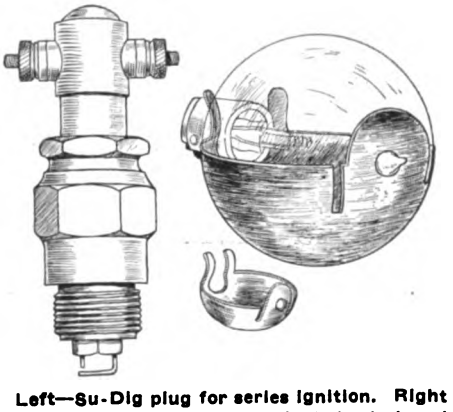
This device is designed to prevent headlight rays from being reflected upward, thus keeping them from glaring into the eyes of drivers of cars and wagons approaching, while at the same time not interfering with the illumination of the road in front of the car. It consists of a nickel-plated spring-brass shield which slips over the bulb, covering the lower half and leaving the upper half clear. The light rays which would ordinarily be reflected upward from the lower portion of the lamp are cut off and only those which are reflected downward on the road from the upper portion are permitted to escape. The price of the protectors is $1 per pair.—Lennon Mfg. Co., Willimantic, Conn.



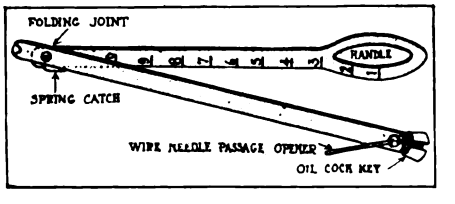
American automatic four-wheel jack, showing rubber-cushioned heads and drop sections



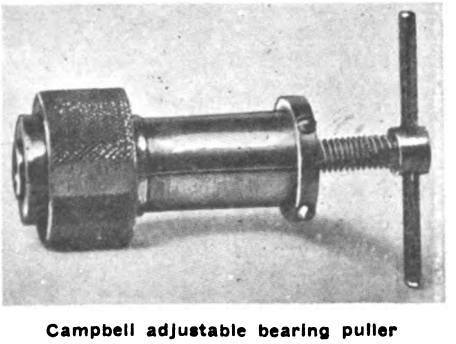
United camp cooking outfit with steel grate



Left—Su-Dig plug for series ignition. Right—Lennon Light Protector which is designed to prevent headlight glare



Manzel gasoline and oil key for Fords



Campbell adjustable bearing puller

American Four-Wheel Jack

All four wheels of the car are run up on runways, which form part of the jack; the axles engage with four rubber-cushioned supporting heads and drop sections under the wheels are automatically lowered when the car reaches the proper position, leaving the tires an inch clear. To release the car a pedal is pressed, when the car moves backward off the jack. Price, $37.50.—American Automatic Jack Co., Hicksville, Ohio.

Manzel Oil and Gasoline Key

This is a folding tool for Fords, 24 in. long open and 13 in. folded, with an oil-cock key and an oil-cock cleaning needle on one end and a gasoline tank scale marked on the shank. With the oil-cock key the oil-level cock under the engine can be reached and tried without difficulty, and if necessary the oil and other passages can be cleaned out with the wire. The scale on the shank is marked to read in gallons to indicate the quantity of fuel in the Ford tank. Price, 60 cents.—Charles W. Manzel Co., Buffalo, N. Y.

Campbell Bearing Puller

A device for pulling magneto, electrical generator, or other bearings of this type, has often been found a necessity in shops doing work on electrical apparatus. With this device it is simply necessary to slide a large knurled ring back toward the handle of the device, allowing the jaws to expand. The puller is then placed over the bearings and the ring again pushed back toward the bearing, which will lock it in place, after which the bearing can be pulled out by turning the handle screw to the right. The puller is adjustable to different sized bearings without any other tools, which makes it a valuable device, since it is self-contained. The material used is steel throughout. The device sells for $10.—Campbell Auto Works, Stockton, Cal.

Left—Before Cadillac eight test on Chicago speedway. S. D. Waldon drinking milk. Also shows Ferdinand Jehle of A. C. A. and drivers W. J. Davidson and Philip Robertson. Right—Cadillac eight averaging 72.49 m.p.h.

Cadillac Eight Touring Car Goes 100 Miles in 82 Min. 46 Sec.

DETROIT, MICH., Sept. 27—In a test run just made on the Chicago speedway under the supervision of the Automobile Club of America, an eight-cylinder Cadillac touring car, fully equipped and carrying a spare wheel and tire, covered 100 miles in 82 min. 46 sec., or at an average speed of 72.49 m.p.h. Windshield and top were down. The fastest lap was made in 1 min. 38 2/5 sec., or at a speed of 73.17 m.p.h., a new record for touring cars.

Two cars were tested, one a new car out of regular production which had never been run prior to being driven to Chicago from Detroit. It had covered 345 miles when the tests began. The other car had been used for experimental work, but the first made the better time, although by only a small margin.

Both cars were put through 100-mile runs, and their performance was strikingly uniform, the new car beating the older one by 1 min. and 30 sec. for the 100 miles. Each car was also given a 1-hr. test, the new car traveling 72.41 miles in that period, which was 1.35 miles more than the other ran in an hour.

The older car traveled the 100 miles in 84 min. 16 4/5 sec., or at the rate of 71.19 m.p.h. The two cars made a total of 200 miles in 167 min. 2 4/5 sec., also a touring car record for this country. The drivers were members of the Cadillac organization.

Indiana S. A. E. Talks Twelves and Aluminum

(*Continued from page* 602)

the single carbureter is the practical arrangement for all touring car purposes so far as we know at the present time. If you are building a motor for the highest possible speed, then you may use a double carbureter or even more carbureters. I believe four would give more power. In fact, I have a twelve-cylinder Sunbeam with four carbureters which performs very well at high speed but not very well at low speed. As to the gasoline economy, I made an official test in Chicago on the board track—which doesn't mean anything—which ran 13 miles to the gallon, at an average speed of 30 m.p.h., or just over that, thinking that would represent ordinary touring speed. By leaning the mixture one notch on the dash control I could have made fifteen, but it would not have been good business, as it would not be the way a customer would drive the car.

"I think every engineer has had experience at some time or other with some fellow who was some sort of a mechanic and would get possibly twice as much mileage and get it consistently, but he would be proud simply of his mileage and would not care for his car to run smoothly and sweetly. Now, the best information I have as to how these cars are going to run under actual conditions is the record of the demonstrators. I have taken the record of the demonstrators which have run several thousand miles and naturally as a technical man would, I have kept track of the gasoline consumption and the grand total is an average of 10.2 miles per gallon. That has been done under demonstrating conditions, where the car was idled, where it ran slowly, pulled hills on high, and where high speed had to be shown. It was about average running conditions to the customer. Some customers will have more favorable conditions and some average conditions will not be as favorable. I try to keep away from giving actual figures on gasoline economy because I have found figures vary too greatly and you cannot be sure the customer will get the same mileage you can, unless you make it absurdly low.

The compression is about 19.5—that is, the combustion chamber is 19.5 of the total volume. We take our compression at 120 r.p.m. and in our case it goes to 75 lb. compression."

Cadillac eight on straightaway on Chicago speedway during tests

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, September 30, 1915 No. 14

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
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SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Vindication of the V

THE paper on the twin six engine read both at Detroit and at Indianapolis by J. G. Vincent has been remarkable by reason of the fact that it has stirred up no opposition, no real criticism, in the discussions. If the Packard twelve had appeared a year earlier, if Mr. Vincent's paper had been read simultaneously with D. McCall White's on the eight last winter, what a storm of disbelief would have been raised!

That the earlier paper raised so much excitement while the later one is treated rather as a matter of course is certainly due to the complete success of the V motor principle as applied to modern engine designs. There is now no longer any opportunity to express disapproval of the duplex connecting rod, the carburetion or ignition layout, the cooling or the power output of a V motor *because* of its being a V.

There are plenty of engineers who hold that four or six cylinders properly applied can give as good results as eight or twelve, and it is very interesting to observe that their ideas do not seem to make good material for discussion in a meeting. It is now clear that early objections to the "complication" of V motors have been overcome, that the strongest engineering objections were matters of mechanical detail rather than of principle, and it is a remarkable thing that the engineering outlook should have changed so much in so short a time.

Speedways and Engineering

PROBABLY the Indianapolis speedway has this year been the scene of more testing work than ever in its history, excepting tests made solely for racing purposes, as visitors from Detroit have made great use of it in addition to the permanent usage of the Indianapolis manufacturers. Not only this, but the Chicago track has also been employed for tests that are demonstrations, or demonstrations that are tests. All this activity on the speedways is serving to again demonstrate their immense value to automobile engineers as testing grounds.

A really good track in Detroit, owned by the manufacturers of Detroit and intended for testing rather than for racing would improve the average Detroit product at least 20 per cent within a year or two. It would be worth the while of every manufacturer to put down a good sum and contribute an annual income for the building and upkeep of such a track and it is remarkable that a scheme along this line has not yet developed. But there is another side to the speedways as well as testing and racing, and this is their value for demonstration performances such as the recent speed tests of Packard and Cadillac at Chicago. There is hardly a member of the industry who does not agree that cars will be sold more and more on performance and less and less on specification, so the value to a manufacturer of officially observed tests is immense, from the publicity viewpoint.

With the speedways thus tending to assist the manufacturer by helping him to improve his cars by private test and to demonstrate the result by public test, the owners of the tracks have a right to ask the automobile manufacturers to be a little more generous. There are two ways of enabling the speedway corporations to make a reasonablee trading profit, one being a wider use for testing and a slightly higher rate of pay for demonstration runs, the other to build more racing cars and help to make American cars that will beat and replace the foreign vehicles. The public will flock to see racing just so long as that racing is good racing, and it cannot be good without the annual production of good speed cars, for the old ones cannot be used again and again.

Speedway Opportunities Neglected

Recent developments in speedway circles show that this is realized, but the making of racing cars is not a task lightly to be undertaken, and it is impossible to hope for more than a moderate number every year. This being so, there is a growing feeling that the increasing public interest in automobile performance will re-create the stock car events. To devise stock car rules is not impossible, and that the public would be attracted to see stock car racing is incontestable. Then, too, there are one-make races which will always draw every owner of that make from miles around and there are other things as well. If every member of the trade would give a little time to thinking on the subject, would realize what an immense asset the speedway is to his business, we should soon have schemes enough afoot to utilize the speedways properly and profitably.

France to Declare 45% Tariff

American Cars Imported Into French Territory to Pay—War Orders Exempt

PARIS, FRANCE, Sept. 27—*Special Cable*—On good authority it has been declared that France will shortly follow the lead set by England, by declaring a duty of 45 per cent on all American cars sold into France or its possessions. This new move is looked upon as a protection measure of the French automobile manufacturers against the American industry and also as a source of revenue. America has a tax of 45 per cent on French automobiles imported costing over $2,000 and of 30 per cent under $2,000. The present action of France exactly reverses the situation. At present the duty on American cars entering France is 75 francs per 100 kilos, or $15 for every 220 lb. On a car weighing 3000 lb. the duty is $225. On the 45 per cent basis this duty will be nearly $700 or more than three times what it is at present. This duty will not affect war orders of trucks or automobiles, but will have a serious effect on American manufacturers retaining agencies in France.

Heretofore England, which has been the greatest purchaser of American cars, has been a free trade country, requiring no duty whatever on American cars entering the British Isles. The present duty of 33 1/3 per cent entirely changes the aspect of American makers so far as export business is concerned.

Moline Plow to Build Cars

FREEPORT, ILL., Sept. 25—The Moline Plow Co., has decided to abandon the construction of buggies in one of its two plants here and, instead, will construct automobiles. The demand for carriages has dwindled rapidly with the increase in automobiles and it is likely that the company will gradually make the shift in other plants as business conditions warrant. The officers of the Moline company are now planning the model for their automobile construction and may reach a definite conclusion during the coming fall or winter.

Kelley Maxwell Consulting Engineer

DETROIT, MICH., Sept. 28—William Kelley has rejoined the Maxwell Motor Company's staff as consulting engineer with especial duties in adapting car design to manufacturing facility.

Moloney Gibney New York Manager

NEW YORK CITY, Sept. 29—Edward F. Moloney has joined the forces of the Gibney Tire & Rubber Co. as manager of the New York branch. He started in his new position Sept. 27 with complete charge of sales in the New York territory under the direct supervision of General Sales Manager C. A. Gilbert. Mr. Moloney was formerly manager of the solid tire department of the Firestone, New York branch.

Sales Manager Gilbert has left for the Coast to establish a branch in San Francisco that will take care of the growing truck tire business West of the Rockies.

American Car Agents in England Oppose New Tax

LONDON, ENGLAND, Sept. 24—It was declared to-day that the 33 1/3 per cent ad valorem import duty on all automobiles and their parts will at present affect only the American manufacturers. The purchasers of American cars will have to pay the new duty, except in the case of one low-priced car. The manager of the London office of this firm explained that only one-third of each car of this make sold in this country comes from America so that duty has to be paid only on one-third of the value of each car.

Several other American cars, however, already have put up the price, one of them being raised $235, while a more expensive car has gone up from $2,300 to $3,000.

Representatives here of American automobile firms are strongly opposed to the new tax urged by Reginald McKenna, the British Chancellor of the Exchequer. A reduction of 15 per cent will be asked.

Anderson Reports Good Conditions

DETROIT, MICH., Sept. 29—Lee Anderson, sales manager of the Hupmobile, who is on the coast, having driven from Chicago there, reports that there is more automobile business in the West than the manufacturers can possibly supply this year. Dealers are generally short of cars and the demand everywhere is exceptionally great.

Joyce Leaves Kelly-Springfield Truck

SPRINGFIELD, OHIO, Sept. 25—James Joyce, for two and one-half years Eastern manager of the Kelly-Springfield Motor Truck Co., this city, has resigned to become Eastern manager of the Houk Mfg. Co., Buffalo, N. Y. Mr. Joyce's resignation becomes effective Oct. 1, 1915.

Hartdorn Grossman Factory Rep.

NEW YORK CITY, Sept. 28—L. G. Hartdorn, until recently production manager of the Emil Grossman Mfg. Co., Inc., Brooklyn, N. Y., has been appointed factory representative to cover the manufacturers in the territory west of Buffalo.

Fail to Settle Time for New Cars

N. A. C. C. Committee To Meet in New York Oct. 6—Definite Action Expected

DETROIT, MICH., Sept. 29—The committee of the National Automobile Chamber of Commerce, Inc., met here yesterday with the hope of evolving some solution of the troublesome question of announcing new models at all seasons of the year, and after considering all of the data on hand, was unable to make any definite announcement as to how the trouble could be remedied. An adjournment of the committee was made to meet in New York, Oct. 6, when some definite action will be taken. Those comprising the committee are: Hugh Chalmers, president Chalmers Motor Co.; John N. Willys, president Willys-Overland Co.; C. W. Nash, president General Motors Co.; C. C. Hanch, treasurer Studebaker Corp.; Alvan Macauley, vice-president and general manager Packard Motor Car Co.; W. C. Leland, manager Cadillac Motor Car Co.

Kansas City Dealers Favor Announcing New Cars Jan. 1

KANSAS CITY, MO., Sept. 24—The Kansas City Motor Car Dealers' Association has put itself on record as favorable to an announcement of their new models for the forthcoming year on Jan, 1 by all automobile manufacturers. A resolution to that effect was adopted by the association at its most recent meeting without opposition. The meeting was that for the election of officers and there was a very large attendance. The consensus of views was that the present plan of making these announcements at uncertain and irregular dates causes confusion and the change proposed is in line with the sentiment of automobile dealers throughout this part of the country.

The association fixed the date of the next automobile show for Feb. 7, 1916, and set in motion the arrangements to make the exhibition the greatest ever given here. Record sales are expected during the coming winter.

Officers Elected

Nelson W. Riley was chosen president of the association, William Brace vice-president and the following were made directors: W. E. Mallory, George A. Bond, Estell Scott, Chas. A. Williams, H. G. Kirkland, A. F. Norton and Henry Bruening. Mr. E. E. Peake will, it is understood, continue as secretary-treasurer, but that election does not come until later.

Chandler Declares 25% Dividend

Board of Directors Favors Issue of 200% Stock Dividend on Common

CLEVELAND, OHIO, Sept. 28—A 25 per cent quarterly cash dividend on the common stock payable to the stockholders Oct. 1 has been declared by the Chandler Motor Car Co., this city. The board of directors also voted in favor of a 200 per cent stock dividend on the common stock subject to ratification by the stockholders Nov. 2.

The common stock of the Chandler company is now $225,000 and if the stockholders ratify the 200 per cent stock dividend this will be increased to $675,000. The preferred stock of the company is $200,000.

Imperial Four Now $850

JACKSON, MICH., Sept. 23—Taking effect to-day, according to an announcement made by J. I. Handley, vice-president and general manager of the Mutual Motors Co., maker of the Marion and Imperial, the price of the Imperial four will be $850. This is a cut from $995, made effective July 1 this year and a reduction of $235 since last season. The price of the Imperial six remains the same.

Edison Battery on Ward Special

NEW YORK CITY, Sept. 27—The Ward Motor Vehicle Co., New York City, will offer its Ward Special, a 750-lb. delivery wagon, for $875 on easy monthly payments, with one year's rental of the Edison battery included. This offer will be open until Oct. 31. The plan is to be tried in Greater New York and New Jersey and may be extended to other cities in the future.

Indiana Service Men Meet

INDIANAPOLIS, IND., Sept. 29—The first of three annual meetings of the Indiana Automobile Service Managers' Association, will be held at Hotel Severin in this city, 3 p. m., Saturday, Oct. 29. The meeting will be of the get-together type, with an address by President H. W. Drew, followed by talks by other members on the recent service managers' convention in Detroit.

Couple-Gear Trucks for England

GRAND RAPIDS, MICH., Sept. 22—Negotiations are pending between the Couple-Gear Freight-Wheel Co. and representatives from the British army, concerning the building of eighty scout motor trucks for Great Britain. These trucks are to be similar to several which the local manufacturer has furnished to the United States Government, and are to be used especially in searchlight and radio work. The trucks are 16 ft. long and 6 ft. wide and have a 60-hp. motor. It is said they will cost $10,000 each.

Studebaker Has 76,000 Orders for 1916 Cars

DETROIT, MICH., Sept. 24—The Studebaker Corp. has over 70,000 domestic orders scheduled for 1916 cars, and more than 6000 orders for shipment to foreign countries, including Canada, Great Britain, Australia, India, China, Philippines, South Africa, South America, Cuba, Porto Rico, Central America and continental Europe. The plants are working to full capacity.

De Lorenzi Sails for London

NEW YORK CITY, Sept. 27—Ernest A. DeLorenzi, export manager of the Maxwell Motor Co., sailed on the Orduna Saturday for his headquarters in London. Mr. DeLorenzi reported that Spain and Portugal are the biggest buyers of motor cars on the continent at the present time. There are scarcely any sales to Norway, Sweden, Holland and Denmark because of the tire embargo situation.

Regal Winter Tops Ready

DETROIT, MICH., Sept. 29—The Regal company has now its series of detachable Sedan tops for winter use for all three of its 1916 models. The new top takes the place of the standard one-man type which can be quickly replaced for summer use. The detachable Sedan type is finished in accordance with the remainder of the body, is electrically lighted, and has large glass windows.

New Studebaker Convertible Top

DETROIT, MICH., Sept. 27—The Studebaker Corp. is now offering a new convertible Sedan top at $150. The top is easily applied to both four and six-cylinder touring models, and weighs but 75 lb. more than the touring car top. The glass of the windows and panels is removable, and when in place, the top is wind, water and weatherproof.

Lozier Moves to Cleveland

CLEVELAND, OHIO, Sept. 25—Harry A. Lozier, who announced last June the H. A. L. twelve, selling at $1,750 either as a two-passenger roadster or seven-passenger touring car, has moved from Detroit to Cleveland. A description of the car appeared in THE AUTOMOBILE for July 1.

Trade Review of the Past Week

Detroit Factories Still Rushed—Dealers Report Good Sales Conditions in All Sections

DETROIT, MICH., Sept. 28—The demand for cars continues unabated, and with favorable conditions, dealers are quite outspoken in their belief that the year will close as a record one for them, so far as this territory is concerned, at least.

The increasing of the price of the Packard cars has not surprised the selling field here to any great extent, for they believe it quite logical under present materials market conditions, and as a matter of fact, they believe that more such advances would not be out of reason. The price increasing of this kind is not regarded as any hindrance to the sale of a car of the Packard type, and there is a general commendatory note regarding it.

Factories Behind Orders

At the Cadillac plant they are now building ninety cars a day, and all departments are working to that schedule. Ford continues to feel a strong demand, and is the usual number of orders behind. The present manufacturing schedule is about the same as it has been for some time—2000 cars total being made in the plant here and branches throughout the country. The factory production is about 500 completed cars now. September sales of Maxwells are said to be far beyond August, which were double the sales of the same month a year ago.

The financial statements of the concerns which have made them public have come in for a great deal of favorable comment among the trade. The feeling is quite general that management of all the concerns has been of the best, and that in spite of some damaging conditions early in the past fiscal year, the makers have so far as possible anticipated the prosperity now being experienced, and have been commendably alert in the matter of conserving every penny in order to give the people better cars for the money, and making money for themselves at the same time.

Good Conditions Everywhere

District representatives calling on the trade in all parts of the country report almost uniformly good automobile conditions everywhere, and the same optimistic view is held by dealers visiting here. They say, however, that in some sections other lines of business do not seem to be feeling the same degree of prosperity. The business man is rapidly awaking to the necessity of the automobile in his business.

Detailed Export Statistics Show That U. S. Dominates Automobile World

United Kingdom Continues Best Buyer, Taking 2619 Cars Worth $3,836,296 in July—France Imports 615 Worth $1,260,693—Big Gains in Exports to S. A. and Asia

WASHINGTON, D. C., Sept. 28—America's supremacy in the automobile world is shown in the latest export figures, published this week exclusively in THE AUTOMOBILE. These figures are in addition to the gross figures published exclusively in a recent edition.

When exports of commercial cars jump from fifty, valued at $106,400 in July, 1914, to 2469, valued at $6,803,001, in July last, and exports of passenger cars leap from 1265, valued at $1,143,419, to 4118, valued at $3,835,347, during the same periods, there can be no question about the United States dominating the automobile world. To this must be added the exports of parts, which jumped from $420,975 to $1,663,997 during these periods.

United Kingdom Largest Buyer

In value of imports from this country the United Kingdom continues to hold first place. The imports of cars from this country into King George's domain increased from 227 cars, valued at $183,988, in July, 1914, to 2619 cars, valued at $3,836,296, in July last. During the seven months ended July these imports from this country increased from 4967 cars, valued at $4,087,763, in 1914, to 14,494 cars, valued at $21,998,-112, in 1915.

Sixteen cars, valued at $15,803, were shipped to France in July, 1914, while in July last the number had increased to 615 cars, valued at $1,260,693. During the seven months' period these exports increased from 1044 cars, valued at $625,-636, in 1914, to 4268 cars, valued at $10,547,826, in 1915.

Italy's imports of cars from this country are not as large as formerly. In July, a year ago, there were sixteen cars, valued at $8,640, shipped to that country, and in July last there were also sixteen cars shipped, but the value had dropped to $6,340. The seven months' period shows that the exports to Italy dropped from 228 cars, valued at $147,-388, in 1914, to 108 cars, valued at $63,-295, in 1915.

While Germany imported sixteen cars, valued at $17,364, from the United States in July, 1914, that country failed to receive a single car from this country last month, while the seven months' imports dwindled from 1063 cars, valued at $799,552, in 1914, to four cars, valued at $2,800, in 1915.

Under the heading "Other Europe,"

Exports and Imports of Automobiles and Parts for July and Seven Preceding Months

EXPORTS

Automobiles

	July				Seven months ending July			
	1914		1915		1914		1915	
	Number	Value	Number	Value	Number	Value	Number	Value
Commercial	50	$106,400	2,469	$6,803,001	443	$648,241	13,428	$37,499,768
Passenger	1,265	1,143,419	4,118	3,835,347	18,499	16,170,181	22,897	20,454,354
Total	1,315	$1,249,819	6,587	$10,638,348	18,942	$16,818,422	36,325	$57,954,122

EXPORTS BY COUNTRIES

Automobiles

France	16	$15,803	615	$1,260,693	1,044	$625,636	4,268	$10,547,826
Germany	16	17,364	.....	.....	1,063	799,552	4	2,800
Italy	16	8,640	16	6,340	228	147,388	108	63,295
United Kingdom	227	183,988	2,619	3,836,296	4,967	4,087,763	14,494	21,998,112
Other Europe	152	130,227	1,144	4,033,680	2,366	1,876,114	4,822	13,089,008
Canada	257	386,234	643	428,348	3,356	4,069,621	3,961	3,192,526
Mexico	2	1,647	19	22,001	54	65,974	61	56,306
West Indies and Bermuda	40	35,033	377	197,292	320	286,063	1,704	916,448
South America	90	62,288	315	157,964	872	709,239	1,212	643,718
British Oceania	311	237,780	382	335,698	2,587	2,233,471	2,369	2,046,047
Asia and other Oceania	115	121,896	252	189,227	1,179	1,110,001	2,178	4,309,410
Other countries	73	48,919	205	170,809	906	807,600	1,144	1,088,626
Parts of (not including engines and tires)	...	420,975	.....	$1,663,997	.....	$3,911,018	.....	$7,343,119
Total automobiles, etc	...	$1,670,794	.....	$12,302,345	.....	$20,729,440	.....	$65,297,241

Tires

Belgium	.....	.....	.....	.....	.....	$301	.....	.....
Germany	.....	$6,090	.....	.....	.....	81,917	.....	.....
England	.....	156,961	.....	$548,729	.....	889,793	.....	2,477,883
Canada	.....	99,514	.....	66,409	.....	649,764	.....	522,234
Mexico	.....	4,218	.....	8,027	.....	32,140	.....	65,451
Cuba	.....	.....	.....	41,788	.....	.....	.....	165,627
Australia	.....	.....	.....	34,089	.....	.....	.....	220,631
Philippine Islands	.....	10,953	.....	22,107	.....	67,106	.....	172,857
Other countries	.....	63,881	.....	168,205	.....	381,071	.....	673,300

IMPORTS

Automobiles

Cars, carriages, other vehicles, and parts of: Automobiles, and parts of—Automobiles..No. dut.	13	$26,168	16	$35,365	104	$178,631	133	$219,826

IMPORTS BY COUNTRIES

Automobiles

France	4	$8,543	6	$17,218	46	$88,709	39	$78,720
Germany	3	6,755	.....	.....	9	15,128	.....	.....
Italy	1	1,000	.....	.....	18	22,798	22	28,526
United Kingdom	3	4,072	1	1,947	13	28,979	25	53,206
Other countries	2	5,798	9	16,200	18	23,017	47	59,374
Parts of (except tires) dut.	.....	$104,338	.....	$8,494	.....	$602,829	.....	$387,797

which embraces all European countries not mentioned above, big gains are shown. In July a year ago 152 cars, valued at $130,227, were sent to these countries, while in July last the number had increased to 1144 cars and the value to $4,033,680. During the seven months' period the exports to "Other Europe" increased from 2366 cars, valued at $1,876,114, in 1914, to 4822 cars, valued at $13,089,008, in 1915.

Canada's imports of cars from this country have taken a jump, increasing from 257, valued at $386,234, in July, 1914, to 643, valued at $428,348 in July last. However, during the seven months' period the exports amounted to 3356 cars, valued at $4,069,621, in 1914, and to 3961 cars, valued at $3,192,526.

Although Mexico is having war the figures show that exports of American cars have increased from two, valued at $1,647, in July, 1914, to nineteen, valued at $22,001, and from fifty-four, valued at $65,974, during the seven months of 1914, to sixty-one, valued at $56,306, during the same period of 1915.

The West Indies and Bermuda have taken a big jump in the imports of American cars, the figures showing that forty cars, valued at $35,033, were imported there in July a year ago, increasing to 377, valued at $197,292, in July last, while during the seven months' period the imports increased from 320 cars, valued at $286,063, in 1914, to 1704 cars, valued at $916,448, in 1915.

South American Gains

South American countries are taking more kindly to American cars, the figures showing that the exports to our Southern neighbors increased from ninety cars, valued at $62,288, in July a year ago, to 315 cars, valued at $157,964, in July last, while during the seven months' period the exports rose from 872 cars, valued at $709,239, in 1914, to 1212 cars, the value of which, however, was only $643,718, in 1915.

The exports of cars to British Oceania in July, 1914, were 311 cars, valued at $237,780, increasing to 382 cars, valued at $335,698, in July last, but during the seven months' period there was a drop from 2587 cars, valued at $2,233,471, in 1914, to 2369 cars, valued at $2,046,047, in 1915.

Asia Also Gains

Exports of cars to Asia and other Oceania are increasing. In July, a year ago, the number exported to those countries was 115 and the value, $121,896, increasing to 252 cars, valued at $189,227, in July last, while during the seven months' period the number exported increased from 1179, valued at $1,110,001, in 1914, to 2178, valued at $4,309,410, in 1915.

The detailed tabulation of exports and imports is given herewith.

Mexico to Canada Non-Stop Run

Chandler Six on 1789-Mile Trip Without Stopping Motor or Wheels

CHICAGO, ILL., Sept. 28—*Special Telegram*—With but two days' preparation a Chandler six stock touring car started last Sunday from Tia Juana on what is claimed to be the most strenuous automobile tour ever attempted. From Mexico to Canada, without stopping either the wheels or the motor, is the record for which C. H. Hunter of Los Angeles and four companions are trying.

Eat and Sleep in Car

The non-wheel non-motor stop Chandler passed through Sacramento at 4 o'clock with the speedometer registering 767 miles. The total distance for the trip is 1789 miles and it is claimed that unless the tires blow out or the men break down under the strain the run will be completed at an early hour Thursday morning.

The men are eating and sleeping in the machine as well as taking gasoline and oil on the run from the Chandler dealers along the route. A long funnel with an elbow is used to get at the gasoline tank. The run attracted such wide attention in southern California that the Universal Film Corp. sent a camera operator on the tour to tell the story of the great demonstration of the efficiency of the modern automobile in film for the Universal Weekly. This is the first time that a picture company has devoted a reel to an automobile demonstration without cost to the manufacturer.

The car passed through Marysville, 815 miles, by morning half way to the Canadian line on the first non-stop run across the United States.

Equipment Features

Equipment features of the car are: Goodyear cord tires, Gray & Davis electric system, both Klaxon and Sparton horns, Boyce Motometer, Stewart speedometer and vacuum fuel feed, Bosch spark plugs, Rayfield carbureter and Monogram oil.

Rules Gasoline Is a Domestic Necessity in Texas

AUSTIN, TEX., Sept. 27—According to a ruling of the state attorney general's department gasoline is a provision and a domestic necessity and as such it can be sold on Sunday mornings up to the hour of 9 o'clock. One of the State's blue laws permits the sale of certain foodstuffs, produce and milk before 9 o'clock in the morning on Sundays. While gasoline is not mentioned in the law the attorney general holds that it comes within the exempted provisions. However, the enforcement of the so-called Sunday law as to gasoline and other articles and goods is confined to only a few towns of the State. In all the larger cities gasoline is sold all day long and it is also possible to buy most kinds of foodstuffs and nearly everything else except intoxicants on Sunday. The request for a ruling on the sale of gasoline question came from the county attorney of Hays county at San Marcos.

S. O. Raises Gasoline 1 Cent in St. Louis

ST. LOUIS, MO., Sept. 29—*Special Telegram*—For the second time in two weeks the Standard Oil Co. to-day followed the lead of the independent refiners by raising the price of Red Crown gasoline 1 cent per gal., the new price being 10.9 cents. Since Sept. 15, the independents have been selling their No. 3 gasoline at 9.9 cents from wagons and at 11 cents at filling stations. It is expected that the independents will soon announce another increase as they have declared their intention of bringing the price back to 17.5 cents where it was two years ago, before the Standard started its series of eight cuts of 1 cent per gal. each.

S. O. Meets Gasoline Price Increase

KANSAS CITY, MO., Sept. 24—The Standard Oil Co. has met the increase in the price of gasoline established by the Independents. On Sept. 16 the Standard announced the 1-cent rise in the Kansas City market, and now both independents and Standard are getting 9.8 cents a gallon. In some cities of Missouri gasoline is selling at 14½ cents, after an increase of 2 cents a gallon coincident with the 1 cent rise by the Standard at Kansas City. In Springfield the E. M. Wilhoit Oil Co. is getting 11.6 cents for gasoline, while the Standard and others are getting 10.6 after the 1 cent rise.

Gasoline Up 1 Cent in Milwaukee

MILWAUKEE, WIS., Sept. 24—In common with other markets, gasoline prices in Milwaukee have been raised 1 cent. Both Standard and independents have announced the advance, attributing it to an increase of 1 cent in the price of crude. The advance is due largely to the falling off in the supply in the Cushing fields in Oklahoma. So-called low test gasoline is selling for 11½ cents at filling station; 65 deg. at 15 cents and other grades correspondingly higher. Prices, however, were lower in 1914.

Swedish Embargo on Rubber

STOCKHOLM, Sept. 25—The Swedish Government has placed an embargo on rubber and varnishes.

Increasing Output of High-Class Cars Feature of Indiana Progress

Factories Rushed to Keep Up with Orders—Accessory and Parts Makers Also Busy—Friendly Rivalry of Engineers Brings Out Best of Designs

INDIANAPOLIS, IND., Sept. 27—Indianapolis is apt to be neglected somewhat by comparison with the greater center of Detroit, but if it were not for the concentrated industry of the latter city Indianapolis would certainly rank high among the automobile cities of the world.

For enterprise, take the most recent developments, and we find that Indianapolis is producing two twelve-cylinder cars, the National and the Pathfinder, to the one of Detroit. Take originality, and we can easily point to a half dozen firms in the Indianapolis section who design and build their own cars practically throughout. Take quantity, and it is easy to show that Indianapolis ranks high in output, more especially if we except such cities as Toledo whose output of automobiles is dependent mainly upon one large factory.

The Indiana Spirit

Without doubt Indiana in general and Indianapolis in particular has derived great benefit from the presence of the speedway. It is on this racing track that the automobiles of the Indiana manufacturers are tried and proved, and it is here of all places on the surface of the earth that automobile engineers have gathered together in friendly rivalry with experimental machines.

Last week, just before the reading of J. G. Vincent's paper on the twelve cylinder motor, almost any day would have found a gathering of Indiana's automobile engineers at the 2½-mile oval. On Sept. 24, for example, W. G. Wall (National); J. G. Vincent (Packard); Howard Marmon (Marmon); George Weidely; A. E. Winckler (Case); F. H. Nutt (Haynes), and several other engineers took turns to drive each other's 1917 experimental models.

Indianapolis Prosperity

With them were a score of others all more or less vitally interested in the engineering side of automobilism, each gaining knowledge and experience by the courtesy and freedom of the others; each helping to advance the automobile by free interchange of opinion with the others. Perhaps this ought to be called the speedway spirit, rather than the spirit of Indianapolis, but however this may be it is to the credit of Indianapolis that it is the first city of the globe to see such gatherings a common sight.

Like Detroit, Indianapolis is experiencing a year of prosperity, the like of which has never before been seen. Of its big factories, the National is building additions that will almost double its size and capacity—partly owing to the twelve, but more on account of general excellence of trade. The Pathfinder Co., lately reorganized, have orders on their books which encourage all production records to be broken. The Cole Co. have had a wonderfully prosperous season with their eight and look forward to a continued demand which will tax the resources of the engine makers for many months to come, while the Empire Co. are busy too, and the Nordyke & Marmon Co. are making the new Marmon 41 as fast as the factory can handle the material.

Outside Indianapolis, but in the same district, the Haynes Co. of Kokomo are so busy that their final inspection is being conducted in large tents, pending the completion of new buildings, which will enable the output to be raised to between 30 and 40 cars per day. In the same city the old Apperson Co., who also make practically every part of the car that bears their name, are turning out an exceptional quantity, and the same is true of every manufacturer in Indiana.

Nor is it only the complete automobile manufacturers that are busy, for it must not be forgotten that Indianapolis and the district surrounding can boast several important parts makers.

For instance Wheeler & Schebler are making an ever-increasing number of their carbureters, and their output now totals at the rate of over 350,000 per annum, nearly half a million. At Kokomo another well-known carbureter, the Kingston, is being made at a rate of well over 1000 per day, together with coils and magnetos which also are products of the Bryne Kingston Co.

At Marion, a stone's throw from Kokomo, is the Rutenber factory, which is rushed to the limit, despite recent new buildings and additions, since the Rutenber light six of 3 by 5 in. has proved one of the hits of 1916 with the automobile manufacturers.

South Bend, Anderson and other surrounding towns of automobile importance are likewise busy to the limit of capacity, and a bit over, so Indiana is without doubt taking its full share of the great wave of prosperity which is being enjoyed by the automobile industry of America.

Probably in thinking of Indianapolis few people would fail to remember first of all the Prest-O-Lite Co., but no doubt many would also reflect that the coming of electricity must have injured the automobile end of this great business. How little it really has been affected may perhaps be gaged by the following figures.

Taking the Prest-O-Lite gas tank service as it bears upon the automobile only, and neglecting the gas used for welding, for house lighting and for other purposes, the bill that the Prest-O-Lite Co. has to foot for the transportation of empty and full gas tanks still stands at the astounding figure of $675,000 per year. In the last twelve months over 20,000 car loads of automobile size tanks alone were handled, and it is computed that the number in use exceeds 1,400,000 tanks. A rough average tonnage of freight per annum on empty and full tanks handled by the main factory and its twenty-one charging branches reaches the amazing total of 700,000,000 lb.

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Blood Bros. Discontinue Cornelian

DETROIT, MICH., Sept. 29—The Blood Bros. Machine Co., Allegan, Mich., which has been making the Cornelian cars in addition to its universal joints has decided to discontinue the manufacturing of automobiles of which about 100 were made. Hereafter the factory will be devoted exclusively to the manufacturing of the Blood universal plants of which 3000 to 3500 are now made per month. Over 100 men are employed and the concern states that it has already enough business to occupy its attention for three months with orders from truck makers. Negotiations are under way to sell the car business to Allegan interests.

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Packard's New Prices—Why They Are Higher

DETROIT, MICH., Sept. 25.—As reported briefly in last week's issue of THE AUTOMOBILE, the Packard Motor Car Co. has increased the selling price of its Twin Sixes of both models, the raise being from $150 to $200, according to the model or the body style. The new prices for all Packard cars are given herewith.

In a letter to all its dealers the Packard company made some interesting statements as to the reason for increasing the prices. Part of the letter reads as follows:

"The cost of aluminum has advanced $50 per car, consisting of approximatively 300 lb. of castings, which have increased 12 cents per pound; 110 lb. of sheet aluminum, which has advanced 11 cents per pound, and aluminum molding, which has increased $1.50 per car. Brass and copper have advanced approximatively 4 cents per pound. There are approximatively 250 lb. of brass castings

on each car, and these represent an increased cost of $10. The materials for our radiators have advanced $2.50 to each radiator. Lamps have gone up $2 per set. Crankshaft and connecting-rod bearings have advanced $2.50 per car. The advance on door handles alone represents 50 cents to each car.

"High-grade steels show a terrific increase, and the advance from this source is approximately $13 per car. We have to pay $2 more per motor for tungsten steel valves, and ball-bearings represent an increase of $3.50 per car. Frames represent an advance of $4.50, and the trimming leather alone costs $17.50 more for each car.

"Together with many less important items the total increase in actual cost of materials is between $150 and $200 per car, with no prospect of relief."

An out-of-town Packard dealer in speaking about the new prices said that if the war in Europe will last another six months the probabilities are that not one automobile manufacturer will be able to reduce his prices next year. In fact, the example of the Packard and Cadillac companies will most likely be followed by other concerns, as it is getting more and more difficult to get materials, even at higher prices.

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Perfection Tire Appears

FORT MADISON, IOWA, Sept. 23—A new tire, guaranteed to be heat-and-water proof and to give satisfactory service for 7000 miles without punctures or blowouts, will shortly be placed on the market by the Perfection Tire & Rubber Co., Fort Madison, which is now erecting two plants. The first unit will be entirely completed, with machinery installed, by Oct. 15. The second will be ready for occupancy not later than Dec. 1.

The initial output will be 1000 tires a day, commencing Dec. 1. These tires will be manufactured under the Evans patent, which combines the use of asbestos and rubber.

The Perfection Tire Sales Co., which will have its main office in Buffalo, N. Y., will take care of the sales end of the business. J. N. Sochrest will head this department.

Troubles with Trucks at the Front

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Efficiency Improved—Ignition, Cooling and Brakes Some Weak Points

LONDON, ENGLAND, Sept. 10—In a recent visit made by an American truck representative with a military transport to the front in Flanders, an opportunity was afforded of observing the work of motor trucks in the war zone. Since the opening of the war many changes have been made which have increased the efficiency of the trucks. Chief in this regard is putting men who have had most experience on certain makes of trucks and keeping them driving these makes. It has also been found profitable to keep trucks of the same make as close together as possible in the same convoy and increasing the size of the convoys to do this. It has been found advisable to have a reserve wagon accompany convoys, this wagon equipped with the necessary spare parts, and skilled mechanics for the particular make of truck used in the convoy.

A frequent trouble with many English makes of trucks using force feed lubrication is that they have the pump in the bottom of the crankcase sump with outside oil pipes delivering the oil from the main bearing to the crankshaft. These external pumps are rapidly broken by vibration, which is immediately followed by loss of oil and in nearly every case burned out bearings follow.

Ignition Not Waterproof

Not sufficient protection is given the ignition system to make it waterproof in several makes of trucks. Bad weather conditions have made many of the roads near the front veritable water bogs, the water splashing through the radiator and then carried by the fan through the ignition terminals.

On many English makes the road clearance is not sufficient, with the result that the tie rod of the steering gear frequently strikes the ground, throwing the wheels out of line. There are other makes which, because of the small clearance, really bury themselves in the mud and some with large rear axles which catch the mud have not power enough to drag themselves out.

Some trucks are very much behind in the matter of lubricating the wheels, which in some cases is done by a large grease cup threaded into the outside of the hub. The same is true with universal joints. It is the exception rather than the rule to see grease cups remain in; they all loosen, due to centrifugal force.

Cooling Most Important

Trucks without water pumps are generally boiling all of the time. In fact, cooling is one of the most serious matters with many trucks. This is aggravated by the lack of attention given trucks by many drivers, and also by road conditions.

Another serious fault is that clutches are not sufficiently fool-proof and quite frequently have not a large enough factor of safety to take care of the overloading and poor driving the vehicles are subjected to. In almost ninety-nine out of 100 trucks observed the drivers had their heavy military boot resting equally heavily on the clutch pedals, which meant early trouble.

It seems as though the majority of designers have tried to show how heavy they could make the fan and how light or cheaply they could buy the belt. This, coupled with a very inefficient inaccessible belt adjustment, does not help the cooling situation. Many makers are only beginning to realize that they must have better protection in front of the radiators.

So often each particular maker has his own idea to what particular height the body should be from the ground with the result that scarcely any two trucks can back up to the same load platform and unload or load heavy crates. In addition, in the same make of trucks there will often be half a dozen different designs of tailboards, and as these invariably get broken, there is needless trouble in replacing them.

Brake Adjustments Poor

Brake adjustments are very poor, being so frequently in inaccessible places or requiring some special kind of tool, which is invariably lost to make the adjustment.

There is a great scarcity of rubber tires. Scarcely a week ago 150 American trucks of one make were still being held in the crates at a French port waiting for tires.

The situation in England with reference to America is quite unusual. The sentiment against American trucks is strong, but it is a dog-in-the-manger attitude because all of the British makers are booked up with the War Department for 6 or 8 months, and as trucks are needed they must come from America.

New Prices on the Various Models of Packard Cars

	Model I-25		Model I-35	
	New Price	Old Price	New Price	Old Price
Chassis only	$2,350	$2,200	$2,650	$2,450
Seven-passenger touring car	2,750	2,600	3,150	2,950
Seven-passenger salon touring car	2,750	2,600	3,150	2,950
Six-passenger touring car	....	....	3,150	2,950
Five-passenger phaeton	2,750	2,600	3,150	2,950
Five-passenger salon phaeton	2,750	2,600	3,150	2,950
Two-passenger runabout	2,750	2,600	....	....
Three-passenger coupe	3,700	3,550	....	....
Six-passenger limousine without cab sides	4,150	4,000	4,550	4,350
Six-passenger landaulet without cab sides	4,150	4,000	4,550	4,350
Four-passenger brougham	4,200	4,050	4,600	4,400
Seven-passenger Imperial limousine	....	....	4,800	4,600
Seven-passenger salon limousine	....	....	4,750	4,550
Seven-passenger limousine with cab sides	....	....	4,650	4,450
Seven-passenger limousine without cab sides	....	....	4,600	4,400
Seven-passenger landaulet with cab sides	....	....	4,650	4,450

Maxwell Earnings $2,337,950

Net Income $2,303,314, Equal to 18.75 Per Cent on Preferred Stock

DETROIT, MICH., Sept. 24—The annual report of the Maxwell Motor Co., this city, whose fiscal year ended July 31, 1915, shows net earnings of $2,337,950.21, a 61 per cent increase, compared with $1,430,445 in 1914. The total income, amounting to $2,560,041 was $789,618 greater than that of 1914, which amounted to $1,770,424. After deducting $256,726 depreciation, the surplus or net income amounted to $2,303,314.41, equal to 18.75 per cent on $12,279,932 outstanding first preferred stock as against 12.26 per cent on the same stock in the previous year. This would permit a distribution of 7 per cent on this stock, 6 per cent on the $10,127,468 second preferred and 6.5 per cent on the $12,778,057 third preferred.

President Walter E. Flanders in his report to the stockholders stated that the net working assets of the company at the close of its second fiscal year were approximately $7,165,000, as compared with $5,835,000 at the close of the first fiscal year. The cash on hand is $2,652,629 as compared with $1,783,993.

Following out the policy established at the time of its incorporation, the company has disposed of its remaining idle plant at Tarrytown, N. Y., and is, therefore, operating factories at Dayton, Ohio; Newcastle, Ind., and Detroit.

The total volume of sales during the past fiscal year shows an increase of 62 per cent. The company manufactured and sold in Aug., 1915, 5217 cars, as compared with 2161 cars in Aug., 1914. Shipments in Sept., 1915, will probably exceed those of Aug., 1915.

Income Account of Maxwell Motor Co., for 1915 and 1914

	1915	1914	Changes
*Net earnings..	$2,337,950	$1,430,445	$907,505
Other income..	222,091	339,979	117,888
Total income.	$2,560,041	$1,770,424	$789,617
Depreciation ..	256,726	264,956	8,230
Surplus	$2,303,314	$1,505,467	$797,847

Balance Sheet of Maxwell Motor Co. as of July 31, 1915, Compared with 1914

Assets	1915	1914
*Real estate, buildings, machinery	$5,192,626	$4,462,222
Investments	795,827	694,656
Goodwill, patents, trademarks, etc....	26,500,000	26,500,000
Inventories	5,146,902	4,588,972
Accounts receivable ..	596,119	428,496
Notes receivable	229,289	212,455
Prepayments	44,757	50,898
Due on sale contract..	95,000	.....
Cash	2,652,629	1,785,992
Sight drafts out for collection	642,987	.....
Total	$41,896,135	$38,723,693
Liabilities		
First preferred stock.	$12,279,332	$12,279,332
Second preferred stock	10,127,468	10,127,468
Common stock	12,778,058	12,778,058
Real estate mortgages	15,709	30,161
Accounts payable	1,134,150	619,598
Wages accrued	120,743	73,485
Taxes accrued	47,910	51,811
Customers' deposits ..	296,421	206,596
Due on contracts.....	109,080	.....
Reserve for depreciation	1,635,470	951,718
Reserve for contingencies	50,000	100,000
Reserve for retirement of preferred stock..	130,000	.....
Profit and loss surplus	3,171,794	1,505,467
Total	$41,896,135	$38,723,693

*The real estate additions during the year amounted to $310,202; increase through reappraisal, offset by corresponding increase to reserve for depreciation, $420,202, making the total of $5,192,626 on July 31, 1915.

Aluminum Again Advances

NEW YORK CITY, Sept. 28—Markets this week made a few small changes. The trading conditions were somewhat brisker. A substantial gain took place on Wednesday in Bessemer steel which rose to $24.50, a gain of 50 cents. The open-hearth market was firm during the whole week making no change at all. Aluminum, which had continually been rising, again advanced on continued heavy buying from domestic users. The price yesterday was 47 and 49 cents for spot in ton lots, and even at this high price there is very little to be had. The antimony market showed further weakness, with no bidders in sight. The copper market had one of its determined upward spurts last week. Producers marked up their prices to 18¼ cents for thirty days delivery. There was a firm demand and it is expected that it will continue to rise. The exports of copper for the week ending Sept. 23 were 3396 tons, against 3927 tons for the same week last year. The exports since Sept. 1 are 8823 tons, compared with 14,087 tons in the same period last year. That Europe is in need of a large amount of lead is evident by the fact that foreign countries are making enormous inquiries in the local market. An advance in the price of lead will be made within a few days. Lead has advanced 10 cents a 100 lb. The rest of the metal markets remained dormant.

The oil and lubricants markets were weak, making only two changes. Linseed oil made an advance of 2 cents. The principal rise took place on crude oil. Pennsylvania crude went up 5 cents a barrel, making the price now $1.70.

The crude rubber market was not particularly active last week and contained no essentially new features from those previously reported. There is a good demand for rubber, but it is more or less routine and does not vary to any considerable extent.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.45	.45	.45	.47	.47	.47	+.02
Antimony	.27½	.27	.27	.27	.27	.27	—.00½
Beams and Channels, 100 lbs.	1.51	1.51	1.51	1.51	1.51	1.51	..
Bessemer Steel, ton	24.00	24.00	24.50	24.50	24.50	24.50	+.50
Copper, Elec., lb	.17¾	.17¾	.17¾	.17¾	.17¾	.18¼	+.00½
Copper, Lake, lb	.18	.18	.18	.18	.18	.18¼	+.00¼
Cottonseed Oil, bbl	6.23	6.25	6.25	6.38	6.60	6.90	+.67
Cyanide Potash, lb	.23	.23	.23	.23	.23	.23	..
Fish Oil, Menhaden, Brown	.39	.39	.39	.39	.39	.39	..
Gasoline, Auto, bbl	.16	.16	.16	.16	.16	.16	..
Lard Oil, prime	.85	.85	.85	.85	.85	.85	..
Lead, 100 lbs	4.45	4.45	4.35	4.55	4.55	4.55	+.10
Linseed Oil	.54	.54	.54	.56	.56	.56	+.02
Open-Hearth Steel, ton	25.00	25.00	25.00	25.00	25.00	25.00	..
Petroleum, bbl., Kans., crude	.80	.80	.80	.80	.80	.80	..
Petroleum, bbl., Pa., crude	1.65	1.65	1.65	1.65	1.65	1.70	+.05
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	..
Rubber, Fine Up-River, Para	.55½	.56	.55½	.55½	.55½	.55	—.00½
Silk, raw, Ital	3.95	..	4.05	..	..	4.05	+.10
Silk, raw, Japan	3.62½	..	3.65	..	..	3.67½	+.05
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	..
Tin, 100 lb	33.00	32.75	32.25	32.50	32.50	32.75	—.25
Tire Scrap	.04¼	.04¼	.04¼	.04¼	.04¼	.04¼	..

Pathfinder Adds Two Directors

INDIANAPOLIS, IND., Sept. 27—Following a considerable increase in business, the Pathfinder company has found it expedient to enlarge its organization and to this end two new names have been added to the board of directors. These are W. E. Stalnaker and G. H. Mosher. The new board of directors now includes the following: President, W. C. Teasdale, Jr.; vice-president, W. E. Stalnaker; sec.-treas., W. K. Bromley; directors, Crawford Fairbanks, C. J. Root, George H. Mosher, Karl Feilcke.

Mattingly and Chichester on Blood Board

ALLEGAN, MICH., Sept. 22—L. H. Mattingly and F. I. Chichester have been appointed members of the board of directors of the Blood Bros. Machine Co. Mr. Chichester is president of the First National Bank and Mr. Mattingly represents among other interests those of the Kalamazoo City Savings Bank, Kalamazoo. Mr. Mattingly is managing director of the company.

M. P. M. Maker Elects Directors

MT. PLEASANT, MICH., Sept. 20—At a meeting of the stockholders of the Mt. Pleasant Motor Co., which makes the M. P. M. four- and eight-cylinder cars,

two new directors were elected, J. A. Damon and C. A. Kellogg, while H. A. Sanford, W. A. Keen and N. J. Brown of the old board were re-elected. The capital stock of the company has been increased to $15,000 and an effort will be made to add at least an equal amount within the next few weeks. The business outlook is reported by officers of the company to be most promising.

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Toledo-Ford Tire Elects Directors

TOLEDO, OHIO., Sept. 25—The first annual meeting of the stockholders of the Toledo-Ford Tire Co., was held recently in this city. The following directors were re-elected: R. F. Teall, R. O. Wire, William Dunbar, C. E. Taggart, A. O. Hamilton. The two new members of the board are G. N. Graham and Henry Hard. The company is producing about 400 tires a day or around 12,000 a year.

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Duplex Power Car Elects

CHARLOTTE, MICH., Sept. 22—At the annual meeting of the board of directors of the Duplex Power Car Co. the old officers were re-elected. The officers are, Frank P. Town, president; Frank E. King, vice-president; Horton H. Bryan, treasurer and M. J. Lamson, secretary.

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Republic Truck's Second Increase to $500,000

ALMA, MICH., Sept. 4—For the second time this year the stockholders of the Republic Motor Truck Co. have voted to increase the capital stock of the company. The first time this increase was from $50,000 to $250,000. Now they have decided to increase it to $500,000.

Securities Markets Strong

Many Substantial Gains in Various Issues—Trading Conditions Normal

NEW YORK CITY, Sept. 28—Stocks were active and generally strong last week, with pronounced advances in a number of issues. The recent distribution of a 50 per cent cash dividend by General Motors acted as a renewed stimulant for the so-called war stocks. With the many gains that took place General Motors once again was the feature of the markets. There was a strong tone at the opening with a continued rise in all issues except two, these declining but a few points. The closing bid of General Motors was 540, a gain of 58 points. Another noted rise among the specialties was Overland with a gain of 21 points. Maxwell served to stimulate an advancing movement in the company's shares, and all three issues rose to substantial gains. There was a total volume of 61 per cent sales increased over 1914. The rest of the specialty stocks made but a few points gain.

Tire Markets Boom

The tire issues last week all recorded net advances ranging from one-half to 27 points. A 20-point rise in the Goodyear common on top of a 10-point advance was taken as convincing evidence that the company proposes a large stock distribution. Kelly-Springfield featured the tire market with a 27-point rise. With the betterment in tire sales it is likely that the U. S. Rubber Co. will earn a balance above preferred dividends equal to more than 8 per cent on the $36,000,000 common. Many other small gains took place in the tire issues, such as Firestone with a gain of 15 points and Goodrich with 3½ points. The rest made but minor gains.

Detroit Conditions Normal

Although the Detroit issues recorded many good gains the trading conditions were normal. General Motors featured the market there also with a gain of 55 points. Maxwell's closing price was 53, which was 9 points above last week's rating. Studebaker common made a very good rise on Friday, rising 17 points and on Saturday dropped but 2 points. The rest of the stocks made a few small changes.

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White Co. Increases Capital to $8,000,000

CLEVELAND, OHIO, Sept. 24—Following a reduction in capital stock on Sept. 22 from $3,000,000 to $2,500,000, the White Co., this city, has filed an application for an increase to $8,000,000.

These changes are in line with the recent announcement by which notice was given of the calling of $500,000 preferred and the issue of an enlarged preferred stock which will be distributed among members of the White organization who desire to retain their investment, but to drop out of the active management. Holders of the old preferred were also given rights to the new preferred. The public interest is limited to $500,000 of preferred, all of the remaining stock being held by the White family.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	110	..
Aluminum Castings pfd			102	..	..
J. I. Case pfd			79	84	+1
Chalmers Motor Co. com	No quotations available at this time on account of war.		116	120	+7
Chalmers Motor Co. pfd			96	101	..
Electric Storage Battery Co			77	78½	+4
Firestone Tire & Rubber Co. com			540	..	+15
Firestone Tire & Rubber Co. pfd			111	..	..
General Motors Co. com			344	345½	+58
General Motors Co. pfd			113	115	+1
B. F. Goodrich Co. com			69	71	+3½
B. F. Goodrich Co. pfd			108	109	..
Goodyear Tire & Rubber Co. com			310	..	+15
Goodyear Tire & Rubber Co. pfd			109	..	+ ½
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			29	31	..
International Motor Co. pfd			58	63	—3
Kelly-Springfield Tire Co. com			230	235	+20
Kelly-Springfield Tire Co. 1st pfd			90	92	+2
Kelly-Springfield Tire Co. 2d pfd			235	240	+27
Paige-Detroit Motor Car Co			..	450	..
Maxwell Motor Co. com			52	53¾	+6½
Maxwell Motor Co. 1st pfd			92	94	+3
Maxwell Motor Co. 2d pfd			44	46	+7
Miller Rubber Co. com			190	195	..
Miller Rubber Co. pfd			107	109	..
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			120	..	..
Packard Motor Car Co. pfd			100	..	..
Peerless Motor Car Co. com			130	..	+10
Peerless Motor Car Co. pfd			92	94	—1
Regal Motor Co. pfd			..	21	..
Portage Rubber Co. com			55	58½	..
Portage Rubber Co. pfd			93	94	..
*Reo Motor Truck Co.			16½	17½	..
*Reo Motor Car Co				32¼	.. + ¼
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp. com			74	76	+6½
Stewart-Warner Speed. Corp. pfd			106	..	+1
Studebaker Corporation com			139	140	+10½
Studebaker Corporation pfd			107	108½	+1
Swinehart Tire & Rubber Co			86	90	..
Texas Company			163	165	+10
U. S. Rubber Co. com			52	53½	+ ½
U. S. Rubber Co. pfd			106	107½	+2
Vacuum Oil Co			223	228	+5
White Co. pfd			110	..	..
Willys-Overland Co. com			213	214½	+21
Willys-Overland Co. pfd			107	109	+1½

*Ex dividend. Par value of these stocks $10; all others $100 par value.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
ACTIVE STOCKS					
Chalmers Motor Co. com	..	97	..	121	..
Chalmers Motor Co. pfd	..	..	97½	102½	+ ½
Continental Motor Co. com	155	180	280	..	..
Continental Motor Co. pfd	..	75	85	90	..
General Motors Co. com	60	..	340	350	+55
General Motors Co. pfd	80½	..	112½	115	+1½
Maxwell Motor Co. com	10½	..	53	59	+9
Maxwell Motor Co. 1st pfd	28	..	91½	94½	+3½
Maxwell Motor Co. 2d pfd	..	..	45	47	+9
Packard Motor Car Co. com	..	..	123	130	+3
Packard Motor Car Co. pfd	90	94	100	..	..
Paige-Detroit Motor Car Co	..	..	..	450	..
*Reo Motor Car Co	..	20	32½	34½	— ½
*Reo Motor Truck Co	10	10½	16½	17½	— ½
Studebaker Corporation com	..	..	137	142	+17
Studebaker Corporation pfd	..	..	106	110	+1
INACTIVE STOCKS					
*Atlas Drop Forge Co	21	..	..	31	..
Ford Motor Co. of Canada	..	500	1500	..	..
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	20½	22	..
Regal Motor Car Co. pfd	25	..	..	21	..

Kissel to Double Production

Two Additions Started—Four-Story Office Building Also on Enlargement Schedule

HARTFORD, WIS., Sept. 24—Ground was broken last week for the first of an important series of building operations at the plant of the Kissel Motor Car Co., this city. The company is preparing to double its production in the near future.

Two new buildings are started, one for storage and shipping, and one for the enameling department. The former is to be 100 ft. long and the other 110 ft. long, each being 35 ft. wide. The third structure, soon to be started, is a four-story office building, which will house all of the executive and clerical forces of the company, including the cost and drafting departments. A production of thirty to thirty-five passenger cars per day will be possible.

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Splitdorf Electric Buys $1,000,000 Plant

NEWARK, N. J., Sept. 24—The purchase for $1,000,000 of the Sumter Electrical Co., Sumter, S. C., by the Splitdorf Electrical Co., this city, has been closed. This new plant will be used to produce magnetos of every type, including low-tension types for use on stationary, marine, and tractor engines. The company is building nearly 1500 Dixie magnetos a day.

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To Subscribe $250,000 for Flint Workmen's Homes

FLINT, MICH., Sept. 21—At the weekly meeting of the Board of Commerce held to-day, announcement was made that within a few hours after the general campaign for workingmen's homes was started this morning, $31,000 had been subscribed. Last week $65,000 was subscribed and it now looks as if the $250,000 which is needed will be forthcoming ere long. C. S. Mott, president of the Weston-Mott Co., is general chairman of the work and trustee for the fund. It is intended to have 1000 houses built as soon as possible. At the present time there is such a shortage of homes that in many houses twice the number of people are housed than normally.

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Page Makes Trailers

MARSHALL, MICH., Sept. 18—The Page Bros. Buggy Co., an old established concern which has been making buggies and carriages for many years, is now also making trailers which will be known as the Page Auto Trailers.

The trailers are made in four models. Models A and B have 750 lb. capacity, but while the former has 1⅛ by 5/16 in. round edge steel tires and costs $40, the other model is equipped with 1⅛ in. solid tires, the price of this model being $50. Both have the same kind of body, 38 by 82 in., with 7 in. sideboards and 4½ in. flareboards. Sheldon axles and springs are used. Both models C and D are listed at $75 and have 1250 lb. capacity, 1⅜ in. solid rubber tires, artillery wheels. The former model has 7 in. straight sides but model D has 11 in. straight sides.

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Dry Climate Tire Plant Starts Active Manufacture

DENVER, COL., Sept. 22—The Dry Climate Tire Mfg. Co., a new $200,000 Colorado corporation, started its Arvada factory yesterday. A force of twenty-five men is preparing compounds and fabric, and the concern expects to be turning out tires for the trade next week. A few special tires will be built the last of this week for exhibition at the Automobile Trades Association's fall show starting next Sunday in connection with the International Soil Products Exposition.

The company expects to have two or three shifts of fifty men each at work within a few weeks. With this force and the present equipment, the plant will have a capacity of 100 casings and 350 tubes every eight hours. The building making the first unit of the factory cost $28,000 and the machinery, which is the most modern obtainable, cost $35,000. Plans are under way for additional buildings, and enough extra equipment has already been ordered to increase the capacity of the plant more than 50 per cent. The factory manager is W. J. Kreuder.

The new concern aims to reach about ten states in the Rocky Mountain territory, and has a special process of curing and compounding designed to increase the life of tires in this dry region.

The factory is located 7 miles from Denver, with good shipping facilities.

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Dividends Declared

Paige-Detroit Motor Car Co., Detroit, Mich., 5 per cent for September, payable Oct. 10 to stockholders of record Sept. 30.

Republic Rubber Co., Akron, Ohio: Quarterly, 1¾ per cent on common and preferred, payable Oct. 1.

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35 Per Cent Dividend to Walpole Creditors

BOSTON, MASS., Sept. 27—Judge Dodge in the U. S. district court has allowed a seventh dividend amounting to 35 per cent to all creditors of the Walpole Tire & Rubber Co. This brings the total dividends to 85 per cent.

Motor Truck Too Much for R. R.

Kentucky Commission Exonerates C. F. & S. from Long and Short-Haul Rule

LOUISVILLE, KY., Sept. 24—The Kentucky State Railroad Commission recently entered an order exonerating from the operation of the long and short-haul rule, which forbids a lower freight rate from one given point to another than is charged to intermediate points, the Cincinnati, Flemingsburg & Southeastern into Flemingsburg. The order is subject to a reopening of the case upon ten days' notice after any complaint may be filed.

This is the first exoneration from the long and short-haul clause on account of conditions arising from competition between a railroad and an automobile. It was shown that by reason of the operation of a motor truck between Maysville and Flemingsburg revenues of the 5-mile railroad line, making but the one point, Flemingsburg, have been reduced more than 50 per cent, and this competition is a matter of life or death with it.

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Pratt & Whitney Tool Makers Strike for Eight-Hour Day

HARTFORD, CONN., Sept. 27—The machinists and other employees of the Pratt & Whitney Co. at a meeting to-night voted to strike for the inauguration of an 8-hr. day with no reduction in pay in the plant. At present the plant is run on the open shop plan, 10 hr. a day, with a half holiday Saturday.

Last week twenty-five tool makers employed in the plant went on strike as a protest against the discharge of two other tool makers. The company employs about 3200 men.

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Brown & Sharpe Foundrymen Strike

PROVIDENCE, R. I., Sept. 24—Two hundred men in the foundry of the Brown & Sharpe Co. joined the strike declared against the plant by the machinists several days ago.

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Weldum Succeeds G.-A. Aluminum Co.

NEW YORK CITY, Sept. 24—Owing to difficulties created by the war, the Weldum Co., an American concern, has taken over the business of the German-American Aluminum Co., whose home offices are in Berlin. The Weldum Co., whose officers are practically the same as those who controlled the interests of the German-American concern in this country, is now manufacturing under the name Weldum the metal used for replacing welding in aluminum repair work by using practically a soldering process.

Weldum, which was described in THE

AUTOMOBILE for Sept. 17, 1914, under the name of German-American aluminum solder, is the invention of a German metallurgist and is in common use in that country by the German government. The manufacturers claim that no breaks are too complicated to be repaired by it. Its tensile strength is about double that of aluminum and due to its low melting point, 400 deg. Fahr., a common gasoline torch can be used. By careful work no machining is said to be necessary after the work is completed. It is a secret compound containing eight ingredients, five being metals and the other three salts of metals.

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New Departure Adds

BRISTOL, CONN., Sept. 30—The New Departure Mfg. Co., this city, is erecting extensive additions to its 10-acre plant, and is installing machinery that will enable it to double its present production.

There is in process of construction in this city what will be one of the largest buildings specially designed and equipped for grinding purposes in the world. Another extension will be that of its heat-treating buildings. This building, when completed, will contain 230 oil-fired furnaces. Supplementary to the furnaces themselves, will be a new arrangement of the quenching vats and the operation of a liquefied ammonia gas refrigerating system, which will increase the amount of work per furnace, and hold the processing of the steel to practically perfect uniform quality. Other departments will be increased correspondingly, so that the present 23-hr. per day production capacity will be doubled.

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Pontiac Gets Columbia Truck

PONTIAC, MICH., Sept. 25—The local board of commerce has succeeded in inducing the Columbia Motor Truck Co., Kalamazoo, Mich., to move to this city. A site of five acres will be furnished to the truck manufacturer, and the board of commerce is to take charge of the erection of a suitable plant. The Columbia company expects to build 300 trucks within the next twelve months, it is said.

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Goodyear to Hire 1000

AKRON, OHIO, Sept. 23—The Goodyear Tire & Rubber Co., this city, has started a house-to-house canvass to find rooms for 1000 men that the company will bring here within the next two weeks. Four new buildings, an addition to the plant, will be put in operation as soon as the company can find men to work in them.

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Knox Motors Grants 8-Hr. Day

SPRINGFIELD, MASS., Sept. 23—The Knox Motors Co., this city, employing 400 machinists, has granted an eight-hour working day, without loss of pay, to its employees, to go into effect Oct. 4.

Wins Pa. Speed Trap Appeal

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Court Holds Trap Must Be Worked from Both Ends To Be Legal

CHESTER, PA., Sept. 25—For the first time since the passage of the automobile law of Pennsylvania in 1913 a judge of the State passed on the methods to be used by officers in enforcing the law. Daniel Griffith, was arrested for speeding at Marcus Hook and the magistrate before whom the case was first taken convicted him, whereupon an appeal was taken. Judge Johnson, before whom the case was taken, decided that in order to maintain a speed trap it would be necessary for officers to be at both ends of the trap with stop watches and to be in communication with each other. For a long time many officers in the county have been reaping a harvest by jumping out of bushes and arresting automobilists on the charge of speeding. Judge Johnson also decided that the decisions of all magistrates could be appealed and dismissed the charge brought against Mr. Griffith.

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Enforcing Non-Glare Ordinance in K. C.

KANSAS CITY, MO., Sept. 27—Kansas City police are actively enforcing the ordinances prohibiting glaring lights on automobiles. Recently twenty-one cases were called one morning in police court against owners and drivers charged with violations. Fines imposed ranged from $2 to $5, although the judge hinted at the chance that some maximum fines of $500 might be assessed against repetitions of the offense.

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Non-Glare Ordinance in Minneapolis

MINNEAPOLIS, MINN., Sept. 24—With the adoption of a light dimming ordinance by the Minneapolis city council last Friday the Twin Cities are now on a common basis as to lights and frequent arrests are likely to be cut down. The ordinance forbids use of electric or other headlights that dazzle on automobiles. It also prescribes zones in which street car headlights must be dimmed.

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Solve Delaware and Pennsylvania Tangle

WILMINGTON, DEL., Sept. 27—The tension between Delaware and Pennsylvania automobilists, because of an obnoxious feature of the Delaware law, taxing cars owned by outside corporations, firms and partnerships which come into the State, is such that a state of warfare has existed lately, in that traps have been set in Pennsylvania especially to catch Delaware cars when there was any violation of the Pennsylvania law.

It now looks as if Pennsylvania will take a reasonable view of the matter and will call off the traps, as the motorists are not responsible for the obnoxious feature of the law and have promised to endeavor to have the next Legislature repeal it. Meanwhile the local authorities are giving offending drivers an opportunity to take out a license.

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100 Maxwell Dealers Talk Economy Contest at Plant

DETROIT, MICH., Sept. 27—Maxwell dealers from zone No. 1, which includes all the New England States, New Jersey, Maryland, eastern New York and eastern Pennsylvania, are here to the number of nearly 100. They came to visit the Maxwell Motor Co.'s plant and receive the final instructions for the cross-country economy run or contest which has been arranged for them and for which president Walter E. Flanders has donated three cash prizes.

This economy test started from Buffalo Tuesday. To-night the dealers and at least eighty Maxwell cars will make the trip per boat to the New York State city. Upon arrival there the run will be started, the cars being filled with lubricating oil and water here, the oil tank being sealed. The tank contains 1 gal. of lubricant, which is considered sufficient to enable every contestant to reach his destination. Several of the dealers will travel from 500 to 700 miles and may require three days to get home.

They will leave in two divisions, one traveling east and the other south, and as these divisions near their respective homes they will split. All contestants have received a special blank form of affidavit which they must fill out and mail to General Manager and President Flanders. It is expected that the winner will average 30 miles or better to the gallon.

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Shadow-Boxes Test Headlights in St. Louis

ST. LOUIS, MO., Sept. 20—Shadow boxes to test the projection of headlight rays and enable the municipal adjusting bureau to adjust them to the degree required by a recent ordinance, are being tried out in St. Louis this week. Meanwhile the police have called a temporary halt of their war on headlights.

The shadow-box is in reality a darkened area-way 75 ft. in length and affording space for an automobile to drive in. Should the one now in use at the city hall prove a success, similar shadow-boxes will be installed at all police stations. The police plan to stamp every headlight which has been thus adjusted and approved and such a stamp will exempt the owner from arrest under the dimmer ordinance.

Ford Race at Mich. State Fair

Every Owner of Model T Is Eligible—Heats 5 Miles—Final 10—$500 Prizes

DETROIT, MICH., Sept. 27—Every owner of a Ford Model T car in the State of Michigan is eligible for the race meet which will be held on the 1-mile dirt track of the Michigan State fair grounds, Sunday, Oct. 17, and which is being promoted by General Manager G. W. Dickinson.

It is to be the first race for a trophy to be known as the Michigan Ford Championship Cup, to be competed for twice a year. In addition to the trophy there will be prizes aggregating in value $500.

The principal condition is that the car must be entered by the owner who, like the driver, must be a resident of Michigan.

It is expected that there will be so many entrants that several heats will be necessary. While no distance has as yet been decided upon it is said that the heats will very likely be run over a distance of 5 miles and the final over 10 miles.

The promoter is going to get the advice of the engineers of the Ford Motor Co. as to the distance most suitable or advisable.

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No Race for Corona?

CORONA, CAL., Sept. 22—There is only a possibility of a 1915 Corona road race. Since the Nov. 20 date has been abandoned, opposition to the race has grown and it is now hardly probable that interest can be kept up until the highways into Corona are completed. It is known that the Contest Board will not sanction the race this year unless there is a 75-ft. safety zone between the outer edge of the course and the guard rail of the grandstand and with the stands placed back of the pepper trees which line the course, it is hardly probable that the race will be a financial success as it would be almost impossible for the spectators to see it.

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Hyatt Roller Bearing Announces Winners in Talk Contest

DETROIT, MICH., Sept. 27—The Hyatt Roller Bearing Co. has made known the names of the winners in the contest which which it recently promoted to determine the best talks on Hyatt bearings which salesmen are using to automobile prospects. The winners who are listed in an attractive booklet entitled. "The Six Best Sellers," are as follows: F. E. Cerf, retail sales manager, Ralph Temple Automobile Co., Chicago; Henry Crowther, vice-president Crowther Motor Co., Philadelphia; Albert Hoyt, Chevrolet Motor Co. of Illinois, Chicago; J. E. Staley, Holsman-Stevens Automobile Co., Des Moines, Iowa; Curtiss M. Betts, Mitchell Automobile Co., Chicago; L. S. Vaughn, Oklahoma-Oakland Co., Oklahoma City. In addition prizes and special mention were awarded the following: A. R. Meyer, sales manager, Albaugh Motor Sales Co., Cleveland; G. A. Volbrey, Weber Implement & Automobile Co., St. Louis; Thomas A. Murphy, Ford Motor Co., Portland, Ore.; Edward Coyle, De Luxe Automobile Co., St. Louis; E. B. Valtzay, Warner Gear Co., Detroit; C. W. Ingrayn, Driggs-Seabury Ordnance Corp., Sharon, Pa.; J. A. Baird, General Motors Truck Co., Pontiac, Mich.; T. M. Leahy, Mitchell-Lewis Motor Co., Racine, Wis.

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Indianapolis Race on Oct. 9 Abandoned

INDIANAPOLIS, IND., Sept. 27—The special invitation 100-mile race which was scheduled to be held on the speedway here, Oct. 9, and for which the American Automobile Association had granted a sanction, has been declared off. It is believed the cause for the abandonment of the contest was the objection of De Palma and Resta to competing against more than one car of the same make in this event. As a preliminary to the race, a 100-mile event for Ford cars had been planned, and though this has been abandoned as well, it may be revived.

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Goodyear Extends S-V Truck Tire Test

NEW YORK CITY, Sept. 28—The Goodyear Tire & Rubber Co., Akron, Ohio, will extend its special S-V truck tire competitive free test offer for another six months. This will make the offer cover a year instead of the three months originally decided on. The new six months' period will end April 1, 1916. The offer is as follows: Equip opposite wheels—at the same time—one with a Goodyear S-V, one with any other standard make tire of like rated size bought in the open market. If the Goodyear S-V fails to cost less per mile than the other, the company will return its purchase price.

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Forty-nine Makes at Cincinnati Show

CINCINNATI, OHIO, Sept. 27—Cincinnati's fall exposition given under the auspices of the Cincinnati Automobile Dealers' Association, will be opened at Music Hall, Oct. 2. To date forty dealers representing forty-nine makes of passenger cars and trucks, have applied for show space. Thirteen accessory houses have so far closed for space.

Topeka Dealer Show Is Success

Have Building of Their Own—Room for 14 Spaces for Exhibition of Cars

TOPEKA, KAN., Sept. 24—The automobile and supply men of Topeka probably got more good out of the State fair than any other group of exhibitors—and their exhibit had been swiftly arranged for, like the things that are done on the spur of the moment. They had a building of their own—and it made such a hit with the fair officials and the county officers, that it may be enlarged.

The automobile men of Kansas—particularly of Topeka—didn't want to take cars to the free State fair and exhibit them in a tent. E. B. Kellam, an old-time Topekan, who had been away for two or three years, got interested, and worked up a plan for the erection of a special automobile building. He and H. H. Southwick of the Southwick Auto Supply Co., and J. R. Cowdrey of the Cadillac Sales Co. got enough subscriptions to pay for a building—then got some more to make the building better.

On a space of 50 by 112 ft. a substantial concrete and brick bed was laid, rising about 3 ft. from the level of the ground, and reached by steps. Posts were set at intervals, and a roof guaranteed for fifteen years raised over this floor. Canvas curtains were installed for walls. The experience of State fair week this year, during which there was a lot of rain, was that canvas walls are adequate—there is no wood inside to be damaged by winter storms or during the summer when the canvas curtains are stored away. And they can be raised for clear sweep for breeze during fair days.

In this Motor Hall are fourteen spaces for exhibition of cars and equipment, each space is 16 by 18 ft. and capable of containing two cars. Each space was filled for the fair. There is a 12½ ft. aisle.

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Electrical Show in Kansas City

KANSAS CITY, MO., Sept. 24—Albert T. Clark, manager for the Anderson Electric Car Co. here started something in the meeting of the Jovian Electric Club of Kansas City last week, and the result may be an electric show during Electrical Prosperity Week, Nov. 29 to Dec. 4.

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To Survey for Los Angeles Speedway

LOS ANGELES, CAL., Sept. 23—The Los Angeles Speedway Association yesterday closed a contract with G. P. Robinson, a Los Angeles engineer, to run the preliminary surveys on the 300-acre

tract near Bell Station, recently purchased by the corporation for the purpose of building a speedway. The engineer is to establish levels and grade lines at every 100 ft. for the use of the contractor who is to be in charge of the construction work. The contracting engineer will probably be George H. Shank of Chicago, who is now in Los Angeles making his headquarters at the offices of the speedway corporation.

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Chicago Clubs in Reliability

CHICAGO, ILL., Sept. 23—The fall Interclub reliability team match between the Chicago Athletic Association, Chicago Automobile Club and the South Shore Country Club to Joliet and return, yesterday resulted in a division of honors between the C. A. A. and C. A. C. The Chicago Athletic Association won the Mayor's cup, which went to the team having the lowest total amount of penalizations, while the Frank X. Mudd trophy, offered the team having the greatest number of perfect scores, was won by the Chicago Automobile Club. The South Shore Country Club had only two of its members penalized, but one of them accumulated a total of 248 points.

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8000 at Los Angeles Show

LOS ANGELES, CAL., Sept. 23—The attendance at the automobile show staged at the Shrine Auditorium here, under the management of Walter Hempel, has shattered all records. There were 1400 machines parked outside the auditorium on opening night and the attendance was figured at 8000. Upon an average, 5000 visitors have attended the show each night.

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Brand Co. Has Pierce in Ohio

CLEVELAND, OHIO, Sept. 28—Pierce-Arrow cars and trucks will be handled exclusively in Cleveland and adjacent counties in Ohio by the Fred P. Brand Motor Co. Mr. Brand assumed full ownership and charge of the business last week and already has under way extensive plans in forming a progressive selling campaign. The new company will inaugurate a service station.

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County Sales Tour a Success

CHAMPAIGN, ILL., Sept. 25 — The Champaign County Automobile Trade Association gave a show tour through the county on Wednesday and Thursday, Sept. 29 and 30. Thirty 1916 models comprised the caravan accompanied by as many salesmen. A few minutes was spent at each place and it is believed that the tour will prove effective in interesting the people of the smaller cities in automobiles and increase the number of sales. It is planned to make these tours twice a year hereafter.

Sales Feature Show at Springfield, Ill.

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Despite Rain, Cold Weather and Other Handicaps Dealers Did Well

SPRINGFIELD, ILL., Sept. 24—Political aspirations of Illinois gubernatorial candidates compensated to a certain degree for lack of a certain class of attendants at the Illinois State fair by reason of the hoof and mouth disease epidemic which kept so many from the farming districts away. The fair which began Sept. 17 had two days of rain, one day church session, two days of cold weather and finally on the sixth day of a nine-day event an attendance which broke any record for a number of years, brought many to the extensive automobile exhibit, and resulted in many sales and good prospects for future sales.

Automobile exhibitors at the fair are almost unanimous in the opinion that the present method of exhibiting cars is antiquated and loses much of its value through their being scattered about the grounds and sandwiched in between other exhibits of every description. They believe that something should be done to segregate the car exhibits where for purposes of comparison as to finish and detail of construction examination may be more readily accomplished by persons interested. The success of the Milwaukee show last week virtually has been shouted from the house tops; at least it has been heard by exhibitors at the Illinois State fair and considerable comment has been heard, which may result in similar action next year here.

Good Year for Farmers

It is interesting to note the wide range of opinion expressed as to the benefit to be derived from exhibiting cars at the fair, especially this year. Dealers, who have been taking their new models to the fair show for the last six or seven years, find conditions changing every year and many of them look upon the material reductions in prices as a controlling factor in selling the farmer a car. Several dealers expressed the opinion that inasmuch as the farmer's money comes more slowly than that of the city buyer, he naturally spends it somewhat more conservatively and for that reason becomes a more ready purchaser this year since he appreciates that he is getting as good if not a better car for less money than he could have done previously.

One thing more noticeably evidenced this year than heretofore is the fact that the farmer has graduated from the low to the medium priced car, in other words those selling from $1,000 to $1,500. Careful survey of the various exhibits develops the fact that fully one-third of the cars shown have been sold on the spot, and before the end of the fair it is likely dealers will have very few cars to take out of the grounds. Several times to-day persons were heard to inquire if they might have certain exhibited cars immediately, or when the fair was over.

Much interest was shown in the farm tractor demonstrations held at intervals in a field adjacent to the grounds. The International Harvester Co. demonstrated its tractors issuing pass-out checks to all those who wished to go out of the grounds to watch the plowing.

Many New Agencies

Many new agents have been appointed during the week and some exhibitors have arranged for enough demonstrations to keep them busy for several weeks. Incidentally it might be said that these demonstrations are not confined exclusively to Illinois, one dealer in particular having arranged demonstrations in four adjoining States.

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Barnes Resigns from Overland

TOLEDO, OHIO, Sept. 25—Claire L. Barnes has resigned from the Willys-Overland Co., Toledo, after having spent two years of special work for which President Willys engaged him. His resignation is to take effect Jan. 1. Mr. Barnes' knowledge of the material and parts business gave him an opportunity in securing favorable prices and satisfactory deliveries of materials for the various Willys plants.

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Kirk Opens Toledo Office

TOLEDO, OHIO, Sept. 25—Ezra E. Kirk has re-entered the automobile field by becoming a manufacturers' distributor with offices at 719-725 Jefferson Avenue, this city. He will handle a number of lines for automobile parts and accessories makers who are seeking representation in the Middle West section.

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Hutchinson Returns to Hupp

DETROIT, MICH., Sept. 25—O. C. Hutchinson, in charge of distribution in the East for the Hupp Motor Car Co., has returned to Detroit, where he will have charge of Hupmobile branches and other duties. V. C. Scriven succeeds him, heading the Hupp Motor Car Co. of New York.

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Kansas City Dealers' Tour Oct. 11-16

KANSAS CITY, MO., Sept. 24—The Automobile Dealers' Association of Kansas City has arranged for its annual trade tour, to begin from this city on the morning of Oct. 11 and continue until Oct. 16, taking in the leading towns of western and southwestern Missouri and eastern and southeastern Kansas. The association will not undertake to cover

over 500 miles, and will devote 4 or 5 hr. in each city to talking good roads and showing cars. Upwards of forty cars will participate.

Included in the planned itinerary are Warrensburg, Clinton, Appleton City, Nevada, Lamar, Carthage, Webb City, Joplin, Pittsburgh, Ft. Scott, Pleasanton, Ossawatomie, Paola and Olathe.

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Chicago Electric Association Disbands

CHICAGO, ILL., Sept. 28—The Electric Garage and Dealers' Association, which was formed a short time ago, was disbanded last night at a meeting held in the hotel Metropole. Soon after the formation of the body, an effort was made to join it to the Chicago Garage Owners' Association as a section but dissension arose. The garage association foresaw a possible change in name being necessary and objected to the electric men coming in as a section, holding they must come in as individual members. The Anderson Electric Car Co. and three others withdrew at the meeting last night and it was voted unanimously to disband and join the Electric Vehicle Association. The funds remaining in the treasury were turned over to charity.

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Only 33 Jitneys in Louisville

LOUISVILLE, KY., Sept. 24—Adverse legislation has curtailed the number of jitneys in Louisville. Only thirty-three cars are now being operated on five streets by the Louisville Jitney Bus Co. Back in April when the movement was at its zenith, 300 jitneys were competing with the street cars.

The latter part of April an ordinance was passed by the city council requiring jitney operators to give a $5,000 indemnity bond, and pay $10 for annual license for cars with eight passengers, $20 for cars carrying eight to fifteen passengers, and $25 for larger cars. The above licenses are not in lieu of other licenses already required.

The new ordinance drove practically all of the operators out of business, when it was enforced about a month later. The Louisville Jitney Bus Co. was organized and thirty-three cars have been operated ever since by this concern under one $5,000 bond.

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$100,000 N. J. Jitney Co. Formed

JERSEY CITY, N. J., Sept. 24—Articles of incorporation of the Auto Hack Co., this city, have been filed. The company has a capital of $100,000 and will start business Oct. 1 with five seven-passenger cars, which will run in Bergen Avenue and Montgomery Street to the Pennsylvania ferry. The company intends to do jitney business.

Jitneys Win Fight in Richmond

$500 Bond Ordinance Repealed and Cars Resume a 5-Cent Service

RICHMOND, VA., Sept. 27—After a legal fight which started in the police court and terminated in the Virginia Supreme Court, in which the city of Richmond was sustained in its fight to place an indemnity bond of $500 on each car thus engaged, Richmond is again enjoying jitney service, though the number of cars is not as great as heretofore because of the high cost of gasoline.

After the city was sustained in upholding its ordinance, citizens of the West End held a mass meeting and urged the City Council to give the jitneys new life. The fight was carried into the Council chamber, and as a result the ordinance was repealed. Mayor George Ainslie signed the repeal papers, and on Wednesday the 5-cent fare cars began regular service. The jitneys are regulated as to the number of passengers they shall carry—no passenger being allowed on the running boards on the doors of the cars. The regulations as to routes are being adhered to and all of the city regulations are being recognized.

The Motor Transit Corp., a subsidiary of the Virginia Railway & Power Co., which put on about forty cars, withdrew the same from service after the independents had been driven to cover because of adverse legislation, and announced that its losses had been about $700 per month besides the wear and tear. The Motor Transit Corp. will not put back the jitneys, but will continue the operation of several large motor buses as feeders for the street cars. It is probable that later transfers will be given from the motor buses to the street cars operating in opposite directions.

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Montreal's Jitneys Vanish

MONTREAL, QUE., Sept. 27—Montreal's jitney service has passed away quietly after a fitful existence of about two months. Started in the middle of April, they enjoyed a fair measure of success at the start, but the service was gradually decreased, and was finally dropped in the middle of July when the Jitney Association of Montreal suspended its operations. The chief cause for the failure of the innovation, as given by one of the promoters of the Association, was lack of co-operation and discipline on the part of the drivers.

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Jitney Insurance Exchange Enters Field

KANSAS CITY, MO., Sept. 23—The National Indemnity Exchange, insuring jitneys and livery cars, has been licensed in Missouri, Oklahoma and Minnesota, and is writing an especially long line in the last-named State. Application is now being made in Arkansas, where it is said many jitney owners wish insurance, and California and Pennsylvania will be entered next. Recently the company received a communication from a jitney organization in New Orleans urging it to enter that city, but Louisiana has no laws under which an interinsurance concern could be licensed. The same situation prevails in Texas. Hundreds of cities have jitneys now which will be eliminated from the streets upon the enforcement of ordinances requiring heavy bond, and in other cities similar present legislation operates against the entrance of the insurance company.

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Holds Jitney Ordinance Illegal

BALTIMORE, MD., Sept. 25—The city ordinance placing an annual tax of $25 per seat on jitney buses has been held to be illegal by Judge Elliott in the Circuit Court, Part 2, on the grounds that the law is discriminatory and prohibitory. The decision is a real victory for the jitney owners. It is probable that the city will take an appeal in the case or that the city council will be called upon to pass another ordinance regulating jitneys.

The Public Service Commission and members of the Automobile Commissioner's force will hold a conference next week at which time they will talk over plans to enforce the rule handed down by the commission which prohibits the overloading of jitneys.

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Special License for Solid Tires

BALTIMORE, MD., Sept. 25—City Engineer McCay, of Baltimore, has given until Oct. 1 for owners of solid tired motor trucks to take out the special license for these vehicles.

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Jitneys Decrease in Washington

WASHINGTON, D. C., Sept. 25—Since the jitneys were placed under the jurisdiction of the Public Utilities Commission the number of machines in use has decreased from sixty to thirty. Eight companies and individuals are now operating jitney buses here. Within the last month two companies operating buses have had financial difficulties and one of these companies has suspended operations because its machines were seized for non-payment of the purchase price. Aside from putting them under the control of the Public Utilities Commission there has been no legislation here affecting the jitneys.

A license fee of $12 is required for each machine carrying ten or more passengers and $6 for each machine carrying under that number. In addition a personal tax of 1½ per cent of the assessed value of each machine is levied.

Factory Miscellany

Selden Starts Addition—The Selden Motor Vehicle Co., Rochester, N. Y., is excavating for an addition to its plant on Probert Street.

To Make Spring Starters—G. L. Rock's spring starter will be manufactured in Jonesville, Mich. A building formerly used for automobile assembling will be used.

Falls Rubber Plant Ready—The Falls Rubber Co.'s plant in Cuyahoga Falls, Ohio, is nearly ready for operation. The new machinery has arrived and is being installed.

Remington Buys Vaughan Plant—The Remington Motor Co. has bought the plant formerly occupied by the Vaughan Motor Car Co., Kingston, N. Y. This plant has been idle for two years.

New Paige Addition—A building permit was obtained to-day by the Paige-Detroit Motor Car Co., Detroit, Mich., for a four-story addition, 312 by 60 ft., the cost being estimated at $61,500.

To Erect Plant—The E. E. Wentworth Corp. of Maine, that has the entire distribution of Overland cars for the State, is to erect a big plant at Springvale for the manufacture of cars, bodies, etc. It will cost $50,000.

To Make Signals—The Sherman-Crane Automobile and Signal Co., Denver, Col., manufacturer of automobile direction signals, has written to the St. Paul Association of Commerce regarding a proposed site in the Midway district. The company is capitalized at $100,000.

Studebaker to Build Testing Track—The Studebaker Corp. has effected a lease for a large tract of river frontage, directly across from plant No. 3. This is to be used as a testing park for Studebaker cars as they come out of the factory. The corporation will build a track on the grounds.

To Make Automobile Hardware—The Keeler Brass Co., Grand Rapids, Mich., makers of automobile hardware, metal specialties, etc., will immediately commence the construction of an addition to its plant, 150 by 200 ft., to be used for cutting operations with punch presses and automatic screw machines.

Seattle Co. to Build—The Western Automobile Co., Seattle, Wash., has been incorporated with $1,000,000 capital stock, by C. A. Cawley, G. L. Grant and S. L. North. The company has acquired a factory at Rainier Avenue and Lane Street, Seattle, and will establish an assembling plant and machine shop.

Firestone Foremen Hold Outing—Sept. 18, foremen, superintendents and officials of the Firestone Tire and Rubber Co., Akron, Ohio, to the number of 200 motored 60 miles to the old Firestone Homestead at Columbiana, Ohio, where they spent the day as the guests of President H. S. Firestone. It was the third annual Homestead Outing.

Lakey Foundry to Enlarge—At a meeting of the directors of the Lakey Foundry Co., Muskegon, Mich., it was decided to enlarge the plant and double the number of men employed. The foundry now occupies 25,400 sq. ft. of floor space and when the additions are completed the floor space will be 43,600 sq. ft., while the working force will be increased from 200 to 400.

Sphinx Ships Delivery—The Sphinx Motor Car Co., York, Pa., which recently made the announcement of putting on the market a light-weight delivery car, shipped the first car from the factory this week. The car sells for $695, the same price as the touring car manufactured by the Sphinx company. It is of 1000 lb. capacity and is equipped with an electric lighting system and self starter. Increased shipments of Sphinx cars are being made from the factory.

No Homes for Muskegon Workmen—Like Flint, Pontiac and other Michigan automobile manufacturing centers, Muskegon, Mich., is now facing the serious problem of being able to house all its workers. When the additions to the Continental Motor Mfg. Co.'s plant will be finished, 1200 more men will be employed. Several other plants, such as the Campbell, Wyant & Cannon Foundry Co., the Lakey Foundry Co., the Muskegon Motor Specialty Co., will add several hundred men to their forces, although there are hardly any houses for rent now. One real estate company which had sixty-three homes for sale two months ago now has only four unsold, and another which had more than thirty now has none. There is talk of getting city officials and leading citizens together to organize a corporation with a capital of possibly $100,000 for the purpose of building several hundred houses at once.

The Automobile Calendar

Sept. 26-Oct. 10	Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Sept. 27-Oct. 3	Salem, Ore., Show, State Fair.
Oct.	Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct. 18-25	Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2	Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2	New York City, Sheepshead Bay Motor Speedway 350-Mile Race.
Oct. 2	Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9	Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 4-10	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6	Columbus, O., Garage Owners' Convention.
Oct. 4-14	Wichita, Kan., Show, Wichita Auto. Dealers' Assn.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9	Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14	Chicago S. A. E. Standards Committee Meeting.
Oct. 16	Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 16-23	Pittsburgh, Pa., Show, Motor Square Garden, Automobile Dealers' Assn.
Oct. 17	Twin City Speedway Match Race.
Oct. 18-19	Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Oct. 18-24	Troy, N. Y., Show, State Armory, Troy Automobile Dealer's Assn.
Oct. 20-21-22	Excelsior Springs, Mo., National Assn. of Automobile Accessory Jobbers' Meeting.
Oct. 24	Fort Worth, Texas, Race Meet.
Nov. 1-3	Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 12-20	Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18	Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4	Electric Prosperity Week.
Dec. 31	New York City Show, Grand Central Palace.
Jan. 8-15	Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb.	Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12	Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 15-20	Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19	Newark, N. J., Show.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry

Watson a Service Head—The Kent Motors Corp., New York City, distributor for the Abbott and Marion, has appointed William Watson superintendent of service.

Hobert Handling Master Carbureter—T. R. Hobert, formerly with the Peerless Motor Car Co., Cleveland, is now handling the Master carbureter in St. Louis, headquarters being at 5205 Delmar Avenue.

Wickham Resigns from Minneapolis Studebaker—F. A. Wickham has resigned his position with the Minneapolis branch of the Studebaker Corp., having been with it for more than five years. He is planning organizing a company to handle tires.

Barnett King Factory Rep.—I. S. Barnett, until three weeks ago president of the Kentucky Automobile Co., Louisville, Ky., Cadillac dealer, has been appointed factory representative of the King in Kentucky and southern Indiana, with headquarters in Louisville.

Recent Haynes Appointments—J. C. Tegder has been made assistant sales manager of the Southern department of the Haynes Automobile Co., with headquarters at Atlanta, Ga. F. B. Cornell and Harry Chalfant have been appointed district representative and service department head, respectively, with headquarters at Atlanta.

Smith in Charge—G. A. Smith has been detailed by the Ford Motor Co. to take charge of the service and repair departments of the Everyman's Car Co., corner of Sparks and Kent Streets, Ottawa, Ont. The latter has been delegated the exclusive right to sell Ford cars in Ottawa with sub-dealers at Vankleek Hill, Russell, North Gower, Casselman and Aylmer. Its big new plant is now in operation.

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Dealer

Louisville Co. Adds White—The Callahan Motors Co., 811 South Third Street, Louisville, Ky., agent for the Scripps-Booth and Chandler cars, has acquired the agency for the White in the Louisville territory.

Mitchell in Salt Lake City—The Meredith Automobile Co., Salt Lake City, Utah, has taken on the Mitchell. The company is located at 65 West Fourth South Street. J. B. Hamby is sales manager. The company has taken on the distribution for Utah, Idaho and Wyoming.

Motor Men in New Roles

Beltzig Firestone Office Mgr.—E. H. Beltzig has been appointed office manager of the St. Louis branch of the Firestone Tire & Rubber Co., Akron, Ohio.

Shetter Heads York Co.—The Penn Auto Co. has opened sales rooms at 31 West Philadelphia Street, York, Pa. G. W. Shetter is the manager of the new company.

Yancey a Manager—L. T. Yancey of St. Louis, has been appointed manager of the service department of the Columbia, Mo., branch of the Hudson-Phillips Motor Car Co.

Oswald Heads Louisville Co.—The Reliable Double Tread Tire Co. has opened an office and workshop at 907 West Broadway, Louisville, Ky. J. F. Oswald is the new manager.

Cooper Goes to Topeka—J. R. Cooper, formerly factory representative of the Overland at Kansas City, has been made manager of the truck department of the Overland at Topeka, Kan.

Curtain Resigns—T. E. Curtain has resigned as sales manager of the Columbus Cadillac Co., Columbus, Ohio, to engage in business for himself. His plans for the future have not yet been made public.

Ranney Heads Seattle Willard—The Storage Battery Service Co. of 1532 Broadway, Seattle, Wash., has been appointed agent and service station in Seattle and surrounding territory for the Willard storage battery. L. J. Ranney is manager of the firm.

Fisher Retires—R. T. Fisher has retired from the Campbell-Fisher Sales Co., Columbus, Ohio, Madison distributer, and will devote his time to other interests. H. B. Gilchrist, vice-president of the company, will assume the duties of secretary and treasurer.

Thomas Resigns from Moline—J. V. Thomas, who has been associated with the sales department of the Moline Automobile Co., East Moline, Ill., for the past year, has resigned. He will be succeeded by D. M. Beal, who has been manager of the branch in Omaha.

Campion Handles Swinehart Tire—Ed Campion, former sales manager of the Marathon Tire & Rubber Co., Cuyahoga Falls, Ohio, and former manager of the Seattle branch of the Firestone Tire & Rubber Co., has opened a distributing house for Swinehart tires in Seattle. His territory embraces the States of Washington, Oregon, Idaho and Montana and the Canadian province of British Columbia. Campion's store is located at 909 East Pike Street.

Returns to Ranney Staff—W. H. Van Deusen, formerly in charge of the wholesale department of the A. Elliott Ranney Co., New York City, and since June wholesale manager for the Carl H. Page Motors Co., is again associated with the Ranney company in charge of the wholesale distribution of King cars.

Patten Succeeded by Buse—R. H. Patten has resigned his office as vice-president and general manager of the Buse-Patten Motor Car Co., Buffalo, N. Y. Gustave Buse will succeed him in the management of the company which distributes Grant, Hupmobile, National and Moon cars in Western New York.

Foss Pierce Commercial Mgr.—W. J. Foss has been appointed commercial manager of the Pierce-Arrow Motor Car Co., Buffalo, N. Y. Mr. Foss has been associated with that company for the last 10 years as treasurer of the Foss-Hughes Co., distributor of that car in Philadelphia, Baltimore, Washington, Wilmington, Providence and Newport.

Guyon Joins Elyria Co.—F. R. Guyon has left the American Ball Bearing Co. to become assistant manager of sales of the Elyria Iron and Steel Co. The executive offices of the Elyria concern have recently been moved to Cleveland.

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Dealer

Master Carbureter in Cincinnati—The Carbureter Sales Co. has been organized in Cincinnati, Ohio, by C. Shuster and Edward Voss, Jr., to handle the Master carbureters. Headquarters have been opened at Court and Elm Streets.

Packard Service Bldg. in Chicago—An addition is planned for the Packard Motor Co. of Chicago. The new structure will cost $125,000 and is located at 2338-42 Indiana Avenue, just north and in the rear of the present property at Michigan Avenue and 24th Street. It will be completed by Jan. 1. Fireproof construction will be utilized on the five-story service station. It is to have a frontage on Indiana Avenue of 78½ ft. and will be 160½ ft. deep.

To Make Tires—The Huntington Tire & Rubber Co., Huntington, W. Va., capitalized at $25,000, will make automobile tires in that city. The plant will have a capacity of fifty tires a day. The incorporators are F. M. Bailey, J. F. Schmidlapp, J. M. Thornburgh, P. M. Walker and Roy Bailey.

New Garage for Canton—Oscar Sogan and J. C. Opperud have bought the White Front garage at Canton, S. D., from Elling Ellingson.

Ward Makes N. Y. Lease—The Ward Motor Vehicle Co., New York City, has leased a store and basement at 1838 Broadway, New York City.

Handles Gray & Davis Line—Jenkins & Robinson, proprietors of the Blue Ribbon Garage, at 69 Central Street, Worcester, Mass., have been appointed representatives for the Gray & Davis equipment and a service station has been installed.

First Municipal Garage in Texas—The first municipal garage ever established in Texas, is located at Dallas. It is in charge of chief mechanic G. L. Vaughan. It is fully equipped for the work and was established only a few weeks ago.

John & Arthur Moves—The John & Arthur Co., one of the biggest accessory houses at Boston, Mass., has been forced to vacate its salesrooms at 117 Massachusetts Avenue because it has outgrown them, and it will be located at 165 Massachusetts Avenue shortly after Oct. 1.

Pope Parts Service in Mass.—Owners of Pope-Hartford cars in Massachusetts and the northern New England States are to be taken care of in the matter of new parts by the Pope-Hartford Co. of Boston, which in the future will carry a complete line for the various models.

The Hartford Motor Car Co., Hartford, Conn., is enlarging the parts plant and is going into the manufacture of all parts for these cars on a larger scale then ever before.

New Stations Completed—The new service stations under construction at Springfield, Mass., one at Winchester Square for the Corson-Berry Co., agent for the Studebaker, and the other at 600 State Street for M. G. Barrett, who has the Metz line, have been completed.

Maguire to Build—J. W. Maguire, who has sold the Pierce-Arrow at Boston, Mass. for years, has petitioned the city authorities to grant him a permit to build a service station at 1061 Commonwealth Avenue, right beside the structure now owned by the Packard Motor Car Co.

Packard Buys Land in Cleveland—The Packard Company will build a $125,000 fireproof structure running from Prospect Avenue, S. E., to Carnegie Avenue, Cleveland, Ohio, to be used as an agency. The building will be two stories with a 98-ft. frontage on Prospect Avenue, and a 322-ft. depth.

Baltimore Trade News—The Double Mileage Tire Co., Inc., of Buffalo, N. Y., has opened a branch at 533 North Howard Street, Baltimore. It is said that other branches will be opened in other parts of Maryland.

The new headquarters of the Baltimore Buggy Top Co., 107 West Mount Royal Avenue, Baltimore, have been formally opened. H. D. Coulson is in charge.

The Wayne Oil Tank & Pump Co., North Avenue near Linden Avenue, now is handling the products of the company of Fort Wayne, Ind. The members of the local agency are H. Winternitz, Jr., and M. J. Gutman.

The Beehler & Ogden Motor Company, Lexington Street, near Carey Street, has taken the agency of the Allen cars.

Colorado Trade News—J. A. Nisbet, who recently secured the Scripps-Booth agency for Colorado, has moved into permanent quarters at 1551 Broadway, Denver.

A. C. Friedman has started a plant for making over old tires at 1241 Broadway, Denver, under the business name of the Western Double Tread Tire Co.

The Platt-Fawcett Motor Co., 1249 Broadway, Denver, Stearns and Mitchell distributor, has taken the State agency for the Paige, which was recently given up by Lester G. Palmer.

George Stroehle Sons, Idaho Springs, Col., are planning to build a garage next month. The building will be 60 by 110 ft., and will be arranged for an accessory display. C. K. Miller, at present in charge of the automobile work machine shop, will be manager of the new garage.

Late Ill. Trade News—Donald Joy has taken the agency for the McFarlan car for Morgan and adjoining counties in Illinois, and will make Jacksonville the distributing point.

J. B. Harris of 116 East Washington Street, Springfield, has taken the agency for the National car.

Naffziger & Holderly of Minier, Ill., have taken the agency for the Argo.

The Frank H. Cole Motor Car Co. has outgrown its present quarters at 217 East Front Street, Bloomington, Ill., and has leased the double building of two stories, now occupied by the Bloomington Motor Co., distributor for the Ford car. The latter company is completing a large, fireproof building of three stories at 305-11 West Jefferson Street and, as soon as possession is taken of the new structure, the Cole company will move into the one vacated. The changes will be made about Oct. 1.

Late St. Louis Items—The George C. Brinkman Motor Car Co., 2818 Locust St., St. Louis, Mo., has been appointed distributor of the King line in the St. Louis district, including the eastern half of Missouri and the southern half of Illinois.

The Illmo Motor Mdse. Co. has moved into its new quarters at 1174-76 North Kingshighway, where it will handle Michelin tires and a full line of oils, accessories and supplies and is equipped with a complete vulcanizing plant. H. F. Goudy is manager.

The Independent Tire Co., 3150 Locust Street, St. Louis, Mo., will triple its space in the near future. The company has leased the building at 3152 Locust Street recently vacated by the Koochook Rubber Co.

The Missouri Auto Specialty Co. has doubled its sales room space and service capacity by moving into its newly equipped building at 1903-1905 Locust Street.

Philadelphia Automobile Agencies Combine—The Stearns Motor Car Co. of Philadelphia and the Eveland Motor Car Co. have been consolidated under the firm name of the Yerkes-Eveland Co., to handle the Stevens-Duryea account, the Stearns-Knight and the Stewart truck. For the present the locations of the two organizations will remain as heretofore, namely on Ridge Avenue above Broad Street for the Eveland company, and the northeast corner of Broad and Mount Vernon Streets for the Stearns. The main offices will be at the latter location and the main service station at the first-named address. Plans are under consideration, however, to merge the two establishments at one location, the truck department to be conducted separately under H. C. Minor. Officers of the new concern are: William C. Yerkes, formerly of the Stearns company, president, and Winsor Eveland, formerly of the Eveland Motor Co., vice-president and general manager.

Toledo's New Garage—What is said to be the most modern, most completely equipped and one of the largest garages in the Middle West is the new home of the United Garage at the corner of Jefferson Avenue and Ontario Street, Toledo, Ohio. The new home contains 60,000 sq. ft. of floor space and occupies the five-story and basement structure formerly known as Burt's Theatre. The building has been completely remodeled and rebuilt. The building is constructed of brick and concrete and is equipped with automatic sprinkler system and automatic fire alarm. Among the other modern features of the garage are rest and retiring rooms for ladies, shower baths for tourists, electric elevators of the largest size, that travel 60 ft. a minute, tire-inflating service to every foot of space in the entire structure, equipment to wash two cars at once in the shortest possible time, a service and repair department that will overhaul a car in a few hours' time, so that tourists will not be delayed, and special road and travel information bureau.

Recent Incorporations in the Automobile Field

Canada

HAMILTON, ONT.—East End Garage Co., $40,000. F. A. Robertson, C. R. Robertson, G. S. Dunkin.

OTTAWA, ONT.—Auto Products Co.; $250,000. W. J. Halpin, P. J. Daly, L. R. O'Connell.

OTTAWA, ONT.—Everyman Car Co.; $40,000. A. M. Jacques, F. H. Jacques, C. A. Jacques, J. W. Nicoll, R. I. Schram.

VANCOUVER, B. C.—Ford Lock Co.; $25,000; maker. B. P. Youmans, J. M. Hoff, G. B. Simpson.

Colorado

DENVER—Auto Sales Co.; $25,000. H. W. Curtis, J. A. Davis, D. C. Triggs.

Delaware

WILMINGTON—Motor Transit Co.; $600,000. F. S. Coleman, H. B. Lanyon, H. E. Latter.

Georgia

ATLANTA—Compression Inner Tube Co.; $10,000. S. A. Culbertson.

Illinois

CHICAGO—Boulevard Tire and Supply Stores; $10,000. Jesse Spalding, A. T. Carton, H. A. Gardner.

CHICAGO—National Carbureter Co.; $5,000. W. P. Habel, W. A. Edward, C. G. Lamb, W. H. Williams.

CHICAGO—Safety Ford Starter Co.; $2,500. W. J. Montgomery, S. B. Krohn, H. D. Gibbons.

MARSHALL—Marshall Motor Co.; $2,500. Albert Sockler, Bertha Sockler, A. L. Ruffner.

Indiana

AUBURN—Dekalb Mfg. Co.; $150,000; automobile manufacturer. W. J. Vesey, A. J. Vesey, W. J. Vesey, Jr.

EVANSVILLE—Saunders Auto Co.; $2,000. J. F. George, R. Saunders.

EVANSVILLE—Day Motor Car Co.; $10,000. E. F. Day, O. S. Meeks, Jr., F. L. Schumpert, Jr.

INDIANAPOLIS—Shade-O-Lite Co.; $25,000; to make dimming devices. F. W. Beauchamp, C. H. Thompson, R. F. Davidson.

INDIANAPOLIS—Zeglen Tire and Fabric Co.; $50,000. Casimer Zeglen, F. I. Hardy, E. R. Dean.

INDIANAPOLIS—Indiana Bull Tractor Co.; $5,000. T. F. Moorman, L. F. Moorman, R. H. Greene.

SOUTH BEND—No-Leak Rubber Tire & Tube Co.; $12,000. F. J. Cosgrove, F. A. Hull, B. J. Engledrum.

SOUTH BEND—Indiana Auto Sales Co.; $10,000. H. L. Simonton, H. H. Albert, E. J. Engstrom.

SOUTH BEND—Zeglen Tire and Fabric Co.; $50,000; rubber and fabric products. C. Zeglen, E. R. Dean, F. I. Hardy.

Kentucky

GEORGETOWN—Prather Demountable Wheel Co.; $40,000. M. B. Ainsworth, J. C. Prather, A. P. Prather, Oklahoma Prather.

GLASGOW—Dickinson Bros. Motor Co.; $12,000 to $20,000.

LOUISVILLE—The Lee Tire Sales Co.; $10,000. W. G. Stiglitz, Louis Stiglitz and Herbert Rudolph.

OWENSBORO—Owensboro Motor Car Co.; $4,500. O. C. Williams, R. P. Keene, Lee Hart.

Massachusetts

MALDEN—Parks-Osgood Co.; $25,000; automobile maker. Howard Osgood, G. A. Parks, P. M. Foss.

Michigan

DETROIT—Michigan Auto Top & Painting Co.; $25,000. H. E. Bullen, C. D. Girard, E. E. Pratt, W. J. Hoskins.

DETROIT—Detroit Auto Accessory Co.; $2,000. J. C. Beck, T. A. Ballinger, O. C. Hull.

DETROIT—Federal Brass Works; $50,000. C. R. Murphy, S. C. Reynolds, F. A. Behr.

DETROIT—Gasolock Sales Co.; $5,000. C. R. Chisholm, R. G. Clark, R. B. Johnston.

DETROIT—Detroit Motor Appliance Co.; $45,000. W. E. Carpenter, H. R. Crawford, H. R. Lewis.

DETROIT—Century Mfg. Co.; $40,000; vehicle manufacturer. Edwin Denby, Philip Breitmeyer, John Gillispie, W. P. Pagel.

DETROIT—Standard Auto Co.; $50,000. E. S. George, A. H. George, W. S. Stebens.

DETROIT—West Detroit Auto Sales Co.; $8,000. C. C. Cook, H. E. Smith, R. A. Snelling, A. B. Wickham.

DETROIT—Jiffy Starter Co.; $15,000. A. W. Cronk, Henry Platz, Perce Shekell, R. Wachman.

DETROIT—Service Truck Co.; $10,000. E. H. Fowler, K. Warren and H. R. Stoepel.

DETROIT—Auto Service Mfg. Co.; $1,000. E. E. Wasey, C. L. Christie, J. P. Nurdorfer.

DETROIT—Falcon Motor Truck Co.; $20,000. A. B. Hazzard, O. B. Mallow, F. T. Lodge.

DETROIT—A. S. C. Co.; $1,500. W. W. Tackabury, J. E. Hamilton and H. E. Avery.

DETROIT—Hurst Garage Co.; $1,000. H. W. Hurst, A. E. Badge and J. C. Shields.

DETROIT—H. P. Engineering Co.; $1,000. H. E. and O. A. Peters, E. R. Holmes.

DETROIT—Cole Tire-Protector Co.; $100,000. F. S. Baker, S. M. Cole, H. M. Cole.

WYANDOTTE—Detroit-Wyandotte Motor Co.; $300,000 to $100,000.

Minnesota

MINNEAPOLIS—Twin City Cord Tire Co.; $50,000. C. A. Ennis, M. A. Hessian, C. L. Archer.

Missouri

JEFFERSON CITY—Battery Service Co. of St. Louis; $3,000. W. O'Shuhre, M. J. Cline, E. B. Jennings.

JEFFERSON CITY—The Motor Transportation Co. of St. Louis; $10,000. H. C. Stifel, R. A. Huber, N. C. Hadley.

ST. LOUIS—Velie Automobile Co.; $7,500. H. L. Schnure, A. Steiner, W. L. Hausman.

ST. LOUIS—H. Bender Tire Co.; $2,000. S. Vazis, H. W. Killersman, C. F. Mieke.

ST. LOUIS—H. S. H. Mfg. Co.; $10,000; maker of radiator caps. P. G. Hoffman, H. A. Hood, Garrard Strode.

New Jersey

NEWARK—Self Vulcanizing Rubber Co.; $25,000.

NEWARK—Empire Mfg. Co.; $25,000; spark plug maker. J. L. Cobb, F. J. Miles, W. P. Murphy.

New York

BROOKLYN—Delling Auto Co.; $10,000; dealer. J. A. Lederman, B. L. Lockwood, M. M. Salomon.

BUFFALO—Transmission Ball Bearing Co.; $100,000; maker. W. J. Murray, J. P. Beatty, W. M. Wilson.

BUFFALO—Derrick, Gannon Motor Sales Co.; $10,000. R. L. Derrick, F. T. Gannon, J. G. Lesswing.

ROCHESTER—Double Mileage Tire Co.; $10,000; manufacturer. F. L. McCausland, Warren Bulkeley, J. Mahker, 319 Electric Avenue.

ROCHESTER—Big Six Auto Livery Co.; $25,000. J. Rodenbecker, C. J. Trumeter, C. R. Bradley.

UTICA—R. and V. Motor Co.; $10,000. W. A. Van Wie, J. M. and G. B. Russell.

New York City

Duffy Motors Corp.; $5,000. L. J. Goldman, G. S. Ludlow, S. C. Duffy.

Lexington Motors New York Corp.; $50,000. F. I. Barrows, A. A. Woodruff, W. S. Fowler.

O'Toole Motor Renting Service; $5,000. A. J., J. J. and T. F. O'Toole.

Utilities Sales Assn.; $5,000; parts. D. Doell, B. Sommer, F. H. Hull.

United States Auto Service Corp.; $50,000. J. De Barbier, J. Condon, L. Ferger.

Schuyler Garage & Supply Corp.; $5,000. John Irving, Beatrice Irving, J. F. Ford.

Westchester Accessories Co.; $5,000. P. M. Pelletreau, B. J. Wagner, C. H. Ludder.

North Carolina

ACME—Moore and Connor Co.; $10,000; automobiles and accessories. T. V. Moore, D. R. Connor, E. P. Moore.

Ohio

ASHTABULA—Ashtabula Auto Sales Co.; $4,000. G. A. Brockway, G. M. Parker, W. H. Collender, J. C. Moran, M. C. Collender.

CANTON—Auto Garage and Sales Co.; $10,000. J. H. Boose, E. C. Scheffler, E. N. Sweitzer, C. E. Halliwell, A. N. Hurst, R. J. Keeder.

CINCINNATI—Double Life Tire Co.; $5,600. Harry Frank, Sophie Frank, Louis Goldstein, Julius Loewenstein, Ignatz Stern.

CLEVELAND—Cleveland-Ford Tire Co.; $10,000 to $100,000.

CLEVELAND—Brown Spring Oiler Co.; $10,000. W. H. Brown, B. B. Wickham, D. H. Tilden, W. J. Budd, G. M. Reilly.

CLEVELAND—Superior 105 Garage Co.; $10,000. A. Frankel, W. G. Cole, H. Jones, Hazel Cole, Florence Frankel.

CLEVELAND—B. & B. Valve & Motor Co., $1,000. B. A. Beckett, C. C. Vrooman, C. E. Bellen, H. L. Parmenter.

CLEVELAND—Cleveland Automobile Show Co.; $7,500. Richard Inglis, R. J. Bulkley, F. X. Cull, I. W. Sharp, M. T. Flanagan.

COLUMBUS—Columbus Cadillac Co.; $25,000. Morton McGiffin, F. E. Felton, T. B. Bolton, E. S. Jenkins, R. G. Morrison.

COLUMBUS—Fireproof Garage Co.; $10,000. W. D. Huber, A. C. Huber, A. E. Huber, Olive Swift, J. A. Keever.

DAYTON—Fireproof Garage Co.; $10,000. W. D. Huber, A. C. Huber, A. E. Huber, O. M. Swift, J. A. Keever.

FINDLAY—Crofoot Mfg. Co.; $25,000; to make a contrivance for shipping automobiles. E. H. Crofoot, C. L. Casterline, J. E. Fennerty, G. L. Cusac, S. W. Maschoo.

LIMA—Gramm Motor Truck Co.; $1,250,000 to $2,500,000.

OWENSBORO—Owensboro Motor Car Co.; $4,500. O. C. Williams, R. F. Keene, Lee Hart.

SALEM—Porter Rubber Co.; $125,000. J. C. Porter, A. H. Boyd, W. F. Church, C. F. Smith, L. P. Metzger.

SEBRING—Sebring Tire & Rubber Co.; $200,000. John Hotchkiss, W. F. Smith, C. B. Smith, H. D. Weaver, W. B. Stevenson.

TOLEDO—Ohio Tire Service Co.; $1,000. G. W. Henne, M. E. Hubbard, Samuel Lover, J. M. Lover, A. C. Moore.

TOLEDO—Universal Motor Co.; $100,000. Howard Lewis, H. J. Kehoe, F. S. Lewis, P. W. Alexander, F. W. Gaines.

TOLEDO—Jonas Battery Co. changed to Toledo Battery Co.

YOUNGSTOWN—Security Automobile Mutual Insurance Co.; no specified stock; to write automobile insurance. B. E. Cornelius, C. A. Cochran, Phillip Wiel, G. H. Kennedy, E. E. Dennison.

Pennsylvania

ALLENTOWN—Allen Street Sweeper & Auto Co.; $10,000; to make trucks and street cleaning apparatus. A. G. Dewalt, 309 North Sixth Street; H. S. F. Barner, J. F. Garman, Henry Krouse, Henry Hantz.

South Dakota

PIERRE—United States Wheel and Tire Co.; $300,000. E. S. Gleasman, S. D. Ross, C. B. Nelson, L. H. Moore, E. G. Hoffman, H. P. Moses, J. R. Atwood, H. M. Wilcox, G. W. Shaw.

Tennessee

MEMPHIS—American Auto Jack Co.; $10,000; maker. J. E. Richards, H. W. Watson, P. H. Pierce and others.

Texas

AMARILLO—Overland Texas Co.; $10,000. T. S. Likine, T. F. Turner, A. S. Rollin.

AMARILLO—Western Motor Co.; $1,000. C. H. Dixon, W. L. Fore, C. C. Chenoweth.

DALLAS—Overland Service Corp.; $5,000. T. F. McBruler, E. L. Gaddis, G. E. Mannatt.

DALLAS—Malff Thomson M. C. Co.; $15,000. G. A. C. Malff, E. J. N. Lanhom, R. M. Thomson.

DENISON—Denison M. C. Co.; $2,500. B. S. Benedict, Frank Platter, W. W. Lankford.

SAN ANTONIO—Blumberg Motor Mfg. Co.; $25,000; motor maker. H. G. Blumberg.

Virginia

RICHMOND—Armstrong Tire Co.; $10,000; manufacturer. H. H. Chalkley, N. Rutenberg, A. R. Lane.

Washington

EVERETT—Northwest Tire Company; $2,000. Arthur A. Bailey, James C. Lashna.

OLYMPIA—Capital Transit & Repair Co.; $2,000. L. J. Meyers, H. H. Schultz, O. A. Schultz.

SEATTLE—Jacquemine Auto Steel Wire Tire Co.; $100,000. Eugene Jacquemine, Evan Gough, J. R. Cabanne.

SEATTLE—Bailey Garage & Machine Co.; $20,000. J. W. Bailey, J. F. Scearce.

SEATTLE—Western Automobile Co.; $1,000,000. C. J. Grant, C. A. Cawley, S. W. North.

SEATTLE—Hainsworth Motor Co.; $25,000. J. W. Hainsworth, C. L. Hall.

SEATTLE—N. Foster Co.; $10,000. J. F. LePage, V. S. McKenny, N. H. Foster.

SPOKANE—Inland Automobile Assn.; $50. T. S. Lane, F. W. Guilbert, H. Weatherspoon.

SPOKANE—Spokane Motor Transportation Co.; $6,000. Paul, Ralph E. B. Quackenbush.

Wisconsin

APPLETON—The Appleton-Buick Co.; $5,000. M. J. Konrad, F. M. Charlesworth, F. Felix Wettengill.

ASHLAND—Simple Gas Engine Co.; $10,000. A. L. Preimersberger, C. A. Anderson, W. F. Thommes.

CEDARBURG—Automobile Jack Co.; $25,000; maker. J. R. Thill, E. J. Broth, M. N. Green.

EAU CLAIRE—Northwest Wisconsin Overland Co.; $50,000. J. A. Taylor, S. H. Hancock, E. A. Arnold.

MEDFORD—Medford Automobile Club; non-stock corporation; O. N. Nystrum, C. F. Lenpke, E. C. Nystrum, W. H. Newburg, H. M. Koehler.

MILWAUKEE—Transmission Research Co.; $25,000. A. D. Whipple, F. L. Bader, C. Doerfler.

MILWAUKEE—Roberson Electric Appliance Co.; $10,000. L. C. Roberson, P. A. Klumb, D. C. Madden.

MILWAUKEE—Milwaukee Auto Engine & Supply Co.; $6,000 to $30,000.

MILWAUKEE—Oil Gas Machine Co.; $25,000. F. J. Blum, H. M. Wink and E. O. Linton.

MILWAUKEE—Teutonia Avenue Garage Co.; $3,000. A. F. Schunk, A. C. Milbrath and F. R. Wahl.

MILWAUKEE—Wetmore Mechanical Laboratories Co.; $2,000. C. P. Wetmore, M. J. Walsh, W. C. Sieker.

MILWAUKEE—Leo Hofmeister Co.; $10,000. Leo Hofmeister, C. M. Waechter, H. S. Kaczynaska.

CEDARBURG—Automatic Jack Co.; $25,000. J. R. Thill, E. J. Groth, M. N. Green.

West Virginia

CLARKSBURG—Harrison County Automobile & Garage Co.; $10,000. G. H. Gordon, R. L. Strother, O. L. McDonald, C. E. Ash, J. S. Blackman.

VOL. XXXIII. NEW YORK—THURSDAY, OCTOBER 7, 1915—CHICAGO No. 15

The AUTOMOBILE

Careful Design Gives Lightness

Weight Is Cut from Franklin Car By Careful Choice of Materials and By Elimination of Useless Metal

TO the engineer who is really desirous of learning the secrets of Franklin light weight automobile manufacture, the list of weights of parts and the drawings herewith are practically sufficient a story. The fact that the Franklin has an air-cooled engine probably helps the weight reduction, but each engineer must settle this for himself by making comparison with the weights of parts and assemblies from his own car.

Since the article Cutting the Weight which appeared in THE AUTOMOBILE for Aug. 5, the steady stream of correspondence has proved beyond any doubt, if indeed there was any beforehand, that light weight is the most desirable attribute of the automobile which it most commonly lacks at present, except in isolated instances. Much experiment on the speedways has shown that the weight factor is all-important in determining accelerative power, and that a few hundred pounds saved is the equivalent of quite a large increase in the cylinder capacity of the engine; also it is well known that tire wear and gasoline consumption are connected very intimately with weight.

What Is a Light-Weight Automobile?

There are three classes of automobile from the passenger capacity point of view. The largest is for seven, the medium for five and the smallest for two or three passengers, and it is desirable that there should be developed some notion as to just what is a commendably light weight for each of these three. Manufacturers who have aimed at the greatest luxury have paid the least attention to weight, so we find that the most expensive seven-passenger cars weigh from 4500 to 5000 lb. and the cheaper ones are very little lighter, the weight difference being made up of differences in equipment and in the solidity of accessories.

The five-passenger car is more difficult to place, as its weight varies much more, there being a wider choice of horsepowers than is obtainable in the seven-passenger class. But to make a carefully considered estimation it will be fairly close to 3500 lb. often heavier than this, and seldom lighter. At the other end of the scale, perhaps the Ford is the lightest of all with is approximate 1500 lb. in five-passenger form, and this car being a fairly good performer, there seems plenty of room between the average of 3500 lb. and the minimum of 1500.

When we come to two- and three-passenger jobs they are so seldom specially built that the weight runs almost as high as for the five-passenger, but signs are not wanting that there is a real demand for a three-passenger car which is loaded to capacity with this number of persons. Taking the very few examples that do exist, an average of about 1700 to 1900 lb. is obtained, so that the five-passenger Ford is a good deal lighter than most specially built two-passenger cars.

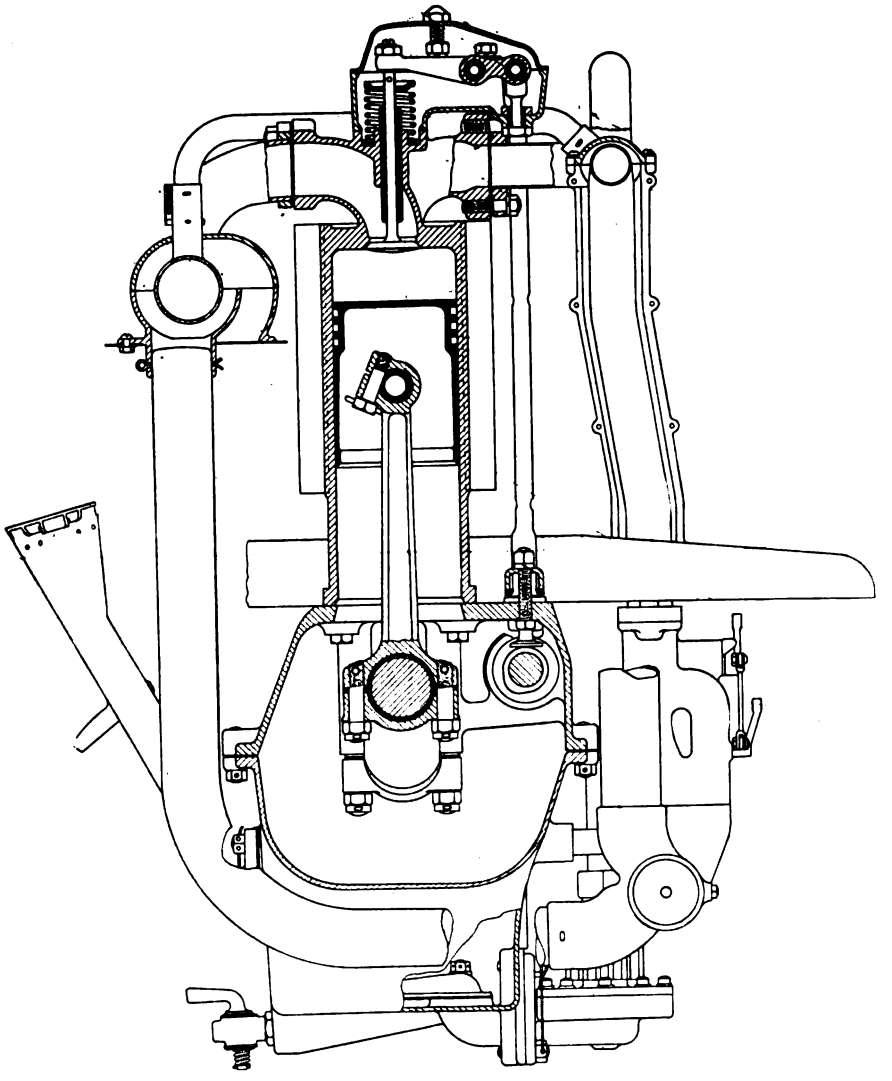
How then can it be said what is "light" and what is "heavy" when such amazing differences as this exist?

In any form of human striving it is always a help to have some target, to have some tangible goal. For the seven-passenger car it might be 3000 lb., for the five-passenger 2250 lb. and for the smallest class of car 1500 lb. The truest of all proverbs is "you never know what you can do till you try" and in weight cutting so few have tried as yet.

Franklin Pioneer in Lightness

Low weight has been a Franklin ideal for years and it is admitted by the company that however light their five-passenger car may be now they hope to make it still lighter as experience suggests new ways for saving. Allowing for manufacturing variations, which is always fairly large in the most carefully made chassis, the average weight of the 1916 Franklin car complete would be approximately 2600 lb. and this lightness is not obtained by any skimping of the essentials.

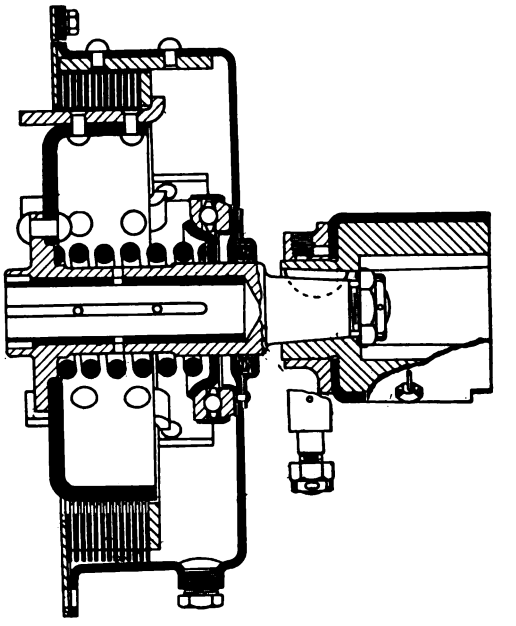
At the present moment the Franklin company is producing a series 8 car which is the same as the series 7, for which a number of detail weights are given, and it is easy to show the way in which weight is steadily cut out by quoting a few differences between the two series models. Using aluminum instead of steel for the fenders has permitted a *saving* of 38 lb. to be made. Substituting aluminum for steel in other places where sheet metal is used as for the running board shields and dashboard parts, has saved 30 lb. more. Careful analysis of the body construction has enabled wood and metal to the tune of 21 lb. to be eliminated without effect upon the strength, the capacity or the comfort. Redesign of the universal joints and the driveshaft has reduced the weight 5 lb. Just these few things have together cut 94 lb. from the weight and the extra cost is very little, so little that it



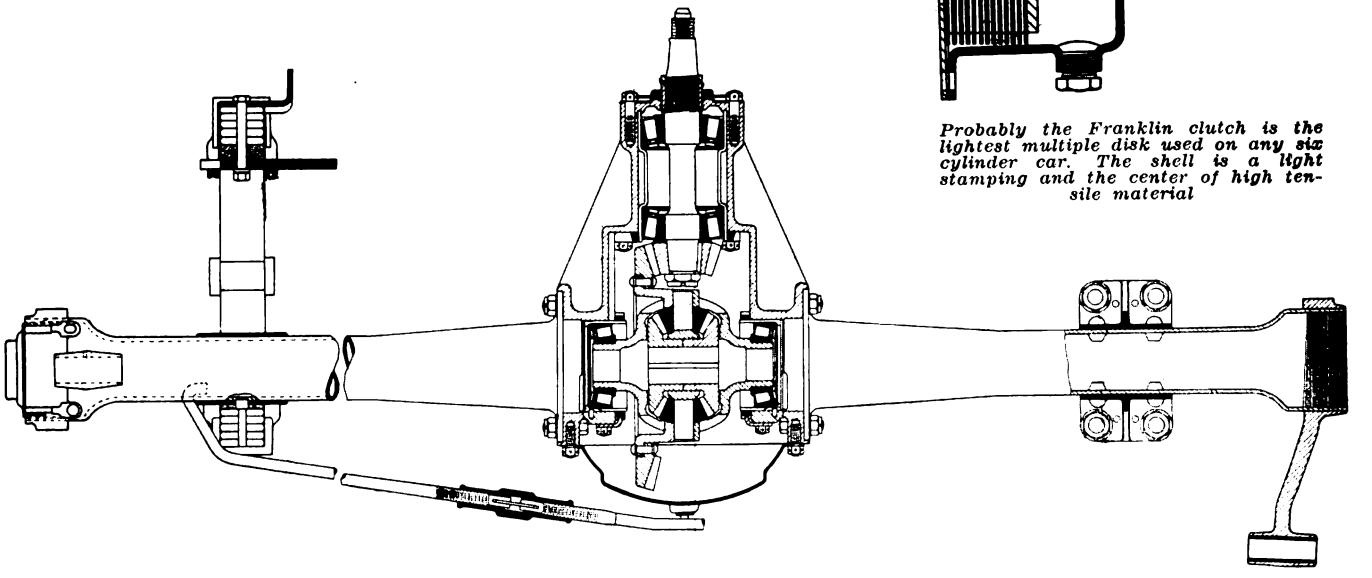
This section of the Franklin engine shows the amount of cast iron saved by the air cooling

Weight of Main Assemblies and Detail Parts of Franklin Series 7

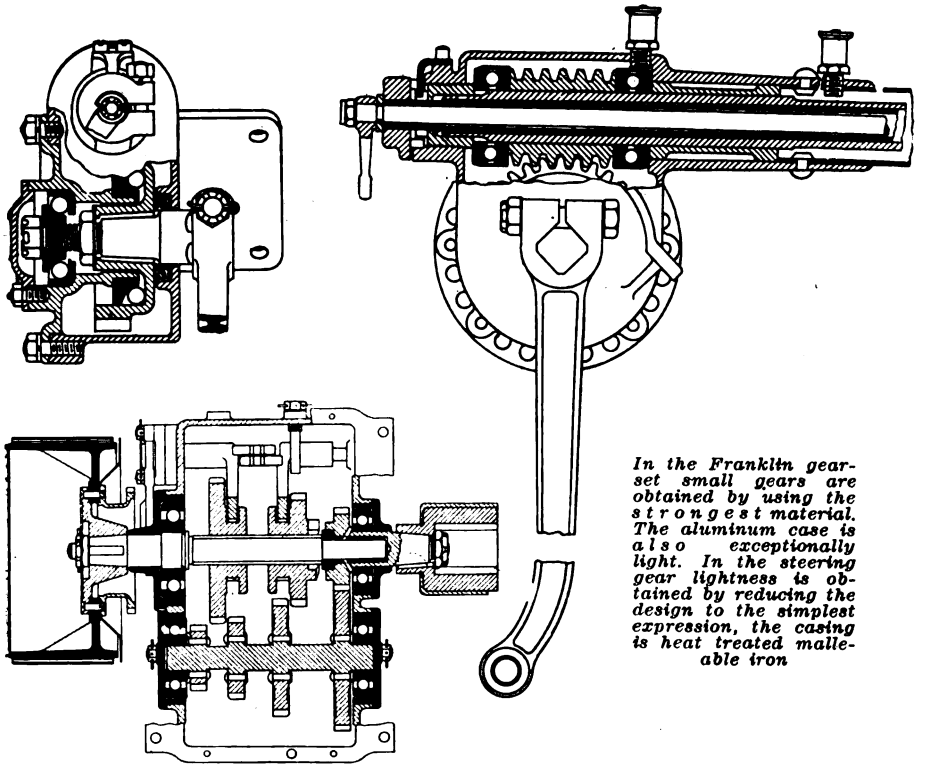
NAME PART OF CAR	WEIGHT M-7 Lb.	Oz.
Front axle	163	10
Rear axle	253	12
Transmission	133	1
Steering device	36	4
Engine	637	..
Sill with running boards	176	..
Running boards	23	4
	29	12
Front mudguards (1)	23	4
Rear mudguards (1)	13	8
Front wheel only (1)	42	..
Rear wheel only (1)	45	8
★Body	486	..
Glass front	30	14
Top dust cover	6	4
Top with curtains	73	10
Hood	35	6
Gasoline tank	25	4
Battery	85	2
Set of lamps	11	12½



Probably the Franklin clutch is the lightest multiple disk used on any six cylinder car. The shell is a light stamping and the center of high tensile material



Shows the construction of Franklin rear axle with thin, drawn steel tubes and aluminum die-cast differential housing. Observe the ingenious method of attachment for the outer ends of the tie rod

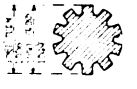


In the Franklin gear-set small gears are obtained by using the strongest material. The aluminum case is also exceptionally light. In the steering gear lightness is obtained by reducing the design to the simplest expression, the casing is heat treated malleable iron

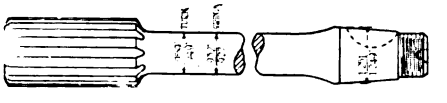
NAME PART OF CAR	WEIGHT M-7 Lb.	Oz.
Horn	3	10
Luggage carrier	16	2
Goodyear plain tire (1)	29	42
Goodyear non-skin (1)	32	13
Flywheel guard	5	2
Mud apron	5	8
Battery pan	..	13
Engine boot	27	8
Headlamp brackets (1)	3	4
Left toe board	2	8
Right toe board	7	9
Floor board	10	..
Sill finish strip (1)	2	2½
Front seat cushion	10	7
Rear seat cushion	27	8
Front seat cushion spring	4	11
Rear seat cushion spring	16	4
Complete equipment	32	..
ENGINE		
Oil baffle plate	..	1½
Valve lifter guide	..	5
Walking beam support cap	..	2¼
Oil pump drive shaft	..	8½
Walking beam support tube	..	6½
Engine rail (rear)	8	12½
Crankshaft bear. cap screw lock	..	2
Camshaft bushing (front)	..	11¼
Camshaft rear bearing cap bush.	..	4
Camshaft center bush (upper)	..	6¾
Camshaft center bush (lower)	..	6¾
Camshaft middle bush (lower)	..	3
Camshaft middle bush (upper)	..	2½
Camshaft front bush (lower)	..	6
Camshaft front bush (upper)	..	5
Camshaft rear bush (lower)	..	4¼
Camshaft rear bush (upper)	..	3¾
Camshaft bear. cap screw lock spacer	..	2½
Crankshaft	44	10
Suction yoke	6	4¾

★With top and glass front, with rear cushion, without front seats. No side curtains.

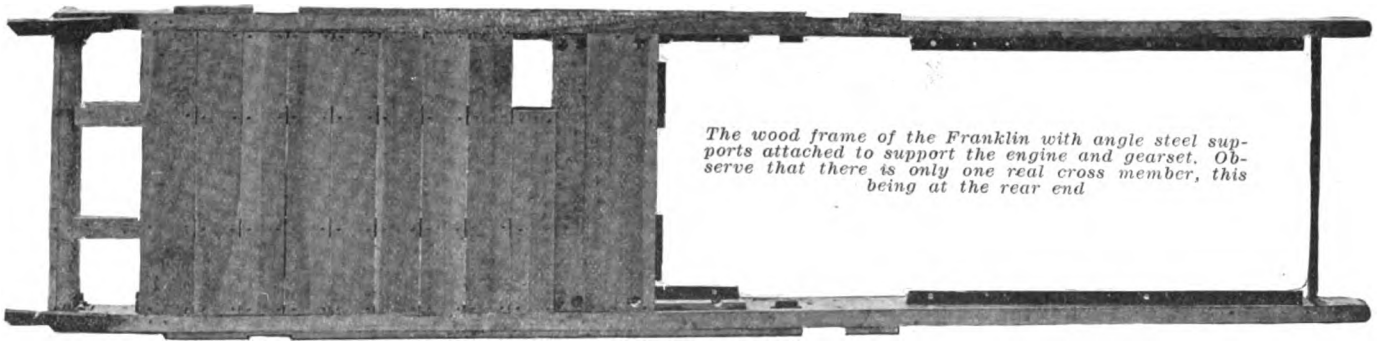
NAME PART OF CAR	WEIGHT M-7 Lb.	Oz.
Exhaust yoke	11	7½
Camshaft	10	7½
Starting crank shaft	..	14
Connecting-rod complete	2	10
Tire pump bracket (rear)	..	13
Tire pump bracket (front)	..	..
Valve lifter guide yoke	..	2½
Front engine rail	4	12
Starting crank shaft	..	14
Starter	53	10
Flywheel disk	6	1
Hot air pipe	2	..
Starting crank clutch	..	6
Cylinder jacket	..	15
Engine jacket complete	5	4
Walking beam stud	..	2½
Oil tank filler float rod	..	½
Carb. aux. air valve stem	..	¾
Throttle valve stem	..	1¼
Air control sleeve	..	3
Carb. lift valve	..	1¾
Cylinder comp. with valves, etc.	22	4½
Carb. base	1	5
Hot air box	..	15
Piston ring	..	1½
CHASSIS		
Trans. univ. block	2	5¼
Exh. yoke stuff. box nut	..	7¼
Univ. block pins	..	5¼
Univ. block pins bush	..	5½
Muffler tail pipe support	..	7
Muffler support	..	5½
Clutch trunnion con. rod	..	8½
Trans. sill angle iron	1	13
Engine sill angle iron	6	..



Dimensions show how using high tensile steel allows driveshaft weight to be cut



NAME PART OF CAR	WEIGHT M-7 Lb.	Oz.
Exhaust pipe	4	3
Foot lever shaft	2	9
Rear corner sill angle	..	14
Accel. bell crank shaft	..	2¼
Dash diaphragm	2	3
Engine jacket front	2	12
Sill	123	..
Running board complete (R)	23	4
Running board complete (L)	29	12
TRANSMISSION		
Low speed pinion	..	12½
Reverse idler gear	..	11¼
Sec. shaft inter. gear	2	1½
Sec. shaft driv. gear	3	10¼
Secondary gear shaft	2	4¼
Trans. engine clutch gear	2	2
Trans. engine shaft cap (front)	1	3¾
Trans. sec. shaft cap	1	2¼
High and int. shifter fork	1	7
Low and rev. shifter fork	1	6½
Trans. univ. shaft end	3	9½
Sliding gear shaft	3	9½
Reverse idler stud	..	8
Shifter fork guide	..	9½
Trans. univ. sleeve	1	9
Secondary shaft comp.	9	14
Trans. engine shaft cap (rear)	1	12
Trans. rail (rear)	5	13
Trans. rail (front)	5	..
Trans. brake carrier	1	13
TRANSMISSION COVER		
Change gear hand lever	2	5¼
Shift lever shaft	1	10
Emer. brake hand lever	2	15
Change gear lever stud	..	3½
Shift lever shaft sleeve	..	4
Emer. brake quad. rack	..	4½
Change gear lever quad	..	1
Trans. cover cap (lower)	..	8¾
Trans. cover cap (upper)	..	5
Inside change gear lever	..	11½
Transmission cover	5	1
DRIVE SHAFT		
Universal joint (rear)	4	4
Universal joint (front)	4	4
Drive shaft pins	..	6½
Univ. joint sleeve	3	5¾
Driveshaft pin bush	..	5½
REAR AXLE		
Diff. bear. support cap	..	14
Rear hub. bear. retainer	1	7½
Rear axle gear case	14	7½
Emer. brake bands	4	½
Pinion shaft bear. case	2	5½
Brake band spring	..	5¼
Bevel driv. pin. shaft	3	2
Rear axle gear case cover	2	10
Pin. bear. case cap	..	14¾
Rear axle truss rod (left)	..	11
Rear axle truss rod (right)	1	5¾
Pin. case packing nut	..	3
Rear spring support	4	8
Spring pivot bolt	..	2
Rear axle shaft	12	3
FRONT AXLE		
Knuckle pin	..	11
Steering knuckle (right)	7	1
Steering knuckle (left)	10	7
Knuckle con. rod lug	..	10¾
Front spring chair	3	4
Front axle yoke	3	6
Front spring fastener plate	..	4
Front wheel bearings (4)	4	..
Front axle tube	15	..



The wood frame of the Franklin with angle steel supports attached to support the engine and gearset. Observe that there is only one real cross member, this being at the rear end

would be practically nothing were it not for the present high price of aluminum.

Crankshaft Is Heaviest

In the lists of parts chosen more or less at random and arranged in groups in the center columns of pages 640 and 641 will be found parts of every sort of material. The complete assembly weights are hardly so instructive as those of the petty portions because it is only by study of the detail that the assemblies have been kept so light. In the engine it is noteworthy that the crankshaft, wherein weight has *not* been saved, weighs 44 lb. and the six cylinders total 132 lb., exactly three times as much. Here, of course, is a chance for more saving still, as the use of aluminum, which is not impossible with air cooling, would at least halve the cylinder mass. One of the most amazingly light parts is the flywheel disk—6 lb.—but this is merely the back plate and the weight of the wheel when the fan parts have been joined to it is not exceptionally low.

In making power plant comparisons, remember that the total of 637 lb. for the complete engine includes all the cooling system and that the equivalent of the water weighs nothing, so the weight compares with that of a watercooled motor plus radiator plus water. That the valve gear in total is heavier than the valves and operation of an L-head motor is probable but the overhead construction is a great aid to the success of the air cooling.

Riveting a Feature

Throughout the whole chassis it may be noticed in the illustrations that a very free use is made of rivets for effecting permanent junction between parts. Also it may be observed that a very large number of small individual pieces is used so that each piece is quite small and light until it reaches the assembly stage. Naturally, the main object of this form of design is to suit the requirements of the production end of the business, for the Franklin factory system is one of the most elaborate and yet simple of its kind. Facsimile production is assisted by the use of small unit parts rather than heavy pieces, but lightness plays a very large part in swaying the engineering department toward their use.

As an example take the drawing of the clutch which shows the light, stamped steel outer case or shell with the keys that secure the disks attached by rivets. To machine them solid would call for both a heavier stamping or a casting and would add considerably to the cost. Then again in the gearset the gears themselves are separate pieces and are riveted to the countershaft but there are no flanges, merely a slightly raised collar on the shaft to correspond to the position of each gear. The rivets pass through holes drilled half in the collar and half in the gear providing a perfectly secure attachment and a series of driving keys simultaneously. This method eliminates the flange, gives a cheap and simple countershaft and the simplest possible form of gear blank. Further the gear blank being of equal section throughout is stated to be less susceptible to warping in the hardening process.

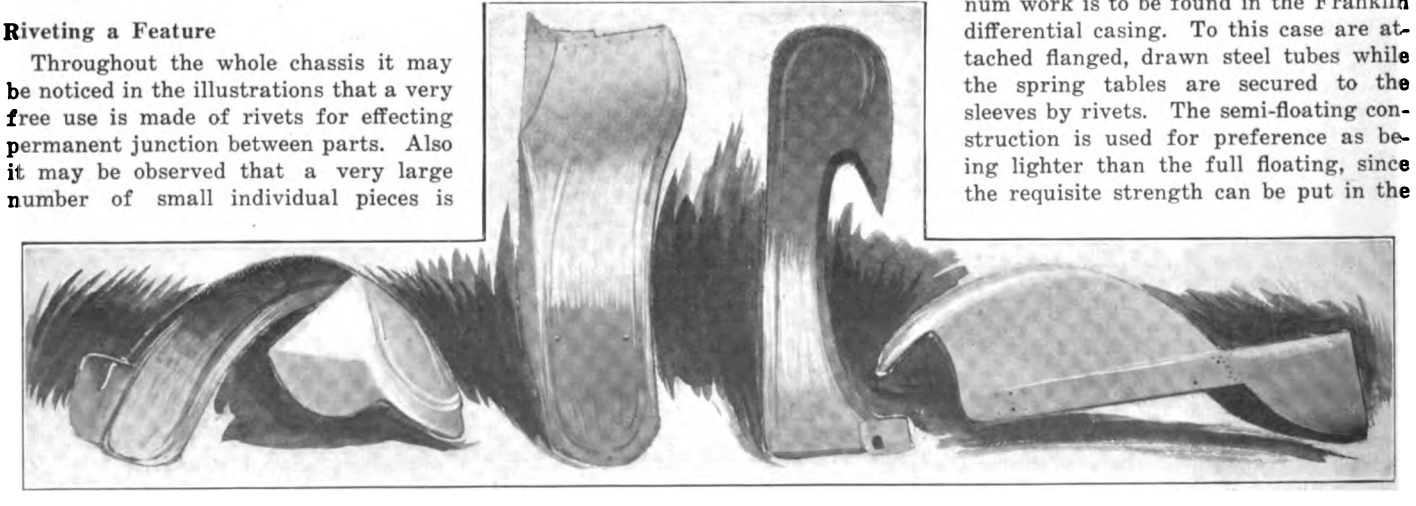
Another lightness feature shown in the gearset section drawing is the service brake, a band lined with Raybestos on a light, wide drum. This brake replaces the usual pair of external brakes on the rear axle with their brackets, bands, pull-off springs, etc. Being of smaller diameter and requiring much shorter linkage to the pedal it cannot weigh as much as half the ordinary service brake. Of course there are some who object to a driveshaft brake, but this is outside the present subject.

It will be granted by any engineer that a good transmission brake is satisfactory if properly designed and the Franklin construction shows how much weight it can save. Incidentally the brake is lighter than the majority of shaft brake designs in general use.

In the same drawing as that of the gearset is the steering gear which is also very light, and it is particularly interesting to learn that the Franklin Co. uses malleable iron for the case because, with the riveting system of assembly the lightest job is obtained with a fairly hard and strong material. Aluminum has been tried for this gear inclosure, but when the construction is modified to suit it the final result is not lighter than that in use. It may be observed that there is no waste metal in the gear, the malleable iron casing conforming closely to the configuration of the worm gear inside.

Rear Axle Complete 253 Lb.

The Franklin Co. was among the first users of die-castings and one of the neatest examples of permanent mold aluminum work is to be found in the Franklin differential casing. To this case are attached flanged, drawn steel tubes while the spring tables are secured to the sleeves by rivets. The semi-floating construction is used for preference as being lighter than the full floating, since the requisite strength can be put in the



A set of aluminum fenders for the series 8 Franklin. These are the same as the steel mudguards used on the series 7 but weigh 38 lb. less. Strength is obtained by beading and the fenders are quite as rigid as steel

driveshafts with a smaller expenditure of metal than would be necessary if the weight of the car was to be borne by the axle tubes. Bearings are reduced in number and therefore in weight correspondingly.

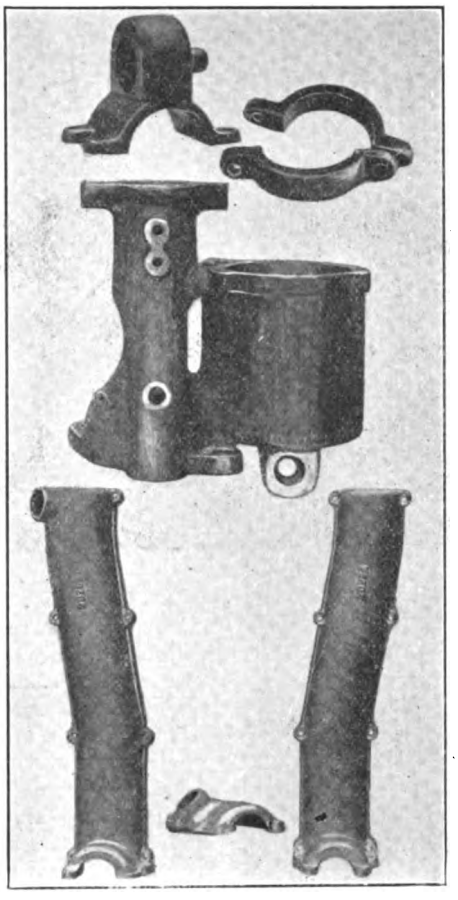
In making the cylinder castings the vertical cooling fins are set in the sand and so secured by the act of casting, this making a lighter and more efficient construction than is obtainable with cast-iron fins.

It may be observed from the table that the gearset is remarkably light, as from the drawing, that the same quality characterizes the clutch, and it may here be explained that the Franklin practice of using a separate gearset is dictated only partly by the difficulty of combining the motor to make a unit power plant. Of course, where the flywheel is used as a powerful cooling fan it is not so simple to make a unit job, but it would not be impossible to do so.

It is considered, however, that keeping the two assemblies separate allows weight to be saved in both gearcase and crankcase, while the frame attachment of the gearset does not weigh as much as the arms which otherwise would be needed to secure it to the crankcase with an adequate degree of rigidity.

Reasons for Wood Frame

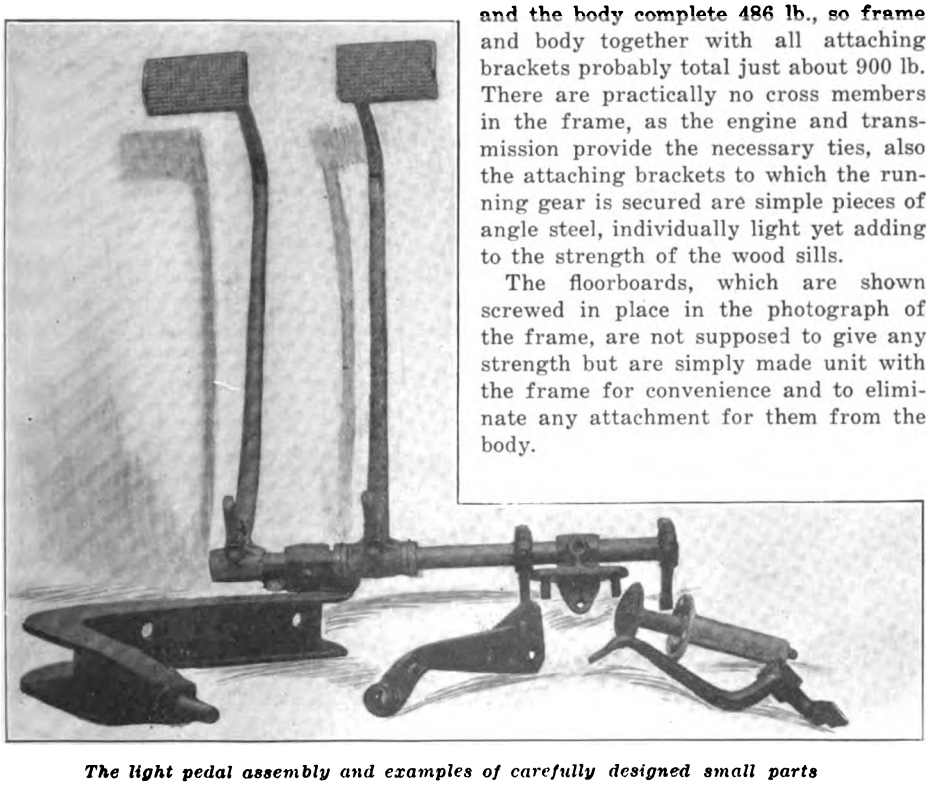
Coming to the main peculiarities of the Franklin, apart from the engine, there are the wood frame and the full elliptic springs. The latter are solely a question of designer's preference; they are used because the engineering faculty of the Franklin company thinks them the best form, and weight has little to do with the matter.



Aluminum carbureter body and hot air pipe and malleable iron muffler cut out

The frame is not quite the same proposition, however, as the system of assembly depends upon it, and it adds a good deal to the rigidity of the body. The sill with running board weighs 176 lb. and the body complete 486 lb., so frame and body together with all attaching brackets probably total just about 900 lb. There are practically no cross members in the frame, as the engine and transmission provide the necessary ties, also the attaching brackets to which the running gear is secured are simple pieces of angle steel, individually light yet adding to the strength of the wood sills.

The floorboards, which are shown screwed in place in the photograph of the frame, are not supposed to give any strength but are simply made unit with the frame for convenience and to eliminate any attachment for them from the body.



The light pedal assembly and examples of carefully designed small parts

It is claimed that the wood frame is much stronger and less liable to injury by accident than any steel frame, but it seems possible that the weight could be reduced in a different type of chassis by the Brush system of specially disposed sheet steel. Thus we may write down the wood frame as a peculiarity of design obtained without sacrifice of lightness.

Careful Detail Work

Where much weight is put in an ordinary chassis needlessly is in the petty parts. Just a few of these are shown in the photographic illustrations, and of these the most striking is the pedal assembly. Using good steel for the forgings a very small shaft can be employed, and there is no lack of strength or rigidity in the pedal arms. The foot plates are of the ordinary width which enables the dimensions of the other parts to be judged by eye.

In the same photograph are included three small brackets for various purposes, these being iron. Their feature is the use of webs to give strength, care being taken that the webs are in the proper places. The little bracket in the center would often be a mass of steel two or three times as heavy and yet no stronger or better.

In the top photograph are examples of aluminum work in the carbureter and the hot air pipe; the latter being a sand casting weighing only 15 oz. At the top is a malleable iron exhaust cut out, and this is practically as small as it could be with no waste metal whatever in it.

Think About Detail

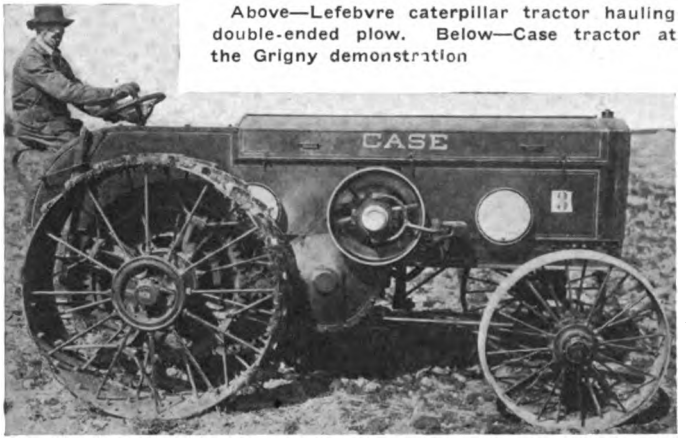
The Franklin car is in many respects peculiar, its mechanical features are largely unique and engineers may disagree as to the merits of some of them, but the points illustrated in the foregoing almost all of them apply to any sort of chassis. Eliminate the motor and the full elliptic springs and there remains just as much originality of thought in the more ordinary portions remaining.

Some of the parts look absurdly light; many engineers might without shame be afraid to use such light constructions, yet the Franklin has a reputation unimpaired by any doubts on the score of durability. To those, therefore, who are looking for ways to reduce the weight of a chassis the Franklin details of design provide probably the most instructive study that is readily available to-day.

A year or two more will show to what extent the same principles will come to be applied generally, and there are many who think that once the engineering thought of the industry is concentrated upon the making of truly light automobiles, the results will exceed the wildest speculations. In the race for "ability" it is likely that weight will prove more important than cylinders.

France To Subsidize Farm Tractors

Maximum Is One-Third Purchase Price Except In War Districts Where It May Be One-Half



Above—Lefebvre caterpillar tractor hauling double-ended plow. Below—Case tractor at the Grigny demonstration

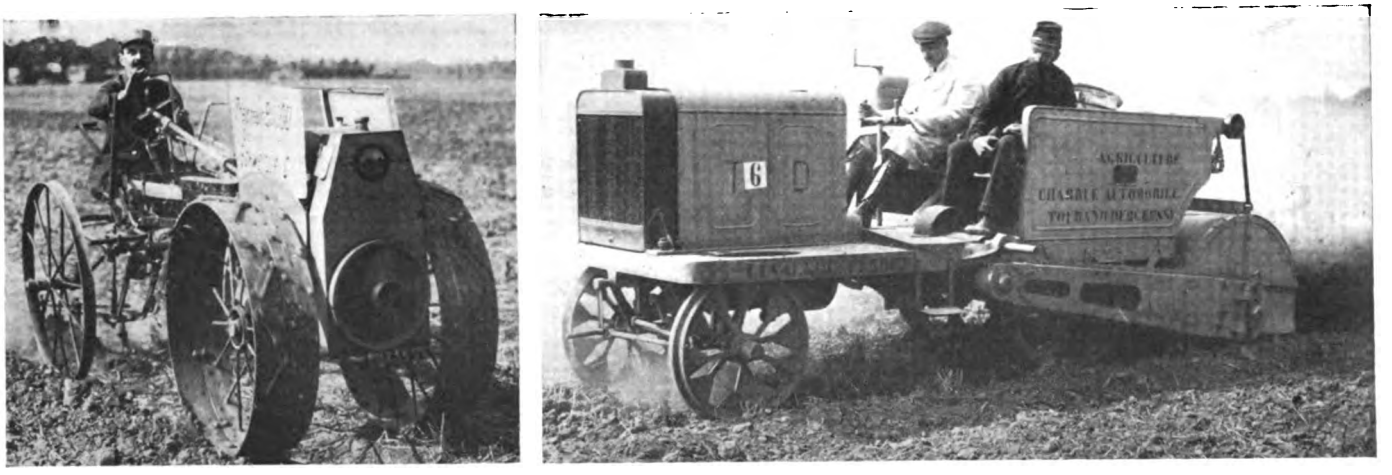
PARIS, Sept. 15—Subsidies are now granted by the agricultural department of the French government to farmers, groups of farmers, and municipalities for the purchase of motor plows, motor tractors and motor-driven agricultural machinery. Applications for the subsidy must be made through the district Prefect and must be accompanied by a description of the motor it is intended to purchase, cost price, conditions of payment, and a technical report on the nature of the land and the conditions under which the motor will be used. The scale of subsidies fixes the maximum at one-third the purchase price, except in the case of districts which have suffered by the war, when the amount may be increased to one-half. The subsidy will be paid immediately proof has been given that the motor has been delivered and that the purchaser has paid his share of the cost. Each year the government district agricultural inspector will deliver a report to the Minister of Agriculture on the results obtained by the use of these subventioned motors in his district.

This subsidy scheme, which goes into force immediately, will undoubtedly bring about an immense increase in tractors. The entire scheme is remarkably simple. It provides for the grants to established groups of farmers comprising not less than seven members, co-operative societies, syndicates of small farmers. The grants can be made to the communes or townships during the war only.

The announcement of this subsidy scheme gave additional interest to the motor tractor demonstrations held this week at Grigny, about 20 miles to the south of Paris. The demonstrations were privately organized, but received the presence of the Minister of Agriculture, and the management were given the use of some reserve troops for the necessary work in connection with the motor farming. American, French and Italian machines were presented and shown at work. The American-made machines were the two Bull tractors; the Aultman & Taylor gas tractor; the Case tractor, and the Bijou machine. Italy showed but one machine, the Moto Aratrice, a three-wheeler having a twin vertical motor and a single driving wheel. Among the French machines were two with rotary plows; the Motoculture, a very small machine with a compact modern type four-cylinder motor driving the road wheels through a two-speed gearset and the rotary picks by shaft and bevel gears, and the Tourand-Derguesse. This latter machine is a very modern construction with the latest type of four-cylinder block motor type, magneto ignition, forced feed lubrication, inclosed working parts, and drive to the road wheels and to the plow by means of chains. Another French machine was the Lefebvre caterpillar, which has been in service in France for a number of years.

While all the machines have long got past the experimental stage, the smaller units attracted greater attention, and much importance was attached to ability to turn readily in small

Left—La Motoculture machine with driver astride four-cycle motor. Right—Bull tractor in Grigny demonstration



Left—Bijou twin-cylinder tractor, like the Case and Bull, an American product. Right—Tourand-Derguesse with rotary plow

fields. Heavy tractors of 60 to 100 hp. were almost automatically ruled out under French farming conditions, by reason of their great size and time lost in turning them at ends of the fields. Agricultural conditions vary considerably in France, but as a rule it is the small and medium size tractor which attracts attention. Another point to which American manufacturers must devote attention if they wish to enter this market is fuel economy. With gasoline selling at 52 to 55 cents a gallon leakages cannot be afforded. The French government having decided to monopolize denaturized alcohol and encourage its use for internal combustion motors, it is certain that this fuel will be almost exclusively employed under the new scheme for farm tractors. Thus foreign manufacturers will have to be prepared to supply motors and carbureters specially designed to run on denaturized alcohol—this fuel will doubtless be 50 per cent alcohol, 50 per cent benzol.

Moto Aratrice twin-cylinder single wheel drive tractor

American Truck Survives Shell Fire

AFTER six months' active service, the first of the Pierce-Arrow 5-tonners has fallen to German shells. This truck, together with a number of others, was delivered in England minus a body. It was substantially armor plated at an automobile and armament factory in the Midlands and fitted with a special quick-fire gun for anti-aircraft work.

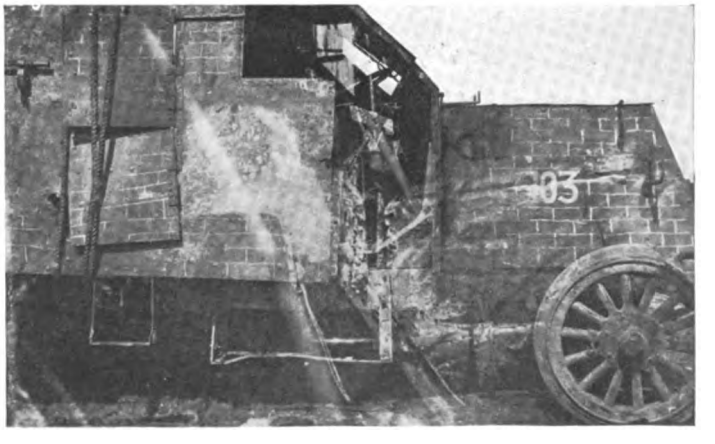
Under modern methods of warfare even a 5-ton truck with an armor-plated body is an inconspicuous object on the landscape. To-day its sides may represent a brick wall; to-morrow they will have changed to a stone wall; during the next night they have been metamorphosed into a hay-rick; another coat of paint and they have become a common wayside hedge.

On the particular occasion under review the first shot was 100 yd. short, but this was sufficiently near for the crew to dive into a convenient dug-out where, with 4 ft. of earth and stout beams above them, they watched through a loop hole. The second 6-in. shell was 50 yd. over. The third hit the car on the left-hand side, carrying away all the lower supports of the armor, loosening up every rivet and shearing off a large number of them. The explosion occurred inside the body and carried away the doors and window flaps and burst the gasoline tank. A fraction of a second later the entire car burst into flames, for the 12 gal. of gasoline had flowed over the whole floor.

It was at this moment that the fun began, for there were 300 rounds of ammunition for the gun and 1000 rounds for the rifles and small arms aboard that car. From the safety of their dug-out the crew watched the firework display.

That night another Pierce truck crept up to the armored car and a delicate towing job was undertaken. The right rear wheel had five spokes burned out and had lost all the rubber with the exception of the strip in contact with the ground when the firework display started. The steering wheel had disappeared, but a lever clamped to the column served to guide the truck.

An examination showed that there was no necessity for this. It was almost impossible to move about within the body owing to the mass of twisted and shell-nicked pieces of metal. But the motor was in good condition. The water-jackets were intact; the radiator had lost no water; most of the lubrication pipes had their joints unsoldered; all ignition wires had gone; the rear wheels were useless and an entire set of tires had to be obtained. In three days that chassis was in running order.



Armored Pierce truck, disguised as brick wall, hit by shell

Shipping 2000 Cars a Day

System in Shipping Department Enables Ford to Ship 333 Freight Carloads of Automobiles Daily—204 Loading Platforms Assist in Preventing Accumulation of Cars

By Marc Braun

THREE hundred and thirty-three freight carloads of automobiles have been shipped daily by the Ford Motor Co., Detroit, Mich. This is more than six trainloads of fifty railroad cars per train, and is based upon a manufacturing schedule of 2000 Ford cars per day.

The story of how the Ford company has systematized its manufacturing methods, to enable it to build 2000 automobiles or more a day, has been told. It has been found highly interesting. Little, however, has been made known as to how the company manages to ship such an enormous daily output.

System Makes It Possible

Because if it seems extraordinary, even in these days of wonderful progress and achievements in the automobile industry, for one manufacturer to build in a single day as many cars as was the total annual production of many a leading automobile maker only a few years ago, it is almost as astonishing that it is possible to ship 2000 or more automobiles, not only once or twice after special railroad and other arrangements had been made, but regularly, day after day, and without special previous arrangements.

System made this possible.

Preventing Accumulation of Cars

Just as it required systematizing the work in every department connected with the construction end of the business, so it was necessary to find ways and means and new methods to enable the daily production to be entirely shipped daily. The policy of the company is to get rid of the day's output in order to avoid accumulation of finished cars, as this would disorganize the working system.

300 People in Shipping Work

To take care of this shipping 300 men and women are employed exclusively in the Detroit traffic and shipping departments, attending only to matters having to do with outgoing and incoming freight cars and materials.

The Body Chute

The actual shipping work begins at the body chute which is located in the shipping yard and connects with the body stockroom. Under this chute the tester drives the chassis to a designated point where, as soon as the chassis arrives it receives its body. This comes down the chute, and, almost automatically, finds its way into a temporary position on the chassis. The car is then driven to the finished car assembling platforms, where it is taken in hand by crews of freight handlers, who take off the body, wheels, fenders, guards, etc., before loading into the freight car.

Domestic Shipments Disassembled

Cars for domestic trade are nearly all shipped partly disassembled. This means that the chassis is loaded vertically in one end of the freight car and the body in the other end. The wheels, guards and fenders go separately. In this manner six automobiles are loaded into a 36-ft. freight car, or eight into a 40-ft. car, the latter being used for shipments west of Chicago.

About 95 per cent of all the cars are shipped that way,

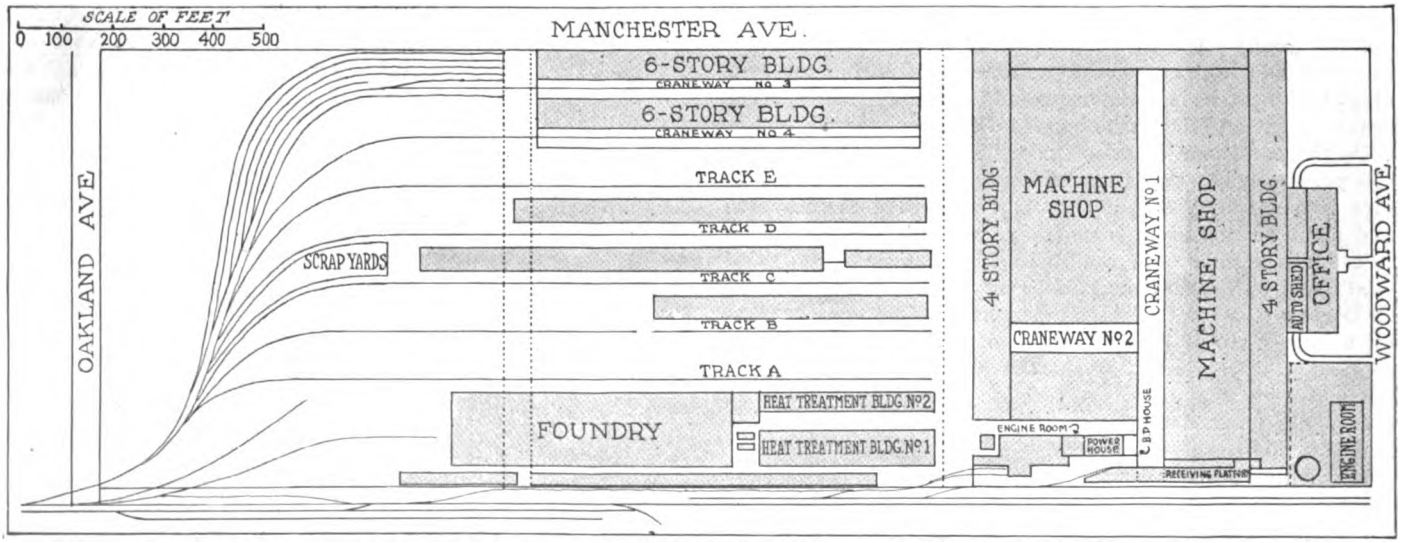
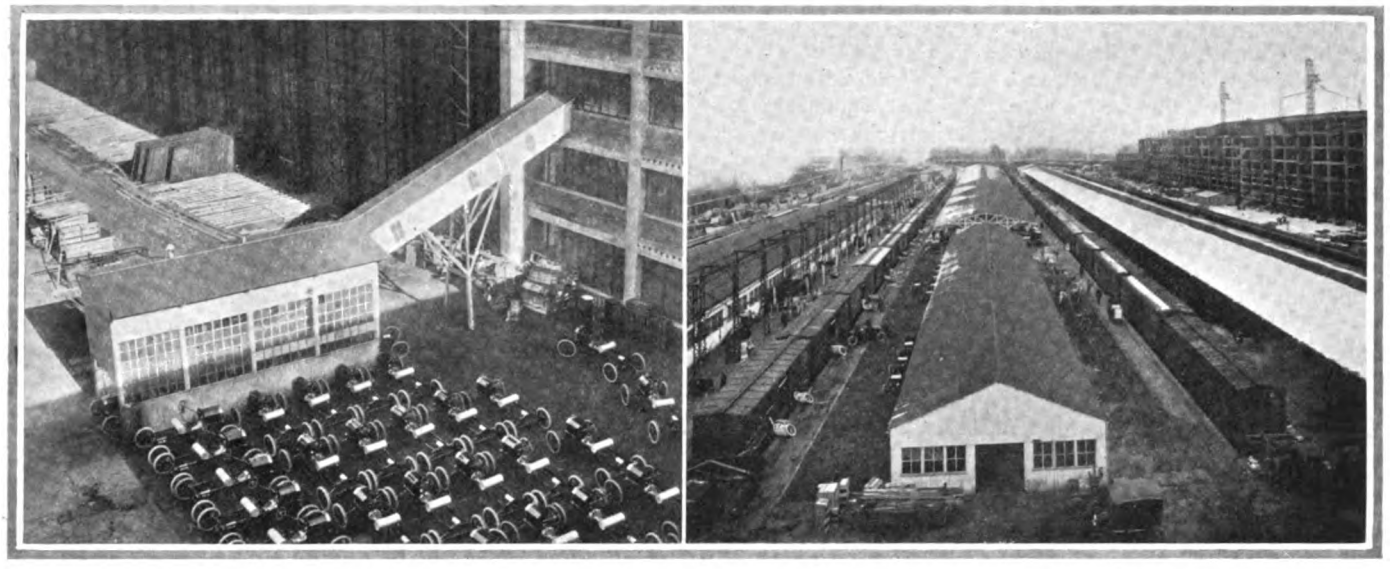
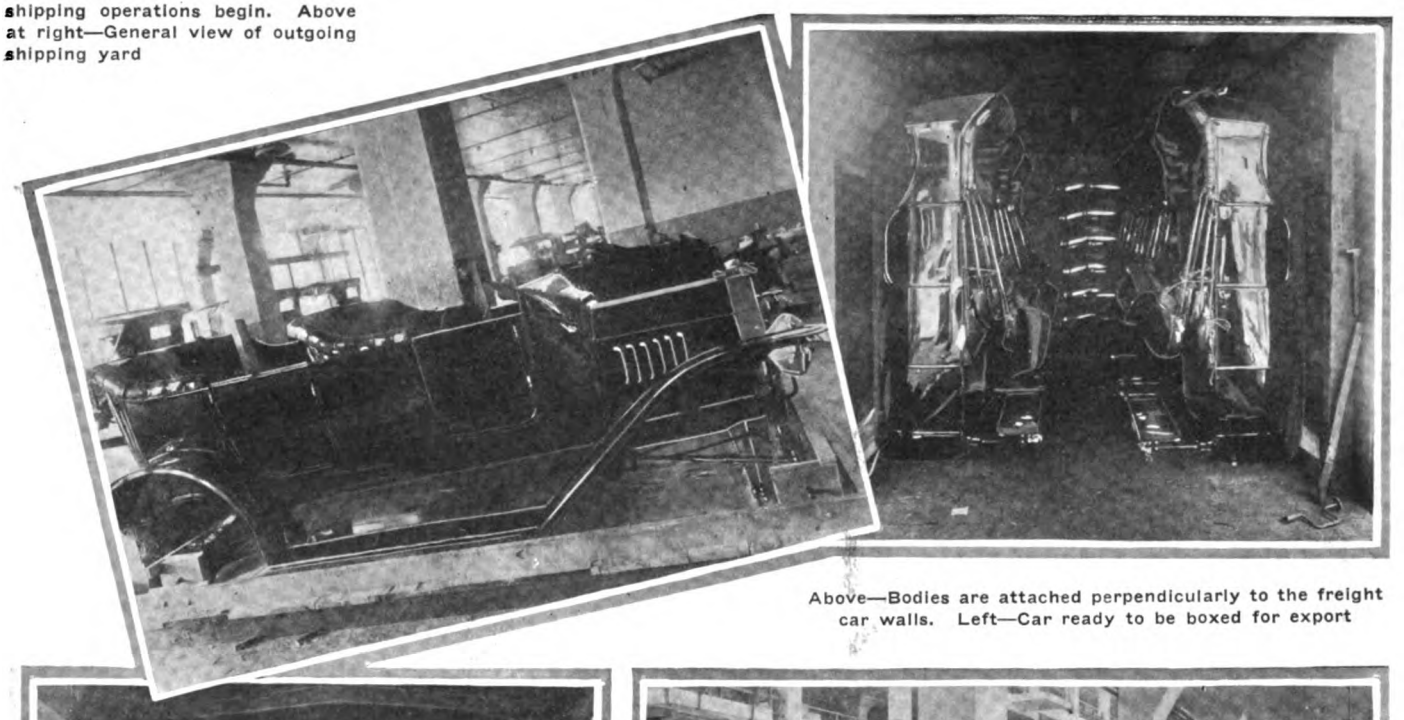


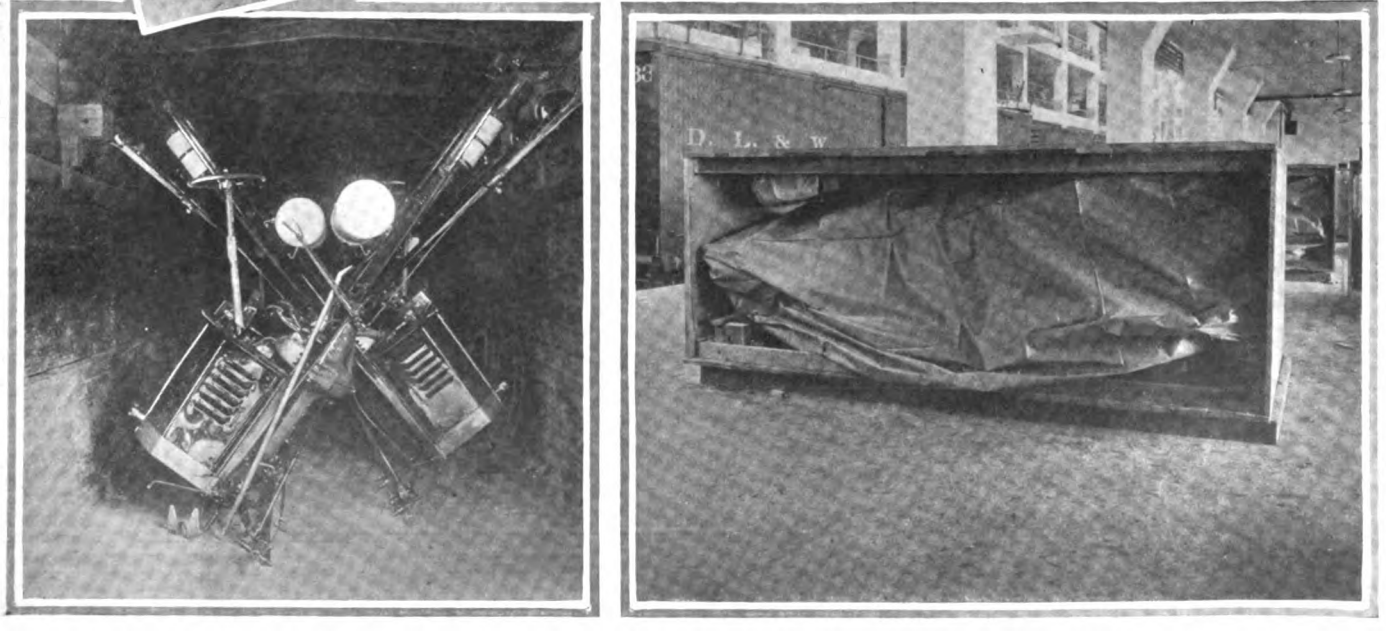
Diagram showing layout of the Ford Motor Co. shipping department. Two of the seven tracks entering the Ford yards are in the six-story building while the others are indicated at A, B, C, D and E, these having loading platforms on each side with covered wooden buildings or sheds to protect from rain goods stacked there for shipment. There are 204 loading platforms facing the two railroad tracks which enter the six-story building and two traveling cranes lift specially constructed carriers of incoming materials upon these platforms or lower to the ground loading floor goods which are to be shipped



Above at left—Body chute where shipping operations begin. Above at right—General view of outgoing shipping yard



Above—Bodies are attached perpendicularly to the freight car walls. Left—Car ready to be boxed for export



Left—Chassis are loaded into the freight car diagonally. Right—Car wrapped up and ready for boxing

the other 5 per cent going forward completely set up or ready for immediate use. When shipped in this way only three automobiles go into a freight car. Only dealers who cannot order more than three cars at a time have shipments forwarded that way inasmuch as the freight charges are the same as if six cars are sent. The railroad rates are always per 10,000 lb., and the actual total weight of six Ford cars will not exceed that figure.

The loading operation consists in placing and attaching the bodies in two rows of three in one-half of the freight car, and the chassis, also in two rows, in the other half of the car. While these are placed in a diagonal and alternate position, the bodies are placed perpendicularly. Fenders and mud-guards are fastened together in lots of six, and then attached against the sides of the freight car. The wheels are fastened all along the walls.

Inspection and Checking

After a car is loaded a loading inspector comes to see if everything to go into that freight car has been placed in it. After he is through, the shipping clerk is called for the final checking. Then the car is turned over to the sealer who locks and seals it and attaches upon the door an instruction tag for the railroad.

This tag reads as follows:

Important—Rush Car No. .....
This Car Loaded by
Ford Motor Company
Highland Park Plant.
Switch to.....R. R.
Date.....

For loading and unloading work 130 men are now employed exclusively on the shipping platforms. They start at 6.30 in the morning and go home at 3.30 in the afternoon, having half an hour at noon. They work in shifts or crews of five or six men and load 100 cars into the freight cars in 1 hr. It requires an average of 20 min. to load six Fords into a freight car.

Cars for Foreign Countries

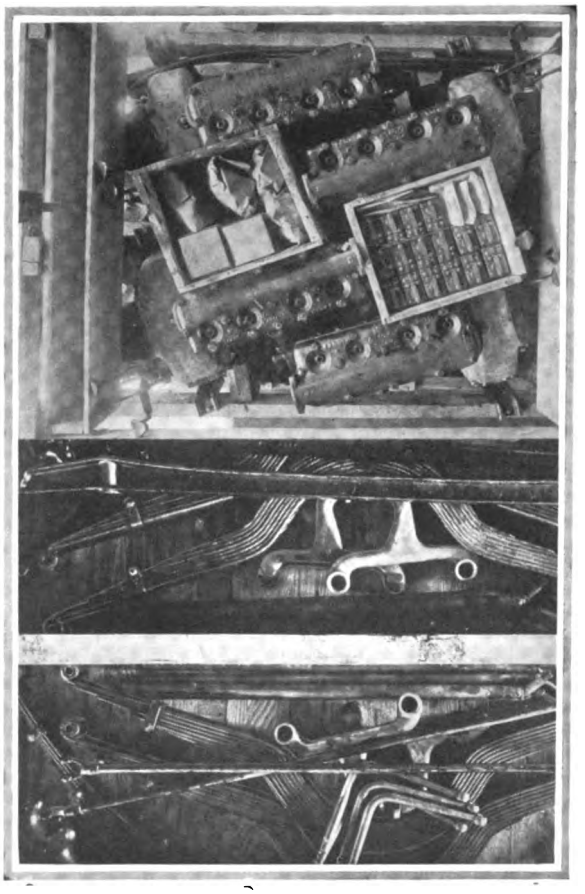
Cars for shipment to foreign countries, excepting those for the Ford assembling plant in Manchester, England, are knocked down and completely boxed. This means that the wheels, springs, guards, fenders, windshield and top are taken off, leaving the chassis with the motor and body on. In this way the car takes up much less room, which means a big saving in freight charges. At the same time, only such parts and accessories are taken off as will not require the service of a specialist to again put on.

For the Manchester Plant

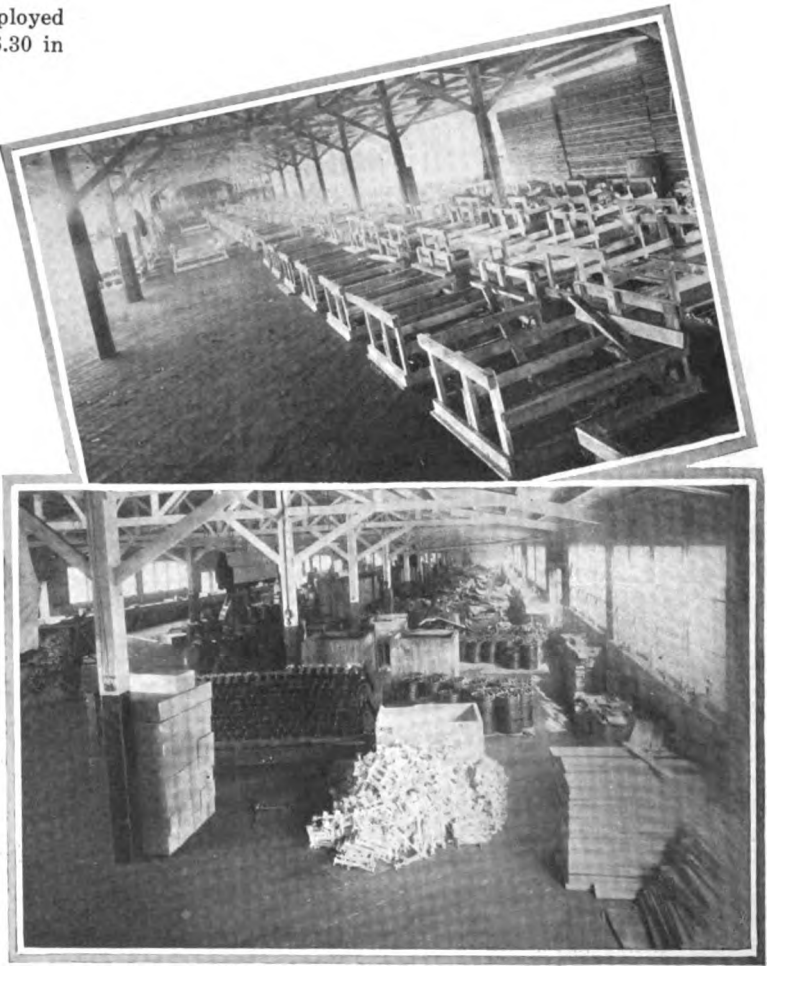
Shipments of cars for Manchester go forward entirely disassembled. The motors are shipped four in a box, together with all the motor's parts or attachments. Frames and bodies go forward in lots as motor car parts.

For some time an average of twenty-five cars have been shipped daily to foreign countries. This does not include what is being sent to Manchester.

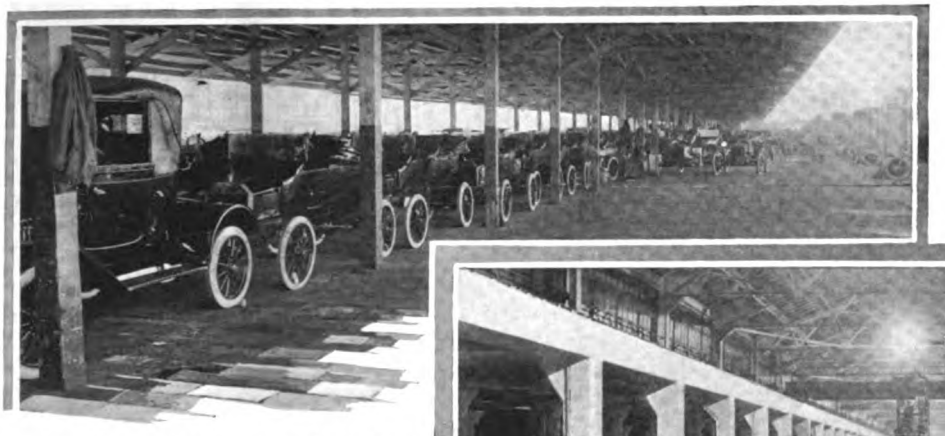
Seven tracks of the Detroit Terminal Railroad are in the yards of the Ford plant, and they connect with all the Detroit freight stations. Five engines are in constant use exclusively for the company, three during the day and two at night,



Above—Top view of a shipment of motors to the Manchester, England, assembling plant of the Ford company
Below—Bottom of the box in which motors are shipped to the Manchester assembling plant. All space is utilized



Above—Part of department for shipping to Manchester, showing crates in which four motors and their parts are packed
Below—Another section of the department for shipping to Manchester. Here parts, some of which are shown, are packed



Left—Shed platform where cars for export only are brought to be loaded

Below—A view in the six-story shipping building, showing some of the 204 loading platforms

to haul outgoing and incoming freight cars.

190 Carloads Go Out Daily

The daily outgoing traffic averages 190 carloads, and the inbound freight averages seventy-five carloads a day.

The loading capacity of each of the seven tracks is 1000 ft., and they hold twenty-four ordinary 36-ft. freight cars.

The tracks for incoming freight are located in the huge shipping and stockroom building. The entire ground floor of this six-story structure, which is 850 ft. long and 200 ft. wide, is used as a receiving department for incoming materials, while the other five stories hold the radiator, top and body, curtain and upholstering, painting and trimming, windshield, finished and miscellaneous stockrooms.

This building has on each floor facing the two railroad tracks seventeen loading platforms on each side, or, all told, 204. Through the entire length of the building two craneways, each having two traveling cranes, are in constant operation. They are used to lift upon the platforms in specially constructed carriers the incoming materials or to let down to the ground loading floor goods which are to be shipped.

In the yard outside of the main shipping building are the other five tracks, on each side of which are loading platforms having either a wooden building completely covered or simply a shed under which goods for shipment are stacked and thus protected from rain.

General Traffic Department

The general traffic department's personnel consists of a general traffic manager and three assistant managers, one on claims, tarriffs and classifications; one in charge of the loading and checking of outbound carload shipments, and one in charge of all inbound shipments. There are also a chief clerk, the rate clerks, billing clerks, car checkers, stenographers, yard master and clerks, all told twenty-five employees in addition to the 130 loaders on the dock.

Less-Than-Carload Shipments

There is a second shipping department for less-than-carload shipments at the head of which is a chief shipping clerk. He has 123 assistants, such as office clerks, packers and checkers.

Parts and Accessories Separate

Besides shipping 2000 cars a day to dealers and distributors, large quantities of parts and accessories are shipped daily to some of the Ford assembling plants throughout the country. The loading of these parts is done generally on the tracks in the shipping building, thus not interfering with the loading of complete cars.

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Canadian Exports to U. S. $97,013

The total automobile export trade by Canada with the United States to March 31, 1915, which closed the fiscal year, amounted to $97,013 as compared with $138,978 in 1914. Automobile parts amounted to $35,558 in 1915 as compared with $36,341 in 1914.

Canada shipped fewer cars to Great Britain in 1915 than to the United States, the total value of these amounting to $76,050 against $320,407 in 1914. Automobile parts, however, amounted to $130,001, considerably larger than the United States figures. The parts shipment in 1914 to Great Britain amounted to only $1,895.

Shipments to other countries in 1915 amounted to $2,472,761 as compared with $3,112,477 in 1914. Automobile parts in 1915 to other countries amounted to $243,070, a considerable gain over 1914, which amounted to $197,621.

Imports from the United States, Great Britain and other countries were considerably larger than the exports to these countries. Automobiles and trucks to the value of $4,591,182 were sent from the United States to Canada in 1915, a drop of nearly $2,000,000 from the 1914 figures which were $6,528,086. As a matter of fact, imports from Great Britain and other countries in 1915 also showed large drops from the 1914 figures. Great Britain shipped cars and trucks in 1915 to the value of only $252,898 as compared with $621,979 in 1914.

Automobile parts imports to Canada were also lower. The United States imports, though lower, led in value, the 1915 imports being $2,142,895 as compared with $3,926,077. Great Britain showed a proportionate drop, its 1915 figures being $22,337 as compared with $31,981. Imports from other countries amounted to only $961 compared with $8,321 in 1914.

The Engineers' Forum

Early Days of Aluminum Pistons

By Joseph Leopold,
Engineer, Walker M. Levett Co.

NEW YORK CITY—Editor THE AUTOMOBILE:—In view of the interesting discussion which has appeared in your journal of late, relative to the utility of aluminum and its alloys for efficient automobile construction, it is perhaps, opportune at this time to offer some brief historical data and instances of extremes beginning from the time when aluminum alloy made its début in this progressive field, and leading up to the present day; the elapsed period being, needless to say, comparatively short.

I consider it recognizable that my company is the pioneer foundry making a specialty of aluminum alloy for piston purposes, and, assuming this to be authentic, it quite naturally follows that it has been most intimately associated with the expanding wave of popularity accorded these metals and while refraining from the extreme, observation based on practical experience has created the conviction that Magnalite pistons have become a fixture and will be of still greater importance in the future development of the high-speed motor.

Aluminum Cylinder Preceded Piston

Prior to the time when the automobile manufacturer became cognizant of the fact that weight in reciprocating parts must be materially diminished if high speed was to be obtainable, we were invited to experiment in casting cylinders for an extremely high speed, intensely efficient type of aeroplane engine. Cost was to be a secondary consideration—reduction in weight imperative. Subsequently, after repeated efforts and diligent experiments, we succeeded in producing an aluminum alloy cylinder which fortunately met every requirement. Our customer completed, in his experimental department, the most rigid of tests before mounting the motor, and from all information in our possession the same motor is giving satisfactory and efficient service to this day, the cylinder walls showing a remarkably low percentage of wear.

The proposition of using aluminum alloy pistons apparently had not occurred to anyone up to that time. It dawned upon this manufacturer that if this alloy would answer for cylinders it should also answer for pistons and we naturally then made them the object of experiment. The cast-iron pistons used at that time weighed slightly in excess of 6 lb. each. We made up a set of pistons which weighed about 2 lb. each from an alloy somewhat analogous to Magnalite. It might be said at this point that all concerned in the experiment were more or less dubious as to the ultimate results and consequently "the bench engineers" of our foundry, as well as those of the motor plant, expressed an assortment of theories about as numerous as the number of persons employed, but the pistons accomplished even more than we anticipated.

It was, perhaps, chiefly fortune that the clearance and remaining factors of importance were approximately correct, for if failure had resulted at this instant, it is extremely probable we should have passed up the matter of aluminum alloy pistons as impracticable. From this point the development of Magnalite pistons was evolutionary.

From all data obtainable, Fred S. Duesenberg, manufacturer of the motor bearing his name, was one of the first engineers to attempt a practical succession of experiments with the aim of determining constant factors in Magnalite piston installation. It was easy to realize the benefits that would surely accrue if these pistons could be made to respond to every requirement. The exceptionally light weight and quick thermal conductivity were obvious as elements of great magnitude, particularly where high speed or light weight were consequential considerations.

As Mr. Duesenberg was specializing in high acceleration motors for both racing and aeroplane usages, it was manifest that the merits of Magnalite pistons at that period should readily appeal to him and so aluminum alloy pistons were introduced to automobile racing. Their utility and adaptability soon won the hearty indorsement of the entire racing fraternity, and it was not long after this that automobile manufacturers conjectured it might be practicable to increase the value of their standard productions by the use of Magnalite pistons with the result that Magnalite is now a familiar product to a major part of your readers.

It might be of interest to note here that out of thirty-six cars equipped with these pistons participating in twenty-four of the largest races in 1915, sixteen have taken first place, sixteen second place and four third place. In one instance—the 100-mile Chicago Challenger Race—the remarkable work performed by the Stutz car equipped with Magnalite pistons is most worthy of especial consideration since it was the initial American car to sustain a track record of over 100 m.p.h. in competition. James Pugh's Disturber IV, equipped with Magnalite pistons was the first motor boat to maintain an average speed of more than 60 m.p.h., a truly remarkable performance.

Cerman Allcy a Basis

The origin of alloys is usually a matter of speculation and Magnalite is no exception to the rule. In Germany for a number of years a metal was produced called Magnalium which possessed many Magnalite qualities. The high cost of aluminum at that time limited its general use and production, consequently, while the metal offered valuable properties for a variety of purposes, the price was then prohibitive for general commercial adaptation. As the methods for producing aluminum were simplified the price of the metal decreased; therefore a diversified use of it was possible on a huge scale. Our experimental department then undertook to produce a metal which would combine all of the desirable qualities of this German product and simultaneously eliminate certain features which were undesirable for automobile piston requirements. These endeavors resulted in Magnalite, which is a specially adapted Magnalium form of metal for piston construction.

Since the use of alloy pistons has become universal, the rules governing their machining and installation are becoming more generally known, with the result that where

such deterrent influences as seizing, piston slap, or scored pistons might have been prevalent in experimental stages, they are now simple details which may be avoided.

The extremes to which Magnalite pistons have been subjected up to the present time with successful results, include a design of 12⅞ in. bore for a heavy duty engine contrasted with a ⅞-in. piston for a working model of an air-cooled aeroplane engine. Limits such as these called for specific consideration.

Some idea of the endurance of this metal may be had through racing experience at the recent Twin City meet. A broken valve worked itself into the cylinder while the car was running at a speed of approximately 90 m.p.h. The terrific hammering of the piston against the tungsten steel valve forced it through the top of the cylinder, but left the piston itself intact and except for a wide gash in the dome, it showed little indication of what had happened.

At the Chicago race, an oil feed in one of the motors became clogged in such a way that insufficient oil was circulated and after each lap or so it was necessary to stop the motor in order that it might cool off. During the time it was running, the heat generated was so great that the top of one of the pistons fused sufficiently to sink down between the arms of a system of special ribbing which was designed for racing purposes. As the motor remained intact the piston was not removed, and when the oil trouble was overcome the car went back into the race badly distanced, but still "in the running" with probably what was one of the most peculiar looking pistons ever finishing in an automobile race. A number of other racers had iron pistons give way on account of the excessive speed and heat. This customer feels that he need not worry any more about piston trouble.

In another car a set of pistons had been used for approximately 2500 miles of actual racing with an additional 1500 miles of practice work. During one race a connecting-rod broke near the wristpin boss with the result that the piston was jammed against the top of the cylinder forcing the latter about 2 in. above its normal position. Except for the fact that in forcibly pulling the piston out of the cylinder it was badly scored, there were no other signs of serious damage. This connecting-rod broke at a speed of well over 90 m.p.h.

Piston Wear Is Slight

A recent examination of a motor equipped with Magnalite pistons after running over 20,000 miles showed a maximum cylinder wear of 0.00125 in., while with iron pistons that had formerly been used in this motor, a wear of 0.011 in. in 18,000 miles was determined by caliper. Perhaps one of the most interesting evidences of the extreme possibilities of Magnalite pistons may be found in a carte-blanche order which we recently received from a firm now making one of the finest automobile racing and aeroplane engines. The letter accompanying the order for an experimental set of fourteen pistons for this concern stated that it had been their practice to machine their pistons from the solid steel billet. Light weight was mandatory, so it was left entirely to our judgment to produce if possible a piston that would stand up as well as one of steel and at the same time permit them a saving of approximately $160 per engine. One restriction was that the Magnalite pistons must be as light—lighter if possible—than the piston machined from steel.

Examination of the blueprint showed that 1 mm. thickness was allowed for finished steel construction in the skirt, offering some idea of the light weight construction employed. After giving the matter due thought, we finally produced a piston which weighed less than 11 oz. or about 1 oz. less than the steel piston. We permitted our skirt a thickness of 2 mm. in the alloy metal, and by the system of ribbing referred to above, we secured a rigidity and strength at the points of principal stress which we believed would meet every requirement. Furthermore we advised our customers on shipping the order that if they were willing to permit us to design another piston for them, with the understanding that the results were to be regarded as purely experimental, we were confident that a further saving in weight of at least 2 oz. could be made possible by slitting segments from parts of the skirt which do not carry any appreciable stress other than that of simply guiding the piston movement. We believe that the satisfactory results following the tryout of the first order, as evidenced in a subsequent large order for pistons of the same design, will warrant this company undertaking the experimental work with the lighter piston at an early date and are awaiting their decision with much interest.

Prefers Iron or Steel

By E. H. Sherbondy

Consulting Engineer, Clay & Sherbondy

BUFFALO, N. Y., Editor THE AUTOMOBILE:—In reference to the discussion which has appeared in recent issues of THE AUTOMOBILE, on the comparative merits of the use of aluminum motor pistons and cylinders:

The two fundamental considerations with regard to the use of aluminum for motor pistons and cylinders, are taken to be the maximum strength of the material in question, and the heat flow from the gases of combustion to the cooling water and crankcase air. The heat flow depends only on the heat capacity of the gases of combustion and the cooling water. The piston proper is heated by convection and radiation; this heat is carried off mainly by convection to the cylinder lubricating oil film and the rate of convection depends upon the maximum temperature within the cylinder and the piston speed. This heat is again carried by convection from the lubricating oil film to the cylinder wall, and in turn carried by conduction through the cylinder wall proper and finally by convection to the cooling water. It then results that the conductivity of the material employed for the piston is not of material consequence.

Inertia Forces Unimportant

The second consideration for the use of aluminum as a piston material is the necessity of reducing the inertia force values to a factor within reasonable limits. Consideration of the inertia forces of reciprocating mechanisms is very old in the field of kinematics, and has been treated of in almost all text books on mechanics. However, consideration of the inertia forces alone is only a partial treatment of this subject, the important factor being the resultant secured by combining the inertia diagram with the indicator diagram. At low motor speeds the inertia forces are always very small, though the indicator pressures may be very high. Under these conditions the maximum turning effort is developed during the first half of the piston stroke. At high rates of revolution quite a different state of affairs exists. The inertia forces gain very materially in value, in fact, as the square of the motor speed, and it then results that the maximum turning effort is developed during the last half of the piston stroke. I believe that automobile motors are ordinarily designed on the basis of an initial indicated pressure of about 350 lb. If this pressure is taken as the basis of construction, it is clear that the values of the inertia forces are of little matter until they exceed the indicator pressure. The speeds at which this occurs are beyond those reached by any excepting a few racing motors. Clearly, of course, we do not wish to have the inertia diagram cut the indicator diagram at two places during the expansion stroke, as this would result in a rapid reversal of pressure on the bearings, putting the connecting-rod in tension.

Automobile motors of current construction, which are ap-

plied to touring and commercial vehicles have such restricted valve capacity that it is impossible for them to reach rates of revolution high enough so that the inertia factor is a matter of very great importance. Until motors are constructed for current use which have speeds of from 4000 to 5000 r.p.m., we shall not be much concerned with the minor problem of inertia.

Piston Friction Large Factor

Professor Reidler has shown that the friction between the piston and cylinder walls amounts to more than 30 per cent of the total friction of the motor. Professor Tower on lubrication concludes as a result of his experiments that where an oil film exists between two metal bodies having relative motion, the friction is independent of the material of which they are composed. The coefficient of friction of aluminum on any other material is not a factor for consideration as long as lubrication persists. The mechanical efficiency of the motor can only be increased by reducing the friction of the machine elements and that due to the movement of the gases.

The writer has tried various aluminum alloy pistons in automobile, stationary and aeronautical motors, and in every case where a motor was operated at maximum power for long continued periods failure resulted. Cracked heads, cracked piston pin bosses, scoring, and in one six-cylinder, two-stroke motor of 5 in. bore, we melted the deflector heads off the pistons.

I cannot but agree with F. R. Porter that what we need in motors having a high output relative to the displacement, is materials which have a great maximum of strength, which is not enormously impaired at the temperatures occurring in internal combustion engines. After having tried aluminum, steel and cast iron for piston and cylinder construction, the writer concluded that for this service cast iron is far superior to any other material yet tried.

High Tensile Iron

By recent metallurgical experiments we have been able to increase the maximum strength of cast iron to between 60,000 and 70,000 lb. and, where it has been desirable, to give this material the same hardness which commercial chrome nickel steel has in its untreated state.

Again where the cost factor enters into the problem, as it always does, commercially, steel is out of the question, and we believe that cast iron is far the best compromise.

Empire Engineer Thinks Sixes Good for All Cars Up To 2600 Lbs.—No Excuse for Cheap Twelves

By Louis Schwitzer
Production Manager, Empire Automobile Co.

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—The multi-cylinder engine has been the logical consequence of the necessity for reducing the cubic inch displacement of the individual cylinder to obtain maximum efficiency combined with smooth, quiet running and long durability.

The decrease of the bore brings with it light moving parts and reduction of the inertia stress, light bearing pressures and facilitation of the lubrication problem. The light power impulses of the individual cylinder reduces the vibration to the minimum so it cannot be noticed by the occupants of the car when accelerating the motor, giving the desired smoothness.

There is no question that the multi-cylinder engine, may it be the eight-cylinder, or twelve-cylinder, will not replace the four and six, each type of engine having its own field.

It is shown that the average American car has about 1 cu. in. piston displacement for each 10 lb. of its weight. Each maker simply will decide how many cylinders of an individual maximum displacement of 50 cu. in. per cylinder are necessary to propel his cars to give them the necessary ability. The different classes of cars group themselves in about the following groups: up to 2000 lb., 2500 lb. to 2600 lb., 3000 lb. and above.

It is obvious that the four-cylinder motor with 200 cu. in. displacement, this being the multiple of the "50 cu. in. maximum piston displacement per cylinder" will handle the 2000 lb. car very well, while the six-cylinder of the same individual cylinder displacement will take care of all cars as high as 2600 lb. Above that there is no doubt multi-cylinder engines will be employed.

The "50 cu. in. maximum piston displacement cylinder" will have its bore limited (in the writer's opinion) to about 3½ in. maximum diameter. These are the logical consequences as seen from the engineer's point of view, but there are other conditions which influence the individual maker of cars, especially of the low priced, light weight type.

The national advertising campaigns of a few big concerns create a demand for certain types of cars which he often must follow, even against his best judgment as to what is best for his product. The advertised features of the big manufacturer may be necessary improvements and features of his own product, but entirely superfluous and not desirable in the product of the smaller manufacturer, who is building a different type of car, but yet these National campaigns make the features advertised for the general public a "fashion hint" which tries to force the other makers.

This is particularly the case with the multi-cylinder motor. The public in general does not realize why the multi-cylinder motors have been built. They simply take them as a development which applies to all motor cars. The writer remembers when the first eight cylinder motor was announced in this country. All our dealers simply got scared to death, and worried because we did not want to decide to build an eight-cylinder car, and believed that they would be entirely out of the running with the four or six. Of course time has proven this to be different. It has been shown that the small car works with excellent satisfaction with the four- or six-cylinder motor with the proper individual cylinder displacement, and that the low-priced multi-cylinder car has disappeared from the market. This probably was partially because of the low cost that could be allowed for the construction of such a motor. It could not be built with the same degree of care, workmanship and material as could the four or six which was ample for this weight of car.

The announcement of the twelve-cylinder motor has caused a similar disturbance in the trade, and there are appearing already low-priced twin-six cars for the construction of which there is absolutely no necessity from the manufacturer's point of view, but which are being built for reasons as said before.

It is not only a matter of necessary piston displacement for the individual car, but also of economy. On cars of greater weight, above 3000 lb., which naturally are also higher priced cars, economy does not play as important a factor as it does on the low priced and light weight car, because a different class of the public buys it. This is another reason why the multi-cylinder engine, in the writer's opinion, will not not conquer the field of the low priced car, except in individual cases where it will be employed as a stimulant of sales, and not because it will perform better.

Luxurious Streamline Body Not Yet Built

Some Suggestions for Future Development

By Julian F. Brasor

NEARLY two years ago there appeared in this magazine a criticism of automobile bodies in general, written by the writer of this article, in which were pointed out the errors of the designs then in use, how they had remained practically unchanged since the back-door type of tonneau and that it seemed as though the manufacturers would never have time to consider the most important part of a car, its general appearance. Suggestions were made as to the improvement of the bodies, the principal one being the body with only two doors, it being argued that this was the only logical step toward a real improvement in the general appearance of the car. It was predicted that in 5 years this type of design would be common and would meet with great favor, and that not until then would the automobile have become an automobile, a complete change from the horse-drawn carriage.

The Two-Door Design

Within the last year no less than four great manufacturers have offered cars with the two-door idea. They are old and well established companies, so it must be taken that they have considered this idea a good one. The purpose of this article is to show that the real streamline car with a luxurious body is yet to be built, and that merely closing the fore doors and dividing the front seats is not arriving at this type of body. The accompanying illustration gives a clear idea how different it is from the present two-door cars, yet it is not radical in any way.

The chassis has a very long wheelbase in order to place all the weight of the car between the axles, without sacrificing any space in the body, and as it is hung low and the running boards are hung below the axles these features give the car a sturdy, well balanced and fast appearance, the whole secret of which is in the long horizontal sweeping lines of the body. Note the one piece oval fenders and how the rear ones are swept over the wheels, the cantilever spring suspension permitting the jacking up of the car if necessary, without getting besmeared with mud. Note the rounded radiator, that it is placed considerably back of the front axle and that the water cap is unusually large, and that the bonnet and cowl rise in a straight line to meet the windshield, which is built into the body and is really a part of it.

Comfort and Style

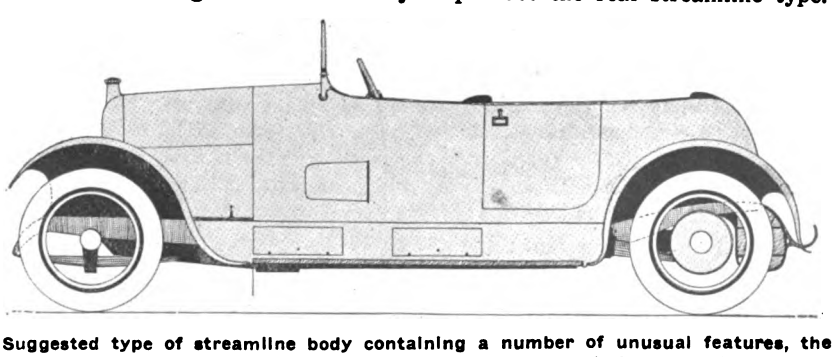
Most windshields look as though they were merely stuck on the bodies. The bonnet widens on all sides to meet the body in one smooth surface. The perfect union of the bonnet and body is the secret of the real streamline car. The body is unusually wide and is slightly wider at the top than at the bottom, this feature giving the five passengers plenty of room as well allowing the use of deep, heavy upholstering and thick cushions which rest flat on the floor of the body and are kept from sliding forward by concealed leather stays when not in use. Note that the upholstery is barely noticeable above the top of the body, yet this does not spoil the comfort of the seats since the body is high-sided without being top-heavy. Note how the rounded back pitches forward, placing the rear seat in front of the rear axle, a feature which makes for easy riding and also overcomes any heavy strain on the rear axle and tires.

Note the sweeping horizontal lines extending from the one-piece windshield to the rounded back, yacht-like lines obtainable only in the two-door type of car, which make it a genuine "streamline" body. Note the shape and size of the doors, that the hinges are concealed yet the handles are left exposed to break the monotony of the perfectly smooth sides. To overcome poor ventilation in the fore part of the body, which is unusually roomy, a new kind of ventilator is used. Louvres have never given real ventilation except in the hood.

Armored-Car Type Ventilators

This ventilator was suggested by the armor plates of the armored cars of Belgium. Its shape and size are in perfect harmony with the lines of the car and above all things it will give perfect ventilation. It fits flush with the sides of the body and is opened from the inside. It can be opened any distance up to right angles with the car. It slides on a brass bar with a screw-lock so it may be held perfectly rigid at all times. Of course the front seat is divided, left hand drive with center control is used, the steering column having a pitch of 33 deg. It is placed near the cowl, which has an instrument board within easy reach. The motor may be either of four or eight cylinders, generating its own electric light and having an electric starter, while worm drive with underslung cantilever springs and wire wheels are used. Since the body is very wide it extends over the chassis frame several inches, the space between the running boards and the frame being utilized for the tool boxes and batteries. The oil and gas are carried in a large tank in the rear which is built rigidly onto the frame. Note that the tire irons are also built onto the frame and that they are pitched forward. There is nothing more unsightly than to see one or two heavy tires hanging over the back of a car just as though they were ready to fall off. The entire body and hood are of cast aluminum with the radiator and other metal trimmings of brass highly polished. The color is preferably a light one with dark running gear. Very dark colors tend to hide the lines of a car if it has any.

This cannot help but show that there are yet many undeveloped possibilities in body design especially in the open types, and while cars cannot be built to suit individual opinions nor new ideas "rushed" on the public, now is just as good a time as any to produce the real streamline type.



Suggested type of streamline body containing a number of unusual features, the idea being the combination of artistic appearance and riding comfort

Fan Design Remains Unstandardized

Although Total Variation in Diameter Is Small There Are Many Intermediate Sizes

By J. Edward Schipper

ONE of the parts of the car which is absolutely non-standardized is the fan. If you take a dozen names of manufacturers at random, you will find that the fans are not only widely different for the same size of cars, but are different in diameter, the number of blades, pitch of the blades, and in the speed ratio at which they are driven. When a car is designed the draftsman draws a fan and it is turned over to the manufacturer with little attention. In many instances it would be difficult for the car manufacturer himself to tell why a certain type of fan has been adopted. The result is that nothing like standard, or even similar, practice will be found in cars of the same size and same cooling arrangement.

Naturally the fan diameter will be governed by the amount of space the designer is able to allow beneath the hood. The width of the radiator and its height must be carefully considered in order that there will be a draught through the entire radiator. As it is, however, this is not always accomplished. In some radiator and fan arrangements, there is a reverse flow through some sections of the radiator; in other words, instead of suction, there is ejection of air.

Definite Classification Possible

It can readily be conceded that it would not be possible to come down to one standard fan diameter. It would be possible, however, to make up a set of drawings which would embrace definite classifications of the types now in use, and would provide standard dimensions to work it. The best efficiency of the fan will be secured at a certain definite rotative speed, but even with an engine which revolves at varying speeds it would be possible to bring the fan speeds to whatever is desired by simply changing the ratio between the pulleys.

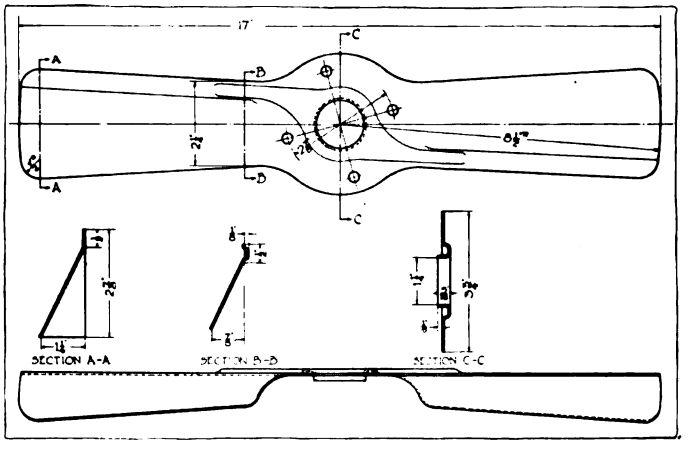
The accompanying tabulation was made up from a list of cars selected at random. It will be noted that the projected radiator areas vary all the way between 1.49 and 4.47 sq. ft. Taking care of these varying areas which represent the differences to be found between the smallest and largest cars, the variation in fan diameter is only a little over 7 in. for passenger cars, or between 14 and 21.125 in. The Knox tractor, which is included in the list, has a fan diameter of 24 in. Taking the passenger cars alone, a variation of 8 in. if gaged in steps of 2 in. could be divided into four diameters which might possibly be 14, 16, 18 and 20 in., if another size was needed, a 22-in. diameter could be used. The diameters used in the passenger cars listed are 14, 16, 18, 14.25, 19.625, 21.125, 20, 17, 13 and 19.5, or, in other words, nine different diameters, some varying from others by only 0.25 in. In this same set of fans, the number of blades runs all the way from two to six, exclusive of a sixty-four-blade Sirocco fan used on the Franklin. The pitches of the blades vary between 25.5 and 67 deg. to the plane of rotation. The ratios between the crankshaft and fan vary between 1 to 1 and 1 to 2.1.

Fourteen Variables

Ideal fan design to meet conditions such as obtain in a gasoline engine used in automobile work, where the speeds vary over a wide range, is such an elusive and impossible condition that it is out of the question. There are at least fourteen variables in fan design. These added to the varying quantities introduced by the requirements of an automobile fan render anything but empirical design impossible. It is of course true that there are several known conditions to be met. It is quite obvious that the fan has its greatest work to do when the motor is running on low gear. Another condition under which the fan must be efficient is when the motor is idling, with the car stationary. Again, the fan must do good work at ordinary touring speeds. Here are three different conditions of fan velocity under which good efficiency is required. These speeds are different for each motor and conditions are therefore anything but constant. Nevertheless, there are so many other variables entering into the necessary calculation, that no matter what fan is used it can be nothing better than a compromise and hence it would not be difficult to arrange a series of design which would cover all conditions and which would reduce the widely varying designs now on the market to standardized conditions.

Blades Are Factors

The question of blades will probably be one of the difficulties in the way of making compromise designs, but even if four standard sizes and pitches in two, three, four, five and six-bladed fans were made it would be a great step in advance. The light pressed metal fans depend upon a larger number of blades not only for efficiency but for spoke strength. The two-bladed aeroplane designs are favored where castings are used. Between these two extremes, there are all the types mentioned, and each has a large number of users. It seems that if any type could be abandoned it would be the five-blade as this is used by fewer concerns than any of the other types. The three-blade is not used to as large an extent as the four and six, but there is no doubt that higher efficiency at most speed ranges can be obtained with this type when considering the necessities of automobile design. The two-bladed fan is also a highly efficient type and a typical design of this sort is shown in the accompanying illustration.



Typical two-bladed fan used on the Hupmobile

Tabulation of Fan Dimensions, Showing Variation

Car	Model	Max. Hp.	Front Rad. Area, Sq. Ft.	Fan Dia.	Blades	Pitch	Crank-shaft to Fan Ratio
Buick	D-45	48	2.288	16	5	32°	1 to 1.5
Cadillac	51	70	3.43	19.5	6	25	1 to 1
Chalmers	26-C	53	3.1	18	3	55	1 to 2.25
Chalmers	32-B	47	2.44	18	3	67	1 to 2.25
Dodge	1915	35	2.08	16	6	24	1 to 2.3
Ford	T	20	1.82	13	4	25	1 to 1.71
Hupmobile	N-1916	40	2.46	17	2	..	21 to 19
Knox (Tractor)	35	..	4.23	24	4	30	1 to 1.65
Locomobile	48	82	3.93	20	6	30	1 to 1.5
Pierce-Arrow	A-3	..	4.47	21.125	6	60	1 to 1.375
Pierce-Arrow	B-3	..	3.74	21.125	6	60	1 to 1.375
Pierce-Arrow	C-3	..	3.37	19.625	6	60	1 to 1.375
Saxon	Four	18	1.49	14.25	2	25.5	1 to 1.828
Saxon	Six	34.7	3	14	4	25.5	1 to 2
Studebaker	1916-4	40	2.9	18	6	34	3 to 4
Studebaker	1916-6	50	2.9	18	6	34	3 to 4
Willys-Overland	83	35	2.63	16	6	34	1 to 2.1

The standardization of the fan, of course, has for its object the saving of money to both the manufacturers of automobiles and fans and for all practical purposes the only work which could be undertaken immediately in this direction would be that which would have effect on the costs of fan manufacture. The reduction in the number of pressed metal fan sizes to be made would be the first point to consider. To reduce the number of sizes, the first step would be to make four or five standard diameters, allowing the pitch and number of blades to remain matters of choice with the fan manufacturer.

Where the diameter is limited in this way, it would immediately give the fan manufacturers fewer sizes to work to and would no doubt result in a saving. In addition, the dimensions at the hub are also capable of standardization, particularly in the pressed metal designs. The bore of the fan and the dimensions of the bolt circle together with the bolt sizes and distribution are also susceptible of standardization since practice in mounting does not vary so widely that it could not be brought into line at this point.

The cast fans are more difficult to handle than the pressed metal design because when cast the design has been worked out to fit some particular mounting condition in most instances. Still, it might be possible that pressed metal and cast practice could be brought down to the same level as regards hub dimensions and bearing mountings. Where ball bearing fans are used, and this is rapidly becoming general practice, the bearing mountings are certainly a feature which could be well brought down to a limited basis.

Pitch Relatively Unimportant

No radical step such as making hard and fast rules for fan diameters pitches and numbers of blades could be thought of at the outset, but it is reasonably certain that with the diameters determined the number of blades used would begin to reduce itself to a standard quantity for fans of given dimensions. The matter of pitch is relatively unimportant in the pressed metal design because it is simply a question of bending the blades to the required angle. It is quite certain that the variations of pitch angle will not be so great but that a slight variation in the bending process will take care of the entire range of pitches. Referring to the table herewith, an angle of about 30 deg. to the plane of rotation seems to strike quite close to general practice.

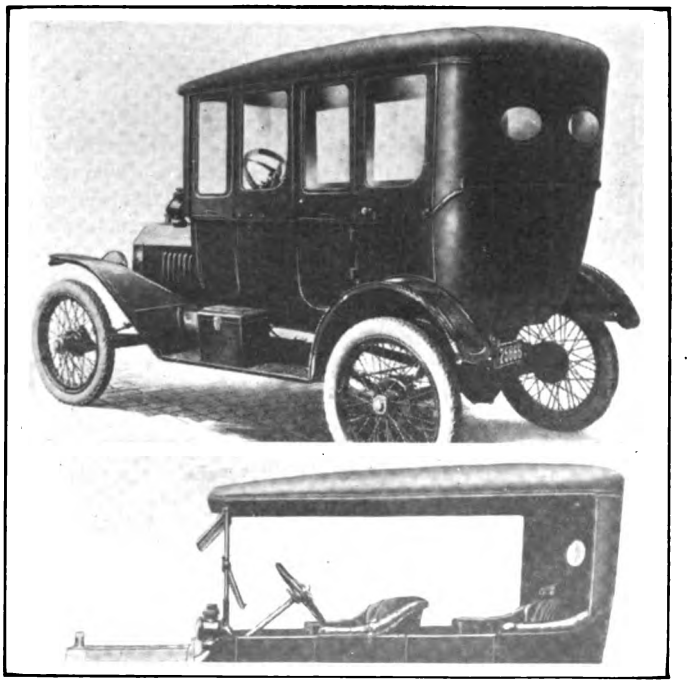
In spite of all these variations in pitch the problem as regards this matter is not one which need fundamentally to be examined until after the work of inducing fan manufacturers and automobile manufacturers to accept a series of graduated diameters for pressed metal fans which will cover the desired field and yet require only a few designs in place of the large number now in use. The standardization of the hub will also be of benefit to ball bearing manufacturers.

Weather-Proof Top for Fords

A TOP designed to make the Ford an all-year car in the strictest sense of the word has been brought out under the name of the limousine top for Fords, by the Detroit Weather-Proof Body Co., Detroit, Mich. It is an attractive and practical removable top which can be easily handled and sells for a moderate price. The top is designed to be of good appearance and to have attractive lines while at the same time having substantial workmanship.

The canopy frame work is made of wood and the braces are of light and strong sheet steel. The entire top and sides are covered with a high grade of imitation leather which is weather-proof. The inside lining is of fine gray cloth giving a very smart finish. The side panels are plate glass. The doors are a patent flexible design which slide noiselessly up and down, disappearing entirely from view when raised. It is possible with this door to open it partially for ventilation and it is claimed by the designers that with this arrangement the top has exceptional conveniences for ventilation. With everything closed, the car is entirely storm and weather-proof, but by removing the side panels and doors, which can be done quickly, a very handsome fair-weather top remains. A rain-vision windshield is included.

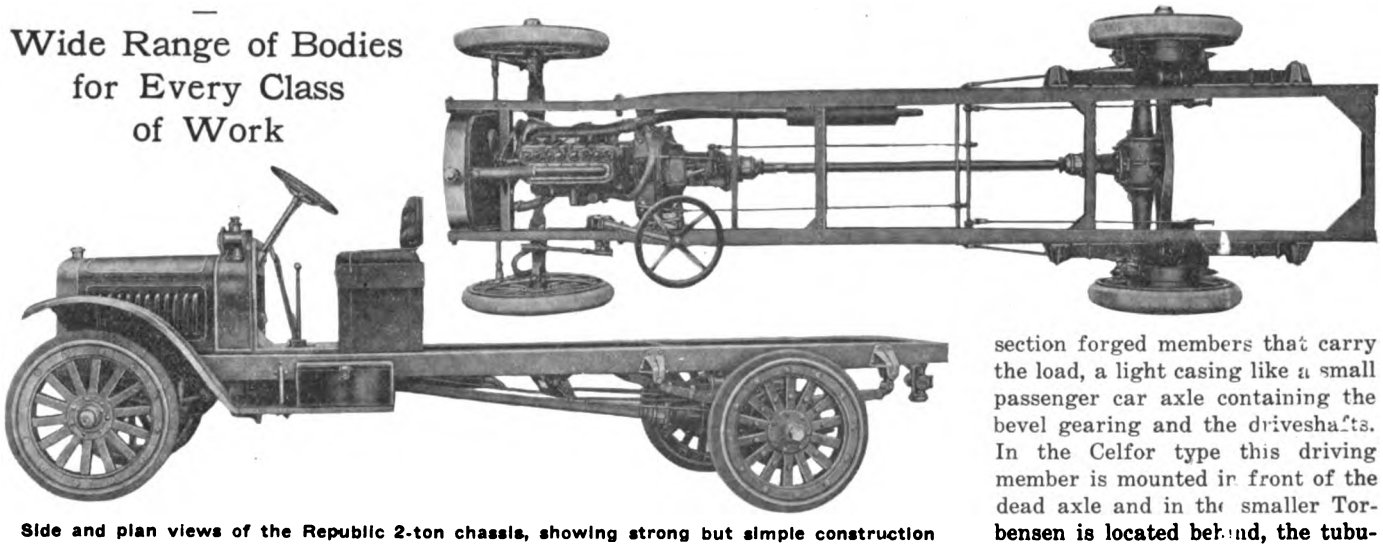
The limousine top for Fords which has been designed and built with a view of obviating any rattle can be put on by anyone who is able to handle a wrench and screwdriver and for owners of 1914 Fords a special cowl is supplied for a small additional sum. The tops sell for $77.



Limousine top for Fords open and closed

Simplicity Features Republic Trucks

Wide Range of Bodies for Every Class of Work



Side and plan views of the Republic 2-ton chassis, showing strong but simple construction

IN the passenger car field the big outputs of moderately-priced cars come mainly from factories where the assembly system of manufacture has been adopted, and it is reasonable to suppose that much the same industrial condition prevails in the truck division. But there is one striking difference, which makes it impossible for passenger car procedure to be applied to truck manufacture without any change in method and this is the fact that absolute single model specialization is an impossibility.

The assembler of truck chassis can make a wide range of sizes without great expense because the whole field of motor and parts manufacture offers him so wide a choice of components. Careful layout design enables the assembly process to be closely similar for quite a wide range of models, and the truck lacks the elaborate fittings and body parts of a passenger car, so it is possible to make half a dozen commercial vehicle models almost as economically as to make one only.

Acting on this principle the Republic Motor Truck Co., Alma, Mich., is able to produce a sufficiently wide range of vehicles to suit almost any sort of work at distinctly moderate prices, as instance the ¾-ton at $995 and the 2-ton at $1,830.

The Republic company is an upholder of the internal gear drive, using this type of axle on both chassis. Two makes of axle are used, the smaller truck having a Torbensen and the other a Celfor. All have unit power plants and large diameter tubular propeller shafts.

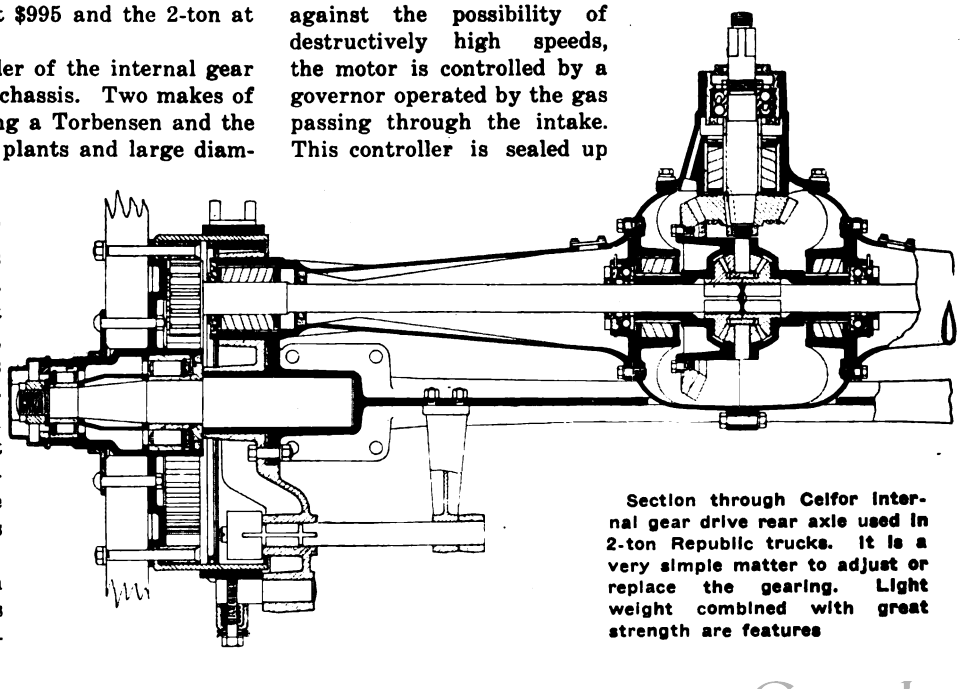
The choice of the internal gear axle has been dictated by the belief of the Republic company that its light weight in proportion to its strength is a very real advantage. It is easy to obtain a wide range of sizes, and another very large advantage is that the gear ratio is readily variable. To suit the size of the pinion and of the annulus gear to the district where the truck will be used is a simple and inexpensive process, and the ultimate renewal of worn gearing is equally easy.

Both the Torbensen axle used on the small chassis and the Celfor axles of the larger model have stout I-section forged members that carry the load, a light casing like a small passenger car axle containing the bevel gearing and the driveshafts. In the Celfor type this driving member is mounted in front of the dead axle and in the smaller Torbensen is located behind, the tubular driveshaft from the gearbox passing through the center of the dead axle which is enlarged and pierced for this purpose. All torsional and driving stresses are resisted by the ample rear springs and all shafts throughout the axle members are supported on roller bearings.

In the design of the axles there are no right or left hand parts, which means that bearings, brake bands, etc., are all interchangeable, and this further facilitates repairs or adjustments. Brakes are internal and external on drums which inclose the driving mechanism at each end of the axle and it is to be observed that the length of the various levers and the layout of the links enables a very powerful retarding force to be exerted without great effort on the part of the driver.

Motor Is a Continental

The motors used are Continentals, one size caring for the ¾-ton model, and a larger size for the 2-ton. Moderate size of motor and a fair crankshaft speed are favored because the high speed engine weighs less for its power than the slow speed kind. To guard against the possibility of destructively high speeds, the motor is controlled by a governor operated by the gas passing through the intake. This controller is sealed up



Section through Celfor internal gear drive rear axle used in 2-ton Republic trucks. It is a very simple matter to adjust or replace the gearing. Light weight combined with great strength are features

inside the intake pipe and has no external connections whatever, so it cannot be tampered with except by tearing down the assembly. The Stromberg carbureter bolts to the intake pipe and can be removed or replaced without any interference with the governor mechanism so the governor is practically integral with the cylinder block.

The difference in motor size between the two models is not great as the stroke is 5 in. in both, the bore of the smaller engine being 3½ and that of the larger 3¾ in.

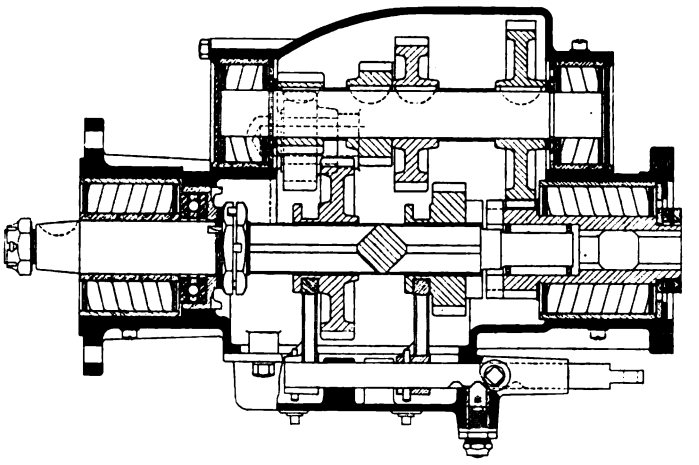
Crankcase of Aluminum

The governor is set to allow a maximum road speed of about 20 m.p.h. for the ¾-ton job, and about 17 m.p.h. for the 2-ton. The motors are L-head block types with individually accessible valves. To save weight the whole crankcase is aluminum, and in the interests of simplicity the water pump is dispensed with, ample syphon circulation being insured by large water ways within the cylinder casting and big outside pipes. Lubrication is a combination of forced and splash, the three main crankshaft bearings having a pressure supply while dip troughs care for the connecting-rod bearings. To the helical timing gears at the front end there is a separate lead from the pump, which latter is a plunger type operated from the camshaft. Ignition is by Bosch magneto, though a complete electrical equipment, including starter and Westinghouse lighting outfit, is obtainable for an extra charge.

A multiple plate dry disk clutch is housed in part of the crankcase that incloses the flywheel and the gearbox is bolted up on a bell housing. This, being small, is of cast iron, and provides three forward speeds, the control being central. Large roller bearings support the gearshafts which are of a special alloy steel and it is claimed that the gearset is designed to support a 50 per cent overload, a highly desirable feature for a commercial vehicle.

Frame Is Flexible

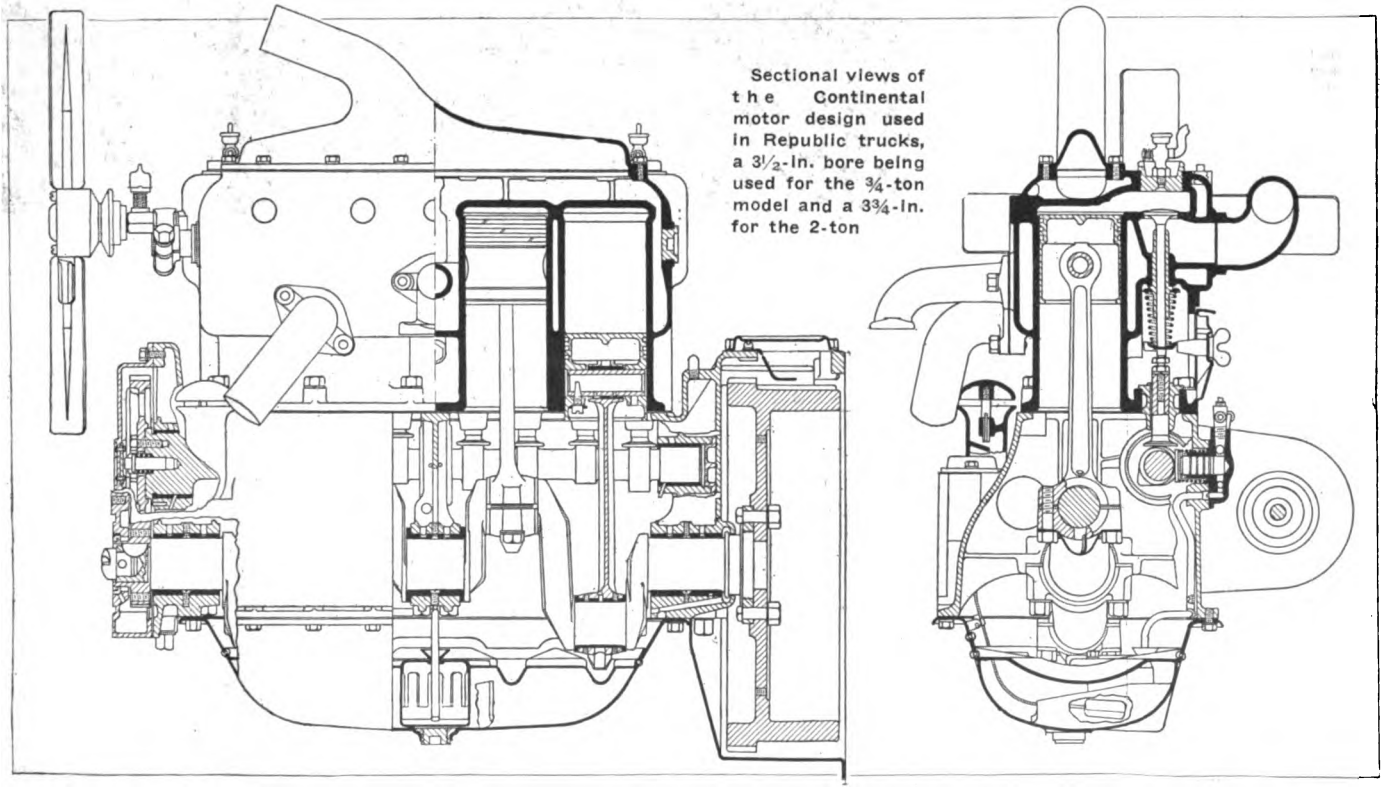
In the frame there is no rigid member, the disposition of the components being such that freedom to weave cannot affect alignment detrimentally. For the engine there is a three-point suspension, two motor arms lying close to the flywheel and a front end swivel being bolted to a cross member, but this same member is not used for the attachment of the radiator. It is essential above all else, that frame weave shall not affect the delicate structure of the cooling apparatus, so a special dropped, cross member is mounted in front of the motor support and the radiator rests on two pads about half the width of the frame apart. A recent change in Republic design is the substitution of a pressed steel radiator shell with a removable core for the integral design used previously.



Three-speed Covert gearbox used in the Republic trucks

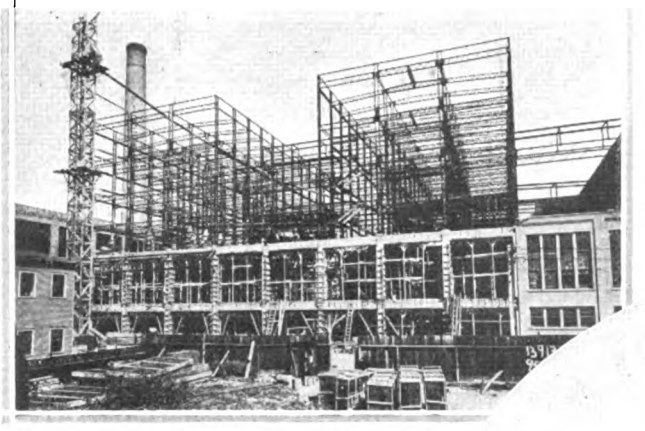
Wide Range of Bodies

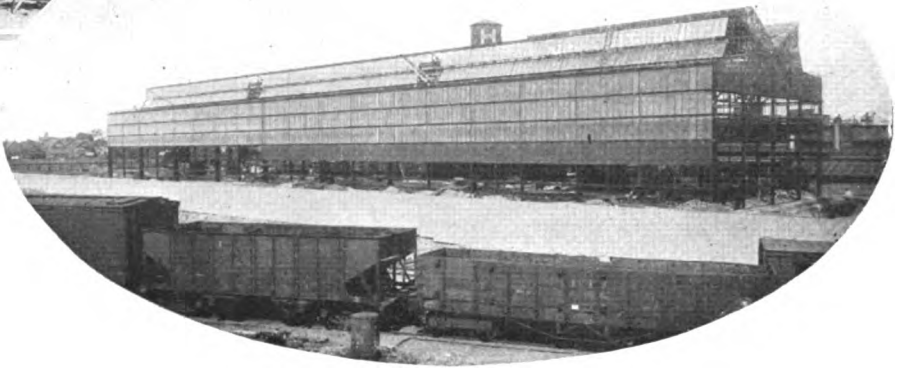
In details the Republic chassis are well cared for, there being no joint without its greaser, but more important still, there are a minimum of places that require lubrication. When the body is on, the only places that are in the least difficult of access are the universal joints, and these call for but infrequent attention. As regards the rest, ten minutes would more than suffice to care for everything. Of course the range of bodies available is wide. These are all made in the Republic plant and the company takes considerable pride in the quality of workmanship and the degree of finish.



Sectional views of the Continental motor design used in Republic trucks, a 3½-in. bore being used for the ¾-ton model and a 3¾-in. for the 2-ton

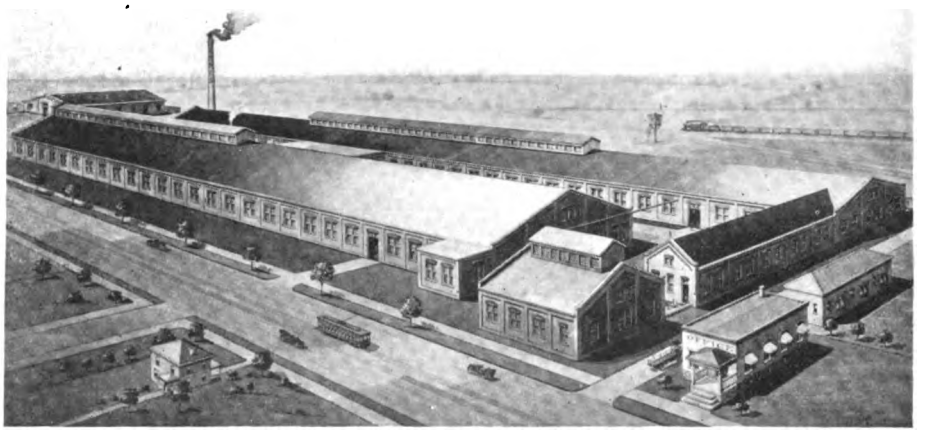
Some Recent Factory Building Operations



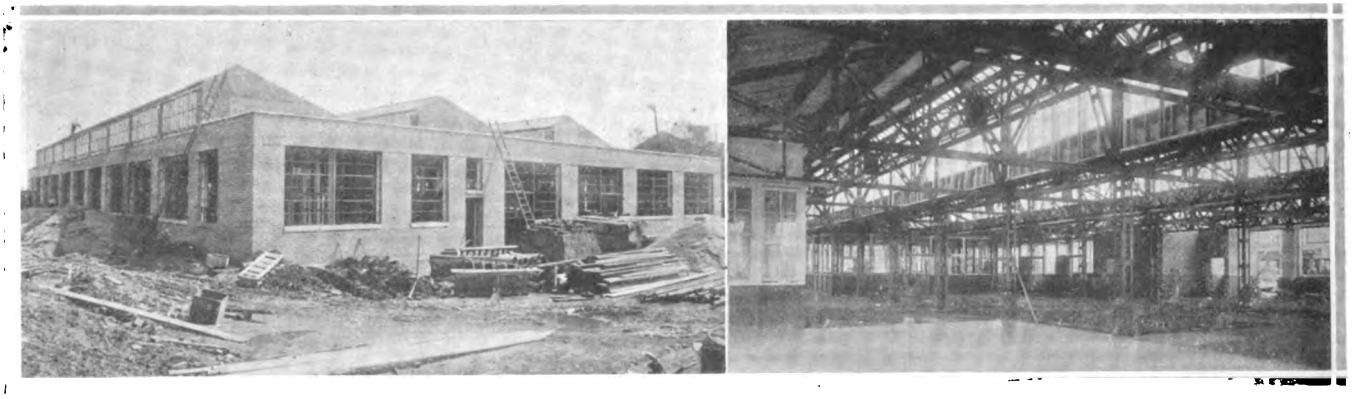


Above—One of the five additions to the factory of the Firestone Tire & Rubber Co., Akron, Ohio, which aggregate over 300,000 sq. ft. or 7 acres of floor-space. It is expected these additions will be completed before snow flies. Through these additions the present output of 7500 tires per day will be increased to 12,000 per day, a gain of 60 per cent.

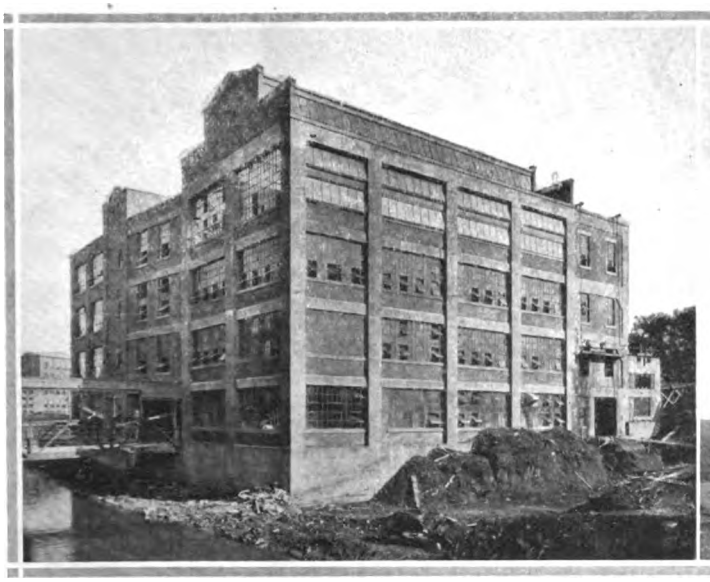
Oval—Recent addition to the plant of the Hydraulic Pressed Steel Co., Cleveland, Ohio, which was originally designed to be 360 by 80 ft., the materials used being steel, concrete and glass. An interesting feature of this building is the fact that the contract called for its completion in 8 weeks but the contractor completed it in 42 days, thereby earning a bonus of $100 per day. Before the building was completed it was found necessary to enlarge it and the contract was let to extend it 200 ft. further, making it 560 ft. long and 80 ft. wide



Right—Plant of the Oakes Co., Indianapolis, Ind., which has added three large buildings, increasing the capacity of the plant to 2000 fans per day. The new plant contains new machinery, several 46,000-lb. presses, enameling ovens, etc. Several acres comprise the grounds and private railroad switches have been built

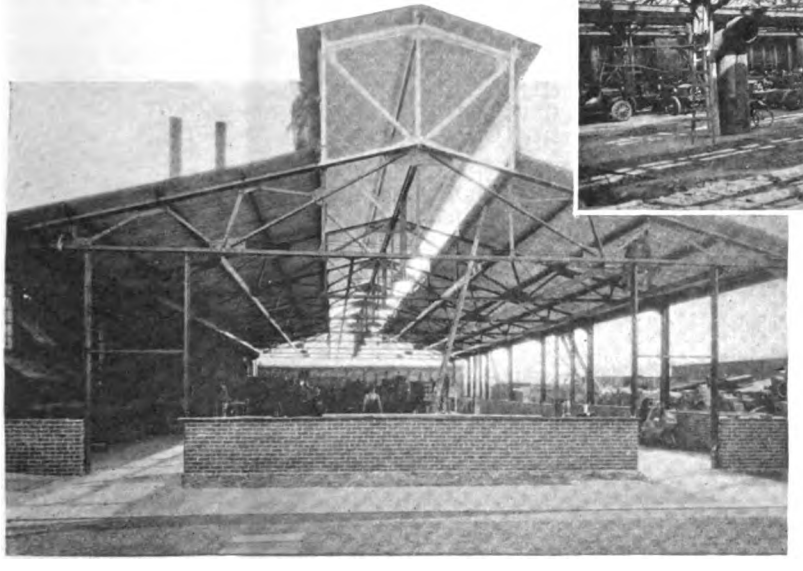


Above are illustrated the exterior and interior of the nearly completed addition to the factory of the Aluminum Castings Co., Cleveland, Ohio. The greatly increased demand for aluminum products and especially for castings of this metal for use in the automobile industry is taxing the facilities of the company to a marked degree



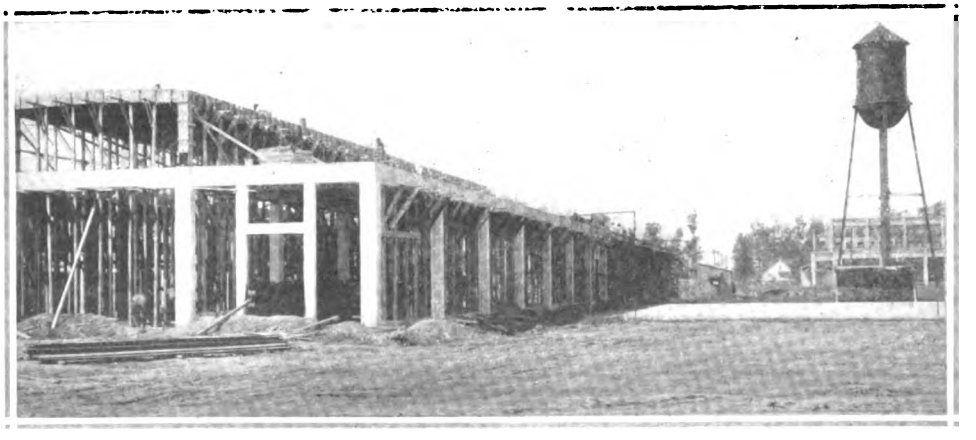
Above at the left is illustrated the addition recently completed by the New Process Gear Corp., Syracuse, N. Y. This structure is four stories in height and 120 by 100 ft. The main plant across the creek is connected with the new building by the bridge illustrated. Excavation at the right is for an additional five-story building, 180 by 100 ft.

Above at the right is the new four-story commercial car worm drive axle plant of the Timken-Detroit Axle Co., Detroit, Mich. The total floorspace is about 100,000 sq. ft., and with machine equipment the cost is about $500,000



Above—Interior of the new truck erecting department of the Packard Motor Car Co., Detroit, Mich. This building is 240 ft. square and of steel and glass construction. As shown in the illustration, over 100 trucks were run in on the completed portion of the new floor and given final adjustment as fast as the cement dried

Left—One of the two new factory additions of the Remy Electric Co., Anderson, Ind., which, like all the other Remy buildings except the administration structure, are one story high so that with high ceilings an exceptional amount of fresh air and light is admitted



Right—New storage battery plant of the Prest-O-Lite Co., Inc., Indianapolis, Ind., which will increase the total floorspace of the company's plant 45,000 sq. ft., or 33⅓ per cent. This addition, which will cost $60,000 and machinery $25,000, is to be completed Dec. 1, all construction being handled by the company's own engineers with the exception of the roofing. The company is at present turning out 400 storage batteries per day, and this output will be greatly increased by the added facilities

The Rostrum

Reasons for Motor Overheating

EDITOR THE AUTOMOBILE:—Will you kindly publish a wiring diagram of the Coey Flyer 1916 model? This car is new and has a starter which never did work. I think that the wiring has been tampered with in transit.

2—Also, the motor heats up on level or down grade and won't pull at all on a hill or up grade. It does not miss and the motor idles nicely, but when it starts up hill the engine seems to choke up and stop. It does this on low gear with wide open throttle. The mixture smells too rich and the carbureter is a Carter with dash control. Have tried the control in all positions.

E. Palestine, Ohio. G. E. M.

—The wiring of the diagram you request is published in Fig. 1. It would be well to see if the coil is securely grounded to the angle platform as the system on the Coey is grounded throughout. The ignition wiring diagram is in the cover of every coil box and the diagram shown is for the lighting and starting system.

2—The reasons which may be assigned to the trouble you mention are:

a—spark is retarded too much.

b—float too high in the float chamber.

c—hot air pipe giving too hot a mixture.

d—spark shorting across terminal inserts in distributer.

To eliminate the first trouble, the igniter should be advanced on the vertical shaft as far as possible and carried practically up to the point where an ignition knock develops.

The second trouble may be remedied by adjusting a small knurled nut on the top of the float chamber to the point marked *L* or to the point where you obtain the best results.

The third trouble if it is from that, can be remedied by taking off the hot air pipe until the weather becomes cooler.

The fourth trouble can be remedied by cleaning and sand papering the inside of the distributer until it is perfectly smooth.

Gathered Wheels for Easy Steering

Editor THE AUTOMOBILE:—Why is the distance between the front wheels of an automobile greater at the top then at the bottom?

2—How are the valves of a four-cycle engine re-timed?

3—What is a floating rear axle?

4—What is the difference in connecting the battery cells in series or in parallel?

5—Will you explain the method of changing from high to low speed when a sliding gear transmission is used?

F. Warren, Mass. W. N. T.

—The reason for this is to make steering easier. The object of tipping the wheels in this manner is to bring the point of contact between the wheel and the ground in a vertical line below the axis of the steering knuckle. When the line of the center of the steering knuckle produced is coincident with the contact of the tire and the ground, there is less tendency for the wheel to be thrown out of line when an obstruction is met on the road.

2—By re-timing the valves you probably refer to bringing them back to the original time of opening and closing after the timing for some reason has been disarranged. On the flywheel of the motor there are marks which indicate the actions of the valves when these marks register with a fixed point on the engine frame. Taking for instance the mark I. O. 1. This indicates that when this mark registers with the permanent point, the inlet valve on No. 1 cylinder is just starting to open. Therefore, with these two marks registering, the camshaft gear must be turned until the camshaft is in such a position that the inlet cam on No. 1 cylinder is just starting to open the valve. The gear is then slipped back into mesh and the motor is timed.

3—THE AUTOMOBILE published in the issue for Sept. 9, on page 472, an article explaining the different types of axles. The floating axle is one in which all the weight is taken upon the axle housing and the wheel bearings are mounted on the outside of this housing. The axle shaft only transmits the driving torque and therefore the shaft can be withdrawn without altering the position of the wheel.

4—When batteries are connected in series, the positive poles of one cell are connected with the negative of the next, and so on. When in parallel all the negatives are connected and all the positives. Connecting in series gives the effect of adding the voltages while connecting in parallel adds the amperage. Thus, if six 1-volt cells were connected in series, the result would be a 6-volt current while in parallel the voltage would be about 1.

5—In changing from high to low speed, when a sliding gear transmission is used, the process merely consists of taking out the clutch by depressing the clutch pedal and bringing the shifter lever back in the gate to secure the low gear mesh. If there is difficulty in doing this without noise the clutch should be merely slipped a little and not entirely withdrawn. Move the lever with a moment's pause in the free position and the clutch will speed up to suit the faster revolution of the lower gears; or increase the motor speed while in neutral with clutch momentarily engaged.

Troubled with Explosions in Muffler

Editor THE AUTOMOBILE:—I have a 1913 Studebaker 35 and am troubled with explosions in the muffler. I have ground in the valves and have tried adjusting the carbureter and valves without effect.

I get the explosion whenever I cut down the gas and particularly in going down hill. Am using an exhaust horn. Would this have any effect upon it?

2—I also have a 1914 Buick truck which does not start on the battery without spinning it for 3 or 4 min., but will start quite easily on the magneto and will run after starting on either magneto or battery. Can you tell me what the trouble is and how I could remedy this?

Allston, Mass. F. W.

—The only reason for getting an explosion in the muffler is that an unburned charge has found its way into this part of the car. This means that the cylinders are not firing regularly and consequently that there is trouble with the functioning of either the carburetion or ignition. It would be well to examine the spark plug points to see if they are not too far apart and also to adjust the carbureter so that the motor fires regularly on all four cylinders. The exhaust horn

has nothing whatever to do with the muffler explosions which are due to the fact that an unburned charge escapes into the muffler to be followed by a hot exhaust which explodes the unburned charge in the muffler.

2—No doubt the batteries are weak and need renewal.

Setting Loosened Automobile Wheels

Editor THE AUTOMOBILE:—Kindly give me the proper method of setting automobile wheels that have loosened in the felloe and hub.

2—Give me the timing of the 1910 4-40 Locomobile.

Manhattan, Nev. F. C.

—This work will have to be done by a competent wheelwright who will have to thoroughly go into the causes of the loosening before he can make a repair. It would be dangerous to attempt to do this work yourself as the failure of the wheel might result, with serious consequences.

2—The timing of the 1910 4-40 Locomobiles is as follows: Admission opens on top center; admission closes ⅜ in. past bottom center; exhaust opens ¾ in. before bottom center, and exhaust closes ⅛ in. past top center.

Complete Circuit for Splitdorf Ignition

Editor THE AUTOMOBILE:—Will you kindly publish sketch showing the complete circuit for a Splitdorf coil, showing both battery and magneto circuits?

Barberton, Ohio. F. S.

—You do not mention the model magneto you refer to nor whether you are using the dash transformer or the tube transformer. A typical wiring diagram for each is given in Fig. 2.

Operation of Chevrolet Electric System

Editor THE AUTOMOBILE:—I have recently bought a Chevrolet roadster and would like to get a simple description of the workings of the electric starting, lighting and ignition systems used on this car; Auto-Lite and Connecticut ignition.

If such descriptive articles have appeared in THE AUTOMOBILE please mention issue.

Washington, D. C. J. S. C.

—The starting, lighting and ignition system is composed of the Auto-Lite for cranking and lighting and the Connecticut for ignition. The Auto-Lite lighting and cranking system is the two-unit type, an electric motor connected through the Bendix drive with teeth in the flywheel rim, serving for rotating the crankshaft and a separate generator driven by helical gearing providing current for lighting and ignition. The latter has in unit with it a Connecticut coil and distributer to take care of the ignition. A complete description of the Chevrolet line appeared in THE AUTOMOBILE for Nov. 26, 1914, on page 989.

Weights of Franklin Power Plants

Editor THE AUTOMOBILE:—Kindly publish the weight of Franklin series five and eight motors, no electrical equipment for lighting and starting in either case.

Chula Vista, Cal. H. A. SPRAGUE.

—The weight of the Franklin motors is always computed as assembled completely with the clutch which is housed in the flywheel. Including the starter, the series 5 Franklin motor weighs 634 lb. The series 8, 642 lb. The starter alone for the series 5 weighs 92 lb. and for the series 8, 58 lb. These figures do not include the battery unit.

Building High-Speed Light Six Racer

Editor THE AUTOMOBILE:—I contemplate building a small bore, high-speed racer. I want to use a small light weight, high-speed motor of 3 by 5 bore and stroke, six-cylinder, delivering its maximum power at 3000 r.p.m. I contemplate using a 3 to 1 gear with 32 by 4 tires. Is this type of motor suited for this work and is this gear too big? Any other information along this line would be greatly appreciated.

Tompkinsville, N. Y. G. S.

—The best way to proceed is first to build the motor, then place it upon the block securing the horsepower curve after which the gear ratios can be laid out so that the motor is capable of operating at the peak of the horsepower curve when the maximum effort is desired. The arrangement of the manifolds, gas passages, etc., have so much to do with the motor that it will be impossible to predict the performance in advance.

Extreme Bore Limited by Practice

Editor THE AUTOMOBILE:—Would you kindly advise me the extreme bore regardless of the length of the stroke which could be used in a motor to come under the 300 cu. in. piston displacement?

Orchard Lake, Mich. C. H. B.

—By this you no doubt mean to infer that the motor must be within the limit of practical design and since you do not mention the number of cylinders, a four-cylinder motor will be assumed. Taking a motor of 3-in. stroke as being about as little as possible to come under the head of even reasonable practice, the bore of such a motor would be 5⅝ in. to give a displacement of 295.2 cu. in.

Information on a 1908 Pope-Toledo

Editor THE AUTOMOBILE:—Will you kindly furnish me with the following information regarding a 1908 Pope-Toledo four-cylinder motor, 4⅞ by 5?

1—Center to center distance on the tie rod.

2—Timing of valves.

3—In the bore of the driving gear on the camshaft are

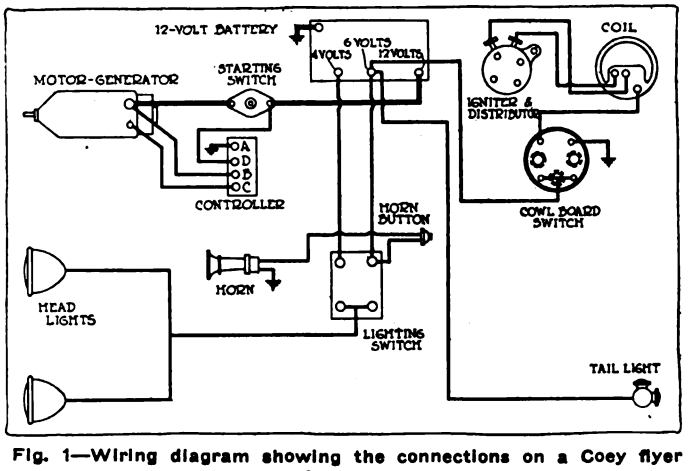


Fig. 1—Wiring diagram showing the connections on a Coey flyer 1916 model

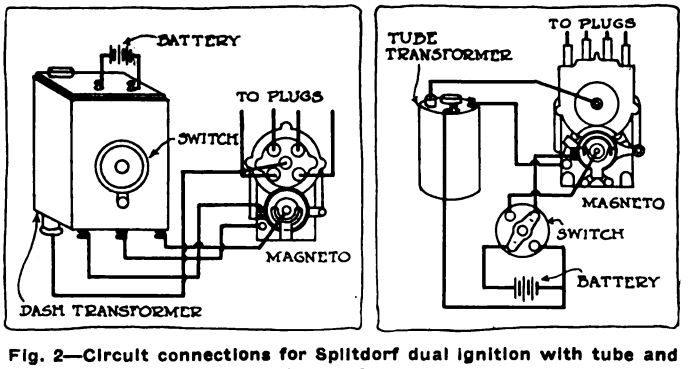


Fig. 2—Circuit connections for Splitdorf dual ignition with tube and dash transformers

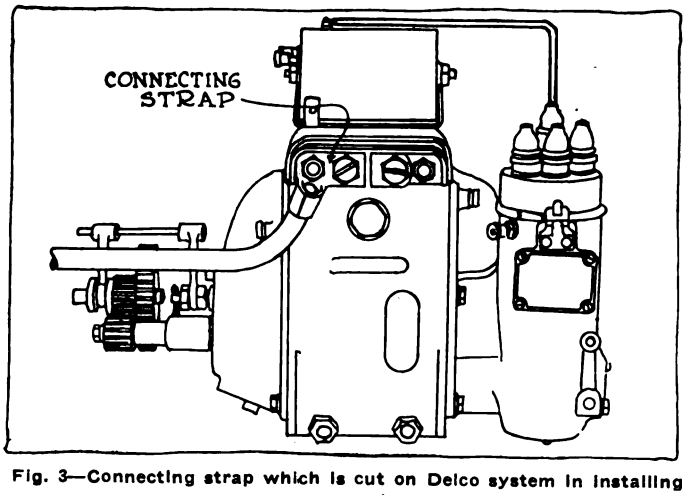


Fig. 3—Connecting strap which is cut on Delco system in installing an ammeter

two keyways. Are these intended for setting for high or low speed?

4—Center to center distance from rear to front axle spindles.

5—Principles and operation of the oiler with which this machine is equipped. It is a five-feed oiler with a single pump, but the oil is delivered through individual sight feeds. It would appear that it is forced under a small piston inclosed in the sight feed glass which rises under the pressure. The top of the piston shows a white telltale and the oil is by-passed under the piston to the delivery tube.

6—Is the auxiliary dash tank equipped with any form of automatic shutoff to take care of pressure delivery from the rear tank?

7—The splash oiler does not appear adequate to properly supply oil to the crank throws and it is contemplated installing a high pressure single-cylinder pump connected by manifold to the crank throws and camshaft bearings. Is this advisable?

8—When reducing the load on the chassis is it possible to remove some of the spring plates?

Camden, N. J. W. S. C.

—The distance, center to center, on the tie rod is 46¼ in. The dimensions of this motor are 4⅞ by 5¼ in.

2—The timing of the valves is as follows: The exhaust opens ½ in. before center, and closes ⅛ in. past center. The intake opens 1/16 in. past center and closes according to above. This is measured on the flywheel.

3—In the bore of the driving gear on the camshaft are two keyways. These are not intended for setting the high or low speed.

4—The center to center distance from the rear to the front axle spindles is 125¾ in.

5—The oil in the five-feed oiler is forced under a small piston inclosed in the sight feed glass which rises under the pressure. The top of the piston shows a white telltale and the oil is by-passed under the piston to the delivery tube.

6—The auxiliary dash tank is equipped with any form of automatic shutoff and will take care of pressure delivery from the rear tank. It is not advisable to install a high pressure single-cylinder pump connected by manifold to the crank throws and camshaft bearings.

7—No.

8—It is suggested that you install new springs when reducing the load in the chassis, and we would not advise removing the spring plates.

Wants to Install Ammeter on Delco System

Editor THE AUTOMOBILE:—We have a Buick 37, 1914 model, equipped with Delco system and would like to install an ammeter showing the charging rate, but not to show a discharge when the starter pedal is pressed down to start the engine.

Iuka, Kansas. M. & P.

—The accompanying wiring diagram shown in Fig. 4, gives the connections necessary to install the ammeter. In order to make this operative it is necessary that the brass strap connection between the motor terminal and the generator terminal on the side of the motor generator be cut. This is a very easy matter with the later types of these instruments where the strap is on the outside, but which will be considerable labor if the instrument is of the earlier type in which the connection is on the inside of the frame.

A diagram showing how this may be connected on the Delco system is given in Fig. 3.

Zip Motor Built in Detroit

Editor THE AUTOMOBILE:—Can you tell me who built the motor and who built the wheels for the Zip cyclecar? Is it possible to replace the bearings in these wheels without removing the spokes first?

2—What size Hess-Bright ball bearings would fit these wheels?

Pueblo, Col. L. C. J.

—You do not state the model you are driving. The Zip Cyclecar Co. discontinued operations last November, although the service business is at present being continued by H. A. Huebotter, 2110 Main Street, Davenport, Iowa. The twin-cylinder air-cooled motor was made by the Universal Machinery Co., Milwaukee, Wis. The four-cylinder water-cooled motor was built by the Hermann Engineering Co., Detroit, Mich. The wheels were made by the Standard Welding Co.,

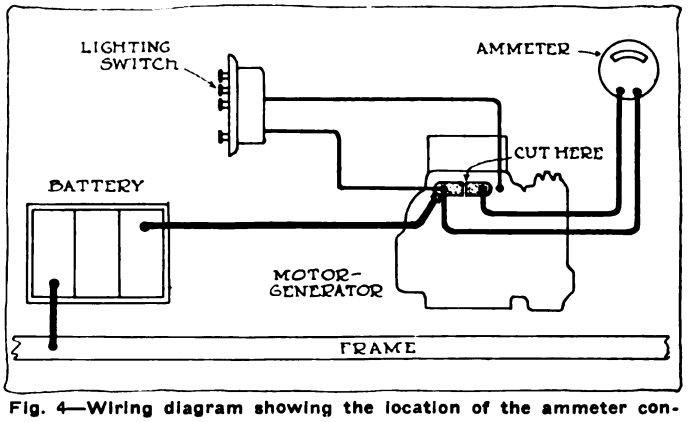


Fig. 4—Wiring diagram showing the location of the ammeter connections on the Delco system

Cleveland, Ohio. The cups of the wheel bearings cannot be taken from the hub without disassembling the wheel and it is generally preferable to replace the wheel altogether. Prices on the different parts can be obtained from the address given. No record of any experiments with annular ball bearings in these wheels are on file.

Piston Displacements of Racing Cars

Editor THE AUTOMOBILE:—What is the bore and stroke of the four racing cars, Mercedes, Peugeot, Delage and Bugatti?

2—What piston displacement have they?

3—How many cylinders?

4—What radiators do they use?

5—Do six-, eight- and twelve-cylinder cars compete with four-cylinder cars on the Chicago board track providing the piston displacements are the same?

St. Louis, Mo. A. L. E. B.

—Bore and stroke of the 4.5-liter Peugeot is 3.62 by 6.64. The new Peugeot racers known as the 3-liter cars, have bore and stroke of 3.07 by 6.13. The Bugatti has a bore of 4 in. and a stroke of 5.937. The Delage has a bore of 3.65 and a stroke of 7.1 and the Mercedes is 3.69 by 6.3.

2—The piston displacements are as follows: Mercedes 270.9; Peugeot 183 and 274; Delage 299, and Bugatti 298.

3—These cars are all four-cylinder types.

4—The radiators are not alike and THE AUTOMOBILE has no record of the manufacturer.

5—The racing rules do not limit the number of cylinders, merely providing a piston displacement limit.

Starting on Compression Not Harmful

Editor THE AUTOMOBILE:—Does starting the engine of an automobile on compression affect the engine in any way?

Dallas, Tex. W. B. S.

—This method of starting will not harm the motor, although at one time its effects were seriously considered. The general consensus of opinion is that the explosion is so much weaker than the ordinary one that no harm could possibly result.

Brake and Drawbar Horsepower

Editor THE AUTOMOBILE:—Please explain the difference between brake horsepower and horsepower at the drawbar? Also, is the horsepower the same for all manufacturers and is its value 550 ft.-lb. per second?

Rock Island, Ill. C. H. H.

—Brake horsepower signifies the horsepower delivered by the crankshaft of the motor and is generally measured upon some form of braking device such as the Prony brake or some type of dynamometer. Horsepower at the drawbar is generally a measure of the towing power of the vehicle.

Horsepower means the same to all manufacturers as it is a definite quantity meaning 33,000 ft.-lb. per minute, or 550 ft.-lb. per second.

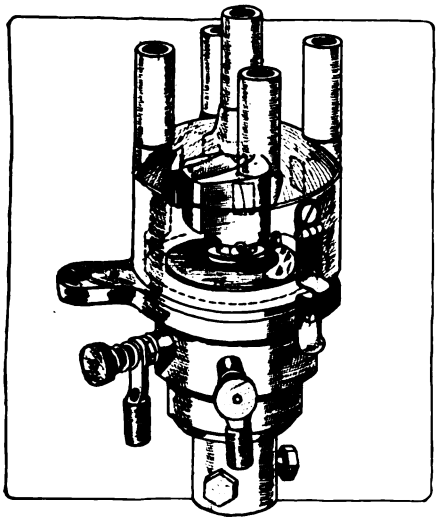
Timing of the Two-Speed Model A Krit

Editor THE AUTOMOBILE:—Please give me the timing of a Krit model A two-speed motor? Kindly show the position of crank throw as spark occurs in the first cylinder.

Marion, Ohio. D. G. T.

—The spark timing of this motor is such that the explosion occurs when the piston is within 3/32 in. of completing the stroke. This will enable you to set your ignition timing accordingly.

New Connecticut System Is More Compact



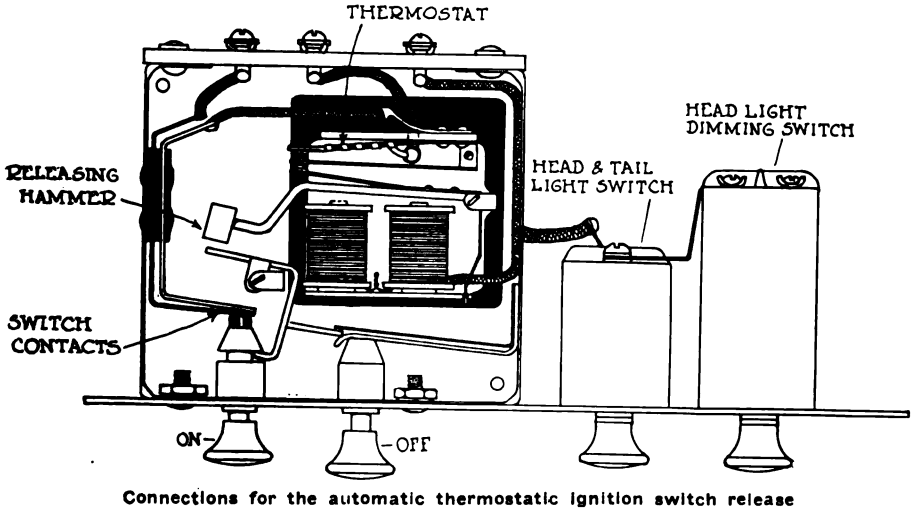
New Connecticut igniter housing which has a rounded top for the reception of the leads to the spark plug. This improved design eliminates the gathering places for moisture and dust and is an improvement over the flat top design

THE Connecticut Telephone & Electric Co., Meriden, Conn., has brought out an improved type of its automatic ignition system which is considerably simplified and more compact than previous types. The principle has not been altered, the improvement having to do only with mechanical construction.

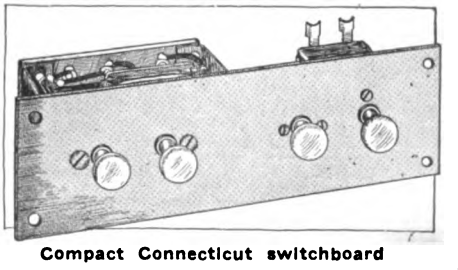
The igniter housing now has a rounded top for the reception of the leads to the spark plugs, this form being an improvement over the flat top in that it provides no lodging place for moisture and dust, etc. At the same time, the housing which carries the distributer segments has been made lighter. The distributer arm also has been lightened and made more compact. Other improvements include the adoption of a new type of compression lock washer holding the cover plate over the breaker mechanism in place and a new type of inclosed ball bearing at the lower end of the driving shaft.

In principle, the new type of switch, which is in addition to the standard round type, is exactly like the older one except that it is mounted entirely behind the dash with nothing in view except a plate and four switch buttons. One of these serves to make the ignition circuit and another to break it. A third button switches on head and tail lamp and the fourth button dims the head lamps for city driving. Any combination of lighting switches can be incorporated in the switch plate.

When the ignition switch is closed, current drawn from the storage battery is caused to pass through a tiny thermostat on its way to the coil and thence to the distributer and finally to the plugs. If the motor is not started within a short time after the switch is closed—the length of time is easily adjustable—the thermostat closes a circuit through a tiny electric buzzer operating a releasing hammer which automatically opens the ignition circuit and thus prevents the battery draining itself. Obviously, if the motor is stalled and not again started, the thermostat will open the circuit in the same way. Thus, it is impossible for the motor to stand idle for more than a minute or so with the ignition switch closed. When the motor is running the amount of current passing through the thermostat is so small that it is negligible and has no effect.



Connections for the automatic thermostatic ignition switch release



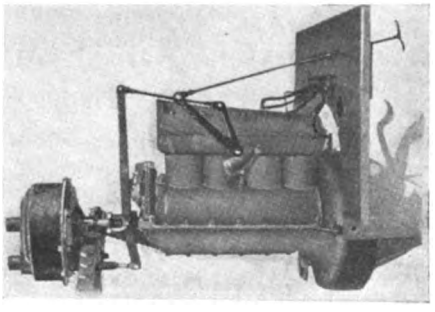
Compact Connecticut switchboard

ACCESSORIES

Cleveland Starter for Fords

UNDER the name of the Cleveland spring cranker a starter has been brought out for Ford cars which derives its power from a flat chrome-vanadium spring 2½ in. wide and 12 ft. long. This spring is coiled like the main spring in a clock, one end being fastened to the steel case and the other to an extension of the crankshaft. The winding is accomplished by a pawl and ratchet arrangement which is released by a trigger on the dash.

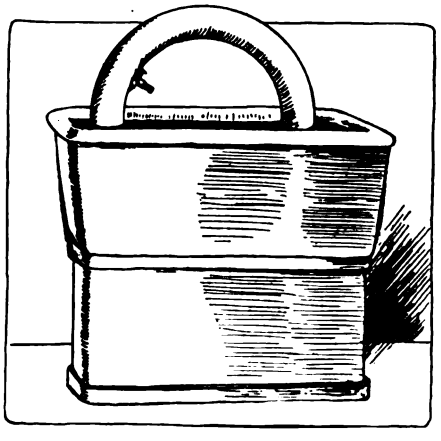
When the motor starts running under its own power the spring automatically rewinds, and when fully wound the apparatus ceases to operate. The rewinding takes from 20 to 30 sec., according to the speed of the motor. The price complete is $45.—The Forest City Electric Co., Cleveland, Ohio.



Cleveland starter on Ford motor

Ideal Tire Testing Tank

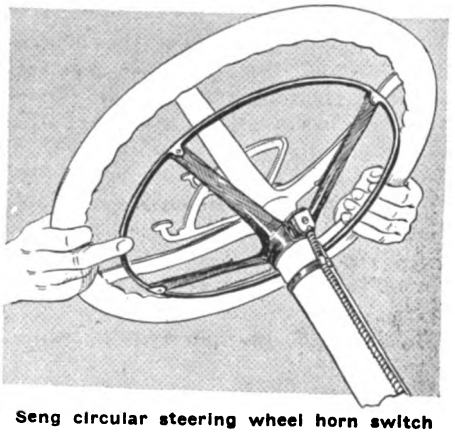
For a garage convenience there has been brought out a tire testing tank of porcelain under the name of Ideal. The white porcelain background reflects instantly the bubbles as they arise from the leak in the inflated tube. The porcelain used in these tanks is highly glazed so that its surface may be cut clean and white without any trouble. The tank stands 30 in. from the floor and will hold the largest tube. Its height from the floor to the top of the rim is 32 in.; inside depth is 15 in.; inside width, 8 in.; length over all, 36 in., and inside length, 32 in. To connect this fixture with the sewer a 1½-in. trap should be used. It may be filled with water by hose or overhead swinging faucets as desired.—The Trenton Potteries Co., Trenton, N. J.



Ideal porcelain tank for tire testing

Seng Circular Switch

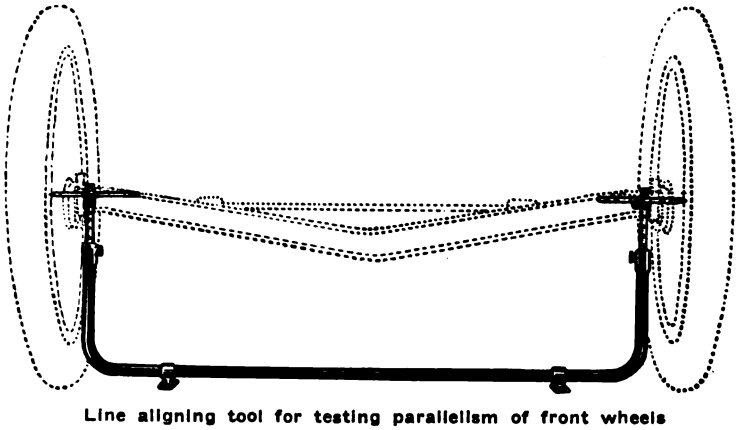
The Seng ring, of smaller diameter than the steering wheel, is placed under the wheel and concentric with it; its diameter is such that it is conveniently reached by the fingers. Pressure on it closes the horn circuit and sounds the signal; the pressure may be applied at any point, and the position of the steering wheel makes no difference. Price $3, Ford type $2.50.—W. P. Seng, Chicago, Ill.



Seng circular steering wheel horn switch

Line Wheel Aligner

The Line tool for testing the alignment of the front wheels of a car consists of a tubular shank with the ends bent at right angles and carrying adjustable pointers which can be applied to the rims, obtaining true measurements and eliminating the uncertainty due to measuring from tires which are not perfectly true. The vertical adjustable rods are graduated, as is also one of the horizontal pointers. The bent shank facilitates getting the measurement at the rear of the wheels. Price, $10.—Mechanical Utilities Corp., Chicago, Ill.



Line aligning tool for testing parallelism of front wheels

Holophane Reflectors

A heavy metal reflector, designed especially for outdoor work where it will be subjected to the action of the weather, is one of the products of the Holophane Works. Heavy porcelain enamel is used on all the surfaces, white inside and green outside, with the exception of a copper nut at the top. This reflector is suitable for headlights and is detachable.

The nut is tapped for ½-in. pipe connection and is locked to the reflector by a bearing of ample surface. By using four lights around a car an excellent illumination is obtained. The angle type, 12¼ in. in diameter and 14½ in. deep, is suitable for such work. A lamp for use in this work is turned out which has 200-watt argon-filled Mazda light. The list price of the reflector is $4 each.—General Electric Co., Cleveland, Ohio.

Camp Bed for Small Cars

A canvas bed, utilizing the seat cushions and braced by iron rods, is slung under the raised top of the car and affords comfortable sleeping accommodation for two persons. The makers state that it can be put up in about 3 min. When not in use the bed can be rolled into a compact bundle and stowed on the running board or any other convenient place.—Price, Ford type, $7.50; other small cars, $8.50.—Auto Bed Co., Bellingham, Wash.

Stevens Duplex Reamers

A new line of reamers specially designed for repairmen handling Ford cars has been brought out under the name Duplex. Among others, two reamers are for fitting of the spindle bodies and spindle arm bushings. The diameters of the two reamers which are contained in the one tool are 0.564 and 0.506 in. The reamer is supplied with both

straight and twisted flutes. Other reamers made by the same concern are plain and expanding types of special Ford sizes for use on worn or refinished parts. These are used in work of various bushings in the Ford car and can be brought up to 0.005 in. over size when desired.

To meet the demand for a cylinder reamer that can be used in an ordinary drill press the same concern is marketing one which is made with inserted blades having a cutting angle in clearance requiring but little power to operate. This reamer is fitted with a No. 4 Morse taper reamer shank, and the maker states that it will ream the Ford cylinders accurately in 15 min. It enables the reaming of cylinders for taking 1/32-in. oversized piston. The prices of the above tools are $2 for the Duplex reamer, prices on request for the plain and expanding reamers, and $16 for the cylinder reamer.—Stevens & Co., New York City.

Norton's Spring Leaf Spreader

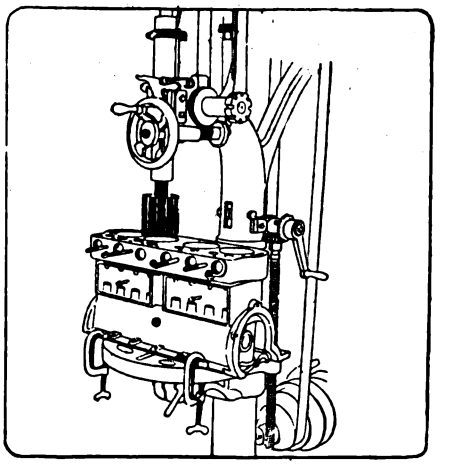
The leaves of the spring require lubricating as well as any other part of the car, for if they become dry they are likely to rust together, preventing free sliding and increasing the tendency toward squeaks. Springs which have become rusty between the leaves cause hard riding which in turn results in worn tires and finally broken springs. With this spring leaf spreader, the heaviest springs can have the leaves separated widely enough to insert graphite, the best known lubricant for this purpose.

As shown by the illustration, the tool is complete in itself, being strong and serviceable and designed to resist wear. The spur or wedge is of chrome nickel steel while the lever which spreads the leaves is a hard steel casting. The end of the lever is a cam enters itself on one side of the spring and at the same time draws the spur in on the other. The price of the tool is $2.—I. S. Spencer's Sons, Guilford, Conn.

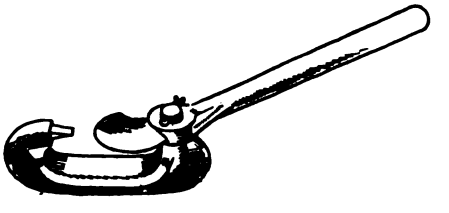
Tempco Spark Plug Brush

A spring steel wire brush set into a malleable iron handle and designed for cleaning carbon and other foreign matter from spark plugs is the Tempco. The end of the handle is forked and forms an alligator useful for turning small nuts, such as terminal nuts. The head terminates in a screwdriver tip, which is useful for adjusting spark plug points. The brush sells for 40 cents.—Tempco Mfg. Co., Chicago, Ill.

Canvas bed for use on small cars. It is illustrated folded and unfolded

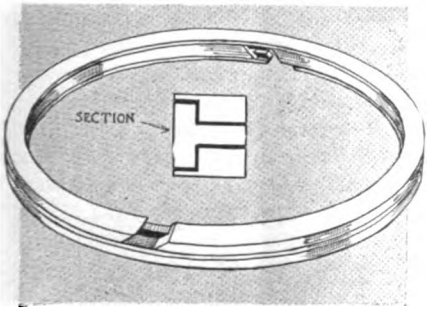


Stevens cylinder reamer for Ford motors

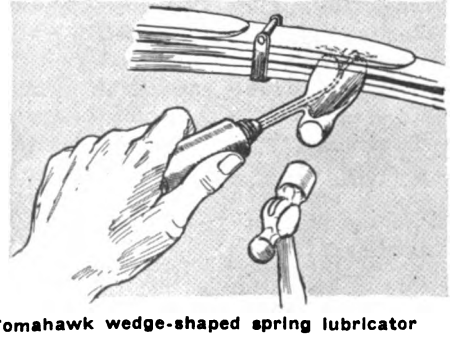


Norton spring leaf spreader for lubricating the leaves

Tempco steel spark plug brush



Trump piston ring, showing section



Tomahawk wedge-shaped spring lubricator

Trump Triple Piston Ring

Made in three sections. The central section is of T-shaped cross section, having flanges which fit into recesses in the two outer sections. All are diagonally split and the joints are set at equal intervals. The sections are concentric. The ring may be applied complete, as if it was of ordinary construction, or it may be put on one section at a time. The makers state that the interstices between the rings hold oil which forms a seal. The rings are 75 cents each.—Trump Mfg. Co., Crown Point, Ind.

Tomahawk Spring Lubricator

A wedge-shaped spreader for leaf springs has a forked edge, in which is a hole for the passage of grease; the spreader head is attached by means of a short shank to a cylindrical grease container, a passage through the shank conveying grease to the outlet in the fork. A twist of the container forces grease through the passages and out at the spreader. The butt of the spreader is made so that it can be hammered to force the tool in. Soft graphite grease is recommended for the work. Price, 75 cents.—C. W. M. Co., Buffalo, N. Y.

Marvel Body Cleaner

This cleaner is a liquid which the maker states is non-poisonous and non-volatile and which, when applied to varnished body work with clean waste and wiped off with dry waste, is designed to remove all dirt and leave a polished surface. It is intended to take the place of ordinary washing and cleaning in addition to furnishing the polishing feature. It sells for $3 per gal., $1.75 for ½ gal., $1 per qt.—Drew Auto Supply Co., Brooklyn, N. Y.

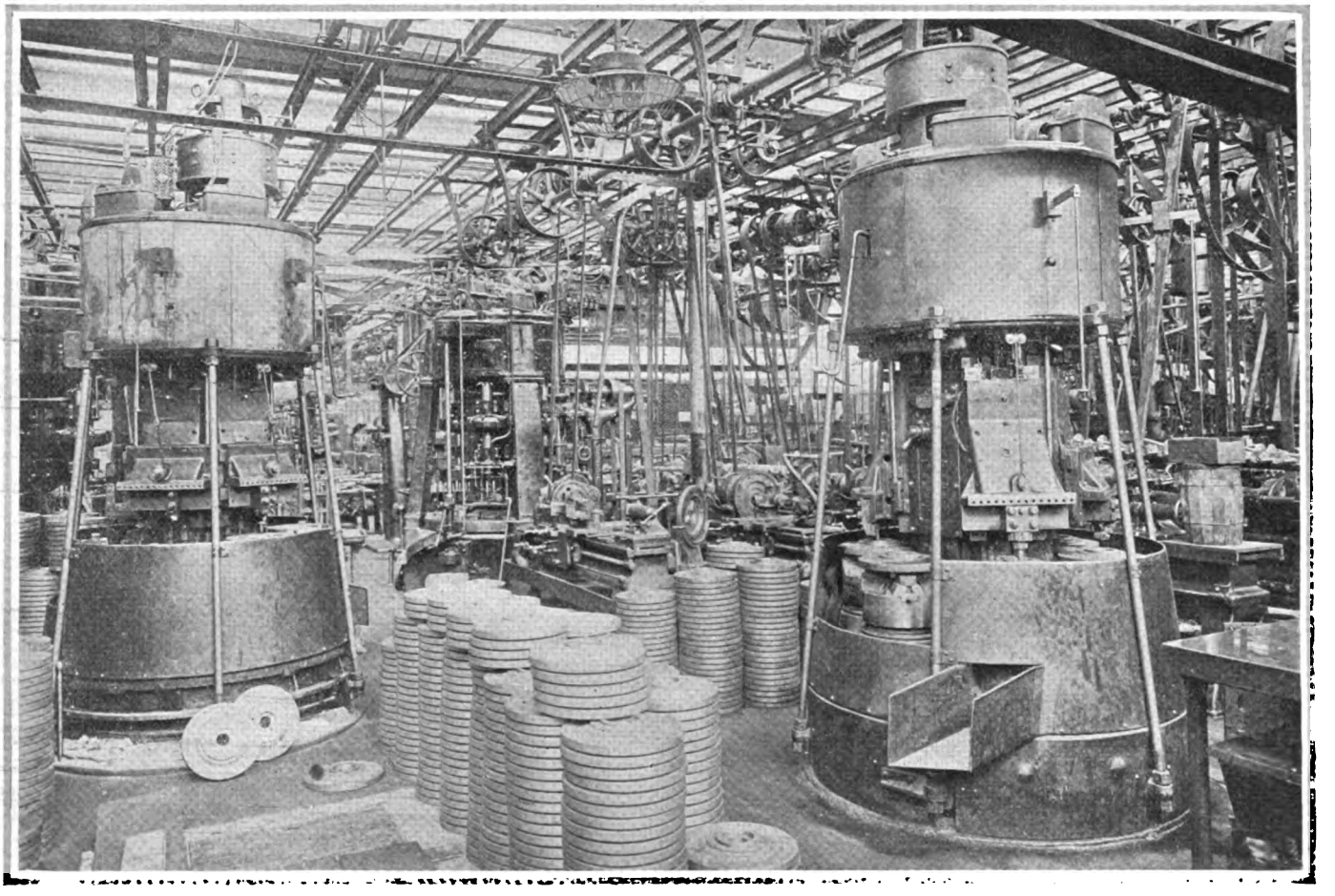
Efficiency Gas

While this method of lubricating is not new, the makers of Efficiency Gas state that their product mixes with gasoline much more thoroughly than does ordinary lubricating oil and that it vaporizes in the cylinders and is deposited on them; a film is formed on the walls of the combustion chamber and, the makers assert, prevents the adherence of carbon.

It is stated that Efficiency Gas will thoroughly mix with gasoline without stirring or otherwise agitating it; that it will not gum up the needle valve or other parts of the carbureter; and that it will thoroughly lubricate the cylinders. One gal. is sufficient for treating 640 gal. of gasoline. The price is $4.50 per gal., $2.50 per half gal.—Gas Engine Efficiency Co., St. Louis, Mo.

Big Turning Machine Saves $250 Daily

Bullard Multimatic Machines Ford Flywheel in 1 Min. 44 Sec.



A COMPARATIVELY new tool is the Bullard Multimatic illustrated above, its object being to enable the rapid automatic production of flywheels or similar parts, the only handling required being the insertion of rough castings and removal of finished work. Essentially the machine consists of six vertical spindles akin to those of a boring mill, but arranged on a circular table. This table is itself on a center and is used to bring the work into seven successive positions. There are six tool carriers located on a massive frame that forms the upper part of the machine so of the seven revolving work spindles six are in position at one instant beneath different cutters and one is idle.

Method of Operation

From this brief description and the illustrations the action of the tool is made obvious. To start work a flywheel in the rough is placed on the open work table and the first indexing movement of the large circular table brings the casting under the first tool. While this is at work on the first operation the attendant places a second rough casting on the next work table and at the next indexing this is carried one stage forward while the first wheel is carried on to a position beneath the cutter for the second operation. At the seventh indexing the first wheel comes opposite the operator in the finished state and he has merely to remove it, substituting a fresh casting.

Needless to say, such a gigantic machine is only of value where fairly large output prevails, but in the Ford plant it is stated that the first two machines to be installed saved $250 a day. In a 10-hour day it is possible to produce nearly 1,000 flywheels from one machine. The price of the tool is about $8,000 but in writing the makers some 6 months after the first installation the Ford company said that the cost of the first two had been worked off. Similar equipment is to be found in several other plants and one of the Multimatics will be used in Packard production for this season.

This tool is a particularly good example of the type of new machinery which is assisting to cut down the cost of manufacture mentioned in THE AUTOMOBILE article last week which dealt with the reasons for the reduced prices prevailing in 1916 model cars.

Had it not been for the great pressure of war orders on all branches of the engineering trade of America it is probable that a much larger number of machines similar to those illustrated would have been available for the rapid and economical production of other parts. It is only recently that the automobile trade has had special attention from the machine tool manufacturer, and the latter is certain to devote more of his time to studying it as soon as the present state of affairs relaxes a little. The production of crankshafts, gears and special work of a like nature could be speeded up greatly by new processes and the quantities are now great enough for it to be worth while to spend large sums in developing new tools.

The Automobile

PUBLISHED WEEKLY
Copyright 1915 by The Class Journal Co.

Vol. XXXIII Thursday, October 7, 1915 No. 15

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
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Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The British Import Duty

GREAT BRITAIN has imposed an import duty of 33 1/3 per cent on automobiles and parts with a view to producing revenue and also protecting the British automobile manufacturers. It cannot be questioned that the revenue is assured, but the efficacy of the protection is to be doubted. The enormous success of American automobiles throughout the British Empire is due to their quality and to the manufacturing methods which enable them to be produced so cheaply. Unless the British makers revise their methods of manufacture the duty will not be of greater assistance to them, in their home country, than it has been in the past in the British colonies. In Canada, Australia, New Zealand and South Africa the American car is supreme despite a high import duty which the British maker has not got against him in these countries. Why, therefore, should it help him particularly at home?

The American automobile industry has never made a great effort to secure British business; it has rather taken the orders that are brought to it and it often allows its British agents to add extravagant profits. The effect of the British duty is more likely to lead American manufacturers to study the valuable British field more closely than it is to act against them. Nothing stimulates the American manufacturer so much as obstacles to be overcome in the development of trade.

Eliminating Waste Metal

EVERY pound of metal or wood in an automobile that is not working is as useless to the owner as the mud that collects inside the fenders. And it is worse than that for it cannot be washed off, and it costs money to carry about from place to place.

It is only because there have been so many other wonderfully interesting things to develop and discover that automobile engineers have so long neglected the weight question, but the neglect has had an evil effect in that it has blinded the eyes of most of us to its absurdity. There are still plenty of engineers who will say with conviction that a comfortable car must be a heavy car. Such an opinion is due to lack of thought and lack of experience with light machines.

In THE AUTOMOBILE for Aug. 5 the possibilities of weight saving by use of light metals was considered and in this issue there is an account of another method for obtaining lightness through the design of all parts primarily from the weight viewpoint. It is by a combination of both systems that the automobile of the future will be developed in which the waste material will be no more than a man could carry.

A Chicago Section

CHICAGO has been chosen as the home of a new section of the Society of Automobile Engineers. Far greater possibilities than the grouping together of the members of the society located in this section of the country may be expected from the organization of this new branch. Chicago is the meeting place of the great agricultural section of the West, the great manufacturing industry of the central states and the most important market place of the continent. It is the greatest educational section west of New York. It is the gateway to the Great Lakes and in the heart of giant industries of every description.

An industry of as varied a nature as the manufacture of automobiles cannot fail to draw inspiration from the environment surrounding the new section. The Chicago I-will spirit is bound to permeate the atmosphere of its meetings and reflect itself in the work of the new organization. The sections are the roots of the society and the new offshoot from the parent organization could not have struck richer soil than the metropolis of the middle West. New thoughts, new ideas and a rich field of endeavor cannot fail to have their influence on the work of the society.

Here is the connecting link between the manufacturer and the consumer. Instead of intimate conversation of manufacturer with manufacturer it can readily be conceived that discussion of subjects of a broader interest will find their way into the proceedings of the new body. The people of the Chicago territory are eagerly following the progress of the automobile industry. The annual exhibitions bring to the city thousands of the natives of other states, and it is indeed fit that this great center has been selected as another center for S. A. E. activity.

Britain Taxes Ceylon Rubber

2⅜ Cents a Lb. Charged on Shipments from London—Will Stabilize Prices

NEW YORK CITY, Oct. 6—Rubber from Ceylon and exported by England has been taxed 2⅜ cents a pound by Great Britain, thus adding about $500,000 yearly to the cost to rubber importers in this country. This export has been added for revenue purposes. The United States from Jan. 1 to Aug. 16 imported from Ceylon 8,567,536 lb. of rubber. Last month, the imports ran up to 1,726,000 lb. At this rate imports amount yearly to about 20,000,000 lb. As the United States is the second largest user of this rubber and as about 95 per cent of the tire companies are using it, it is expected that prices will be more stabilized. It is expected that rubber from the other Eastern States will also receive a tax.

The United States in normal times consumes 50 per cent of the world's production of rubber, and since the war its consumption has grown to about 60 per cent of the total supply.

It is doubtful whether the imposition of the tax will turn American buyers from the British supply to the Brazilian, as it is stated that the Ceylon rubber is 25 per cent richer than the Para product because of loss in washing. And then again, the material derived from cultivated plantations in the East, where modern facilities for gathering are established, is superior in condition to the Brazilian output gathered by natives. The Ceylon rubber is cleaned, milled and dried upon purchase and is ready for manufacturing, whereas South American Para requires from one to two months to be made ready for the mills. This means that firms patronizing Brazilian agents must have capital tied up for a longer period, must employ extra labor and must increase their mill capacity. At the present time there is a drought in the northern part of Brazil.

Plan Automobile Reserve Corps

NEW YORK CITY, Oct. 5—The organization of an Automobile Reserve Corps is being effected in this city following the publication in *Motor Print* of an article by Secretary of War Garrison approving of the idea.

Among the officers of the National Guard in New York City who are leading in the movement are Major General John F. O'Ryan and Captain Lorillard Spencer, the latter a member of the Metropolitan Section of the S. A. E. The Automobile Club of America has given its indorsement.

It is likely that within the next two weeks a mass meeting of motorists will be held in one of the largest armories in the city, at which military authorities and well known motorists will be asked to speak.

Governor Phillips Lee Goldsborough of Maryland, announced to-day in a statement that he heartily approves of the organization of the Automobile Reserve Corps in each State and trusts that it will be successfully carried out. This will mean the establishment of a corps in Maryland as the Governor is commander-in-chief of the militia.

Anyone interested in the movement should address G. T. Bindbeutel, 239 West Thirty-ninth Street, New York City.

Olwell Resigns from Chalmers

DETROIT, MICH., Oct. 5—Lee Olwell, vice-president of the Chalmers Motor Car Co., has resigned, his resignation to take effect Nov. 1. Mr. Olwell came to Detroit in March, 1914, from Dayton, Ohio, where for three years he had been advertising director of the National Cash Register Co.

Maxwell May Pay Back Dividends

NEW YORK CITY, Oct. 6—The plan for the wiping out of the 16 per cent back dividends on Maxwell first preferred stock is expected to be announced in the near future. The method to be adopted will probably be an issue of warrants convertible into the first preferred at par for the amount of accumulated payments. As this issue is now on the 7 per cent dividend basis, the putting into operation of the plan would leave the way open for disbursements on the second preferred, as earnings on the $10,000,000 outstanding were equal to more than 14 per cent.

The annual meeting of Maxwell stockholders will be held Oct. 19 in Wilmington, Del., for the election of directors, etc.

Detroit Co. to Build Tractors

DETROIT, MICH., Oct. 5—Several men prominent in the automobile industry in this city are interested in the Standard Detroit Tractor Co., which has been incorporated and has a capital stock of $100,000. Its object is to make motor tractors. The incorporators are M. L. Pulcher, vice-president and general manager of the Federal Motor Truck Co., who will be president of the tractor company; Edward P. Gemmer, president of the Gemmer Mfg. Co. and Frank G. Jacobs.

Coghlan Klaxon Sales Manager

NEWARK, N. J., Oct. 2—Walter P. Coghlan, formerly in charge of Klaxon sales in the Northwest, takes the place of W. O. Turner as sales manager of Lovell-McConnell Manufacturing Co.

Plan Chicago S. A. E. Section

Project to Be Pushed at October Meeting of Standards Committee at C. A. C.

NEW YORK CITY, Oct. 4—Advantage will be taken of the meeting of the Standards Committee of the Society of Automobile Engineers to push the business of founding a Chicago Section of the society. This is a matter which for the last year has been under consideration by the council and at the last June session of the society, President Van Dervoort mentioned the October meeting of the Standards Committee as a suitable time for carrying it out. At that time, President Van Dervoort stated that he had written a letter to more than 150 members of the society who resided in the Chicago territory and had received a large percentage of favorable replies. It is therefore quite certain that during the month the new section will be organized.

The society officers think that it is fitting that a section of the society be organized in Chicago due to the varied interests which are centered about the metropolis of the Middle West. While the membership in the society may not be as great in the Chicago territory as it is in some other parts of the country, it is certainly a territory in which the membership should grow. Nothing will have the effect of stimulating this growth as much as the foundation of a section where interesting meetings are held frequently.

At the present time in the Chicago territory there are 101 concerns who have representation by 136 members in the society. In addition to these, there are a large number of other members who are attached to concerns not in the territory. The grand total of possible members to draw upon is somewhat over 150. Greater Chicago includes a territory in which a large percentage of manufacturers are engaged in some line of business which could be benefited by membership in the S. A. E.

627 Overlands in One Day

TOLEDO, OHIO, Oct. 5—A new shipping record was established by the Willys-Overland Co. on Sept. 29 when 627 cars left the factory. In the four days from Sept. 27 to 30 inclusive 2233 cars left the plant.

From April 21, when the shipments of new models first began to leave the factory up to Sept. 30, the company had shipped 49,977 cars, an increase of 133 per cent over the 21,426 shipped in the same period last year

Build 1800 Gasoline Cars Daily

Present Total Output of 16 Detroit Factories—Ford Credited with 500

DETROIT, MICH., Oct. 5—The daily output of automobiles from the sixteen active producers in this city is now running approximately 1800 gasoline machines. This total is reached after getting close approximations from each maker, and includes a 500-car schedule for the Ford company. That is, only the proportion of the total daily Ford production throughout the country that is actually assembled here is included. If the total included the number of Fords assembled daily in the various assembling plants it would be close to 2000 cars, bringing the Detroit total, on that basis, to 3300. This would be logical, because all parts of Ford cars are made here, even when assembled elsewhere.

There are several makers in this list with outputs well over 100 cars a day, and three with totals over 200. Attention should be called to the fact, in connection with these figures, that they are conservative. The amount credited to each maker was not an extraordinary day's output, but the average of several days recently.

Production would be considerably greater if makers were not all handicapped for lack of materials. Many of the makers are being held up for certain raw materials, and aluminum seems to be a big offender. The situation is causing much worry among makers generally, not only the car producers but the parts people as well.

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Williams Returns to Overland Plant

TOLEDO, OHIO, Oct. 2—Ralph T. Williams, well known in the automobile trade, has returned from his work with Willys-Overland, Ltd., of London, England, to take the place made vacant by the resignation of Juan T. Yrigoyen, assistant manager of the foreign department at the Willys-Overland Co.'s factory at Toledo.

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Ansted Lexington-Howard Manager

CONNERSVILLE, IND., Oct. 5—Frank B. Ansted has been named vice-president and general manager of the Lexington-Howard Co. Mr. Ansted is the son of E. W. Ansted, president of the Lexington Co.

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Dodge Houk Sales Manager

BUFFALO, N. Y., Oct. 2—R. D. Dodge, formerly Pacific Coast manager for the Olds Motor Works, has been appointed sales manager of the Houk Mfg. Co., this city. F. W. Kyte, former sales manager, has been made assistant general manager.

George W. Houk was elected president at the annual meeting; Ed. McMaster Mills, vice-president; Ira Gleason, director; C. A. Kane, director; and F. H. Moody, treasurer.

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Cannot Fix Uniform Time for Announcing New Models

NEW YORK CITY, Oct. 6—At the regular meeting of the board of directors of the National Automobile Chamber of Commerce, Inc., held here to-day, the committee on a uniform time for announcing new models reported that it had been unable to come to any definite conclusion and that in view of the numerous variable factors involved it could not see how a definite time could be set for this. If new models were announced Sept. 1 many factories which had cleaned up their year's business in May would be idle for three months; this would also affect the closed-car market; if Jan. 1 were chosen the fall trade would be hurt, especially that in closed cars which is rapidly growing; if May 1 were adopted the entire selling season would be affected.

The directors consider the British tax on American cars discriminatory, it being felt that if this tax were for revenue it might be ineffective because virtually prohibitive. The directors agree with the action of the English dealers who have voted and recommended that the tax be not more than 15 per cent.

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No Increase in Hupp Price

DETROIT, MICH., Sept. 29—President J. Walter Drake of the Hupp Motor Car Co. has announced that there will be no increase in the price of the 1916 Hupmobile models, notwithstanding the increased cost of raw material or other causes. The Hupp company is now over 2500 cars behind orders.

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Merinbaum Joins Sun Co.

BUFFALO, N. Y., Oct. 4—S. A. Merinbaum, who has been identified with the Haynes Automobile Co., Kokomo, Ind., for a number of years, first in the capacity of advertising manager and later as sales promotion manager, arrived in Buffalo this morning and took up his new duties with the Sun Motor Car Co.

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Lott Is Chalmers Secretary

DETROIT, MICH., Oct. 4—Charles F. Lott, who has been private secretary to Hugh Chalmers, president of the Chalmers Motor Co. has been appointed secretary of that company. This function had been performed by C. A. Pfeffer, vice-president and assistant general manager.

Standards Meeting Oct. 14

Dates of Section Meetings—S. A. E. Members Invited to E. V. A. A. Convention

NEW YORK CITY, Oct. 5—Thursday, Oct. 14, will be devoted to standards work by the Standards Committee of the Society of Automobile Engineers, who on that day will hold their meeting at the Chicago Automobile Club, 321 Plymouth Court, Chicago.

Through the hospitality of the C. A. C. the members of the Standards Committee have secured a convenient location for their meeting. The club is but a few doors from the Jackson Boulevard and is surrounded by ample hotel accommodations. The purpose of the meeting is to consider reports of some of the standard divisions and new matters which may be brought to the attention of the committee. Some of the divisions have already held recent meetings to prepare reports for presentation at this October meeting. Meetings of the Iron and Steel, Miscellaneous, Springs, Research and Engine and Transmission divisions are scheduled to be held in Chicago on Oct. 13 or elsewhere before that date.

It is expected that those divisions which do not have final reports to present will make reports of progress on the various matters pending. With the establishment of an office and permanent headquarters in Detroit, the affairs of the Standards Committee have progressed even more effectively than in the past and it is expected that the meeting in Chicago will be replete with interesting new data for presentation to the Society at its annual meeting to be held in January.

Some of the subjects which will come up in Chicago at the October meeting, are: Cone clutch housings; headlight glare; standard wire specifications for electrical equipment of gasoline automobiles; lock washers for small machine screws; license plates; piston ring grooves; location of engine and chassis numbers; standard weight of cars; screws for cowl-board mountings; water hose and clamps; spring clip length, opening, etc.; standard inspection methods of physical tests for leaf springs; solid motor vehicle tires smaller than 36 in., and industrial truck standards.

Dates of Section Meetings

October meetings for the Detroit, Indiana and Metropolitan sections will be held Oct. 12 at 8 p. m. in the Convention Hall of the Hotel Pontchartrain, Detroit. K. W. Zimmerscheid, metallurgist of the General Motors Co., will present a paper

on the influence of metallurgy on design.

The Indiana section meeting will be held on Oct. 29, at 8 p. m. at the Claypool Hotel where Charles S. Crawford, Cole Motor Car Co., will present a paper on the characteristics of the eight-cylinder motor.

The Metropolitan section meeting will be held Oct. 21 at 8.30 p. m. at the Automobile Club of America, New York City. The evening will be devoted to metallurgical subjects. There will be an exhibition of motion pictures by the National Tube Co., showing the manufacture of steel tubing from the mine to the finished tube. There will also be a short talk on metallography by Prof. William Campbell.

The E. V. A. A. Meeting

The Electric Vehicle Association of America has extended to the members of the S. A. E. an invitation to attend its convention in Cleveland Oct. 18 and 19. An interesting program has been arranged and a tentative list of the papers includes the following:

Industrial Trucks in the Service of the Pennsylvania Railroad Co., by T. V. Buckwalter; The Electric Taxicab, by I. S. Scrimger; The Edison Battery Service System, by W. M. Thayer; The Function of the Electric Garage, by R. Macrae; Comparative Development of General Power and Commercial Electric Vehicle Loads and Function of Power Salesmen as Electric Vehicle Solicitors, by H. H. Holding; Problems We Are Facing and How They May Be Met, by George H. Kelly; Field for the Small Electric Delivery Vehicle, by Charles A. Ward; Electric Vehicles in Municipal Service, by Arthur J. Slade and R. Duval Dumont; and the Comparative Operation of Electric and Gasoline Machines in the Same Service, by W. J. Miller in collaboration with T. D. Pratt.

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Show Space Drawings Oct. 7

NEW YORK CITY, Oct. 4—A very large attendance of the members of the National Automobile Chamber of Commerce is expected in this city Thursday, when the drawing for show spaces at the New York and Chicago shows will take place at the association headquarters, 7 East Forty-second Street. Applications for space by passenger car makers are as great as in former years and it is expected that all available space in the Grand Central Palace, in New York, and at the Coliseum, in Chicago, will be taken up. The distribution of accessory space will be decided later, and will be handled as formerly by the Motor and Accessories Manufacturers' Association. The order of drawing space by car makers will be according to production during the previous season, this plan having been followed for several years.

Astor Cup Race for Oct. 9

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Postponement of Opening Race at Sheepshead Speedway May Help Late Entries

NEW YORK CITY, Oct. 2—The 350-mile race for the Astor Cup on the Sheepshead Bay 2-mile board speedway, which was scheduled to start at 12 o'clock to-day was postponed at 8 o'clock this morning because of rain. It started raining in New York and vicinity yesterday morning and has rained constantly ever since, the storm being a part of the tropical hurricane that devastated the Southern States. The race will take place on Saturday, Oct. 9, starting at 12 o'clock noon, postponement of a week being necessary for various reasons; first the grounds, which were practically covered with water, would not be sufficiently dried for a race on Monday; and second, several hundred of the help required in conducting the meet could not be obtained except on a Saturday.

Much disappointment was expressed by out-of-town guests at the postponement of a week, many of these coming from places as far distant as Omaha, Atlanta, and St. Louis, having to return home without seeing the race. A canvass of the New York hotels showed over 20,000 out-of-town guests registered, all of these being classed as speedway attendants.

May Swell Starting List

What the result of the postponement will mean cannot be gaged at this time, as many who intended to be present cannot. The effect of the postponement on the number of cars starting may mean the addition of one or two that were not ready but were to have taken their elimination trials early Saturday morning before the race. These cars have not yet taken their trials, but will take them on Thursday, Oct. 7. Fortunately there are no other racing events scheduled so no inconvenience will be caused to the drivers.

De Palma to Drive Stutz

Ralph De Palma will drive a Stutz car at the Speedway Saturday, the motor on his Mercedes being so badly damaged as to make repairing impossible. He will drive the Stutz which Rooney had been originally scheduled to pilot. It is possible that Ralph Mulford may drive the Peugeot car which is a duplicate of Resta's and which is expected to arrive from France the end of this week. Some doubt was expressed concerning whether Barney Oldfield would be able to drive on Oct. 9. This has now been settled and Oldfield has been able to cancel a date in Illinois and will drive his Delage.

The sale of seats for to-day's race exceeded $80,000 and it was expected that if fine weather had prevailed yesterday and to-day that over 125,000 spectators would have attended.

The complete list of starters with their official numbers follows:

NO.	CAR	DRIVER
1.	Peugeot	Resta
2.	Peugeot	Aitken
3.	Delage	Oldfield
4.	Peugeot	Burman
5.	Stutz	Anderson
6.	Peugeot	Wilcox
7.	Stutz	Rooney
8.	Stutz	Cooper
9.	Duesenberg	O'Donnell
10.	Maxwell	Rickenbacher
11.	Mulford Special	Vail
12.	Pugh Special	LeCain
14.	Sebring	Halbe
15.	Duesenberg	Haupt
16.	Duesbenberg	Henderson
17.	Maxwell	Mulford
18.	Peugeot	Hughes
19.	Delage	Limberg
20.	Mercedes	DePalma
21.	F. R. P.	Poporato
22.	Ogren	Alley
23.	Erwin Special	G. Bergdoll

It is not yet certain whether all of the twenty-two will be starters, as some of them have yet to show whether they can make the requisite speed of 85 m.p.h. for a lap of the track.

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Denby Adds 3-4-Ton Truck

DETROIT, MICH., Oct. 4—In addition to its 1-, 1½- and 2-ton models, the Denby Motor Truck Co. now has placed on the market a ¾-ton truck which sells at $890 with open express body. With panel body there is an additional charge of $90 and with open express body but with top, $60.

This light truck has been made to meet the growing demand from department stores, bakeries, meat markets, groceries, and many other merchants having use for a rather small truck which does not have to carry more than 1000 to 1500 lb. It is also a model truck greatly in demand in small towns.

The new Denby is called type U and has a wheelbase of 119 in. Its motor is a four-cylinder block 3⅛ by 4½. Solid tires are furnished, 34 by 3 front and 34 by 3½ rear. The standard color is blue for the body and red for the chassis. In general construction the truck is similar to the other Denby models. Electric starting and lighting will be furnished at an additional cost of $85.

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Eckhart, Auburn Founder, Dies

AUBURN, IND., Oct. 1—Charles Eckhart, 74 years of age, automobile and buggy manufacturer, philanthropist and at one time candidate for governor of Indiana on the Prohibition ticket, died here yesterday following a long illness. He was the founder and president of the Eckhart Carriage Co. and the Auburn Automobile Co., although his son, Morris Eckhart, was in active charge of both businesses.

Car Sales Gain 50% in Canada

7000 More Cars Sold in Ontario Alone Than During Year of 1914

DETROIT, MICH., Oct. 2—Louis Logie, district manager for Canada for the Chalmers Motor Co., reports after an extensive investigation of conditions in Canada, that the sales of automobiles have been about 50 per cent greater thus far this year than in 1914, and that in the province of Ontario, where most of the Canadian automobile manufacturing plants are located, 7000 more cars have been sold thus far this year than up to that time in 1914. The condition is the more remarkable when it is considered that war taxes have been a big drain upon the people while on imported cars the duty is now 42 per cent.

Elkhart Four at $775

ELKHART, IND., Oct. 5—The Elkhart Carriage & Harness Mfg. Co., is bringing out a new low-priced model to sell at $775 as a five-passenger touring car. The specifications include a unit power plant having an L-head 3½ by 5 four-cylinder motor with separate head, vacuum fuel feed with tank in rear, three-speed gearset, Raybestos-faced cone clutch, floating axle, three-quarter elliptic rear springs, wheelbase 114 in. The body is an advanced streamline effect with high sides. Equipment includes electric starting and lighting system, one-man type top, quick attachable curtains and demountable rim with one extra.

Holland Leaves Anderson Electric

SEATTLE, WASH., Oct. 1—Walter E. Holland has resigned his position as research engineer of the Anderson Electric Car Co., Detroit, to become a firm member of the Broadway Automobile Co., Inc., of Seattle, Wash., agents in the Northwest for Detroit electric passenger cars, Walker electric trucks, Elwell-Parker industrial trucks and Philadelphia storage batteries. Mr. Holland will be secretary and treasurer of the Broadway Automobile Co.

Woods Returns to England

NEW YORK CITY, Oct. 4—G. Hubert Woods, representative of the British Westinghouse Electric Mfg. Co., Ltd., who has been at the Westinghouse factories in this country studying the electric starting and lighting systems as applied to American cars, sails this week for England where he will resume his duties as manager of the automobile department of this company. Mr. Woods believes that after the war the electric starter and generator will be as definite component parts of the gasoline engines in Europe as they are in America. Up to the present many British concerns have not mounted these electric units as standard component parts but have listed them as extras.

Mr. Woods is of the opinion that the question of price reduction will sooner or later take a slight change in America and that more attention will be given to car quality, which may mean a slight increase in price.

Tread Committee Report Expected

NEW YORK CITY, Oct. 4—At the regular meeting of the National Automobile Chamber of Commerce, Inc., to be held at this city Oct. 7, it is expected that the committee on automobile treads will report. This committee met in Detroit last week and has its recommendations ready. The manufacturers will continue to produce cars with 56 in. tread as standard, which naturally means that the 60 in. tread is being dropped. The chamber made a broad canvass of dealers through the Southern States and discovered that sentiment was strongly in favor of the standard 56 in. tread. With these dealers the difficulty with the 60 in. tread has been in getting deliveries. The factories have pushed the standard tread orders through as they have represented nearly 100 per cent of production and dealers with orders for 60 in. treads generally had to wait.

It was found in a canvass of road conditions in the South that only in two sections is it difficult to use the 56 in. tread, these being Southern Georgia and Northern Florida, which are bad road sections.

1916 Sphinx for $640

YORK, PA., Oct. 5—For 1916 the Sphinx Motor Car Co., this city, continues its five-passenger touring car with minor refinements at $640, or $55 less than for 1915 and also sells the same chassis for $600 and, with commercial body, for $675.

The new car uses a 3¼ by 5 block L-head motor instead of 3⅜ by 5, developing 28 hp., has Connecticut ignition system and the body has been lengthened and made slightly narrower, while its appearance is lower, the clearance being 9 in., as compared with 10½ for 1915. DuPont Fabrikoid upholstery and Raybestos brake lining are used. Wheelbase remains unchanged at 112 in. and the tires at 30 by 3½.

Mooney with Taylor-Critchfield-Clague

DETROIT, MICH., Oct. 4—Frank J. Mooney, former sales and advertising manager of the Hupp Motor Car Co. has become associated with the Taylor-Critchfield-Clague Co. advertising agents. He will specialize on automobile work.

Sheepshead to Open 1916 Season

Gets May 13 and Sept. 30 on Racing Schedule—Sixteen Dates Allotted

NEW YORK CITY, Oct. 1—The Sheepshead Bay speedway will open the 1916 American racing season. At the A. A. A. contest board meeting in this city yesterday, New York was given May 13 in the spring and Sept. 30 in the fall. This year's racing schedule is placed on a more systematic basis. With the exception of two clashing dates on July 4 at Minneapolis and Sioux City, the rest of the dates are arranged so as to fall, in a majority of cases, about two weeks apart. Sixteen dates, in all, have been allotted ten cities. Two spring races are scheduled, one at New York and the other at Indianapolis on May 30. Following these are two for June, one on the 17th at Chicago and the other at Des Moines on the 28th. Then come three races for July including the two July 4 events at Minneapolis and Sioux City and one at Omaha, July 15. Tacoma and the Elgin Road Race are scheduled during August, the first on the 5th and the latter on the 18th and 19th. Providence and Indianapolis are one day apart in the September dates, the former falling on the 16th and the latter on the 15th. Des Moines has a race scheduled for Sept. 4 and New York for Sept. 30. Omaha and Chicago will hold races on the 7th and 14th, respectively, the latter date closing the season.

Philadelphia Meet April 29?

There is a possibility that the Philadelphia Motor Speedway Association will hold a meet during the latter part of April. C. L. Hower, secretary and treasurer of the association, and P. A. Shaner conferred with Chairman Kennerdell regarding the date for the event at Philadelphia. The track is near completion.

Among these present were: New York City, Everard Thompson, A. T. Herd, W. M. Grove; Chicago, D. F. Reid, Frank Foster, Chris Weihe; Indianapolis, C. G. Fisher, James Allison; Minneapolis, D. F. Wheeler; Omaha, F. J. McShane; Des Moines, Henry Gehring; Tacoma, George Dunn; Sioux City, E. Schultz, and Providence, F. H. Perkins.

The Tentative Schedule

The tentative racing schedule follows:

Philadelphia	April 29
New York City	May 13 and Sept. 30
Indianapolis	May 30 and Sept. 15
Chicago	June 17 and Oct. 14
Des Moines	June 28 and Sept. 4
Minneapolis	July 4
Sioux City	July 4
Omaha	July 15 and Oct. 7
Tacoma	Aug. 5
Providence	Sept. 16
Elgin Road Race	Aug. 18 and 19

England Imposes 33⅓% Duty

British Opinions on Efficacy Vary Widely—Appears Unlikely to Injure American Exportation Seriously

NEW YORK CITY, Oct. 4—At last, after many years of anticipation, Great Britain has imposed sundry import duties including one of 33 1/3 per cent on automobiles and automobile parts. So far Great Britain has been the best automobile customer of the United States overseas, much the best customer in fact, and lately the British demand has exceeded all former vigor. Owing to the war the British automobile trade has been utterly tied up, making cars or other things solely to government order with no output for the private consumer, and this has sent the British dealers flocking to our shores, seeking cars for private customers and also for semi-war purposes. The chancellor of the exchequer has since proposed to waive the duty on motor trucks and parts thereof used solely for industrial purposes.

Dealer's Lot Hard

The lot of the British dealer has been very hard indeed, for depending for his living upon having cars to sell and customers to buy them, he has suddenly lost almost all the former and a large share of the latter. Naturally, he has come to America to replace the British manufacturers, and a study of the news columns of THE AUTOMOBILE for the past six months will show the extremely large number of prominent British retailers who have been in Detroit seeking cars and parts of cars. In this search quite a number of British manufacturers have participated, because the unskilled labor which could assemble a car from American made parts is available in the forms of old men and youths, while the skilled labor necessary for machine shop and other manufacturing departments is entirely absorbed by government demands.

British Consumer Pays

Thus the conditions which at the moment lead to an exceptional British demand are temporary, and it seems unlikely that any duty imposed upon automobile imports will have much effect upon the volume of business done during the war. American cars are selling in England because they are the only cars that can be bought, not because they show up well in competition with the home product, which is the true situation in normal times.

The effect of the tariff can only be guessed, but it seems most probable the immediate result will be that the British consumer will have to pay a slightly higher price. Many Britishers have lately bought American cars at $1,250 who would have willingly spent $2,000 for a home-produced car had they been able to get one, and this class of consumer will not balk at an extra 33.33 per cent.

After the War

There is also to be considered the after-war period, for this will affect the American manufacturer much more than the present instant. When the British industry is freed from munition making and again turning out automobiles the question arises as to how much the duty will act against the American exporter. Herein it may be remarked that the profit secured by the British dealer has often been excessive in the past. With three main exceptions—Ford who manufactures bodies and assembles chassis in England, Overland who imports complete cars, and Studebaker who does likewise, most of the American cars going to Great Britain have been bought here by dealers for the lowest possible price and sold in England for the highest possible price. Often between the two there is a very large margin, considerably in excess of a proper trading profit. Thus the British price for American cars is not likely to be advanced by 33 1/3 per cent to the British consumer.

British Opinions Conflict

Lately *The Autocar*, the leading British automobile paper, has devoted much space to discussion of the subject, and the general consensus of opinion is that, whatever the tariff imposed, the British manufacturer is too old fashioned and too inert to grasp the opportunity offered to him by the tariff. Writing in our contemporary, J. P. Holland, a journalist well known on both sides of the Atlantic and for some time engaged in automobile journalism in America says:

"Eleven years ago I interviewed Alfred Harmsworth (Lord Northcliffe) in New York on his return from a visit to Detroit, Cleveland, and one or two other cities of the Middle West, then rapidly coming to the front as motor car producing centers. The gist of that interview, as published in the *New York Herald*, was to this effect: 'The American small car is destined to dominate the markets of the world if American manufacturers continue to progress as they have done in the past few years.'

"There is no use disguising the fact that the motor industry, that is, the manufacturers of motor cars, have not lost money by the war. On the contrary, they have been flooded with orders, and their factories have been busy night and day. The ordinary overhead charges of selling their product, salesmen's wages, and so forth, have been eliminated. And as an evidence of the profitable margin at which they have done this government work, we have had a striking object lesson in a recent lawsuit, where two middlemen disputed the question of division of commissions, and one of them was awarded the neat little sum of $75,000 as his share in the divided commission. The fact that this sub-agent claimed $250,000 came in the shape of a startling revelation to the public.

Exceptional Treatment Folly

"Under these circumstances, to ask the public to agree to any exceptional treatment of the motor industry after the war would, I claim, be the very height of folly. The mere suggestion of such a proposal would rather have the effect of instituting an inquiry as to the reasonableness of special taxation of the war profits of the motor trade.

"Whether the reasons I have briefly put forward be considered strong enough to warrant the statement that the three courses suggested, namely, prohibition of imports, high protection, or government subsidy, all are equally inadequate to meet the case, I do not know. Should they prove to be so, or, what amounts to the same thing, should the powers that be after the war decide against their adoption, the question still remains to be answered, 'What is the British motor industry going to do about it: How will it regain the position it held before the outbreak of war?'

"This brings me back to the Harmsworth interview of 1904, the fulfilment of which has been so unexpectedly hastened by the events since August, 1914. In that interview Lord Northcliffe rightly placed the responsibility for the future success of the American small car where it properly belonged—on the shoulders of the American manufacturer.

Protective Tariff Inadequate

"The first of these, namely a high protective tariff, will fall far short as an efficient means for building up a domestic industry as compared with its effect a dozen years ago in the United States. This will be readily seen when one considers the state of affairs in New York in the early years of the present century as compared with England to-day. In those days the total output of American factories barely exceeded 15,000 cars annually. The prices paid for imported cars sound fabulously high nowadays. Mercedes chassis, $11,000, Panhard, $10,000, and even a little Darracq 12-hp. heading the list of imported cars in point of numbers at the modest figure of $6,000 apiece. Under such conditions, it may

readily be seen that a high wall of protection gave the American manufacturer plenty of margin for the development of his infant industry.

"Contrast with that state of affairs the British market as it will be when peace is proclaimed. Flooded with American cars selling at prices never touched by British cars, it is doubtful whether a protective tariff which would double the cost of the imported cars would meet the difficulty. Certainly such a duty would fall far short of giving the British manufacturer anything approaching the leeway his American confrère had when French and German cars were selling in New York for three or four times their present-day value.

"It will be necessary, therefore, to seek further afield than the purely nursery methods of protection or subsidy if the British manufacturer hopes to tackle his American rival with his own weapons. And at this point I am afraid I must leave to more technical experts the task of diagnosing between British and American methods for the purpose of adopting the best of American for the future well-being of the English. There are, however, some broad features which even an inexpert like myself cannot fail to observe, and which, I am sure, would well repay the experiment of adoption."

Importance of Colonial Trade

This was of course, before the tariff had been decided upon. Another writer in the same issue of the same publication urges the importance of the Colonial trade of Great Britain, so far neglected by the British manufacturer. He says:

"Protection alone will not save the British motor industry from destruction; enterprise and scientific methods properly co-ordinated on a wide national basis must be our main weapons in the new era of industrial development.

"Unless the British manufacturer is prepared to expand an outlook hitherto essentially insular, and think in terms of an Empire market rather than of an English, Scottish, and Irish market, he might just as well abandon hope of ever making an impression upon an invader who never thinks in less than two hemispheres nor fails to organize his production accordingly.

"I greatly fear, however, that the splendid opportunity for the British motor manufacturer which, to the Imperial thinker existed yesterday, is to-day very much less of an opportunity. Yesterday Greater Britain would have offered open-armed welcome to cars from the Motherland which fitted Colonial conditions, including Colonial purses. To-day the Overseas Dominions may well be visualizing themselves as motor car manufacturing countries.

Canada a Big Producer

"Canada is a case very much in point. Canada to-day produces for her own consumption, and for the consumption of other British colonies and dependencies, probably six times more motor vehicles than we produce in this country. The Ford company's Canadian plant alone is responsible for 35,000 to 40,000 vehicles. Overland and Studebaker are two other big firms similarly operating; and it is the same with one or two tire companies. It makes no difference whether these firms are run with American or Canadian money. They are there, in the British Empire, occupying territory which the manufacturer here at home might have occupied if he had thought Imperially yesterday, instead of merely applauding a florid phrase; and if, as is most likely, any fiscal rearrangement be made, it will leave free trade within the Empire, and these Canadian companies will be inside our tariff wall.

"Where in that case is protection for the British manufacturer? Suppose no other American car makers trek across the frontier what is going to happen to the Ford, Overland and Studebaker? It is the competition of the Ford and the Overland in this country that matters most. Between them these two companies probably sell more cars than all the British manufacturers put together; and I make no doubt that, if necessary, either or both firms would manufacture right inside these islands.

Consumer the Sufferer

"I see no protection from these manufacturers that will do the British car makers the least bit of good; and even if it were otherwise, it must be a protection entirely at the expense of the consumer, and of the distributor, middleman, or agent. As a consumer, I am, not unnaturally I hope, without enthusiasm for any such protection.

"What does the request made by the British manufacturer amount to? It asks that the consumer should go without motor vehicles until after the war, and then should be prevented, if possible, from buying any except British vehicles. This request is made by manufacturers who cannot at present supply cars themselves, and do not propose to attempt to supply cars in price competition with the American vehicles later. Most of the British manufacturers are making a fairly healthy profit out of the war. Many of them are doubtless doing better than if the war had not happened. One or two have probably been saved from extinction by the war. Yet these excellent gentlemen are asking that the profits which they might have made if the war had not happened shall be saved up and handed over to them when they have finished making profits out of the war!

Agents Not Considered

"They are not concerned about the agent of whose indispensability in their scheme they used to sing, and whose service they will seek again most eagerly presently. The agent, with none except American cars to sell, should cease from selling them, shut up the shop, and find another job until wanted! The manufacturers are not concerned about the consumer, yet probably nine-tenths of the consumers have bought other cars partly or wholly for business reasons; and business reasons to-day mean, directly or indirectly, work in connection with the war—work upon which the successful prosecution of the war and the efficiency of the fighting forces depend. The manufacturers are concerned with none of these things."

Against these two, yet a third writer points out that however true the statements of the others may be, the imposition of a tariff will undoubtedly make things better for the British manufacturer. Perhaps, however, the most important utterance is to be found in the editorial columns of the issue which contains these three opinions. In it the editor—a man famous throughout the British Empire for clear thinking on automobile subjects—says:

"It is not a question whether protection in normal times is desirable or undesirable, but entirely a matter of self-preservation. If the British motor industry in common with a number of other home industries be not protected, a large portion of it will be wiped out. This fact is clearly recognized by the greatest commercial rivals of Britain, the United States; indeed, it is so obvious to them that they would regard the British as fools if they did not protect themselves.

Foreign Plants in England

"*One of the strongest arguments against protection is that if a tariff on motor cars be imposed it will merely result in foreign makers establishing factories within Britain itself.* Undoubtedly this prophecy will be realized, but obviously the moment a factory is established within British territory, it becomes a *British factory*. It may result in severe competition for certain existing British firms, and this competition may indeed be very severe and even fatal to some of them; but the nation as a whole will not suffer so *seriously*, inasmuch as the foreign factories established in our midst will in the main give employment to British workmen. On the other hand, with no tariff there will be no incentive for foreign makers to establish themselves in this country, and the natural result will be that the automobile mechanics who to-day are actually in the army, navy, or air service, or are engaged in the manufacture of munitions, will be thrown out of work, and they will not be able to get work in this country at all in many cases, and their only salvation will be emigration and the further impoverishment of the nation.

"At the same time, in all the articles we have published it has been made *plain that tariff or no tariff the British manufacturer will not conserve his industry and his interests if he does not reform his manufacturing methods and his business methods too.* This is one of those statements which at first sight look exceedingly damaging. We would be the last to contend that the British manufacturer could not and should not improve his manufacturing and commercial system, but it must be borne in mind that a very large proportion of the home makers recognize this fact as fully or even more fully than the opponents of a motor car tariff. The view the British manufacturer takes is not that he wants a tariff to enable him to carry on his business precisely as he carried it on before the war, *but it is rather that without a tariff he will be unable to carry it on at all in many cases.*"

Will British Makers Reform?

With the soundness of this summary no thinking American could disagree in general, and all who are well familiar with the British industry will recognize the truth of it. The great question is therefore, will the British manufacturer reform or will he not? If he does not his case seems to be a parlous one in the opinion of his own particular journal and if he does he will have to move mountains if he is to fight American competition on an equal basis.

Chevrolet Capital $20,000,000

200,000 Cars Planned for 1917 —Banner Buggy Owner Interested in Co.

FLINT, MICH., Sept. 29—Through the incorporation of the Chevrolet Motor Co. of Delaware, with a capital stock of $20,000,000, which will become a holding company for the Chevrolet Motor Co. of this city, the latter will at once expand its manufacturing facilities and contemplates rivaling within another year or two the Ford and Willys-Overland companies, as to output, it is said.

Chain of Assembling Plants

In another direction the Chevrolet company will follow the lead of the Ford company, by establishing a chain of assembling plants throughout the country and Canada and by using the local or parent plant principally for the making of the parts needed in the assembling plants. The Chevrolet cars will continue to be made at the main plant, but the 1917 models may be turned out principally from the assembling plants. Of the latter those in New York, Tarrytown, N. Y., and Toronto, Canada, are already in operation, manufacturing cars which they will continue to do in addition to the assembly work. The one in Oakland, Cal., is to be started soon. Still another one will be located in St. Louis, Mo., where the Chevrolet Motor Co. of St. Louis has just been organized and incorporated, the capital all paid up being $1,000,000, Russell E. Gardner, owner of the Banner Buggy Co., being strongly interested in that company. The three-story Banner plant will be turned into an automobile factory as soon as possible. It is planned to employ 500 men and to turn out 25,000 cars a year. The Oakland and St. Louis plants will do assembly work only.

While the output schedule for the Chevrolet Four-Ninety for the 1916 season calls for 60,000 cars, plans have already been laid out for 200,000 cars of this model for 1917. A new assembling plant which will employ at least 1000 men will be started at once. The plant of the Mason Motor Co. and that of the Walker-Weiss Axle Co. where motors and axles are respectively made for the Chevrolet cars, will be greatly enlarged and production will be practically doubled.

According to a statement made by general manager A. B. C. Hardy, the Chevrolet Motor Co. of Delaware will be absolutely controlled by W. C. Durant and his present associates. The rumor that a consolidation with the General Motors Co. is contemplated, is denied by Mr. Durant.

The Chevrolet Motor Co. was organized in November, 1911, in Detroit, its capital stock being $2,500,000. In September, 1912, the company absorbed the Little Motor Car Co. in Flint, and moved into its plant. Its production, which had been 550 cars in Detroit, rose to 3500 the first year here. The second year 7000 Chevrolet cars were made.

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New Rumely Farm Tractor

LAPORTE, IND., Oct. 2—The Rumely General Utility tractor is the name of a new product of the Rumely Co., this city, which has just been standardized and which is now to be manufactured for the market. The company expects the new tractor will fill a demand for a light weight machine and will sell for $725. Its weight is 5700 lb. Its wheelbase is 10 ft. and the total length is 16 ft. The drivewheel is 26 in. wide and 4 ft. 8 in. high. At the side of the big wheel is a smaller idler wheel, the same height, but narrower than the drivewheel. It is 8 in. across. The 15 hp. four-cylinder motor is block cast. All connections in gears and driving shafts are made in side tight cases and all bearings run in oil. The completion of this design gives the Rumely company two distinct types of tractors. The utility tractor is made on motor truck lines while the Oil-Pull designs in the one and two-cylinder models follow out the heavier lines of construction. There are to be two of the new types. The smaller one, which was developed first, is made to pull two plows, with 8 and 15 hp., and will sell for $725. The other will pull three plows and will be 13 and 22 hp. and will sell for $1,300.

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Porter Leaves Chase—Inness and Collard Are Promoted

SYRACUSE, N. Y., Oct. 2—J. A. Inness, formerly manager of the Chase Motor Truck Co., Philadelphia branch, succeeded F. B. Porter of the New York branch Oct. 1. Mr. Porter, who has been the New York branch manager for the past nine years, is leaving the company to take up another line of work.

C. E. Collard, formerly with the New York office of the Chase organization, succeeds Mr. Inness as Philadelphia branch manager.

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Atlanta Co. to Build Trucks

ATLANTA, GA., Oct. 1—Commercial vehicles are to be built in this city. The E. G. Willingham Lumber Co. is preparing to enter the industry upon a large scale, discontinuing its lumber interests in order to devote its attention to trucks.

A steel concrete plant, containing 2500 sq. ft. of floor space, is being erected at the corner of Stewart Avenue and Whitehall Street. The plant will be ready for occupancy by the middle of November.

P. O. Contracts Are Awarded

Ford, G.M.C., Buick, Kelly-Springfield, White and Packard Get Truck Orders

WASHINGTON, D. C., Oct. 2—Acting on bids opened several weeks ago and published in THE AUTOMOBILE at the time, Postmaster General Burleson has awarded contracts for furnishing a number of motor trucks for use in the postal service in Detroit, Philadelphia, St. Louis and Chicago. The new service in Chicago, Philadelphia and St. Louis will go into effect Nov. 15 and will supplant, in part, screen wagon, electric car, mail messenger and city delivery services. The contracts were awarded as follows:

One-half-ton capacity—Ford.

Three-quarter-ton—G. M. C., Buick and White.

One and one-half-ton—G. M. C., Packard and White.

Three-ton—Kelly-Springfield, White, and Packard.

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Chicago Section E. V. A. A. Meets

CHICAGO, ILL., Oct. 5—Fourth annual meeting of the Chicago section of the Electric Vehicle Association of America, was held at the Hotel LaSalle to-night. Reports of officers were limited to 1 min. Secretary F. E. McCall reported that the section has 125 members which is a gain of ten over last year. Thirty members joined and twenty resigned within the year. Forty-two regular meetings were held and expenses were $324.58 or $31.22 a month.

D. C. Arlington, chairman of the traffic regulation committee, told of the work of the year which included recommendations on south side boulevard lighting, starting of street cars by light signal rather than by bell when crossing boulevards, which was condemned, standing of cars in the Loop and the teaching of traffic rules to car owners.

Harry Salvet, chairman of the garage committee, created a sensation by declaring that he had visited seventeen gasoline car branches to-day, saying he was wavering between a gas and electric car. Eleven gasoline men advised him the electric makers were going out of business. One electric dealer told him not to buy of a competitor as he was going out of business and the competitor said the same of the former.

W. F. Bauer, chairman of the standards committee said his committees had recommended a certain number of cells, the method of assembly in trays and the size of rubber jars. This has been presented to President Gilchrist, who has promised to take it up with the execu-

tive committee of the Electric Vehicle Association.

Officers were elected in unanimous vote, supporting the report of D. C. Arlington, chairman of the nomination committee, as follows: George B. Foster, Commonwealth Edison Co., chairman; William F. Bauer, Edison Storage Battery Co., vice-chairman; secretary-treasurer, F. E. McCall, executive committee; W. C. McNitt, chairman membership; D. M. Simpson, chairman papers and program; Gail Reed, chairman garage committee; W. F. Bauer, chairman standards committee; A. J. Brechtel, chairman nominating committee.

Homer E. Neisz, toastmaster, introduced several speakers, among them R. Bland, president of the Associated Garages of America, and W. B. Saylor, president of the Illinois Garagemen's Association. The latter's message was that the electric garagemen should standardize his costs. W. J. McDowell, retiring chairman, was presented with a gold fob.

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Electrical Exposition Opens

NEW YORK CITY, Oct. 6—The Electrical Exposition and Motor Show of 1915 opened here to-day at the Grand Central Palace. As in the past, some of the electrical vehicle concerns take advantage of this exhibition to demonstrate their products. At the 1915 show the members of the automobile industry taking part are the Baker-Rauch & Lang interests, General Vehicle Co., Ward Motor Vehicle Co., Edison Storage Battery Co., Philadelphia Storage Battery Co. and the Electric Storage Battery Co.

The Baker exhibit will be a D. A. Baker coupé, with a thirty-six-cell Exide battery. The Rauch-Lang is a town car with forty-two cell Exide battery. The General Vehicle Co. will show two 1000-lb. wagons, one worm and the other chain-driven. The chain drive job is one of an order of nine from the Arnold Constable Co., New York City, and the worm drive is a fancy panel job for a New York millinery establishment. The Ward Motor Vehicle Co. will have an extensive exhibit including two standard Ward special delivery wagons, one with Edison and one with lead battery, a trailer for this car which sells for $90, a stripped chassis, two rectifiers, one for the Edison and one for the lead battery and in addition one of the new coupés.

New Ward Coupe

The new Ward coupé sells for $1,295 and is fitted with a four-five-passenger body in which all the passengers face forward. The body is of hammered metal streamline design. It is fitted with Goodyear special electric tires, size 33 by 4 in., and the battery equipment is a Philadelphia forty-two-cell nine plate. The mileage is guaranteed at 40 to 60. The finish is royal blue with gray upholstery.

France to Fix Price of Alcohol

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Denatured Product Becomes Gov. Monopoly Jan. 1, 1917, by Law Before Parliament

PARIS, Sept. 17—The law now before the French Parliament dealing with the monopolization of denaturized alcohol and its extended use in the automobile industry, provides that denaturized alcohol shall become a State monopoly on Jan. 1, 1917. The State will arrange for its necessary supply of alcohol from the distillers by means of contracts. The retail price of denaturized alcohol will be fixed by government decree for periods of five years, this price being determined so as approximatively to cover the purchase of raw alcohol, its storage and delivery to wholesale dealers. The denaturizer will be supplied by the State. Its cost, also the expenses in connection with the inspection of establishments allowed to use alcohol not denaturized in the ordinary way, as well as any deficit there may be by reason of the low selling selling price of denaturized alcohol, will be met out of the revenue from the taxation of alcohol for human consumption. The probabilities are that the law will be accepted by Parliament without any important changes.

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Standard Oil Gets Injunction

ATLANTIC CITY, Oct. 1—The Standard Oil Co. has received an injunction in New Jersey against certain garages which were selling a competitor's gasoline under the name of Standard Oil. The injunction forbids the use of the words Standard Oil in connection with the sale of any products not made by the Standard Oil Co.

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Old Knox Co. Stockholders' Claims on Mayo Estate

SPRINGFIELD, MASS., Oct. 2—Holders of preferred stock in the Knox Automobile Co. are endeavoring in the Supreme Court of Massachusetts to have the value of the stock made good to them from the estate of the late Alfred N. Mayo.

The plaintiffs base their suit upon the grounds that the Knox preferred stock contained a proviso that when the surplus of the company exceeded $100,000 the excess over that amount should be applied to the paying off of the preferred stock. In 1906 they claim that the surplus amounted to $466,000; but that Mr. Mayo, who dominated the company, used his influence to cause the company to break the agreement with the holders of the preferred stock. Instead of using the excess money to redeem the stock, it was used, with other money borrowed by the company, for the expansion of the plant and the enlargement of the business. When the company failed the stock became valueless. The stockholders claim that they would not have suffered this loss if it had not been for Mr. Mayo's action in inducing the company to break its agreement with them. They therefore ask the court to order the Mayo estate to make good to them this loss. Two suits have been entered by them, one in equity and one in law. The defendants demurred to both of these suits and were sustained by the Superior Court, and the petitions referred to the full bench of the Supreme Court. A decision will be reached in about a month.

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Chandler Six Completes Non-Stop Run Across U. S.

LOS ANGELES, CAL., Oct. 5—*Special Telegram*—Across the United States from Mexico to Canada without a stop of the motor or the wheels is the feat accomplished by a Chandler six. The car left Tiajuana, Mex., Sunday morning, Sept. 26, at 9 o'clock with the starting pedal and crank socket sealed with the official seal of the Panama-California Exposition. The following Friday afternoon at 1.20 o'clock the car came to a stop at the command of the Canadian customs and emigration officials at Vancouver, B. C., after it had crossed on to Canadian soil.

At the finish of the run the speedometer registered 1889.5 miles. This distance had been stretched on account of detours made at different points to avoid ferries on the scenic Pacific highway. The crew of the car snatched sleep whenever possible on the road, eating and sleeping in the car throughout the entire tour. Chandler dealers and friends along the route supplied the men in the car with food and supplies, gasoline and oil were taken on while the car was moving, by the use of a large funnel with an elbow.

The most remarkable feature of the trip and the one which saved the car from coming to a stop was the drive over the $50,000 north bank railroad bridge which crosses the Columbia River.

A. J. Davidson, superintendent of the Spokane, Portland & Seattle system, with R. C. Wegner, master mechanic of the same road, took a personal interest in the feat of the Chandler and after tieing up five railroad systems and blocking the river traffic the railroad officials rode across the bridge in the first automobile that ever traveled the entire length of the Pacific highway on its own power, the first automobile to ever cross the 3-mile railroad bridge and the first car to travel across the United States without a stop of motor or wheels.

$1,000,000 Stock for Hayes Wheel

Officers of Co. to Submit Plan for Increase from $300,000 to Stockholders

JACKSON, MICH., Oct. 1—The officers of the Hayes Wheel Co. will submit to the stockholders of the company a proposition tending to increase the capital stock from $300,000 to $1,000,000. A stock dividend of 166 per cent, or $500,000, is to be declared and the balance, or $200,000 in stock, is to be given to the owners of the property of the Pioneer Shaft & Pole Co., Anderson, Ind., which the Hayes company has just purchased. This newly acquired plant will supply timber for the manufacture of wheels. The local concern's business has been growing to such an extent that some time ago a plant was started in St. Johns, Mich., where truck wheels only will be made. Still further extensions are contemplated.

General Motors Co. Voting Trust Dissolved

NEW YORK CITY, Oct. 4—The voting trust of the General Motors Co. has been dissolved. The voting trustees were J. N. Wallace, Frederick Strauss, J. J. Storrow, W. C. Durant, and E. W. Clark, who acted under the agreement dated Oct. 1, 1910.

Sufficient funds have been deposited with the Central Trust Co. to pay the 6 per cent, five-year notes maturing Oct. 1, 1915. Holders of stock may now receive stock certificates upon presentation of their stock trust certificates at the Central Trust Co. The trust certificates must be presented prior to Oct. 26, as the books of the company close on that date, to reopen after the annual meeting, Nov. 17.

At a special meeting of the governors of the New York Stock Exchange, $14,985,200 preferred and $16,506,800 common stock was issued by the General Motors Co., in exchange for $14,583,700 voting trust certificates for preferred and $16,189,000 voting trust certificates for common stock, with authority to add $3,053,200 preferred and $3,367,200 common. This makes the total amounts of General Motors authorized to be listed $16,038,400 preferred and $19,874,000 common.

Packard's Fiscal Receipts Estimated at $16,000,000

DETROIT, MICH., Oct. 4—The gross receipts for the fiscal year to Aug. 31 of the Packard Motor Car Co., are estimated at $16,000,000, a gain of $3,000,000. This represents an increased income of 23 per cent. The company, it is stated, sold and delivered 1800 passenger cars, against sales of 2625 the year before and 2983 in 1913. In other words, the sale of cars fell off 30 per cent, but gross gained 23 per cent.

Simms May Increase Capital

NEW YORK CITY, Oct. 6—A special meeting of the stockholders of the Simms Magneto Co., East Orange, N. J., will be held at Room 1400, 25 Broad Street, this city, on Oct. 13 to consider and vote upon a proposition to amend the capital stock of the company from $1,750,000 par value, consisting of 17,500 shares of par value of $100 each of which 12,500 shares are common and 5000 preferred, to $1,855,000 par value, consisting of 12,500 common and 6050 preferred.

Few Market Changes

NEW YORK CITY, Oct. 5—Trading conditions in the markets this week were somewhat brisk, but the changes were few and small. Aluminum has again moved upward, holders asking 48 and 50 cents for spot in ton lots. Antimony is firm and receiving fair support. The asked price is quoted at 27½ and 28¼ cents for duty paid and 26¾ cents in bond. The copper market was firm at the opening of the week with the metal in large demand, sales being made to domestic consumers at 18¼ cents thirty days delivered for Electrolytic and 18 cents for Lake with the same terms. The steel markets were firm with a good general demand for the metal but there was no change in the price.

France and Italy still continue to buy all the steel-making iron that they can secure. Yesterday a new inquiry for 6000 tons of Bessemer steel came into the market for one of the allied countries, reported to be Italy. The lead market was easier last week because of a decline in the London market. All last week outside interests were asking 4.55 cents, which is 5 points over the price of the leading interest.

The oil and lubricants markets were also firm with but two changes taking place. There is a good market for all the refined products, and the demand is even better than anticipated for this season of the year. Crude oil is firm, but there have been no further advances reported.

Swinehart Earns 17%

AKRON, OHIO, Oct. 4—Directors of the Swinehart Tire & Rubber Co. have issued an annual statement showing that the company enjoyed a year of prosperity confined wholly to American trade. Gross earnings exceeded $2,000,000 and net earnings passed the $135,000 mark, which is about 17 per cent on the $800,000 capital stock.

The directors discussed a probable increase of dividends to 7 per cent Jan. 1. No definite action was taken. The regular quarterly dividend of 1½ per cent was declared.

Current assets in the statement issued show: cash $35,022; accounts and notes receivable, $258,822.58; inventories, $741,605; prepaid accounts, $12,211; real estate, buildings, machinery and tools, $319,522.84. Total, $1,417,213.97.

Liabilities are: accounts and notes payable, $400,955; accrued labor, $5,205.95; contingent liabilities, $15,432; capital stock, $800,000; surplus, $195,580.62. Total, $1,417,213.97.

Detroit Commercial Increases Capital

DETROIT, MICH., Oct. 2—The capital stock of the Detroit Commercial Car Co. has been increased from $1,000 to $100,000. This concern was recently organized to make the Detroit package delivery wagon, to sell at $690 with open express or panel body and at $745 with a more elaborate body.

Springfield Metal Body Elects

SPRINGFIELD, MASS., Oct. 1—The Springfield Metal Body Co., this city, has increased its capital stock and elected

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.47	.45	.45	.45	.45	.48	+.01
Antimony	.27	.27½	.27½	.27½	.27½	.27½	+.00½
Beams and Channels, 100 lb.	1.51	1.51	1.51	1.55	1.55	1.55	+.04
Bessemer Steel, ton	24.50	24.50	24.50	24.50	24.50	24.50	...
Copper, Elec., lb.	.18	.18	.18	.18	.18	.18	...
Copper, Lake, lb.	.18¼	.18¼	.18¼	.18¼	.18¼	.18¼	...
Cottonseed Oil, bbl.	6.90	6.82	6.80	6.91	6.86	7.13	+.23
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.39	.39	.39	.42	.42	.42	+.03
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	...
Lard Oil, prime	.85	.85	.85	.85	.85	.85	...
Lead, 100 lb.	4.55	4.55	4.55	4.55	4.55	4.52½	—.02½
Linseed Oil	.58	.58	.58	.58	.58	.58	...
Open Hearth Steel, ton	25.00	25.00	25.00	25.00	25.00	25.00	...
Petroleum, bbl., Kansas, crude	.80	.80	80	.80	.80	.80	...
Petroleum, bbl., Pennsylvania, crude	1.70	1.70	1.70	1.70	1.70	1.70	...
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	...
Rubber, Fine Up-River Para	.55	.55	.55	.55	.55	.55	...
Silk, raw, Italian	...	...	4.05	...	4.05	4.05	...
Silk, raw, Japan	...	...	3.70	...	3.70	3.75	+.05
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	33.25	33.25	32.50	32.25	32.25	32.00	—1.25
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	...

the following officers for the ensuing year: President, Walter L. Fry; first vice-president, Hinsdale Smith; second vice-president, E. McGookin, who is also sales manager, and treasurer, Arthur P. Smith. This concern has recently granted three licenses to manufacture the patented Springfield top for motor cars.

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Claims for $5,500 on Midland

MOLINE, ILL., Oct. 2—An echo of the failure of the Midland Automobile company two years ago, was heard this week when the attorneys for the petitioning creditors, filed a claim for $1,000 fees, while the receiver asked for $1,500. The attorneys engaged by the receiver put in a bill for $3,000, making a total of $5,500. The report of the receiver will be read before the referee in bankruptcy in Peoria on Oct. 18 and action will be taken upon the claims and report at the same time.

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Orders 1000 Automobile Cars

DETROIT, MICH., Oct. 1—Word was received by the traffic department of the Detroit Board of Commerce from the Michigan Central Railroad that in addition to the 500 special cars for automobiles ordered several weeks ago, the road now has placed another order for 500 more freight cars for automobiles. This is one of the first results of the Board of Commerce efforts.

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Dividends Declared

Kelly-Springfield Tire Co., New York City; quarterly of 3 per cent on common, payable Nov. 1 to stockholders of record, Oct. 15.

Securities Markets Active

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Kelly-Springfield Features Market—Anglo-French Loan Is Market Factor

NEW YORK CITY, Oct. 4—Trading is going on an enormous scale and further violent price movements were recorded in last week's securities. There were many changes which showed marked advances. Kelly-Springfield tire featured the market with an advance of 30 points. With Goodyear closing at 335 making a total gain of 25 points and Firestone closing at 560, a gain of 20 points, these tire issues this week showed the largest gains. The rest of the tire issues showed but small gains, ranging from 1 to 10 points.

The specialties markets did not show up as strong as usual, there being but a few small gains. General Motors, which for some weeks has been having a remarkable high record, made but a 4-point rise. The bidding was a little lighter in the specialties during the first part of the week but it was reported that it would again grow strong in a few days.

This seemed to stimulate the market a bit and on Friday there was a marked rise. Chalmers rose from 116 to 140, making the total gain 24 points. The rest of the market gains ranged from 1 to 10 points.

The Detroit markets were strong, the gains being heavy and many. General Motors featured the market, its closing bid being 345, a gain of 55 points. Then followed Chalmers with a gain of 18 points. Continental made a gain of 15 points and Paige a rise of 5 points. These were the main gains in the active stocks. The inactive stocks were weak, there being only two changes made, one a loss and the other a gain of ½ point.

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Goodrich May Issue Quarterly Statements

NEW YORK CITY, Oct. 4—Officials of the Goodrich Tire & Rubber Co. are considering the advisability of issuing quarterly statements in the future. It is probable that figures for the September quarter will be given out next month.

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Acme Die Casting Capital Increase

BROOKLYN, N. Y., Oct. 4—The Acme Die Casting Corp., Bush terminal, will increase its capital stock from $125,000 to $200,000. The company is at present increasing its plant.

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Taylor Puritan Machine Secretary

DETROIT, MICH., Oct. 4—Oscar R. Taylor, formerly with the Port Huron Engine & Thresher Co., Port Huron, Mich. and also with the General Motors Co., has been appointed secretary of the Puritan Machine Co. with which he has been connected for over a year.

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Sigle Sommer Production Manager

BUCYRUS, OHIO, Oct. 1—W. E. Sigle has become production manager of the Sommer Motor Co. Mr. Sigle has occupied a similar position with the Maxwell company at Dayton.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			102	..	..
J. I. Case pfd			79	83	..
Chalmers Motor Co. com			140	146	+24
Chalmers Motor Co. pfd			98	102	+2
Electric Storage Battery Co			73	75	+4
Firestone Tire & Rubber Co. com			560	..	+20
Firestone Tire & Rubber Co. pfd			112	..	+1
General Motors Co. com			348	352	+24
General Motors Co. pfd			111	113	+2
B. F. Goodrich Co. com			77	79	+8
B. F. Goodrich Co. pfd			109	111	+1
Goodyear Tire & Rubber Co. com			335	345	+25
Goodyear Tire & Rubber Co. pfd			109	110	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			29	30	..
International Motor Co. pfd			58	63	..
Kelly-Springfield Tire Co. com			220	227	—30
Kelly-Springfield Tire Co. 1st pfd			89	91	—1
Kelly-Springfield Tire Co. 2d pfd			225	235	—10
Paige-Detroit Motor Car Co			..	450	..
Maxwell Motor Co. com			53	55	+1
Maxwell Motor Co. 1st pfd			92	93	..
Maxwell Motor Co. 2d pfd			44	45	..
Miller Rubber Co. com			198	202	+8
Miller Rubber Co. pfd			109	110	+2
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			126	130	+6
Packard Motor Car Co. pfd			100	..	..
Peerless Motor Car Co. com			122	130	—8
Peerless Motor Car Co. pfd			92	94	..
Regal Motor Co. pfd			..	21	..
Portage Rubber Co. com			54	56	—1
Portage Rubber Co. pfd			92	94	—1
*Reo Motor Truck Co			18	19	+1½

No quotations available at this time on account of war.

*Par value $10; all others $100 par value.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
*Reo Motor Car Co			34½	..	+1¾
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp. com			76	78	+2
Stewart-Warner Speed. Corp. pfd			106	..	..
Studebaker Corporation com			140	141½	+1
Studebaker Corporation pfd			109	110	+2
Swinehart Tire & Rubber Co			87	90	+1
Texas Company			170	172	+7
U. S. Rubber Co. com			54	55½	+2
U. S. Rubber Co. pfd			106	107½	..
Vacuum Oil Co			225	230	+2
White Company pfd			110	..	..
Willys-Overland Co. com			223	225	+10
Willys-Overland Co. pfd			108	110	+1

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS					
Chalmers Motor Co. com	..	97	139	..	+18
Chalmers Motor Co. pfd	..	..	97½	102½	..
Continental Motor Co. com	155	180	295	..	+15
Continental Motor Co. pfd	..	75	83½	..	—1½
General Motors Co. com	61	..	345	355	+55
General Motors Co. pfd	81½	..	111	112½	—2
Maxwell Motor Co. com	10½	..	53	55	—4
Maxwell Motor Co. 1st pfd	28	..	90½	93	—1¼
Maxwell Motor Co. 2d pfd	..	..	44½	47	— ½
Packard Motor Car Co. com	..	..	126	..	+3
Packard Motor Car Co. pfd	..	94	100	..	..
Paige-Detroit Motor Car Co	..	..	..	445	—5
*Reo Motor Car Co	19	19½	35½	..	+3⅛
*Reo Motor Truck Co	10¼	11	18¼	19	+1⅞
Studebaker Corp. com	..	..	140	143½	+2¼
Studebaker Corp. pfd	..	..	106	110	..
INACTIVE STOCKS					
*Atlas Drop Forge Co	21	..	..	29	—2
Ford Motor Co. of Canada	..	500	1500	..	..
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	21	..	+ ½
Regal Motor Car Co. pfd	25	..	..	21	..

$1,000,000 Addition to Tire Plants

Goodrich and Goodyear to Expend That Sum for Larger Manufacturing Quarters

AKRON, OHIO, Oct. 2—Announcements are made by the Goodyear and the Goodrich companies that additions to their plants to be started in the near future will mean an expenditure of more than $1,000,000.

The B. F. Goodrich Co. is excavating on Bartges Street for a five-story building 800 by 270 ft., which will be the largest of any of the structures in the plant. A six-story building is also being erected on Falor Street, on the site of the employment office. The structures on Bartges Street will cost in the neighborhood of $800,000.

The Goodyear Tire & Rubber Co. will erect an eight-story building 200 ft. wide to its present uncompleted addition on East Market Street.

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Empire Acquires New Plant

INDIANAPOLIS, IND., Oct. 2—The Empire Automobile Co. has acquired a new plant in this city. The factory affords a manufacturing floorspace of approximately 150,000 sq. ft. in three combined buildings. The entire Empire production will be carried on in the Indianapolis plant after Jan. 1, the acquisition of this plant centralizing all the interests of the company. Heretofore the general offices have been maintained in Indianapolis while the manufacture of cars was carried on at Connersville. The general sales and executive offices are now located at the factory.

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Paige Breaks Production Records

DETROIT, MICH., Sept. 28—Production at the Paige-Detroit Motor Car Co. is now averaging 150 cars a day. Shipments during the past two weeks were the largest in the company's history. The additions to the plant now completed provide over 100,000 sq. ft. additional floorspace. When all additions are completed, all the new machinery installed and an increased working force added, production will permit the finishing of 250 cars or more per day.

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Knox Motors Co. Refuses to Sell Plant

SPRINGFIELD, MASS., Oct. 5—Overtures have been made to purchase the plant of the Knox Motors Co., by one of the big organizations manufacturing war munitions. The officials of the Knox company admit that offers were made, but state they will not sell the plant. Three companies were bidding for it, the Bethlehem Steel Co., the New England Westinghouse Co. and the General Electric Co. The New England Westinghouse Co. has purchased the Stevens-Duryea plant in this city. As officials of that company are here now an effort was made to get some inkling from them. Vice-president L. A. Osborne of the company stated that they were not after the Knox plant. The Knox company is understood to have filled some of its large war orders for tractors for the past few months as sub-contracts for the Bethlehem Steel Co. so an intimate line has been established between the two companies.

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Briscoe To Build Plant

JACKSON, MICH., Oct. 1—After several months of negotiations between the Briscoe Motor Co. and the Chamber of Commerce, it was announced to-day that as a result, the Briscoe company will build a new plant on Wildwood Avenue which is to cost no less than $100,000 and where possibly more than 5000 men will be employed.

One of the principal conditions for the realization of the expansion plan was that something would have to be done by the city or the citizens to provide at least 200 lots for the erection of workingmen's homes. An organization known as the Billancourt Land Co. was effected and it owns now 130 acres of land on Wildwood Avenue. Two hundred lots are to be offered for sale at $300, payable $50 down and $50 per month. The City Bank, People's Bank, Union Bank and the State Savings Bank are co-operating and will provide loans, with which the new Briscoe plant will be erected. The automobile company will lease the factory and site of about 15 acres for a period of ten years at $10,000 a year, it is said, with privilege of purchase at liberal terms.

The expansion of the Briscoe plant will also mean an extension of the Argo and other concerns in which Benjamin Briscoe and his associates are strongly interested.

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Frost Gear & Forge Adds

JACKSON, MICH., Sept. 28—An addition to the plant and equipment of the Frost Gear & Forge Co. will increase the production capacity of the concern at least one-third. The addition consists of a structure 42 by 132 ft. and when completed the plant will increase its working force of 350 to at least 450. Night shifts are being worked in both the gear cutting and drop forge departments. Orders on the books now will keep the plant working to full capacity for a year and exceed any previous year's business of the company.

Studebaker Plant to Expand

Acquires Additional Property —Co. Plans to Build 75,000 Cars for 1916

DETROIT, MICH., Sept. 30—The Studebaker Corp. has acquired a large property which adjoins its plant No. 3, and will begin at once the erection of additions to that plant. Other additions to be put up in this city consist of a three-story extension to plant No. 5, a new drop forge shop, 62 by 264 ft. and an addition 62 by 140 ft. to the blacksmithing shop, both of steel, glass and tile, to building No. 25. The old De Luxe plant, which is part of plant No. 3, will be torn down and a four-story building 52 by 326 will be erected to be used for machining work. An extension, 35 by 120 ft., will be made to the power house and the freight shipping platforms of plant No. 3 will be rearranged and extended.

These additions to plant No. 3 will probably be followed by others to other local Studebaker plants. Originally the corporation planned to make 60,000 cars for the season 1916, but according to vice-president L. J. Ollier, 75,000 cars have been contracted for.

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Champion Spark Plug Co. Increases Production to 50,000

TOLEDO, OHIO, Oct. 1—An increase in production from 35,000 to over 50,000 spark plugs per day is reported by the Champion Spark Plug Co., this city. This concern recently has been forced to enlarge its factory facilities by the addition of over forty new automatic machines. There has been a proportionate increase in other equipment of the factory.

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Hardwood Men to Boycott Metal Bodies —Boost Wood

MILWAUKEE, WIS., Oct. 2—The propaganda instituted by the hardwood lumber manufacturers of the north, centered in Wisconsin, to induce automobile manufacturers to return to the use of wood bodies instead of sheet metal, contemplates a carefully detailed campaign which is to bear fruit in 1917 and succeeding years. It will be principally an educational campaign, but the lumbermen will use direct means of forcing the issue by gathering their cohorts into an army that will refuse to purchase cars unless the bodies are of wood construction.

H. E. Christiansen, a well known hardwood lumber dealer of Milwaukee, who is taking a leading part in the movement says: "It is a fact that in 1910 and

1911 one motor car builder alone was using lumber at the rate of 20,000,000 ft. a year. In 1915 the same manufacturer is using only 2,000,000 ft. The profit is at least $2 per thousand, so we can see that $36,000 has been lost to the lumber trade in one instance alone."

Every lumberman who purchases a car in the future is to make a particularly strong effort to have his machine equipped with a wood body, according to the plans of the hardwood manufacturers. It is admitted that such procedure will be difficult for 1916, but by 1917 the propaganda is expected to have made sufficient headway to count.

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Goodyear Passes $2,000,000 Mark

AKRON, OHIO, Oct. 4—The annual sales conference of the Goodyear Tire & Rubber Co. was brought to a close last Wednesday, district and branch managers from all over the country having been the guests of the company for a week. The company's record during the past year was reviewed and sales plans laid for the forthcoming season. It was brought out that this has been the Goodyear company's greatest business year, among other things the $2,000,000 mark set for the automobile tire department a year ago having been reached and passed, and it is confidently expected that 1916 will be a still greater year.

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Electric Brush Co. Formed

DOVER, N. J., Oct. 4—The Electric Brush Co. has been formed here with the purpose of producing brush parts for all makes of electrical apparatus used on automobiles. The company plans to carry in stock at all times brush parts which will fit all sizes and types of lighting generators and starting motors, magnetos, etc., produced by all of the various companies.

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General Electric Men Strike

SCHENECTADY, N. Y., Oct. 4—Ten thousand employees at the local plant of the General Electric Co. went out on a strike to-day in their fight for an 8-hr. day, and the remaining 3000, comprising the molders, coremakers, and blacksmiths, voted to-night not to report for work in the morning. This means tying up the entire plant with the exception of the office force.

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Market Warner Products Direct

CINCINNATI, OHIO, Oct. 4—The Warner Auto Top Co., which heretofore has marketed its upholstery and top covers through distributors, has altered its sales policy and hereafter will market its product direct to the trade. All the Warner products hereafter will be marketed under the company's own name.

140,168 Cars in Iowa

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36,000 More Than Total for 1914—Farmers Big Factors in 33% Gain

DES MOINES, IOWA, Oct. 2—Iowa now has 140,168 automobiles registered for the present year. This is an increase of 36,000 or over 33 per cent as compared with the total for 1914 and the total for the present year is expected to reach the 150,000 mark. The registration figures show the notable fact that there are relatively more cars in the rural districts than in the cities.

Using the last federal census as a basis, Iowa now has one automobile to every fifteen persons in the State. In the counties with a large urban population the percentage of car owners is lower. Polk county, in which Des Moines is located and which has the largest urban population of any county in the State, has 5550 cars which is one to every nineteen of population. Woodbury county, in which Sioux City (the second city of the State) is located has 2966 cars or one to every twenty-two of population.

Buena Vista county, with a population of 15,891 which is largely rural, has 1722 cars or one car to every nine persons. Clay county, also largely rural in population, has 1385 cars for 12,766 of population. The same situation prevails in Humboldt, Kossuth, Ida, and other counties with preponderantly rural populations.

Automobile registration fees for the State have been $1,137,500 so far this year as compared with $1,040,135 for the entire year of 1914. The following table of automobile registration fees in Iowa for the years from 1907 to 1915, inclusive, shows the remarkable growth of the automobile business in the State:

YEAR	FEES
1907	$7,202
1908	20,880
1909	36,347
1910	65,608
1911	259,736
1912	485,300
1913	600,000
1914	1,040,135
1915 (to Sept. 28)	1,137,500

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New Milwaukee Gasoline Prices Favor Quantity Consumers

MILWAUKEE, WIS., Oct. 2—A readjustment of the scale of prices on gasoline in Milwaukee and neighboring territory to the end that motorists will pay a premium over the prices made to quantity consumers, has been effected by both independent and Standard companies. For several years, or since the filling station came into vogue, motorists have been paying the same price per gallon for 5 or 10 gal. of gasoline that buyers of 100-gal. lots were charged. For example, a motorist who drove his car to the filling station, of which there are more than 100 in Milwaukee, was able to fill his tank, no matter how little he required, at the same price per gallon which was charged the garage across the way. The readjustment, together with general advances in the price of gasoline, has brought the quotation per gallon on 60 deg. gasoline to 12½ cents at filling station; 11.6 cents per gallon for tank wagon delivery, and 10.6 cents per gallon for tank wagon delivery, 100 gal. or more. From May to September, the price per gallon to individuals buying small quantities ranged from 10.5 to 10.6 cents, or the same price now quoted in lots of 100 gal. or more. The uniform quotations effective Oct. 1 are as follows:

Sp. Gr.	Filling Station, Cents	Tank Wagon Delivery, Cents	Tank Wagon 100 Gal. Delivery or More, Cents
60 degrees	12.5	11.6	10.6
65 degrees	16.5	15.5	14.5
70 degrees	18.5	17.5	16.5
72 degrees	20.5	19.5	18.5

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Gasoline Up 1 Cent

CHICAGO, ILL., Oct. 6—The price of gasoline has been raised during the last week 1 cent. In this city, the Standard Oil Co. of Indiana is quoting gasoline at 11½ cents a gallon for 10 and 50 gal. lots. In Tacoma, gasoline is retailing for 12 to 12½ cents. And in Portland, Ore., it is selling wholesale at 11 cents. For the past six months a number of stations in this city have sold gasoline at the wholesale price, 10 cents. The price went up 1 cent to-day in Denver, Col., most garages selling it at 16 and some at 20 cents.

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Gasoline Up in St. Louis

ST. LOUIS, MO., Oct. 2—The independent refiners have raised the price of gasoline 1 cent, from 11 to 12 cents per gallon. This increase in price followed closely upon an increase made by the Standard company from 9.9 to 10.9 cents.

When the price had been reduced from 17.5 cents to 8.9 cents a gallon the independents called a halt and started to boost the price with the avowed intention of bringing it back to what it was before the price-cutting war. Thus when the independents sold gasoline for 10 cents the Standard sold for 8.9. When the Standard brought its price to 9.9 the independents raised their price to 11 cents. Last Wednesday the Standard raised its price to 10.9 and the independents immediately brought theirs to 12 cents. At the same time the independents raised the price of their No. 2 from 13 to 14 cents and No. 1 from 14.5 to 15.5. They attribute these increases to the increased cost of the crude product.

Michigan Service Men to Organize

First Steps in Formation of Automobile Service Managers' Assn. of Michigan

DETROIT, MICH., Sept. 29—The first steps toward the organization of the Automobile Service Managers' Association of Michigan were taken this afternoon when under the presidency of Alfred Reeves, general manager of the National Automobile Chamber of Commerce, service managers from Detroit and other Michigan factories met at Hotel Statler.

A committee consisting of C. R. Lester, chairman, Packard; D. H. Haselton, Regal, and A. O. Weise, Oakland, was appointed to prepare by-laws and a constitution. Another meeting will be held Oct. 26, when the final organization will be effected.

One of the service managers present stated that the object of such an association is primarily to reach an understanding among all automobile manufacturers of the State as to what the service department should ultimately be; or in other words, to provide a standard service policy. There was no discussion on the subject at this first meeting except that most of those present thought that this serious question of service can be better solved or at least brought to a better and more universal policy by having an organization of those men who look after the service departments in the plants. Such an organization has just been perfected among the Indiana automobile manufacturers and will very likely be before long in the States of Ohio and New York. Quite likely there will be a national organization as a consequence.

The service managers who attended the meeting were: in addition to those already mentioned, C. W. Matheson, Dodge; E. A. Haskins, Federal; Pierre Schon, General Motors Truck Co.; R. O. Gill, Saxon; J. E. Fields, Hupp; J. L. Kenyon, Cadillac, and E. V. Rippingille, Hudson.

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Columbus Garage Convention Postponed

COLUMBUS, OHIO, Oct. 5—The State convention of garage owners which was to have been held here during the three days, Oct. 4, 5 and 6 has been postponed three weeks. The new dates selected are Oct. 25, 26 and 27.

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Detroit Salesmen Organize

DETROIT, MICH., Oct. 2—Preliminary arrangements have been made for the organization of the Detroit Salesmen's Association. A committee was appointed to prepare recommendations to be submitted at a general meeting to be held next week. Among the members of the committee are: C. C. Cunningham, director of sales, Hudson Motor Car Co.; Norvell A. Hawkins, general sales manager, Ford Motor Co.; Harry W. Ford, president, Saxon Motor Co.; H. H. Hill, sales manager, Packard Motor Car Co.; Joseph Mack, president, Mack Printing Co.; F. H. Dodge, general sales manager, Burroughs Adding Machine Co.; H. Wilbert Spence, Mutual Life Insurance Co.; D. M. Barrett, editor *Salesmanship*, and James W. Fisk, director of selling service, J. L. Hudson Co.

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Firestone Salesmen Meet

AKRON, OHIO, Oct. 4—Fully 500 salesmen, branch managers, department heads and officials of the company, attended the home coming of the Firestone Tire & Rubber Co., held here last week. Special cars were run from many parts of the country, bringing in the tire men to attend the meeting. On Sept. 29 the men were received in the executive offices of the Firestone plant and later a number of addresses on tire making and selling were made. At noon a luncheon was served in the restaurant of the company which was followed by an inspection of the plant.

An all day session of the branch managers and department heads was held Sept. 28.

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Wants to Represent Parts Makers in Coventry

COVENTRY, ENGLAND, Oct. 4—G. R. Bromley of the British Components, Bedford Street, Coventry, is looking for several agencies, such as the representation of automobile parts makers, also firms that can supply forgings and stampings of all descriptions and nickel crankshafts. Mr. Bromley is also interested in taking up the sole agencies with anything connected with the engineering, motor and machinery trade.

Mr. Bromley has been in the automobile trade since 1899, having been connected with the Daimler Motor Co. for several years and for two and one-half years with J. L. Lambie of the Bedford Motor Co. or the General Motors, Ltd., Long Acre, London, W. C., as chief outside representative.

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Accessory Jobbers Meet Oct. 20-22

KANSAS CITY, MO., Oct. 4—The National Association of Automobile Accessory Jobbers, whose headquarters are in Chicago, will meet in this city at a convention Oct. 20, 21 and 22, at Hotel Muehlebach. The organization has in view the betterment of merchandising accessories and correcting of existing abuses in the merchandising of accessories.

Denby To Teach Salesmanship

Free 36-Lesson Correspondence Course to Truck Buyers—Course Lasts a Year

DETROIT, MICH., Oct. 4—Something entirely new in the way of assistance or help to the purchaser of trucks has been inaugurated by the Denby Motor Truck Co. It consists in giving free to the Denby truck purchaser a correspondence course of retail salesmanship in thirty-six lessons, extending over a period of one year. The purpose of this business-building and sales-efficiency service is to develop, among the employees of every owner, at least one thoroughly efficient salesman, able to take advantage of the wider trade possibilities that the truck opens up.

The purchaser or owner of the truck is to designate whoever is to be given the lessons, preferably the driver, stating that it believes that he is usually the only man regularly out in the field, that he meets many customers who do most of their buying by telephone and that on his manner, appearance and methods is based the whole reputation of the store with many people.

The correspondence course is divided into four quarterly periods of nine lessons each, which are sent to the students at the rate of three a month. With every lesson there is a number of questions, which the student must answer and return to the Denby company, these answers having a bearing upon the awards of the various cash prizes aggregating $3,000 which the company has set aside to stimulate the interest of the students.

There will be one award or prize of $1,000 which will be paid Nov. 1, 1916, to the student who has shown the greatest progress, whether he has at that time finished the entire course or not. Four quarterly awards of $200 each will be paid to the student who has shown the most progress during the quarter, and there will be four prizes of $150 and four of $75, one for each quarter, to be given respectively to the second and third best students. In addition to these prizes $15 will be paid each month to the student ranking highest for that month and $10 to the one ranking second.

The lessons to be sent to the students will deal with such subjects as getting new customers, making old customers buy more, introducing new goods and many other subjects.

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Boston Dealers Show in Tents at Rockingham Fair

BOSTON, MASS., Oct. 2—Boston motor car dealers took advantage of the fall weather to make a big exhibit at Rock-

ingham Fair the past week. The show was held in two large tents placed together with the side flaps removed, making it one large area. The cars, trucks and accessories were spread around in a circle in each tent, and so one could look about without hindrance. All the Boston agents with exhibits had salesmen there, and the dealers in the border cities and towns on the New Hampshire-Massachusetts line were also on hand. The crowds were big, so the sales made and prospects secured were encouraging.

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Ward Electric on New York-to-Cleveland Trip

NEW YORK CITY, Oct. 5—To secure data on the cost of operating an electric vehicle over country roads, a Ward Special will be sent from this city to Cleveland during the Electrical Exposition and Motor Show at the Grand Central Palace, Oct. 6 to 16. The car will be started in time to reach Cleveland by Oct. 18, the date of the opening of the annual convention of the Electric Vehicle Association of America. The car will use the Edison battery known as the G4. The route to be followed will traverse Albany, Utica, Buffalo and Erie.

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Seventeen Car Makes at Denver Show

DENVER, COL., Sept. 29—The two weeks' fall show under the auspices of the Automobile Trades Association of Colorado has started favorably, with more than twenty exhibits, a good attendance and an excellent sales outlook. It is being conducted in the Automobile Building, one of the separate structures provided near the City Auditorium to furnish extra space for the International Soil Products Exposition, with which the automobile show is connected.

The event is being attended by thousands of visitors from a wide territory, many of whom are prosperous farmers and regarded as prospects for cars. A few sales were closed during the first three days of the show, and many more are counted upon. Seventeen cars are exhibited by ten dealers, and there are eight accessory and supply booths and one special exhibit presenting the work of the trades association.

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Conrad Bell Sales Manager

YORK, PA., Oct. 2—H. W. Conrad, former sales manager of the Pullman Motor Car, York, Pa., has been made the sales manager for the Bell Motor Car Co. W. F. Grove, who filled that capacity since the organization of the Bell company, has been made the factory superintendent. Work on the erection of the one-story frame assembling plant at the Bell factory is being completed and the several departments have been moved into the new addition. To further facilitate operations another addition, 110 by 30 ft., is being erected.

Ohio Jitney Drivers Organize

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Form Ohio Auto Bus. Assn.—To Fight Unfavorable Legislation in State

YOUNGSTOWN, OHIO, Oct. 4—The preliminary organization of the Ohio Auto Bus Association was finished at a meeting of jitney bus drivers held in this city last week. Local organizations in Akron, East Liverpool, Ashtabula, Lima, Marietta and Cincinnati were represented at the meeting. The object of the organization is to fight unfavorable legislation both on the part of the Ohio Legislature and various city councils. The next meeting will be held in Columbus.

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Jitney Bus Plan for Denver Practically Abandoned

DENVER, COL., Sept. 29—All efforts to establish jitney bus transportation in Denver have been fought so bitterly that the enterprise has been practically abandoned. Although there is now pending in court a mandamus suit to compel the city commissioners to issue permits for operating jitney bus lines, there is little hope that the jitney promoters will win the case, inasmuch as the applications for permits were originally rejected on the ground that a jitney bus line is a public utility the same as a street car line, and since the filing of the mandamus suit the jitney has been declared a public utility by both a city ordinance and a State law. Taxicabs require a city license costing $10 a year for cars up to seven-passenger capacity, and there is an ordinance providing for a $500 bond for each car, but this bond feature has not been enforced. The city has not fixed any license fee or bond requirement for jitneys, on the ground that a regular franchise must be secured. The jitneys have been opposed by both street car companies and taxicab concerns.

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Bullen with Michigan Top

DETROIT, MICH., Oct. 2—H. E. Bullen, formerly with the Rands Mfg. Co. is now in charge of the manufacturing department of the Michigan Auto Top Co., which has bought in the bankruptcy court the business and stock of the Michigan Auto Top & Painting Co. S. L. Joseph has been appointed to take care of the sales and financial department.

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Enforce N. Y. Jitney Bus Law

ALBANY, N. Y., Oct. 3—A decision has been rendered in this city which practically compels bus lines in all cities to get city and State permission to operate. The so-called jitney bus law has been sustained in all of its principal phases. As a result of the decision, the courts have held that the following classes of vehicles must secure the consent of the local authorities and go to the commission for a certificate of public convenience and necessity: A bus line, a stage route, a vehicle in connection with a bus line, a stage or motor vehicle route, a vehicle carrying passengers at a rate of fare of 15 cents or less for each passenger within the limits of a city, and a vehicle carrying passengers in competition with another common carrier, which is required by law to obtain the consent of the local authorities of said city to operate over the streets thereof.

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Cleveland Show Jan. 8-15

CLEVELAND, OHIO, Oct. 4—The fifteenth annual Cleveland automobile show will be held Jan. 8 to 15 in the Wigmore Coliseum. Dates and preliminary arrangements were decided on at a meeting at which was effected re-organization of the Cleveland Automobile Show Co., the dealers' organization which gives the show with the sanction of the Cleveland Automobile Club.

Fred H. Caley, who has managed the Cleveland show for four years past, was again elected to be in active charge. The Cleveland exposition comes immediately after the opening show in New York and precedes Chicago's by a week.

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Des Moines Show Feb. 14-19

DES MOINES, IOWA, Oct. 2—The annual Des Moines show, held previously during the month of March, is scheduled for the week of Feb. 14, 1916, according to an announcement by C. G. Van Vliet, secretary of the Des Moines Automobile Dealers' Association, who is manager of the local show. The new date, three weeks earlier than in former years, is better because it puts Des Moines on a circuit of the big automobile shows in the middle west.

The Minneapolis show will be held in the week of Jan. 29 and the Kansas City show in the week of Feb. 7, while the Omaha show follows the Des Moines exhibition during the week of Feb. 21. In former years the local date always conflicted with the Boston show and as a result many factory exhibits could not be shown.

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Lemoine Dies in Paris

PARIS, FRANCE, Oct. 1—M. Louis Antoine Lemoine died recently in this city at the age of sixty-two. He was the head of the automobile spring company bearing his name and was also president of the French Society of Makers of Motor Parts and Accessories.

Factory Miscellany

Elyria Tire to Build—The Elyria Tire & Rubber Co., Elyria, Ohio, will build a two-story 60 by 200-ft. plant.

Tayson Rubber Plant to Be Sold—The Tayson Rubber Co. plant, Wooster, Ohio, it is said, is to be sold to one of the large Akron tire concerns.

Pullman Leases 10,000 Sq. Ft.—The Pullman Motor Car Co., York, Pa., has leased 10,000 sq. ft. of additional floor space which it will occupy this month.

Milwaukee Engine to Add—The Milwaukee Auto Engine & Supply Co., Milwaukee, Wis., is preparing to enlarge its facilities and has increased its capital from $6,000 to $30,000.

New Ajax Plant—A new plant is to be built immediately by the Ajax-Grieb Rubber Co., Trenton, N. J., which will be 200 by 350 ft., three stories, and adding 210,000 sq. ft. of floor space.

Nashville Ford Plant Started—Work has been started on the three-story plant of the Ford company near Twelfth Avenue and Broadway, Nashville, Tenn. The plant will be 75 by 170 ft.

Gardner Machine Adds—The Gardner Machine Co., Beloit, Wis., manufacturing disk grinders for metal working, and supplying many car builders with its devices, is erecting a shop addition providing about 5000 additional square feet of floor-space.

Kelsey Wheel Adds—The Kelsey Wheel Co., Ltd., Windsor, Ont., has ordered the building of an addition, 42 by 112 ft., part of which will be a garage. The other part will be divided into six dry kilns.

Southern Tire to Double Capacity—The Southern Tire & Rubber Co., Augusta, Ga., will double its capacity, at present seventy-five tires per day. The number of employees, which is now fifty, will be increased to ninety.

Vandalia Co. to Make Accessories—The Midland Accessories Mfg. Co., Vandalia, Ill., has been incorporated with a capital of $150,000. The concern is a reorganization of the St. Louis Auto & Appliance Co. and plans to build a $50,000 plant at Vandalia.

Tire Plant for Sebring—A tire manufacturing plant, according to reports, will be placed in Sebring, Ohio, by the Sebring Tire & Rubber Co., recently formed with a capital of $200,000, with J. S. Hotchkiss, W. F. Smith, C. B. Smith, H. D. Weaver, and W. B. Stevenson as incorporators.

Tire Plant for Kansas City—P. E. Werner has leased a plant at Fourth and Central Streets and offices in the Commerce Building, Kansas City, Mo., to make tires. Actual production is expected to start about the first of the coming year. The company is also establishing a plant at Chester, W. Va.

New Linde Branch Plant—All contracts have been awarded for the erection of the new Milwaukee branch plant of the Linde Air Products Co., New York, and work is now well under way. The building will be of reinforced concrete and steel, to be 80 by 100 ft., and will cost $35,000. The location is at Thirty-eighth and National Avenues, West Allis, Milwaukee.

Sterling Truck Builds—The Sterling Motor Truck Co., Forty-sixth Avenue and Rogers Street, West Allis, Milwaukee, Wis., is building a large factory addition. The concern formerly was known as the Sternberg Motor Truck Co. It has been doing a large foreign business, and these demands, together with the unusually large business now being received from domestic sources, has made it necessary to nearly double the size of the works. The plant was erected only four years ago and was then expected to have a capacity for at least ten years.

The Automobile Calendar

Sept. 26-Oct. 10	Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Oct.	Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct. 2-9	Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 4-10	St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4-14	Wichita, Kan., Show, Wichita Auto. Dealers' Assn.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9	New York City, Sheepshead Bay Motor Speedway 350-Mile Race.
Oct. 11-12	Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 11-16	Kansas City Dealers' Tour.
Oct. 12	Detroit, Mich., Hotel Statler S. A. E. Meeting for Detroit, Ind., and Met. Sections.
Oct. 14	Chicago, Ill., S. A. E. Standards Committee Meeting, Chicago Automobile Club.
Oct. 16	Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 16-23	Pittsburgh, Pa., Show, Motor Square Garden, Automobile Dealers' Assn.
Oct. 17	Twin City Speedway Match Race.
Oct. 18-19	Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Oct. 18-24	Troy, N. Y., Show, State Armory, Troy Automobile Dealer's Assn.
Oct. 18-25	Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 20-21-22	Excelsior Springs, Mo., National Assn. of Automobile Accessory Jobbers' Meeting.
Oct. 21	New York City, Met. Sec. S. A. E. Meeting at Automobile Club of America.
Oct. 24	Fort Worth, Texas, Race Meet.
Oct. 25-27	Columbus, O., Garage Owners' Convention.
Oct. 29	Indianapolis, Ind., Claypool Hotel, S. A. E. Meeting of Ind. Section.
Nov. 1-3	Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 12-20	Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18	Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4	Electric Prosperity Week.
Dec. 31	New York City Show, Grand Central Palace.

1916

Jan. 8-15	Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15	Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22, 1916	Chicago, Ill., Show; Coliseum.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb	Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12	Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 15-20	Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19	Newark, N. J., Show.
March 4-11	Boston, Mass., Truck Show, Mechanics Bldg.
May 13	New York City, Sheepshead Bay Speedway Race.
May 30	Indianapolis Track Race.
June 17	Chicago Track Race.
June 28	Des Moines, Ia., Track Race.
July 4	Minneapolis Track Race.
July 4	Sioux City Track Race.
July 15	Omaha, Neb., Track Race.
Aug. 5	Tacoma Track Race.
Aug. 18-19	Elgin Road Race.
Sept. 4	Des Moines Track Meet.
Sept. 15	Indianapolis Track Race.
Sept. 16	Providence Track Race.
Sept. 30	New York City Sheepshead Bay Race.
Oct 7	Omaha Track Race.
Oct. 14	Chicago Track Race.

The Week in the Industry

Newlin Transferred—W. D. Newlin, late of Kansas City, has been transferred to Springfield, Ill., and placed in charge of the Mitchell car as sales mananer for the Sangamon county territory.

Shay Champion Chicago Mgr.—W. J. Shay, recently with Judd & Leland Mfg. Co., and formerly with the United Manufacturers of New York, has become the Chicago manager of the Champion Spark Plug Co., Toledo, Ohio.

Keyt Heads Rockford Cadillac—The title of the Cadillac Automobile Co., Rockford, Ill., has been changed to that of the Keyt-Erb Automobile Co., of which F. P. Keyt is president; Clifford Erb, vice-president, and Walter Lamb, secretary and treasurer.

Gorman Cadillac Rep.—E. C. Gorman has been appointed a district representative for the Cadillac Motor Car Co., Detroit, Mich. He will travel Nebraska, Iowa, the Dakotas, Minnesota, and part of Canada. He was formerly in charge of the Cadillac exhibit at the Panama-Pacific Exposition.

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Dealer

Firestone Plant for K. C.—The Firestone Tire & Rubber Co., Akron, Ohio, will equip a tire plant at Kansas City, Mo., to cost $200,000.

Moline Sells Omaha Branch—The Moline Automobile Co., East Moline, Ill., has recently sold its Omaha branch to R. E. Davis & Co. The deal includes the entire State of Nebraska and western Iowa.

Recent N. Y. Leases—The Gadabout Motor Co., Freeman & Brady, the Holden One-Man Top Co., and the United Auto Co., recently leased space in the building at the southeast corner of Broadway and Fifty-seventh Street, New York City.

St. Louis Dealers' Items—Bart S. Adams, 4701 Washington Avenue, St. Louis, Mo., has obtained the agency for Midgley tires in the St. Louis territory.

The Commercial Auto Body Co. soon will announce a cut of from $10 to $25 on all commercial bodies. This reduction in price, according to Hugh F. Cartwright, president of the company, is due to decreased cost of production since the firm has occupied its new building at Sixteenth and Pine Streets.

The new Ajax tire sign being erected by the Guenther-Methudy Sales Co., 3553 Lindell Boulevard, is said to be the largest west of the Mississippi River.

Motor Men in New Roles

Henderson Seattle Mitchell Mgr.—J. A. P. Henderson is manager of the used car department of the Mitchell Motor Car Co., Seattle, Wash.

Baumann St. Louis Mgr.—The St. Louis Auto-Drayage Co., with W. H. Baumann as manager, has opened a repair and service station at 1907 Locust Street.

Taber in Charge—E. M. Taber has been placed in charge of the truck sales department of Russell P. Taber, Reo distributor at 338 Pearl Street, Hartford, Conn.

LeFebre Returns to Tacoma—R. P. LeFebre has returned to the Tacoma (Wash.) automobile field, and will be at the head of the sales staff of the Cadillac Auto & Supply Co.

Wright Saxon Sales Mgr.—F. S. Wright, formerly with the Studebaker Corp., has been appointed sales manager of the Saxon Motor Sales Co., with headquarters in Los Angeles.

Woodruff Lexington N. Y. Mgr.—A. A. Woodruff is manager of the Lexington Motors New York Corp., which recently opened showrooms at 1840 Broadway. Mr. Woodruff is also treasurer.

Morris Springfield Hudson Sales Mgr.—Merwin Morris is in charge of the sales of the recently organized Hudson Sales Co., Springfield, Ill. The salesroom and office will be at 428 South Fourth Street.

Ernst Metz Assistant Mgr.—N. F. Ernst has gone to Omaha, Neb., where he will be assistant manager of Metz branch there. He has been for three years branch manager of the Metz Co., Utica, N. Y.

Klune in New York—C. A. Klune has opened an office at 51 West Sixty-third Street, New York City, as a manufacturers' representative. He was formerly Eastern representative for the Jones representative.

Join Indianapolis Ford—Joseph Kelly and D. V. Goodman have joined the Indianapolis, Ind., branch of the Ford Motor Co., and will devote their time to sales promotion work, which comprises advertising and publicity.

Linerd Ajax Sales Mgr.—J. B. Linerd, who has been connected with the Ajax-Grieb Tire Co., New York City, for two years, has been elected general sales manager. Mr. Linerd came from the Goodyear company two years ago to reorganize the New York City office of the Ajax. As general sales manager of the New York company he will have the direction of all the salesmen of the company.

Taylor Succeeds Marty—E. A. Taylor has been made superintendent of plants 2 and 3 of the Maxwell Motor Co., Dayton, Ohio. Mr. Taylor succeeds William Marty, who has resigned to become superintendent of plant 2 of the Studebaker Corp.

Whitney Los Angeles Sales Mgr.—R. A. Whitney, who has been identified with the Regal line in Southern California, has been appointed sales manager of the Colyear Motor Sales Co., newly appointed Regal distributor for southern California and Arizona.

Erickson Joins United Truck—F. E. Erickson has joined the United Motor Truck Co., Grand Rapids, Mich., in the capacity of general superintendent. Mr. Erickson was formerly with the Packard Motor Car Co., and later with the Universal Motor Truck Co.

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Dealer

Opens Detroit Office—The General Drop Forge Co., Buffalo, has opened an office in the David Whitney Building, Detroit, Mich., in charge of E. H. Miller.

Bristol Dealers Make Trip—Thirteen Bristol (Tenn.) automobile dealers on Sept. 23 made a 300-mile trip to Knoxville, Tenn. The Paige, Oakland and Maxwell cars made perfect scores.

Ford Buys in Yonkers—The Ford Automobile Co. has purchased the building at 109 to 115 South Broadway, Yonkers, N. Y., and will erect a concrete and brick salesroom, garage and repair shop.

New Accessory House in Columbus—The W. E. Cody Sales Stable Co., Columbus Co., Columbus, Ga., has installed an automobile accessory department, both wholesale and retail, and will have the agency for the Firestone and Diamond tires in that territory.

Montana Garage News—New garages are to be erected in Montana cities showing growth in business as travel over the new automobile trails increases. The Ford company has taken a lease for five years. At Livingston Senator A. W. Milles will erect a brick and concrete garage in the heart of the city which is to be 75 by 140 ft. At Billings, the Barry Motor Co. has the wholesale and retail distributing agency in Montana and northern Wyoming for Oakland cars.

Recent Changes in Louisville—The Samson Engineering Co., Louisville, Ky., has moved its offices from the Snead Building to the Starks Building.

The Compression Inner Tube Co. has opened an office and salesroom at 662 South Fourth Street.

Handles Handy Carbon Remover—The Perfek Device Co., Baltimore, Md., 116 South Greene Street, Baltimore, is now handling locally the Handy, a device for cleaning carbon out of cylinders. The company also is the Eastern distributor of the Perfek steering device.

Baltimore Co. Moves—The Randall Manufacturing Co., Scripps-Booth, Trumbull and Bell distributors, is taking possession of its new quarters, 16 West Mount Royal Avenue, Baltimore. The company will maintain a service station in the rear of the showrooms and offices. W. D. Randall is at the head of the company.

Recent Wis. Trade News—John Luke, who has been conducting a garage and repair shop in the Wagner foundry group at Burlington, Wis., for some years, has formed a partnership with A. H. Voltz. The new firm of Luke & Voltz has leased the Forge garage building at Burlington and will build an addition to be used for repair shop. A complete new equipment of tools will be installed in the building.

James E. Dempsey, formerly of Manitowoc, Wis., has returned to that city from the Pacific coast to arrange for the manufacture of a dirigible headlight device controlled by the action of the steering gear. Mr. Dempsey has patented the device in the United States, Canada, France and other foreign countries.

The Ph. Gross Hardware Co., 218-222 Third Street, Milwaukee, operating one of the largest motor supply departments in the State, has been appointed Wisconsin distributor of the American Ever Ready Works, New York.

E. H. Ramm, hardware dealer, New London, Wis., who has been appointed district agent for the Ford, is building a garage addition to his store and warehouse and will also conduct a repair shop and service station.

Frederick Glines, Omro, Wis., has leased the Leighton building and is remodeling it for garage and repair shop purposes. Mr. Glines has been appointed agent for the Ford.

The stock, machinery and equipment of the Rex Gasometer Co., Beloit, manufacturing measuring devices for gasoline tanks, oil tanks, etc., has been sold to satisfy the demands of creditors.

A. D. Whipple, Frank L. Bader and Christian Doerfler have organized the Transmission Research Co., Milwaukee, with $25,000 capital, to deal in patents; develop inventions and manufacture devices. Messrs. Whipple and Bader have been engaged in design for many years and now intend to market a number of important inventions in the automobile field.

The Estberg Garage, 460 Jackson Street, Milwaukee, established about eight years ago by Emil Estberg, has been sold to C. Ducey. Mr. Estberg will devote his attention to the sale of the Oldsmobile, Chevrolet and Monroe.

The Reo Sales Co. has been organized at Eau Claire, Wis., to handle the Reo pleasure and commercial car in a large northwestern Wisconsin territory. The agency formerly was handled by the Taylor Motor Co., Eau Claire. The members of the new firm are O. G. Kinney, Colfax, Wis., and J. C. MacDonald, Eau Claire. Headquarters have been established at 701 South Barstow Street.

The Bartles-Maguire Oil Co., Milwaukee, one of the largest independents in Wisconsin, will build a large filling station at Twenty-seven Street and Grand Avenue for the accommodation of motorists. The Standard Oil Co. recently built a large station at Grand Avenue and Sixteenth Street.

Denver Trade Items—The Boss Rubber Co., 1548 Broadway, Denver, agent for Kelly-Springfield tires, has been reorganized. S. Z. Silversparre, a member of the firm for several years and recently president of the company, has sold his interest and moved to El Paso, Tex.; F. P. Lilley, formerly vice-president, has been made president; Arthur Lewis, formerly manager of the Salt Lake City branch, is vice-president, while H. G. Peters and Robert Rhea still hold their respective offices of treasurer and secretary.

J. M. Patrick, 1515 Cheyenne Place, Denver, Lewis distributor for Colorado and Wyoming, has just secured the agency for the Abbott-Detroit.

The Ford Motor Co. has closed its downtown salesroom at 1551 Broadway, Denver, and will handle all regular city sales from the assembling plant at South Broadway and Kentucky Avenue.

The Denver Ford Starter Co., 1522 Cleveland Place, manufacturer of a mechanical starter, has taken the agency for the H. & D. shock absorber in that city.

J. M. Patrick, Lewis distributor, Denver, has moved from 533 Marion Street to 1515 Cheyenne Place, where he is occupying the salesroom recently vacated by L. G. Palmer, formerly Paige distributor.

L. E. Kelton, Haynes distributor, has moved from 1616 Broadway into permanent quarters at 1622 Broadway.

A. C. Wagner, proprietor of the Wagner Garage, 1541 Cleveland Place, has taken the agency for the Denby truck.

The firm of Mulnix & Steese, 17 East Colfax Avenue, Grant distributors, has been changed to Mulnix & Rarie, the interest of Mr. Steese having been bought by Baxter Rarie, formerly Grant distributor for northern Colorado, with headquarters at Loveland.

The National Rubber Supply Co.'s Denver branch has moved from 1633 Broadway into larger quarters at 1629 Broadway.

Recent Cal. Trade Items—B. L. Remington and W. L. Maxwell, 38-40 East Miner Avenue, Stockton, Cal., have formed a partnership under the name of the Guarantee Ignition & Battery Co. They will specialize in starting systems for all makes of cars.

The Stockton Auto Ignition Co., representing the Willard storage battery, is erecting a new concrete building on Miner Avenue, Stockton. The company recently received the local agency for the Splitdorf and Bosch magnetos.

Bell & Hinman have purchased the Twelfth Street Garage, 516 Twelfth Street, Sacramento, and will specialze in used cars.

The Traveler's Garage, 521-523 First Street, has been opened by Sellinger & De Gastin, Inc., in Sacramento. The company recently received the Haynes agency.

J. E. White has opened a Mitchell salesroom and service station at 1106 K Street, Sacramento.

The Universal Specialty Co., Los Angeles, has opened a tire construction and vulcanizing plant at 1237 South Figuroa Street.

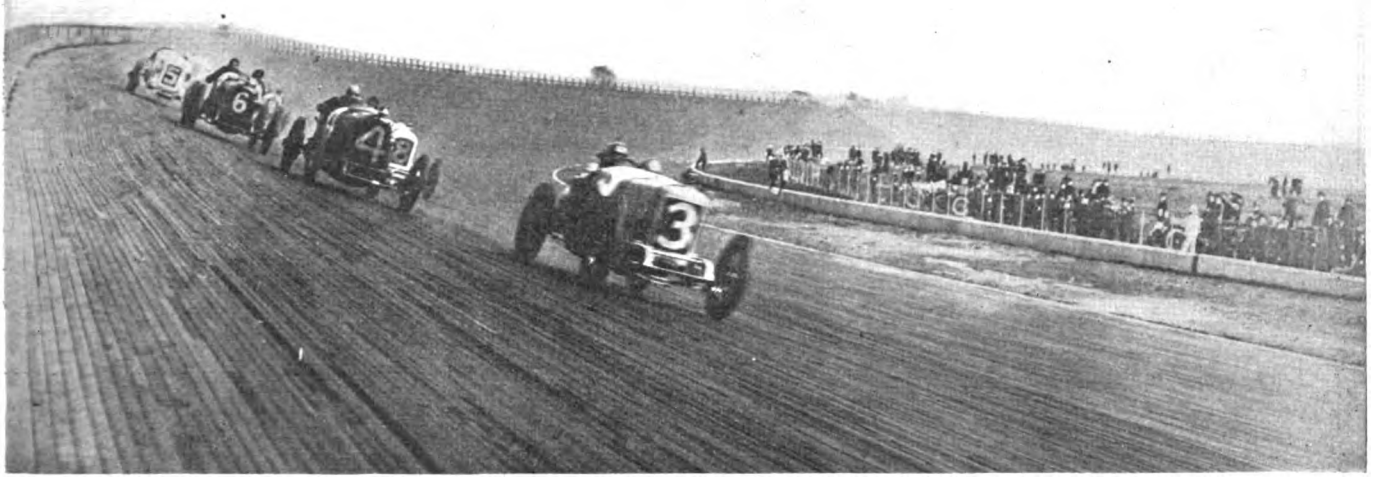
The Big Tree Auto Works, the oldest garage in Los Angeles, has moved into a modern brick building at 1732-40 West Washington Street. The proprietors have been in business in Los Angeles twenty-eight years.

The Los Angeles branch of the Savage Tire Co. has moved into the large brick building at 700 West Seventh Street. In the new building the company has room for 5000 tires and a large office and shipping force.

Washington Electric Agent Builds—Emerson & Orme, Washington, D. C., agents for the Detroit electric, have commenced the erection of a two-story fireproof building to contain salesrooms, service station and garage. It is located on M Street, between Sixteenth and Seventeenth Streets, and will have a frontage and depth of 135 ft. On the first floor there will be a salesroom, 44 by 54 ft., for new cars, and a salesroom, 19 by 54 ft., for second-hand cars. Offices and a waiting room will be located on the main floor, together with a large garage. The charging plant will be located on the second floor. Provision has been made for a third story at some future time. The building will be completed in January.

VOL. XXXIII. NEW YORK—THURSDAY, OCTOBER 14, 1915—CHICAGO No. 16

The AUTOMOBILE



Oldfield, Burman, Wilcox, Cooper and Anderson having a breathless brush on the high banked curve

Stutz Triumphs at 102.6 M.P.H.

Anderson Wins Astor Cup—Rooney in Another Stutz Second—America Takes First Five Places

By J. Edward Schipper

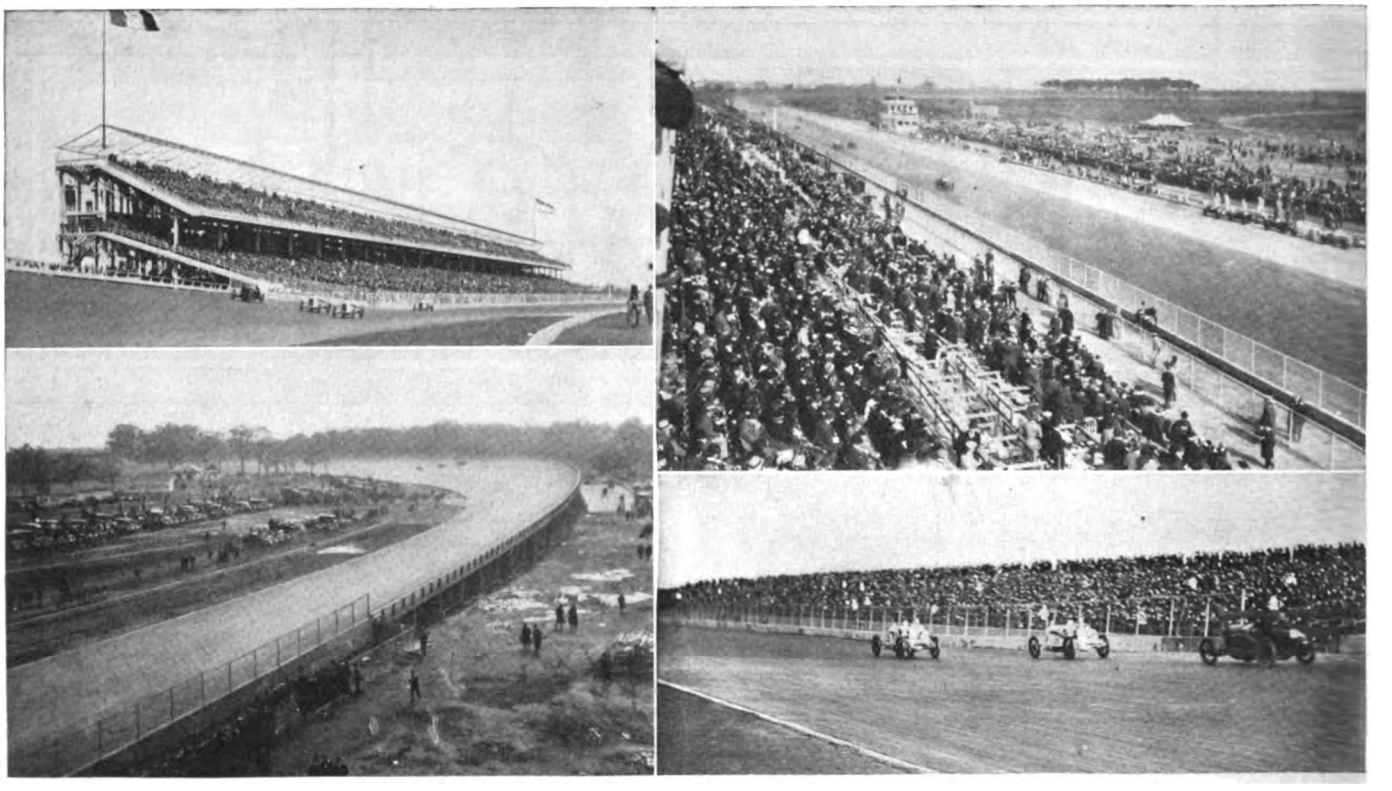
Winners in the Astor Cup Race

Car	Driver	Time	M.P.H.
Stutz	Anderson	3:24:42	102.60
Stutz	Rooney	3:25:29	102.19
Duesenberg	O'Donnell	3:39:55	95.45
Ogren	Alley	3:47:03	92.52
Duesenberg	Henderson	3:47:26	92.31
Delage	Limberg	4:09:23	84.22
Sebring	Haibe	Flagged at 298 miles	
Mulford Spec.	Vail	Flagged at 274 miles	

SHEEPSHEAD BAY MOTOR SPEEDWAY, Oct. 9—Proud is the American eagle to-day. Proud of a victory nobly won over the best that foreign lands could produce. Proud of Gil. Anderson and his triumphant Stutz that completed the 350-miles for the Astor Cup a winner at an average of 102.6 m.p.h.

The great achievement of Anderson alone was an accomplishment that marks a new era in speed competitions, but when Tom Rooney, his team mate, in another Stutz of identical design, crossed the wire 47 sec. later, he completed a victory which sets a new mark for the followers of Mercury. So close were these two white-clad team mates that until the last of the 175 laps had been covered it was impossible to say which would cross the line a winner. Rooney averaged 102.19 m.p.h.

Judgment, design and materials were the factors that lay beneath the surface of the vision of speed. All during the



Estimates of 100,000 attendance were made, the great stands were packed with spectators and the infield with parked cars which are said to have reached the number of 8000

3½-hr. contest the two racers ran with a regularity that showed a realization of what speed was necessary to win, and a determination not to deviate a particle from that speed either to catch those who set too hot a pace at the start or to lag at the finish when the race was won. Like a pair of soaring gulls the Stutz team circled the vast speedway, now gliding along the stretches and now rising like the wheeling birds they resembled high on the parabolic surface of the banked curves. Only one stop did the winner make and but two were made by the second car, the difference in time between the two cars at the finish being practically made up by the additional stop. Anderson's pause in his race to victory was to take on more fuel and Rooney stopped once for the same reason, and besides changed a tire.

Stamina was necessary, stamina of car, stamina of driver and stamina of every vital component. Tires and spark plugs had to stand the strain as well as crankshafts and connecting-rods and to the endurance of the materials Harry Stutz to-day owes the acquisition of 35 points toward the Astor Cup and his drivers the possession of $30,000 in prize money out of the $50,000 total.

Although not making such high speed, great credit for consistent running is owed to the Duesenberg motors and the six cars which they propelled, for of these six no less than five finished in the money and the sixth might have done so had not the driver earned disqualification for a petty breach of the rules.

Contest of Materials

The race was a contest of steel. The scientifically designed track provided the driver with every facility to make all the speed desired and the result, with such men as Resta, Aitken, Oldfield, Burman, De Palma, Wilcox, Mulford, Rickenbacher, Pullen, and others in the line up, was that the drivers were faster than their cars. From the very beginning it was a struggle for leadership, a continuous duel between Stutz and Peugeot, which ended only 6 miles from the finish when all five of the Peugeots had retired to their pits, and two of the Stutzes alone were running.

Harry Stutz with the two winning teams. On his right is Gil Anderson with his mechanic and on his left Tom Rooney

Prizes Won by Drivers in Astor Cup Race

Driver	Speedway Offer	Bosch Magneto	Norma	Vacuum	Total
Anderson	$20,000	$600	$100	$100	$20,800
Rooney	10,000	400	...	...	10,400
O'Donnell	5,000	300	...	...	5,300
Henderson	4,000	...	...	...	4,000
Alley	3,000	...	...	...	3,000
Limberg	2,000	...	...	...	2,000
Haibe	1,400	...	...	...	1,400
Vail	1,200	...	...	...	1,200

Mulford gets $75 for fast elimination lap, given by Vacuum Oil Co.

Resta gets $50 for fast lap during race, given by Norma Co. of America.

Aitken gets a silver trophy with $100 from Motor-Vim Sales Corp., New York City, for leading at 200 miles.

Resta, the cool calculating yet brilliant pilot of the Peugeot quintet, who in the early part of the race achieved a lap at 110 m.p.h., found his magnificent car beaten to surrender at the 104th mile. One of the overtaxed connecting-rods could support the burden no longer.

Aitken in an equally fleet Peugeot, who took up the burden of leadership after Resta had been eliminated, bore the Peugeot flag 138 miles further, at which point he was overtaken by the same fate that had befallen his team mate.

This left Burman alone to uphold the reputation of the house of Peugeot. Nobly he accepted the task and, though with a car slightly slower than the other two, he forced the Stutzes to maintain the pace they had been setting. At last within three laps of the finish, and with $5,000 prize money for third place almost within his grasp, his car too was beaten. A broken clutch removed the last of the Peugeots.

Pete Henderson and Eddie O'Donnell, Duesenberg drivers, with Fred Duesenberg

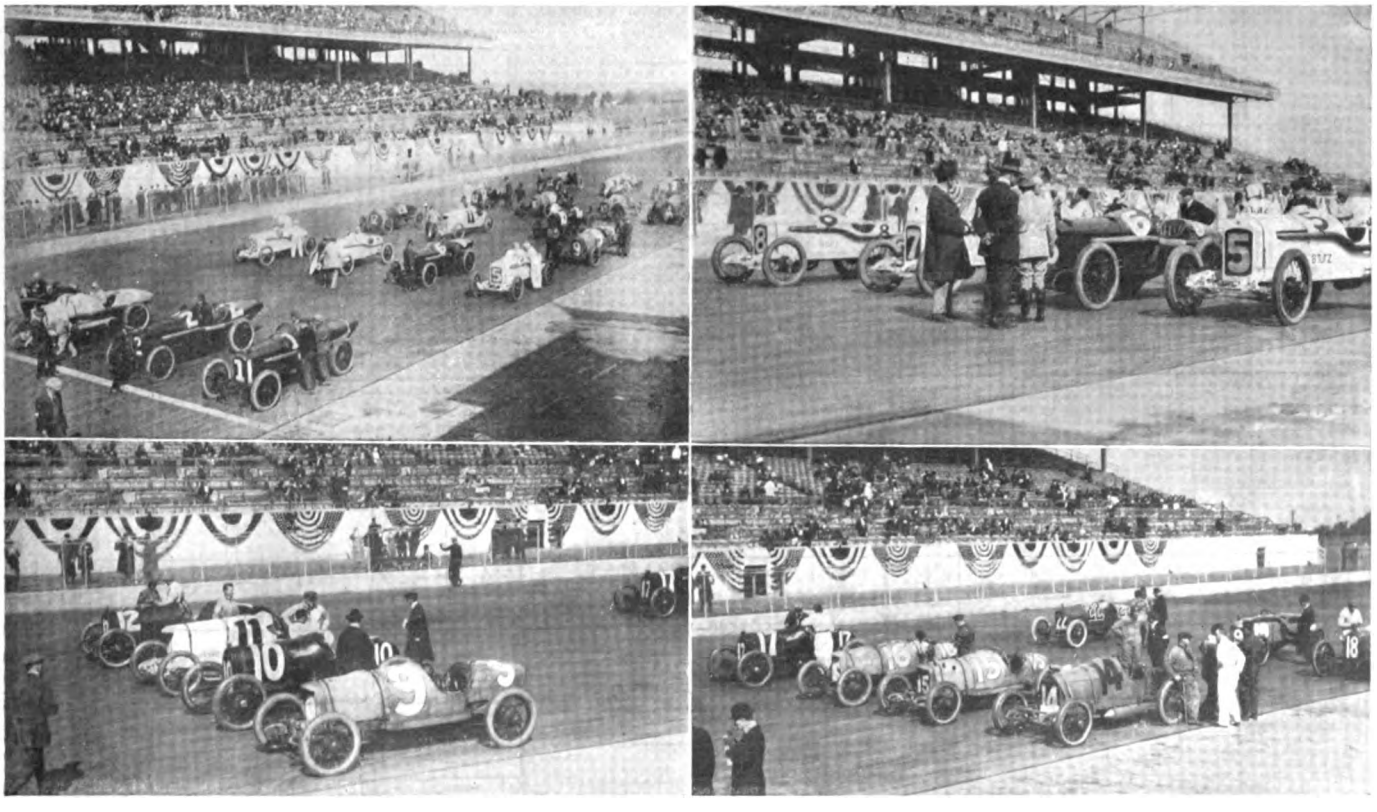
Mulford's new Peugeot ran but 16 miles, suffering then the same fate as that which later overtook Resta and Aitken. Wilcox, too, with the fifth Peugeot came to a stand on the north bank after 74 miles and could not start again.

At the start of the race there were twenty cars. When the starter's flag went down with the signal that the race was over only six had finished and two were still running, but will receive seventh and eighth prize money. Of the six who completed the 350 miles five were American cars. After the two Stutzes were two Duesenbergs driven by O'Donnell and Henderson, occupying third and fifth positions with the Ogren driven by Alley fourth, then came Limberg's Delage, sixth. Haibe's Sebring and Vail's Mulford were still running when the race was called off. Thus, with the Delage, which finished sixth, as the only foreign representative in the race when the end was reached, America's triumph was complete. Far off in the trenches of somewhere in France, Boillot, Goux and Guillot when they receive the news by the devious routes of wartime intelligence will eagerly await the day when they can once again turn the tables. For the nonce, however, American drivers and American cars reign supreme.

An Impressive Spectacle

Never has there been a more impressive scene at an automobile race than that which greeted the throng of enthusiasts when the announcing bomb was hurled high in the air unfurling the stars and stripes which was slowly wafted out to sea by the westerly breeze. The attendance has been estimated as all the way from 65,000 to 100,000 and the true figure probably lies somewhere between these two. With the tremendous inclosure capable of containing many times this number if necessary, it is hard to judge correctly; but stripped to the bare fact it is no doubt true that this Astor Cup race was witnessed by more people than ever entered an inclosure to witness a speed contest at any time in the history of the world.

From early morning New York's great network of transit facilities concentrated its offerings of humanity upon the bridges and tubes leading across the East River to the bor-



Tense Moments—Cars lined up at start waiting for the word which sent them on their momentous ride

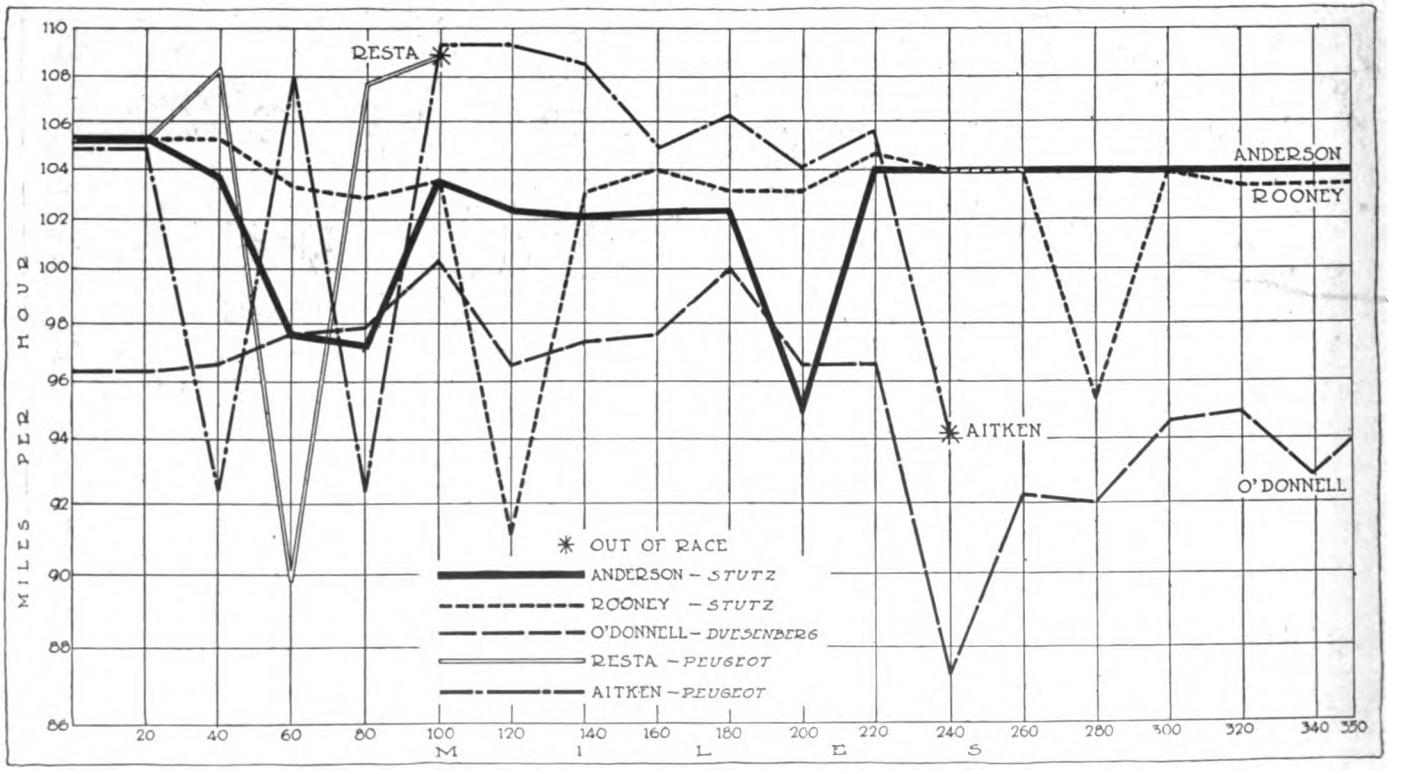
Times of the Cars Every 20 Miles in the 350-Mile Race for the Vincent Astor Cup and

No.	Car	Driver		Miles: 20	Position	40	Position	60	Position	80	Position	100	Position	120	Position	140
5	Stutz	Gil Anderson	Elapsed time	11:25	4	22:51	3	34:29	1	46:10	1	57:48	3	1:09:32	1	1:21:18
			Time for 20 miles			11:26		11:38		11:41		11:38		11:44		11:46
7	Stutz	Tom Rooney	Elapsed time	11:25	3	22:52	4	34:30	2	46:11	2	57:47	2	1:10:59	4	1:22:38
			Time for 20 miles			11:27		11:38		11:41		11:36		13:12		11:39
9	Duesenberg	Ed O'Donnell	Elapsed time	12:28	10	24:54	11	37:11	8	49:27	8	1:01:25	8	1:13:51	6	1:26:11
			Time for 20 miles			12:26		12:17		12:16		11:58		12:26		12:20
22	Ogren	Tom Alley	Elapsed time	13:00	17	25:50	16	38:44	12	51:42	11	1:04:15	12	1:16:57	9	1:29:42
			Time for 20 miles			12:50		12:54		12:58		12:33		12:42		12:45
16	Duesenberg	P. Henderson	Elapsed time	12:36	12	25:18	12	38:02	10	50:36	10	1:03:01	10	1:15:42	8	1:28:27
			Time for 20 miles			12:42		12:44		12:34		12:25		12:41		12:45
19	Delage	Limberg	Elapsed time	13:09	18	25:51	17	40:55	14	53:59	14	1:06:46	14	1:19:29	12	1:32:16
			Time for 20 miles			13:42		15:04		13:04		12:47		12:43		12:47
14	Sebring	Ora Haibe	Elapsed time	12:59	15	42:52	18	1:11:55	15	1:35:52	15	1:49:58	15	2:09:25	13	2:22:25
			Time for 20 miles			29:53		29:03		23:57		14:06		19:27		13:00
11	Mulford Special	Ira Vail	Elapsed time	12:50	13	25:31	13	38:01	9	50:32	9	1:02:47	9	1:15:19	7	1:27:50
			Time for 20 miles			12:41		12:30		12:31		12:15		12:32		12:31
4	Peugeot	Bob Burman	Elapsed time	12:29	11	24:01	6	35:40	5	47:20	4	58:57	4	1:10:44	3	1:22:29
			Time for 20 miles			11:32		11:39		11:40		11:37		11:47		11:45
15	Duesenberg	Willie Haupt	Elapsed time	13:00	16	25:50	15	38:44	13	51:43	12	1:04:26	13	1:17:38	11	1:30:46
			Time for 20 miles			12:50		12:54		12:59		12:43		13:12		13:08
2	Peugeot	J. Aitkin	Elapsed time	11:25	2	24:25	10	35:33	4	48:37	7	59:37	5	1:10:40	2	1:22:03
			Time for 20 miles			13:00		11:08		13:04		11:00		11:03		11:23
20	Stutz	Ralph De Palma	Elapsed time	12:11	7	24:11	7	36:12	6	47:57	5	1:01:22	7	1:13:08	5	1:24:51
			Time for 20 miles			12:00		12:01		11:45		13:25		11:46		11:43
12	Pugh Special	Jack Lecain	Elapsed time	12:51	14	25:49	14	38:43	11	51:44	13	1:04:14	11	1:17:06	10	1:31:05
			Time for 20 miles			13:38		13:34		13:01		12:30		12:52		13:59
10	Maxwell	Ed Rickenbacher	Elapsed time	12:11	8	24:12	8	36:12	7	48:14	6	1:00:09	6	O ut 110 mil	es.	
			Time for 20 miles			12:01		12:00		12:02		11:55				
1	Peugeot	Dario Resta	Elapsed time	11:24	1	22:30	1	35:14	3	46:24	3	57:26	1	O ut 104 mi	les.	
			Time for 20 miles			11:06		13:24		11:10		11:02				
6	Peugeot	Howard Wilcox	Elapsed time	11:28	6	23:15	5	43:18	16	O ut 74 mile	s. Disq	ualified; pu	shed car	.		
			Time for 20 miles			12:27		20:03								
17	Maxwell	Ed Pullen	Elapsed time	12:12	9	24:12	9	O ut 56 mile	s. Broke	n connec	ting-ro	d.				
			Time for 20 miles			12:00										
8	Stutz	Earl Cooper	Elapsed time	11:27	5	22:51	2	O ut 46 mile	s. Broke	'n valve.						
			Time for 20 miles			11:24										
3	Delage	Barney Oldfield	Elapsed time	Out 16 mile	s. Bro	ken piston	and conn	ecting-ro	d.							
			Time for 20 miles													
18	Peugeot	Ralph Mulford	Elapsed time	Out 14 mile	s. Bro	ken connec	ting-rod.									
			Time for 20 miles													

ough of Brooklyn wherein is located the great speedway. Mute astonishment was depicted on the faces of the great masses of New Yorkers, who, hardened as they are to new sensations, never had any idea that such a vast structure could have been arranged to provide a track for the speedy cars. With pictures of the Vanderbilt cup races of old still dwelling in their minds, these people who have not seen an automobile race of note since that time, were treated to a sensation that was little short of bewilderment. The atmosphere of the old Sheepshead Bay track where some of the greatest horse races in the metropolitan district were held has been superseded by the mechanical demons of speed which depend upon steel instead of pedigree.

Infield Was Packed

Packed in the infield were those who came to view the race from the reserved parking space. According to Manager Everard Thompson there were 8000 automobiles holding these spaces. Besides these every available open space held its quota of private automobiles.



Average speeds for each successive 20-mile period plotted for the five fastest cars

$50,000 Prizes Held on the New Sheepshead Bay Motor Speedway, Saturday, October 9

Position	100	Position	100	Position	200	Position	220	Position	240	Position	260	Position	280	Position	300	Position	320	Position	340	Position	350	Position	M.P.H.
1	1:33:02	1	1:44:42	1	1:57:21	2	2:08:58	3	2:20:37	4	2:32:14	1	2:43:53	1	2:55:32	1	3:07:14	1	3:18:54	1	3:24:42	1	102.69
	11:44		11:40		12:39		11:37		11:39		11:37		11:39		11:39		11:42		11:40		5:48		
4	1:34:11	3	1:45:50	3	1:57:29	3	2:08:58	4	2:20:36	2	2:32:14	2	2:44:50	2	2:56:26	2	3:08:03	2	3:19:40	2	3:25:29	2	102.19
	11:33		11:39		11:39		11:29		11:38		11:38		12:36		11:36		11:37		11:37		5:49		
6	1:38:29	6	1:50:37	6	203:03	5	2:15:29	5	2:29:18	5	2:42:24	4	2:55:17	4	3:07:50	3	3:20:37	3	3:33:32	3	3:39:55	3	95.45
	12:16		12:08		12:26		12:26		13:49		13:06		12:53		12:41		12:39		12:55		6:23		
9	1:42:33	9	1:55:22	8	2:08:13	8	2:21:07	7	2:34:03	7	2:46:59	6	2:59:35	5	3:12:53	4	3:27:35	4	3:40:35	4	3:47:03	4	92.52
	12:51		12:50		12:50		12:54		12:56		12:56		12:36		13:18		14:42		13:00		6:28		
8	1:41:17	7	1:53:45	7	2:06:19	7	2:20:28	6	2:33:14	6	2:46:18	5	3:03:14	6	3:15:32	5	3:28:24	5	3:41:15	5	3:47:26	5	92.31
	12:50		12:28		12:34		14:09		12:46		13:04		16:56		12:18		12:52		12:51		6:11		
12	1:45:06	11	1:57:54	10	2:10:40	9	2:23:33	8	2:43:56	8	3:07:19	7	3:19:53	7							4:09:23	6	84.22
	12:50		12:48		12:46		12:53		20:23		23:23		12:34										
13	2:35:21	12	2:48:16	12	3:01:12	12	3:14:12	11	3:27:27	11	3:45:02	8	3:58:27	8	Flagged	at 298	miles.						
	12:56		12:55		12:56		13:00		13:15		17:35		13:25										
7	1:42:13	8	2:01:28	11	2:18:32	11	2:49:24	10	3:12:51	10	3:46:16	9	Flagged	at 274	miles.								
	14:23		19:15		17:04		30:52		23:27		33:25												
3	1:34:13	4	1:45:51	4	1:57:30	4	2:08:57	2	2:20:36	3	2:32:14	3	2:45:56	3	2:57:37	..	3:09:13	..	3:20:49	Out	346 miles		
	11:44		11:38		11:39		11:27		11:39		11:38		13:42		11:41		11:36		11:36	Trans	mission t	rouble	
10	1:43:08	10	1:56:44	9	2:11:58	10	2:32:45	9	2:53:12	9	Out 254	miles.	Disqual	ified; p	ushed ca	r.							
	12:22		13:36		15:14		20:47		20:27														
2	1:33:30	2	1:44:48	2	1:56:21	1	2:07:43	1	2:20:27	1	Out 240	miles.	Cracked	cylind	er.								
	11:27		11:18		11:33		11:22		12:44														
5	1:36:34	5	1:48:14	5	2:03:33	6	Out 210	miles.	Broken	ball be	aring.												
	11:43		11:40		15:19																		
11	Out 156	miles.	Broken	clutch	collar.																		
Burne	d bearing.																						
Broke	n connec	ting ro	d.																				

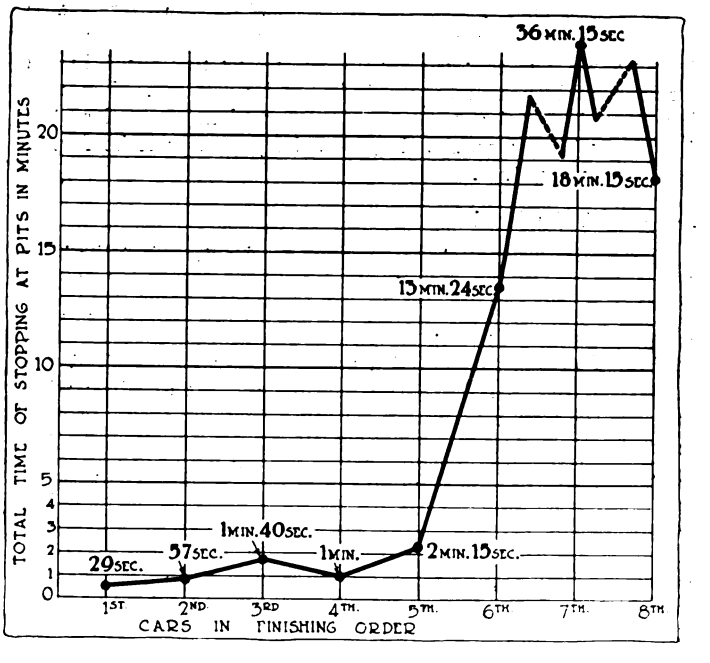
Speedway Organization Proves Good As Huge Crowd Gathers

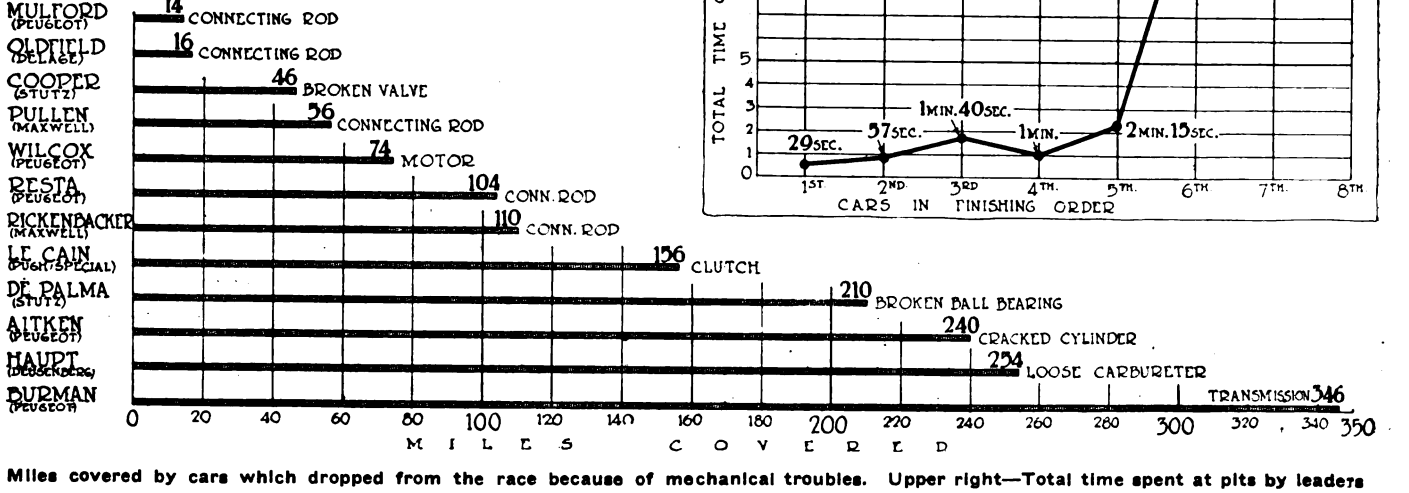
Besides the cars in the infield there were great numbers of pedestrians who preferred to view the race from on foot instead of from the bleachers. The grandstands were easily 85 per cent filled. The masses of spectators were like restless waves as they shifted and swayed, until from the infield the whole scene resembled a sea of faces and colors as the garments of men and women reflected the sun which combined with a gentle west wind to make the day ideal.

Not long after 9 o'clock in the morning the crowds began to stream through the gates. Carefully marshalled under the guardians of the Speedway, those on foot made their way into the grandstands and into the infield while those who preferred to witness the race from their cars drove into their appointed positions in the parking spaces, two deep along the home stretch. A tremendous wave of sound filled the air as the continuous roar of the crowd was punctuated from time to time with the crackling of the exhausts and the hoarse shouts of the megaphone-armed announcers who from the official stand across the track from the grandstand received word from time to time regarding the progress of events.

Race Started at Noon

Shortly before 12 o'clock, at which time the race was scheduled to start, the officials appeared for the inspection





Miles covered by cars which dropped from the race because of mechanical troubles. Upper right—Total time spent at pits by leaders

of the track, the racers were lined in the positions they had earned while in the qualifying trials and all was made ready to send the speedy cars on their way. Just at 2 minutes to twelve the cars were started around amid a great roar from the now rapidly filling stands, on their exhibition paced lap. Four deep in rank and five in file the twenty cars traveled around the track at about 60 miles an hour and as they again crossed the line Fred Wagner, official starter, sent them on their way.

Three of the four cars in the front line were dark blue Peugeots numbered from inside to outside 1, 2 and 4. Number 3 was a Delage. The second line of four cars had three Stutzes and a Peugeot, the Stutz numbers being 5, 7 and 8 with 6 the Peugeot. Thus at the very start, the three teams which were always regarded as the most dangerous contenders, were closely grouped. Resta was number 1 in his Peugeot and cars 1, 2 and 4 driven by Resta, Aitken and Burman streamed out in the order named at the end of the first lap of the race, showing that the pace was to be forced from the very start.

Peugeots Take Lead

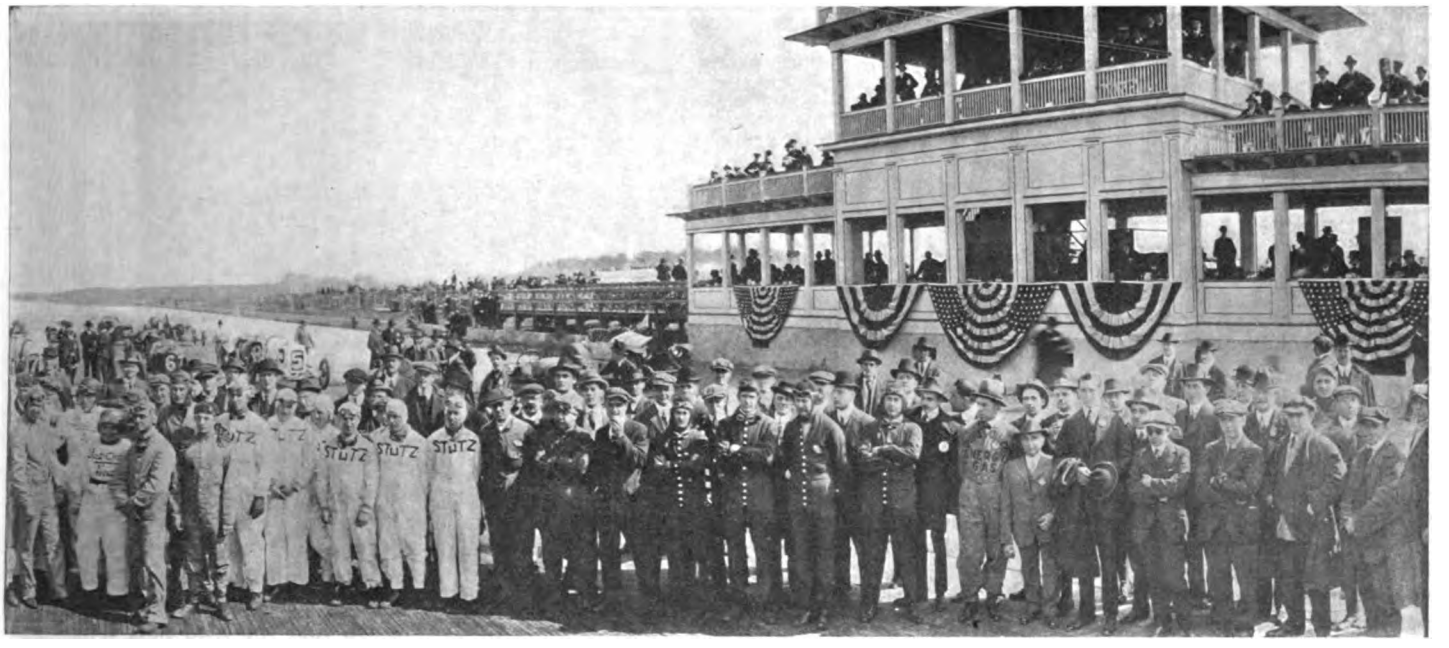
Gradually the line of racers lengthened out. First the blue Peugeots, then the light blue Delages, the white Stutz team, the gray Duesenbergs, the green Sebring, gray and black Maxwells all streaking past so rapidly that when close at hand a blur of passing color and a vivid number was all that the eye could photograph. Gracefully as a flock of birds with wheels which seemed not to turn but to glide over the surface of the track they sped around the great board disk with its surface that resembled the smooth deck of a yacht.

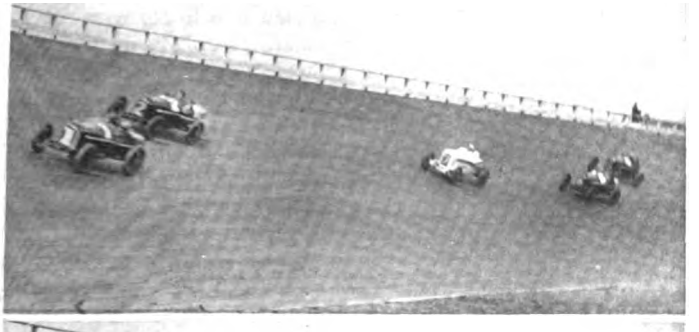
Like a pack of hounds trailing the quarry the barking exhausts of the speeding pursuers forced Resta to do his utmost to hold his early acquired lead. Even among the Peugeots the rivalry for first place seemed to be forcing the leaders to speeds which were dangerously near the ultimate. Each car was possessed of so much endurance measured in speed and distance. The Peugeots took from their store in speed, the Stutz team gaged accurately what could be sacrificed in speed to gain the necessary endurance and—won.

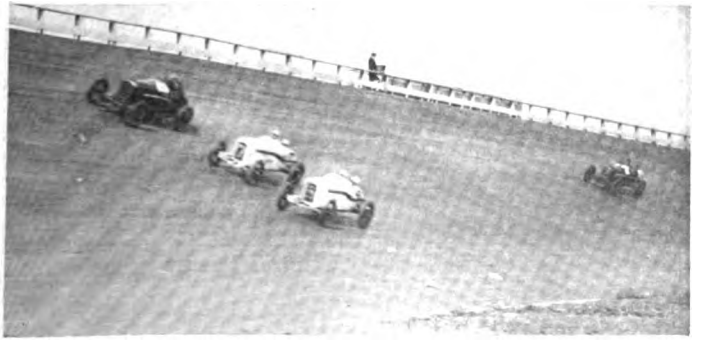
As the minutes passed the group of massed cars gradually developed into a line punctuated by smaller groups, until finally not more than a few seconds elapsed at any time before a car would pass the stands. Singly, in twos and sometimes as many as six in a struggling group they would come gliding down the half mile level stretches and then rising like

Above—Resta pushing his Peugeot to the pits after being retired from the race by a broken connecting-rod
Below—The huge infield offers space for thousands of cars

aeroplanes up the easements into the great parabolic curves at each end of the elliptic track. The smell of hot rubber, burning gasoline and overheated steel filled the air while the babble of voices from the packed seats brought the imagina-







Top—De Palma for many miles trailed Anderson and Burman
Center—Resta with Aitken on his heels leads the field
Bottom—The famous trio, Burman, Anderson and Rooney

tion back to the days of Rome where it was thumbs down for he who failed in battle.

Not an accident marred the day, although the management had provided surgeons and nurses for emergency.

Stutz Pit Signals Big Factor in Victory

All through the day the pits presented a busy scene. When not actually engaged in work upon the cars the attendants were signaling positions and instructions. It is not too much to say that a factor in the victory of the Stutz cars was the level-headed guidance from the pit coupled with the rigid obedience to these signals on the part of the drivers. Tire changes were made in 30 seconds and under. Gasoline was hurled into the tanks in marvelously short time but oftentimes with great wastage as the attendants in their excitement neglected the fact that the mouth of a funnel is only so large even if it is big enough to go over a man's head.

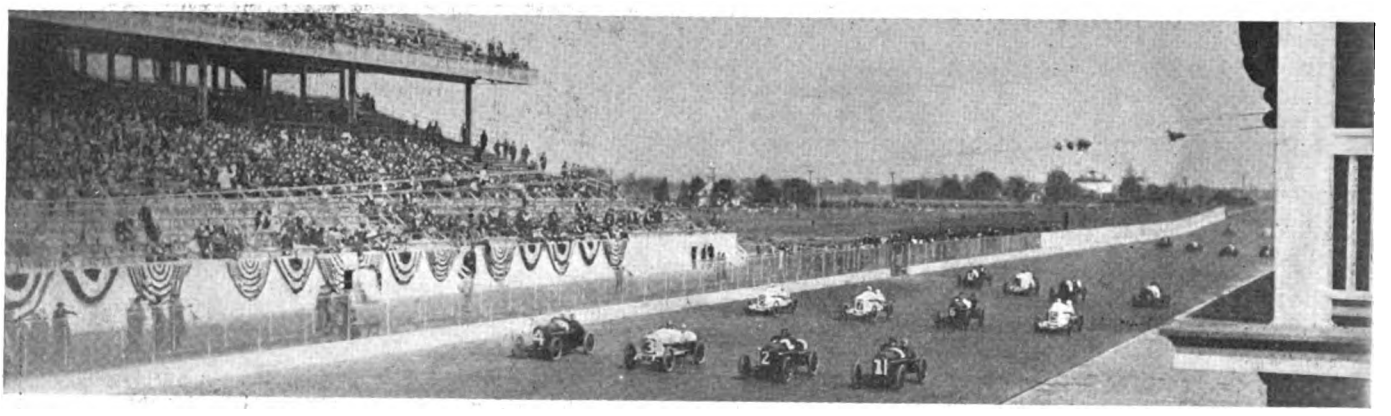
Winner Stopped Once

Anderson stopped but once to take on gasoline. Rooney in the second Stutz stopped once for gasoline and once again to change a right rear tire. O'Donnell's Duesenberg, which finished third, made one stop for gasoline and oil. Alley's Ogren stopped once for the same reason and Henderson, did likewise, with an additional pause for new plugs.

Mechanical troubles bothered the rest who finished, but a prominent fact is that of the eight cars which took prize money, only two changed tires, and these but one apiece. They were Rooney's Stutz and Limberg's Delage.

At 4 o'clock the race was over, having lasted 4 hr. from the time of start. After Anderson had flashed across the line the great crowd started to dwindle rapidly and as they slowly filed from the stands to the awaiting cars and trains the mingled comments arose in a murmur which could be heard throughout the great enclosure. Few regretted having seen the wonderful spectacle and the comments were mostly of awe-struck amazement at the fearful speed attained with the safety which was brought strongly to the fore by the lack of the slightest accident. Practically 103 m.p.h. average had been made for a distance of 350 miles. At this rate of speed it would take but 30 hr. to cross the great continent of America. It would take 10 days to encircle the globe at the equator.

At the end of the first 20 miles there were but eighteen cars of the twenty left in the race. Ralph Mulford had been forced to withdraw his Peugeot on account of a broken connecting rod and Barney Oldfield, with a broken piston, connecting rod and crankcase, also was out of the race. At this



Crossing the line for the first time on the 350-mile grind, showing how evenly the cars maintained their positions on the paced lap

time Resta's flying Peugeot was holding the lead, closely followed by Aitken in his Peugeot and Rooney's Stutz. Immediately behind with not a foot separating the two cars was Gil Anderson in the Stutz, which finally won the race. Resta was setting a heart-rending pace. He was clocked for the twenty-second lap in 65 sec. about 110 m.p.h., the fastest lap of the day. His speed for mile after mile averaged better than 107 m.p.h. This pace soon told on his tires and at the end of the twenty-ninth lap he was forced to make a change on his right rear. This delayed him but a few seconds but enough to lose the lead which was eagerly snatched by Gil Anderson; and the white Stutz racer now became the pacemaker. At 60 miles Anderson was leading with Rooney second and Resta, gaining a few yards on every stretch, third.

When 80 miles was reached Anderson had averaged 103.97 m.p.h. with Rooney still second, and Resta, making laps at 109 m.p.h., third. At 60 miles Ed Pullen's Maxwell and Earl Cooper's Stutz had been eliminated and at 80 miles Howard Wilcox's Peugeot felt the strain of the sustained pace and could not start again after coming to a stop on the north curve. Between the eightieth and one-hundredth miles no eliminations were made, but at 100 miles Resta was again in the lead, having caught the Stutz at 84 miles and shortly after Rooney halted for a tire change. Resta had passed the 100-mile mark in 57 min. and 26 sec., which exceeded the recent record on the Chicago track by nearly a minute and a half.

Peugeot Broke Rod

Just after rounding the turn on the 104th mile Resta's Peugeot began to slacken its pace. A connecting rod had failed and the car was out. It had to be pushed to the pits and the Stutz team had lost their most formidable antagonist. Close behind Resta at the 100th mile were Rooney, Anderson, Burman and Rickenbacker. Rickenbacker had not much farther to go, however, as at the 108th mile he also broke a connecting rod putting his Maxwell among the list of those who had tried but failed. With Resta eliminated, Aitken, who had been delayed at the start, by tire troubles, which persisted to such an extent that he had to make four changes in less than three-quarters of an hour, began to become an important factor in the race. Anderson led at the 120th mile, having covered the distance in 1 hr., 9 min. and 32 sec. at the rate of 103.52 m.p.h. At the 140th mile Anderson was still the leader but Aitkin was crawling up, being less than a minute behind. Burman's Peugeot was 23 sec. behind this, and Rooney 9 sec. back of Burman.

Near the 160-mile mark Vail, who drove the Mulford Special, was compelled to give way to a relief driver due to the fact that he was partially overcome by the fumes of burning castor oil. George Theobold took his place and was the only relief driver used in the race. At 156 miles LeCain had to quit the race on account of a broken clutch collar on the Pugh Special.

All this time Aitken was slowly gaining on Anderson until at the 160-mile mark the latter only led by 29 sec. Rooney followed third and Burman fourth just 2 sec. apart. The race had settled down to a four-sided affair with the two Stutzes against the two Peugeots of Aitken and Burman.

At the 186th mile Aitken flashed into the lead and once more those who were hoping for America to win began to lose heart. The Peugeot had shown superior speed to the Stutz but there was still 65 miles to go and that last 60 miles was a matter of endurance. Anderson, at the 186th mile, made his only stop of the day to take on gasoline. Aitken took advantage of the time to increase his lead by more than half a lap and at the 200-mile mark he led by close to a minute, Rooney taking and leading Burman with DePalma fifth. At this time O'Donnell was sixth, Henderson seventh, with the remaining cars trailing behind. But it was not for long that DePalma remained a factor in the race. At 210 miles a broken ball bearing drove him out, narrowing the field to ten.

By this time Aitken had gotten so far in the lead that it looked as if Burman's Peugeot and the two Stutz cars were to struggle for second place. It was a close fight and waves of excitement swept over the crowd. Only a few seconds separated them at any instant. In the meanwhile Aitken made a stop for gasoline which he managed to take on in 30 sec., but got away again so fast that this did not cost him his lead. Only a few minutes later, when he had traveled 240 miles a cracked cylinder ended his chances of winning the race and entirely altered the prospective leadership.

The fight was now between Burman and the two Stutzes. Rooney took the lead at 260 miles, a few hundredths of a second in advance and so close was it that the timing instrument clocked all three cars at 152 min. and 14 sec., although at this time Rooney led with Burman second and Anderson third with the speed 102.46 m.p.h up to that time. Here the leaders saw that the speed must be increased, if anything, for a win and, wheel to wheel, they tore around the track until 12 miles further on Rooney and Burman both stopped for gasoline. The stop took longer than it should have for Burman lost nearly a lap and a half to Anderson. Rooney also went ahead and with 70 miles still to go Anderson led with Rooney second and Burman third, the leader being 2 min. ahead of Burman.

Burman Made Race

From this point on Anderson held his lead with Rooney and Burman fighting for second place until 340 miles. Then came Burman's breakdown and the veteran, after his magnificent driving for 3½ hr., was compelled to abandon the race. Never did a man drive a more courageous race in vain. Never did a speedway crowd owe more to an unrewarded driver, for Burman made the race but won no prize. Had it not been for his determination 100 m.p.h. average need never have been reached.

Leaders Make Few Stops at Pits

One Tire Change of Five American Cars Which Finished—Broken Connecting-Rods and Spark Plug Troubles Prevalent—Average 5 Miles per Gallon of Fuel—Water Connections Leaked

IN the final analysis the Astor cup race was a struggle of endurance. The stamina of steel and other materials was tested to the utmost and that the stresses on the vital parts of the cars were always close to the ultimate was shown by the fact that from an original field of twenty but eight cars were running when the race was called off.

All the thrills and triumphs took place on the board track where the speeding cars forced the pace higher than ever before in a race of this character. At the pits the activities were not as spectacular but even more deeply filled with meaning as to the hopes and fears of the struggling pilots.

Six Cars Finished

Only six cars finished the 350 miles and two were running when the race was brought to a close. And of the six that finished, the first five were American cars which showed their endurance to such a degree that it need never be said again that America cannot produce cars at least equal to those of Europe. These five cars all were forced at some time during the race to come to the pits; but of the five three only made one stop each for fuel and oil. The other two made one additional stop each, the second Stutz to change a right rear tire and the Duesenberg, which finished fifth, made a change of plugs. Thus the total stops for the first five cars were but seven.

Limberg's Delage which finished sixth, and was the only foreign car to go the distance, stopped three times, making a change of a tire, taking on fuel and water besides making ignition and carbureter adjustment. The two other cars which remained in the running until flagged off the course were Haibe's Sebring and the Mulford Special. The first of these made seven stops and the other five stops.

Early in the race the remarkable pace set by the Peugeot team began to tell upon the striving cars which tried to follow their lead. Before the race was ½ hr. old eight cars had limped into the pits for various repairs. The race endured 4 hr. In the second half hour ten stops were made; in the third half hour period, five; in the fourth, five; in the fifth, eight; in the sixth, nine; in the seventh, four, and eighth, two.

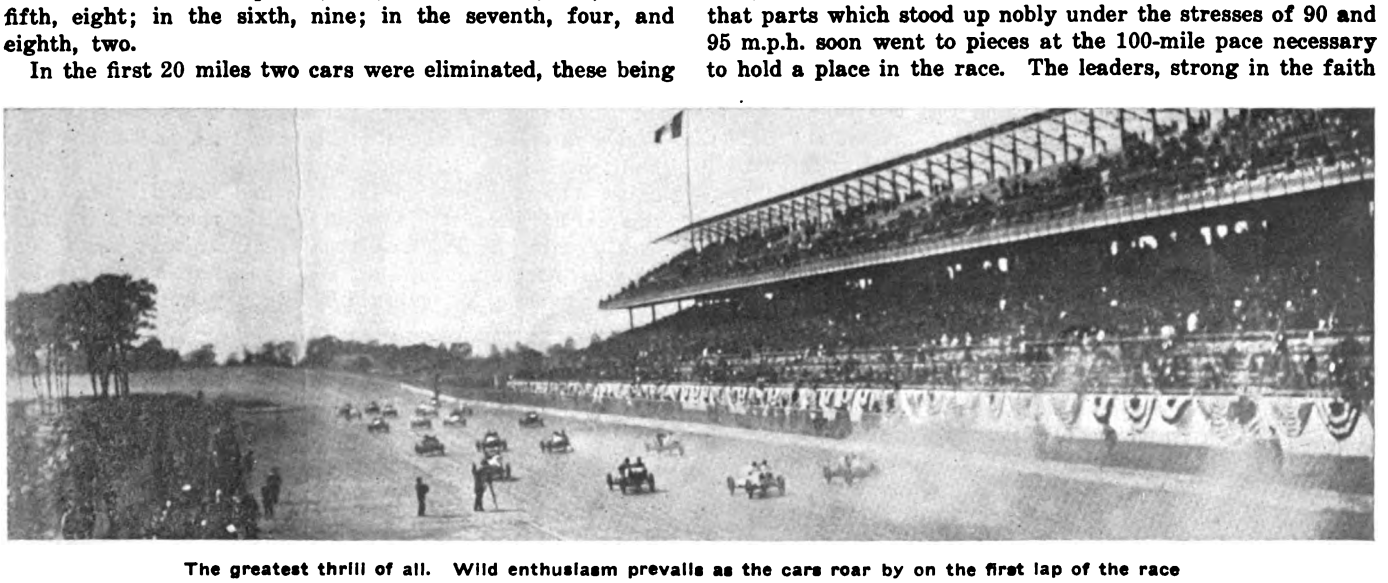
In the first 20 miles two cars were eliminated, these being Mulford's Peugeot and Oldfield's Delage. Between 40 and 50 miles two others went out, Cooper's Stutz and Pullen's Maxwell. Between 60 and 80 miles Wilcox's Peugeot dropped. The next to fall by the wayside were between 100 and 120 miles when Resta's Peugeot, the pacemaker to that time, and Rickenbacher's Maxwell broke down. The next elimination was Lecain's Pugh Special at 156 miles, then De Palma's Stutz at 210 miles, Aitken's Peugeot at 240 miles, Houk's Duesenberg at 254 and finally Burman's Peugeot with only 4 miles to go.

The greatest number of stops was for the replenishment of fuel tanks necessary for every one. On the average the tank capacities of the cars was about 40 gal. and on this amount they ran for about 200 miles, the fuel consumption average being quite close to 5 miles per gallon. The stops for gasoline were fourteen in all. Tires and oil were next in order of importance, ten stops being made for each, although oftentimes oil and gasoline were replenished at the same time that tires were changed. Tire troubles started early. Aitken's Peugeot, although afterwards in the lead and the pacemaker of the race, had to make four changes in the first 45 min. Before he had been on his way 20 min. he had to make his first change and another one 4 min. later.

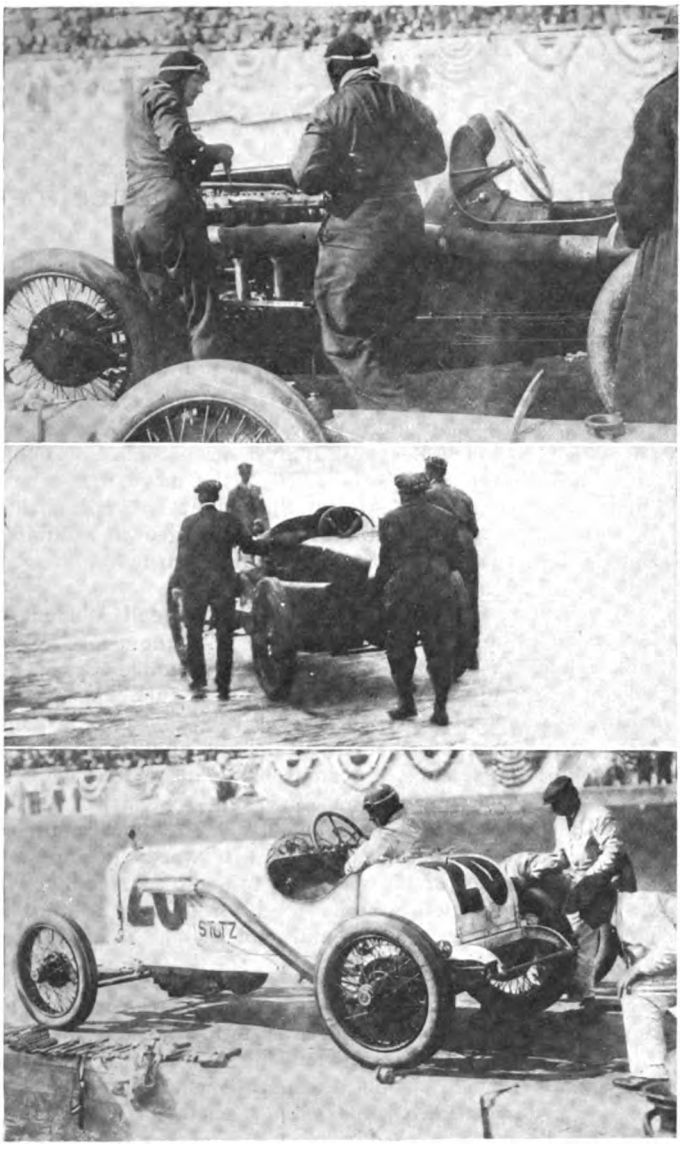
Mechanical Troubles Early

Mechanical troubles also started early in the race. The stops for spark plugs had a greater total than any other in this classification, seven cars pausing at the pits for their renewal. Carbureter troubles caused five interruptions; water systems four; valves and valve mechanisms three; connecting-rods four, and bearings two. Judging from the results during the race it almost looked as if connecting-rods defeated the Peugeot team, for three of the five had to abandon the race because these had broken.

Stops for such important reasons as breaks in the valve mechanism, connecting-rods and bearings were practically always fatal and resulted in withdrawal of the car from the race, and as time went on it became more and more evident that parts which stood up nobly under the stresses of 90 and 95 m.p.h. soon went to pieces at the 100-mile pace necessary to hold a place in the race. The leaders, strong in the faith



The greatest thrill of all. Wild enthusiasm prevails as the cars roar by on the first lap of the race



Studies of effort and of resignation. Top—Wilcox changes plugs. Center—Bringing in Resta's vanquished car. Lower—De Palma takes a new right rear tire as the other cars roar by

of the stamina of their cars immediately adopted the tactics of running the weaker competitors to death, and one by one those who had asked more than steel could supply were forced to crawl to the pits with parts broken that could not be repaired. Although attaining an average speed higher than any had anticipated, Gil Anderson did not have to come to the pits once for a tire replacement. His only stop was for gasoline. His team mate, who was less than a minute behind had stopped but once for tires and at the time of making his change, as much gasoline as could be thrown into the tank during the rapid change of wheels, was supplied. The tire change, however, was so rapid, that more gasoline was splashed on the concrete pit pavement than into the tank.

Six out of the eight who finished did not change a wheel from one end of the race to the other; in fact of the twenty who started but ten tire changes were made and among the eight who finished the total tire changes were two. Tom Rooney changed a right rear on his Stutz when the race was just an hour old, and Limberg changed a right front on his Delage half an hour after first crossing the line.

Making a study of the tire changes it is interesting to note that of the ten tires changed, nine were on the right side, the only left was the rear on Haupt's Duesenberg which was changed at the same time as the right rear because the pit attendants thought it looked worn. The tires at the end of the race did not seem to have traveled the 350 miles at such a speed and it was a noteworthy fact that most of the failures were not due to wear but rather to the ripping off of the tread. The only car equipped with fabric tires, that is Tom Alley's Ogren which had Nassaus, went through the race without a change.

After Oldfield's Delage and Mulford's Peugeot had been eliminated before 20 miles had been traveled, Wilcox brought his Peugeot to the pits for water and a right tire. The overheating was the first sign of the trouble which caused him later to drop out of the race. Fifteen minutes after his first stop he had to make another to take on more water and this time to change his plugs which were so hot that the points were fused practically together. Six minutes later a loose magneto wire, and irregular firing made him stop again, after which he was eliminated automatically by pushing his car which had developed engine trouble of such a serious nature that he could no longer run.

Aitken Had Tire Trouble

Aitken's tire troubles developed soon after the race started. A right front was changed after he had been on his way 19 min. Four minutes later a right rear, then a 16-min. interval and another right front, and 15 min. later another right rear. From this time on he suffered no more tire trouble, but later in the race, when he had held the lead for many a long mile, a broken valve and a cracked cylinder forced him to come to the pits. When water was put in the radiator it poured out the exhaust pipe showing that his trouble was too serious to resume the race.

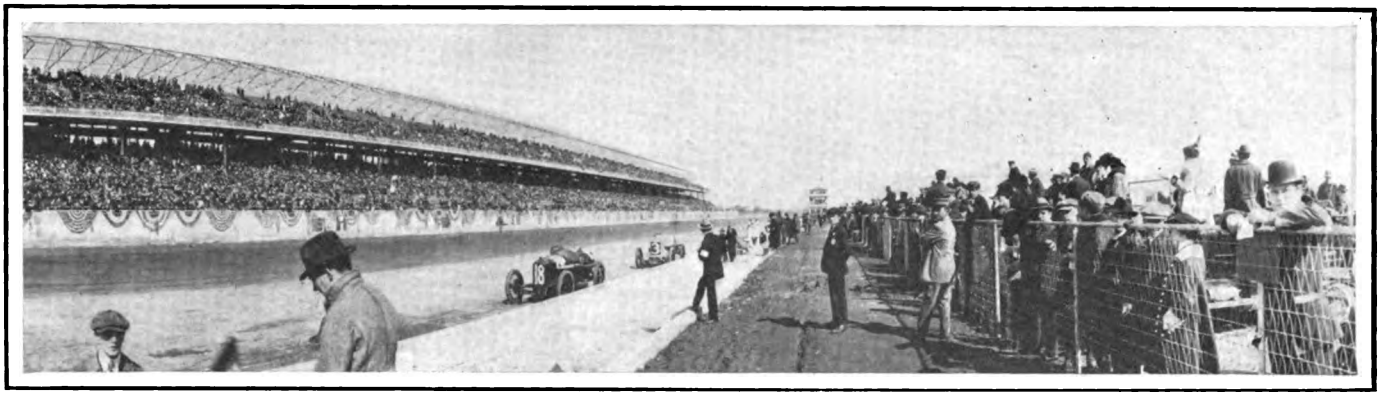
Spark-plug troubles which occurred frequently during the race showed that many of the drivers were either oiling so lavishly that the plugs had become sooted or the design of the cylinder casting was such that the heat was not carried rapidly enough away from the plugs. This bothered Haibe in his Sebring throughout the race. After traveling but 20 min. he stopped and renewed two plugs. Not 15 min. after this his water connections developed a leak and drenched his magneto. A half hour later he had the same trouble and then after another half hour he stopped for two new plugs and shortly after for three more and some oil. He took on plugs and oil again when he had been traveling for 2 hr. and changed two others just before finishing seventh.

A stop for change of plugs was made by Henderson in the Duesenberg not long after he had traveled three-fourths the distance. This was his second stop as when he had just about reached the half-way mark he took on gasoline and oil. Limberg in his Delage changed all his spark-plugs while taking on gasoline and making a carbureter adjustment just after Henderson in his Duesenberg had changed his plugs. The Limberg-Delage was one of the two who finished with tire changes, Tom Rooney, in his Stutz, being the other.

Ira Vail in the Mulford Special went through the greater part of the race with a trouble which threatened at any moment to become serious. This was a cracked exhaust sustained after he had been on his way 1 hr. and 40 min., and had traveled just half the 350 miles. He had a cracked exhaust manifold between the first and second cylinders but this did not prevent his continuing the race and finishing in eighth place. Vail's other troubles were a leaky pump gland, a carbureter adjustment and a dirty carbureter strainer. The leaking pump gland bothered Vail in very much the same way as it did Haibe.

Broken Connecting-Rods

The third car to drop out in the race was Pullen's Maxwell, which had a broken connecting-rod and as a result a broken crankcase. Resta's second stop was his last, as he was eliminated when the race was 1 hr. old, by a broken connecting-rod. Previous to this he had made one stop for a right rear shoe. Only 2 min. after Resta went out, a burned-out bearing eliminated Rickenbacher and his Maxwell, which had not



Two of the derelicts, Mulford's Peugeot and Oldfield's Delage, abandoned at the pits

previously pulled up to the pit wall. The first stop of Jack Lecain's Pugh Special also indicated a fatal mishap as he was forced to leave the race because of a broken clutch collar.

Ralph De Palma's large following were all disappointed, for after changing a right rear tire when he had traveled about one-third the distance, he very shortly after had to make another stop for water, gasoline and oil, and later was put out of the race by a broken ball bearing. Evidently he had suspected the trouble on his previous stop, for while the water, gasoline and oil were being added he had lifted the hood to inspect his motor.

Bob Burman Unfortunate

A genuine sigh of sympathy went up from the stands when Bob Burman after running a magnificent race for 346 miles, and having but two laps to go to finish, was forced to drop out with a loose flywheel, which put his clutch out of commission. Burman had not made a stop before this time except to take on gasoline and oil after he had traveled nearly 300 miles.

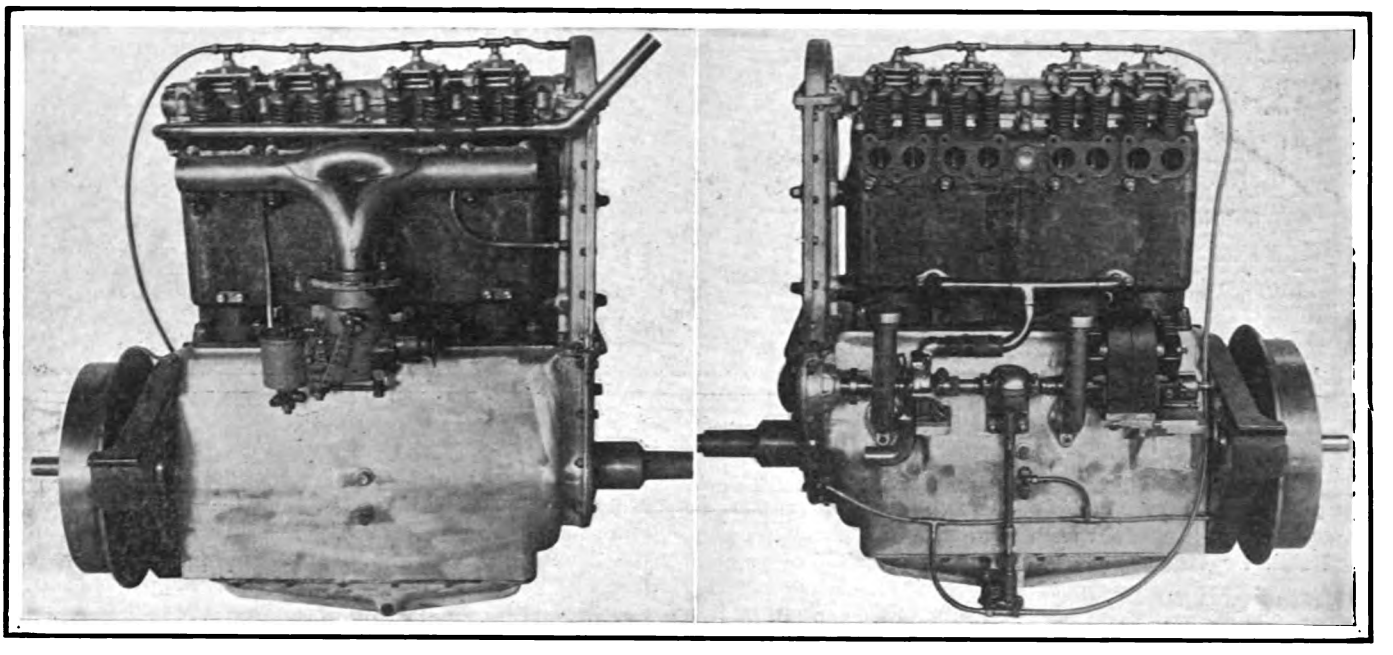
Little time was lost on this stop, and he still had an excellent chance to win the race, or at least to finish in second place as he was neck and neck with Tom Rooney's Stutz at the time. The two remaining Stutzes at this time were in first and second positions. The third Stutz, driven by Earl Cooper, had been forced to leave before the race was half an hour old, with a broken valve.

Willie Haupt nearly came in for some prize money with his Duesenberg car, but a loose carbureter caused him to push his car when he was well along toward the end of his run. He had not been making many stops before this as he did not draw up to the pits until more than 2 hr. after the race had started, when he took on gasoline, water and oil. Shortly after this a broken inlet rocker arm reduced his number of available cylinders to three. Again he made a stop for a right and left rear tire and then another stop for a carbureter adjustment which was the forerunner of the trouble which finally put him out when he started to push his car with its loose carbureter, thereby rendering useless many a weary mile he had plugged along with a three-cylinder motor.

Specifications and Equipment of the Cars Starting in the Astor Cup Race on the Sheepshead Bay Motor Speedway, Oct. 2

No.	Car	Driver	Mechanic	Cylinders	Cast	Bore	Stroke	Cubic Inch Displacement	VALVES		Spark Plugs	Carburetor	Magneto	Oil	Grease	TIRES			Wheels, Make	Wheelbase	Shock Absorbers	Weight	Motometer
									Operation	No.						Make	Front	Rear					
1	Peugeot	Dario Resta	McCarthy	4	Block	3.60	6.67	274	OH shaft	16	K.L.G.	Zenith	Bosch	Oilzum	Dixon	Silvert.	34x4½	35x5	R.W.	106	T.-H.	2400	Boyce
2	Peugeot	J. Aitkin	Becker	4	Block	3.60	6.67	274	OH shaft	16	Oleo	Zenith	Bosch	Oilzum	Dixon	Silvert.	34x4½	35x5	R.W.	196	T.-H.	2300	Boyce
3	Delage	Barney Oldfield	Dashach	4	Block	3.66	7.09	298	OH shaft	16	Rajah	Claudel*	Bosch	Oilzum	Dixon	Firest.	34x4½	35x5	R.W.	104	T.-H.	2250	Boyce
4	Peugeot	Bob Burman	Gable	4	Block	3.65	7.10	296	OH shaft	16	K.L.G.	Zenith	Bosch	Oilzum	Dixon	Silvert.	33x4½	33x4½	R.W.	105	T.-H.	2350	Boyce
5	Stutz	Gil Anderson	Scott	4	Block	3.81	6.50	296	OH shaft	16	Bosch	Strom.	Bosch	Oilzum	Dixon	Silvert.	33x4½	33x5	Houk	102	T.-H.	2340	Boyce
6	Peugeot	Howard Wilcox	Rout	4	Block	3.60	6.67	274	OH shaft	16	Oleo	Zenith	Bosch	Oilzum	Dixon	Silvert.	34x4½	35x5	R.W.	106	T.-H.	2300	Boyce
7	Stutz	Tom Rooney	Rocco	4	Block	3.81	6.50	296	OH shaft	16	Bosch	Strom.	Bosch	Oilzum	Dixon	Silvert.	33x4½	33x5	Houk	102	T.-H.	2404	Boyce
8	Stutz	Earl Cooper	Dutton	4	Block	3.81	6.50	296	OH shaft	16	Bosch	Strom.	Bosch	Oilzum	Dixon	Silvert.	33x4½	33x5	Houk	102	T.-H.	2385	Boyce
9	Deusenberg	Ed. O'Donnell	J. Henderson	4	Block	3.75	6.75	297	Verti. rocker	16	Rajah	Zenith	Bosch	Oilzum	Dixon	Silvert.	32x4½	33x5	R.W.	106	T.-H.	2170	Boyce
10	Maxwell	Ed. Rickenbacher	Getz	4	Block	3.75	6.75	298	OH shaft	16	K.L.G.	Zenith	Bosch	Oilzum	Dixon	Silvert.	32x4½	35x5	Houk	105	T.-H.	2202	Boyce
11	Mulford Special	Ira Vail	Wright	4	Block	3.98	6.00	299	Verti. rocker	8	Rajah	Master	Bosch	Oilzum	Dixon	Silvert.	33x4½	33x4½	R.W.	101	T.-H.	2100	Boyce
12	Pugh Special	Jack Lecain	Pugh	4	Block	3.98	6.00	299	Verti. rocker	8	Bosch	Master	Bosch	Oilzum	Dixon	Silvert.	33x4½	33x4½	Houk	106	T.-H.	2400	Boyce
14	Sebring	Ora Haibe	Guion	4	Block	3.98	6.00	299	Verti. rocker	8	Rajah	Master	Bosch	Oilzum	Dixon	Silvert.	32x4½	33x5	R.W.	102	T.-H.	2499	Boyce
15	Deusenberg	Willie Haupt	Alexander	4	Block	3.98	6.00	299	Verti. rocker	8	Bosch	Schebler	Bosch	Oilzum	Dixon	Silvert.	32x4½	34x4½	R.W.	106	T.-H.	2120	Boyce
16	Deusenberg	P. Henderson	Johnson	4	Block	3.75	6.75	298	Verti. rocker	8	Rajah	Zenith	Bosch	Oilzum	Dixon	Silvert.	32x4½	34x4½	R.W.	104	T.-H.	2100	Boyce
17	Maxwell	Pullen	Stafford	4	Block	3.75	6.75	298	OH shaft	16	K.L.G.	Zenith	Bosch	Oilzum	Dixon	Silvert.	34x4½	35x5	Houk	105	T.-H.	2267	Boyce
18	Peugeot	Ralph Mulford	Stevens	4	Block	3.60	6.67	274	OH shaft	16	Rajah	Zenith	Bosch	Castor	Dixon	Silvert.	34x4½	34x4½	R.W.	106	T.-H.	2300	None
19	Delage	Carl Limberg	Hartman	4	Block	3.66	7.09	298	OH shaft	16	K.L.G.	Zenith	2-Bosch	Oilzum	Dixon	Silvert.	33x4½	33x4½	R.W.	110	T.-H.	2350	Boyce
20	Stutz	Ralph DePalma	Fontaine	4	Block	3.81	6.50	296	OH shaft	16	Bosch	Strom.	Bosch	Mono.	.....	Silvert.	32x4½	33x5	Houk	102	T.-H.	2404	Boyce
22	Ogren	Tom Alley	Smith	4	Block	3.98	6.00	299	Verti. rocker	8	Rajah	Rayfield	Bosch	Oilzum	Dixon	Nassau	33x4½	34x5	Houk	102	T.-H.	2499	Boyce

*4 of them.
Strom.—Stromberg. Mono.—Monogram. Silvert.—Silvertown. Firest.—Firestone. T.-H.—Truffault-Hartford.



Right and left hand views of Wisconsin-Stutz racing motor. Observe center connection on intake manifold which balances pressure

America's Engineering Triumph

Europe's Finest Cars Completely Vanquished By the Product of American Engineering Skill

By A. Ludlow Clayden

NEVER before in America has there been better representation of the finest European racing cars than at the Sheepshead Bay Speedway, despite the fact that the majority were of one make, for that make is the leader of all racing engineering. The conquest of the old Delage cars means nothing, for they were weary with that stiffening which comes with age, alike to machines as to men, but the failure to finish of the Peugeots is a very different matter. Granting that they were older than the Stutz and Duesenberg cars, they are still running as fast as ever before, and the only explanation of their collapse, one after another, is that they were run off their feet, so to speak, by the superior stamina of their American competitors. The race gave precisely the same impression to the beholder as did the French grand prix of 1914, where the Mercedes team ran with such regularity, and so fast that the Peugeots were unable to keep up with them.

Materials of Construction Important

In all racing cars the aim is to work every bit of metal at the extreme limit which it will withstand for the duration of the race, and most cars will support a burst of speed for 10 miles or so which they cannot maintain for 100 miles. In a long race a car is driven as much below its maximum as will suffice, and is only forced to the limit as a last resource. Thus when we see all the Peugeots eliminated in the effort to hang on to the Stutz it can only be argued that the latter were capable of sustaining greater stresses for longer periods.

This means that American steel makers have found materials at least as good as and perhaps better than the famous B. N. D. steels of which the Peugeots are composed so largely, and this is at least as important a thing for the American automobile industry, as is knowledge that American engineers can equal the French in excellence of design.

It is quite possible that one of the difficulties which always present themselves when the attempt is made to keep an old racing car up to its original form when it is far from the land of its origin, is that of finding the proper steel to replace broken or fatigued parts. It is undoubted that the Peugeots which competed last week, and the Mercedes with which De Palma won the Indianapolis race contain the finest steel that Europe has ever produced, mostly of German manufacture, for the Derhion brothers who prepared B. N. D. bought largely from German sources of supply. A glance at the sectional drawing of the Stutz engine gives an idea of the intensity of stressing in every part, and it is at least as great as that prevailing in any foreign motor.

What Is the Limit?

Boillot, the celebrated French driver and engineer discussing the new cars of 1914 with THE AUTOMOBILE'S Paris correspondent shortly before the Lyons race told him that it had been "very difficult to get more power than last year." In that contest the Peugeots and Mercedes had little to choose between them on the score of maximum power, and it is probable that the Stutz motors even, have not quite equalled the *maximum* figure of either, but the Mercedes won in France because it could *endure* and now the Stutz have won for precisely the same reason.

The sixteen-valve engine has brought us to a point where there are two questions to be faced, can we get more maximum power from a cylinder of given size and if we can, shall we be able to find materials to stand the stress?

To sidetrack the question of the motor, for a moment, an interesting study is the much better showing of the leaders in the races of this year, compared with that of the other

cars which contrived to finish within the prize list. Why is it that the speed of the winner is always so *very* much greater than the average speed? In every race on a speedway this year the cars have separated into bunches capable of division into three main crowds, the leaders, the middle men and the tail, and there have been duels between car and car in each class. Of course, in attempting to explain this, only very broad conclusions can be reached, but it is at least a fact that usually we see the entirely special cars in front, the cars with specially designed motors but not special chassis, in the middle group, and the cars with neither highly special motor nor special chassis in the tail.

Take a concrete example and contrast the appearance of the Peugeots and the Stutz with the Duesenbergs. The former have the lines of a thoroughbred from radiator to rear and their stripped chassis have the mechanical beauty of the motor continued throughout the transmission. The Duesenbergs have an engine of the highest class, but regarding either the chassis or the car complete it cannot be doubted but that the motor is wasting more of its wonderful power in mechanical or in air friction. Give the Duesenberg sixteen-valve motor a chassis as good as the Peugeot and it would show itself still more capable.

In concentration upon the motor the chassis is always liable to be neglected; it has been neglected by touring car engineers and by the makers of racing cars, with a few exceptions. Really, it is the truck men who have done most toward chassis development for the circumstances of their business forced it on them. This present season has seen a wonderful cleaning up of passenger car chassis with elimination of much needless detail, and the proof is there for any who care to appreciate it that the racing cars of 1916 will need as much study in the chassis as in the motor.

Approaching the Limit of Power

Much motor development in the near future is unlikely. Since the coming of the sixteen-valve engine, now nearly three years ago, the struggle has been, not so much to get power from it, as to make it able to contain that power without breaking. If the 300 cu. in. motor remains the 1916 size, any more power that is got from it will be a very small amount, probably 2 or 3 per cent at most, and even that is a good deal to hope for.

So the obvious thing to do is to try to devise means for using the power we know we can get safely with the minimum of waste. Lighter chassis would help, not that weight makes much difference when a car is running at full speed, but it does affect acceleration vastly. Watching the Astor Cup race it was easy to see how acceleration was of value in enabling a fast car to slip by a slower one in the most favorable spot, and often passing was prevented for half a lap or more solely by the inability of the faster cars to accelerate quite rapidly enough.

A week ago one might have written that lighter weight would reduce the time lost in tire changing, but when eight cars finish a record-breaking race with only two tire changes between the lot of them, this becomes of less importance. Though, of course, had the season been August the tire changes must have been more frequent.

During the race, two of the Peugeots were pushed in to the pits some considerable distance. Just before the race Resta was observed to place the front wheels of his car dead on the starting line by a gentle pressure of one hand which moved the car forward about a foot. This lightness of "rolling" is not peculiar to the Peugeot, as the Stutz and various other cars are almost, if not quite as free, but it stands out in high relief by comparison with the effort needed to push the average racing machine as seen on the speedways. It means that not a bearing in the transmission, not a ball race in the wheels but is perfectly adjusted and perfectly lubricated, and it means miles an hour more at high speed. Put the Peugeot motor in some of the chassis that are considered good enough for first rank racing, and the car's maximum speed would be less than 100 m.p.h., its acceleration cut in two, and its reliability also halved.

Prediction is dangerous, as so many surprises occur in automobile engineering, but the 1916 season *ought* to show an increase of average speed more on account of chassis development than because of motor innovations.

Failures Mostly of Material

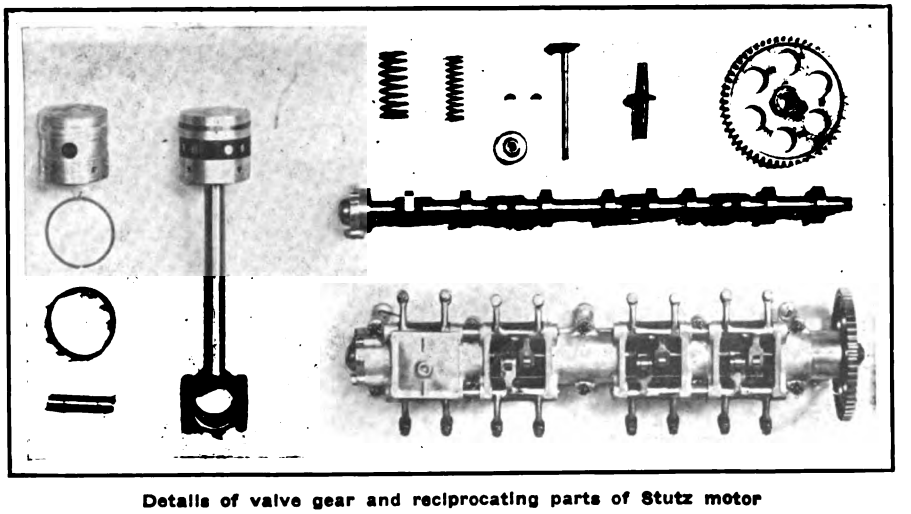
Had the Peugeots been new cars it would instantly have been said that their connecting-rod design was too weak, but we know from past records that this most certainly is not true. Ralph De Palma was eliminated by a broken ball bearing in the motor, yet hundreds of similar bearings have run thousands upon thousands of miles at racing speeds without a sign of trouble. Two or three valves or valve rockers broke, yet scores of others ran through the whole race as they had run through others. So it is not just to blame upon the design any one of these accidents.

Actually blame is not to be used for any failure in machines so highly stressed, rather than saying that the steel in the broken parts was not good we should say that the material of those that did not break was marvelous. But the lesson to be read is that we could do with still stronger steel, our engines develop a trifle too much power.

If any man had doubt of the aluminum alloy piston he ought now to be convinced that he need no longer hesitate. During this year's racing it has given much less trouble than did the best steel pistons in European contests during 1913 and 1914. The alloy piston is no lighter than the steel, it is *more reliable when of equivalent weight;* that is why it is now common on the speedway, and this may easily be written down as the most striking development of the year.

It follows along the line of the foregoing reflections, in that the aluminum alloy has proved to be a better material for making pistons than anything we had before. Its discovery has increased the reliability of the sixteen-valve motor. Perhaps we shall find next year that the aluminum alloy cylinder is also to play a part, that the better heat conductivity of aluminum may be utilized, so as to reduce the temperature of the valves, for instance. Time alone will show, but it is a line of development that is being followed by some and closely watched by others.

Another great development of the year is that of ignition,



Details of valve gear and reciprocating parts of Stutz motor

for this has been an outstanding trouble ever since the sixteen-valve engine was first used. This type of motor having more power per cubic inch of displacement has also a higher working temperature, so that spark plugs suffered in consequence. Throughout the 1913-1914 European racing season only two or three manufacturers of cars were able to keep the plugs in working condition for any length of time, similarly at Indianapolis this year, plug trouble was frequent, but at Chicago it had lessened and did not attack the Sheepshead Bay leaders. Plugs used at present are practically no better than those used six months ago, the difference is in the method of their use. Very high pressure motors need very copious supplies of oil and, if the oil comes into contact with any part that is exceptionally hot, it will carbonize promptly. Thus if the tip of the spark plug happens to be the hottest point in the combustion space it will soot up easily.

To overcome this difficulty there are two courses open; one is to prevent oil from reaching the plug and the other to keep it cool. In the most successful motors both precautions are taken and the plugs are mounted in the center of the cylinder head. In this situation they can be surrounded entirely by water, with only a thin wall of cast iron for the heat to penetrate, and also they are at the point most distant from the periphery of the piston, which is the line past which the oil comes. A plug placed horizontally in the side of the head is right in the line of fire of the oil, and any which does reach it has a lesser opportunity for draining off again, but it may be equally well cooled. A plug located in a valve cap, and so insulated from the cooling water by a thick section of metal, has a harder duty to perform, and if it is also horizontal it is in the worst case possible. These things have been found out slowly, but the principles now find general acceptance and their adoption has produced the satisfactory results now obtained.

Carburetion has changed very little this year. There have been no new wonders in the gas-making field and no great changes in carbureter construction. It is noteworthy that America is now producing carbureters which will compete with the Claudel in power supply, but apart from this there is little to chronicle.

Lubrication also has provided no surprises, the oil employed is almost always a derivative of castor oil of some kind, sundry trifling details of design have helped to prevent oil sent to an overhead camshaft from flooding the valves, and means have been found for ensuring a proper supply of oil to the crankpin bearings in motors with ball bearings on the main crankshaft journals. All these being small matters of individual detail and not questions of principle.

To what extent the increasing use of ball bearings is due to the desire for compactness and elimination of three bearings requiring high pressure lubrication, and to what extent it is mere blind Peugeot imitation would be very difficult to say. The mere fact that Peugeot have used ball bearings sways the mind of the best of engineers when deciding which he will adopt, and it is safe to say that ball bearings would have been employed in the majority of ordinary automobile motors to-day, were it not for the noise which seems to be inseparable from their use.

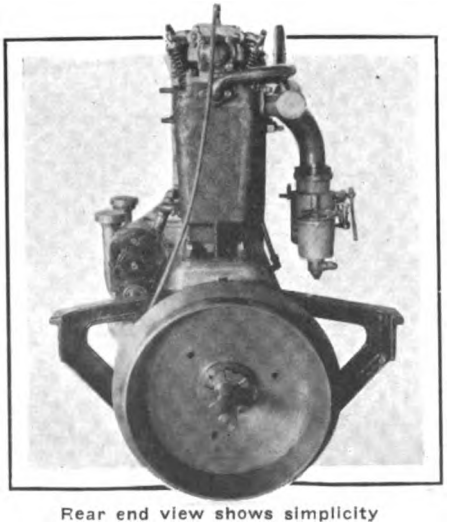
To sum up, the racing season has consolidated the position of the sixteen valve motor introduced by Peugeot in 1913. It has proved American automobile engineering to be able to meet and beat the foreigner. It has established knowledge of materials not possessed before. It has seen no great mechanical novelties, but it has developed and brought to a high pitch of perfection the most modern type of engine.

Stutz Racing Motor Has Light Parts

Large Valve Opening—Many Ball Bearings—Centrifugal Lubrication and Two-Piece Crankshaft, Features of Design

MADE by the Wisconsin Motor Co., Milwaukee, Wis., the Stutz racing engines which have performed so wonderfully well this year, rank with the very finest racing creations of Europe and are now leaders of the whole world. Yet, a glance at their drawings shows that simplicity is a characteristic, that few parts and very light proportions everywhere are the rule. The bore is 3 13/16 in. and stroke 6½ in., giving a total capacity of 296.81 cu. in. or 74.2 cu. in. per cylinder. The maximum power is obtained at a piston speed of 3250 ft. per min., which corresponds to 3000 r.p.m., and is about 130 hp., as shown by block test in the maker's plant. This is practically 0.44 hp. per cu. in. displaced, or 1 hp. per 2.2 cu. in. The brake mean effective pressure which is usually known as ηp is 115 lb. per sq. in. at maximum hp. and has then fallen off a good deal. At just over 2000 ft. per min. piston speed it begins to droop, the value of ηp below this speed being over 130 lb. per sq. in. These figures compare extremely well for the values quoted for foreign engines.

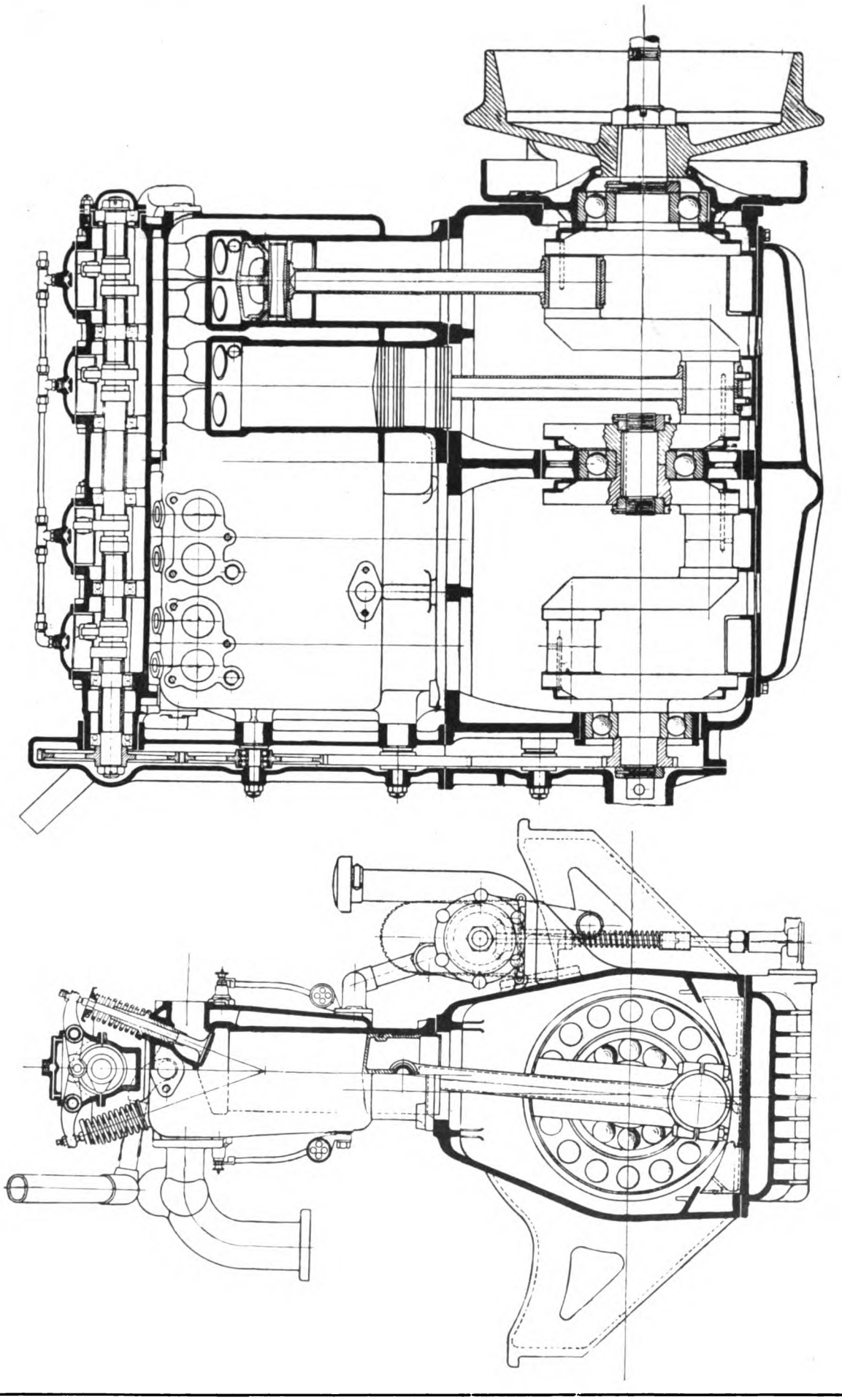
Each of the four valves is over 1.5 in. in diameter. as the port behind the valve has this dimension. The area of the port is 1.767 sq. in. and the lift of the valve ⅜, which gives a peripheral opening of exactly the same value as the port area. Meanwhile as the area of the piston is 11.4 sq. in. and that of the two valves together 3.534 sq. in. the speed of the intake gas at the crankshaft speed corresponding to maximum power is (in round figures) 180 ft. per sec. This is far from a high velocity as many touring car motors are designed on a basis of 200 ft. per sec.



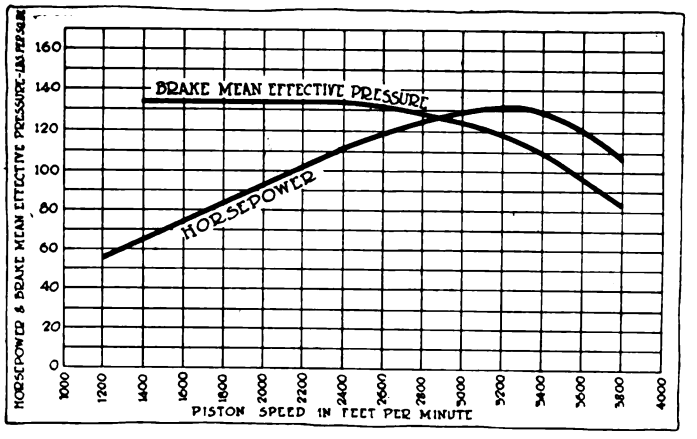
Rear end view shows simplicity

Perhaps the most remarkable feature of the design, as seen in the section, is the extraordinary smallness of the spur gears that drive the camshaft. These have a width of face of only 0.5 in. and their pitch line velocity is 2650 ft. per min. at a crankshaft speed of 3000.

The crankpins are 2.25 in. diameter and the lower end bearings 2⅜ in. wide, the babbitt metal being run straight into the ends of the hollow connecting-rods. The way in which the two halves of the crankshaft are held together is shown in the section, and it may be noted that the balls in the bearings are 1 in. diameter. Of course the use of a divided shaft makes the assembling simple and, much more important, al-



SECTIONAL VIEWS OF WISCONSIN-STUTZ RACING MOTOR 3 13/16-IN. BORE AND 6 1/2-IN. STROKE



Curves showing horsepower and brake mean effective pressure plotted against piston speed in feet per minute

lows the employment of a fairly small diameter ball race. At the bottom of the groove the diameter is about 3 in., so that the peripheral velocity at full power is only 2300 ft. per min. which is not excessive.

The life of a ball bearing is affected vitally by the speed at which the balls roll and if a solid crank were used, in which the center bearing had to be "threaded" into place, the velocity would need to be at least twice as great.

Lubrication Is Simple

For a racing motor the lubrication seems almost absurdly simple. Each lower end carries two splash dippers which are backed by holes that lead directly to the crankpins, but each crank web also carries a gutter ring whence oil is forced by centrifugal pressure through small holes drilled in the pins. So there are three supply holes to each lower end bearing, their diameter being approximately 3/16 in.

Overhead, the camshaft has a ball bearing between each set of cams, and over the top case is a header which throws a copious stream of oil directly upon the cams and the roller ends of the rocker arms. From the camshaft case excess lubricant drains back to the crankcase. Like the crankshaft and camshaft, the timing gears are also mounted on ball bearings, so the only plain bearings in the whole motor are the lower ends and the piston pins. The latter are interesting in that the pin is fixed neither to the piston nor the rod, but is free to move in either.

In the longitudinal cut it may be noticed that small oil holes lead to the ends of the piston pins from points just beneath the single ring. The piston shown in the drawing is steel made on the same principle as the Sunbeam, with a center leg to rest against the wristpin and act as a heat conductor to aid in keeping cool the center of the piston head. Magnalite pistons were used in the race and one of these is shown in the photographic illustration. There it may be seen that the wristpin is constrained against endwise movement by a thin steel ring slipped over the middle of the piston.

Very Simple Crankcase

The designers are to be complimented upon the idea of putting the oil pump outside the crankcase for two reasons. Firstly, it enables the case to be designed solely from the viewpoint of rigidity, and allows that rigidity to be obtained with a minimum of metal; the drawings are enough to show how very strong the section of the crankcase is.

Secondly, having the pump external and in the free atmosphere must have a quite considerable influence on the temperature of the oil. It may also be observed that the quantity of oil actually carried in the base chamber is quite small, and the latter is ribbed deeply for cooling purposes. It is thought, from Peugeot experience, that a continuous supply of fresh, unused oil is necessary for racing motors of this type, where high pressure feed to the lower end bearings is an impossibility. This Wisconsin-Stutz holds just about enough oil internally for the maintenance of circulation and the fresh supply is enough to control the temperature.

Harry Grant, Twice Vanderbilt Winner, Dies of Burns

NEW YORK CITY, Oct. 8—Harry F. Grant, twice winner of the Vanderbilt cup race, died last night in the Coney Island Hospital as the result of burns he suffered on Sept. 28 when his Maxwell took fire at the Sheepshead Bay Speedway.

Grant's death comes as a surprise, as it had been reported only a few days ago that he was recovering.

The accident which caused his death occurred just after he had completed one circuit of the 2-mile track on a practice spin. As he went up the banked turn on his second practice lap his car suddenly was enveloped in flames. Situated as he was on the bank of the track, it was impossible for him to apply the brakes and instead he kept his car, which was going faster than 90 m.p.h., under control until he passed the curve. Then he jammed on the brakes.

The fire was due to a loosened gasoline line and a backfire at the carbureter. The car was only slightly damaged.

HARRY GRANT

One of the most famous of American automobile racing drivers died on Thursday night, Oct. 8, in the Coney Island hospital due to the burns sustained in a practice spin at the Sheepshead Bay motor speedway on Sept. 28 preliminary to the Astor cup race and after he had qualified his Maxwell for the great contest. Grant's long racing career was chiefly distinguished by his winning of the Vanderbilt cup race in 1909 and 1910, the only time this contest has been captured by the same driver twice in succession, although he won a number of other important races

Grant's racing career, which began in 1907, was brilliant and free from accidents. His only other serious mishap was at Corona last fall, when one of his wheels broke while traveling in a race at 95 m.p.h. The car turned over and burst into flames when the gasoline tank was rent, but Grant escaped unhurt. Another misfortune overtook him in California in a Vanderbilt Cup race, when one of his helpers filled his gasoline tank by accident with water at a crucial moment in the race, putting the car out of commission.

Harry Grant was born in Cambridge, Mass., in 1877. While a young man he became interested in automobiles and worked for several years as a salesman and demonstrator in the Boston offices of the Alco company. In 1907 he started racing on small dirt tracks. His success encouraged him to enter the Lowell road race in 1908 and he made the fastest lap in the contest. A tire explosion lost the 1909 Lowell race for him.

In 1909 and 1910 on a Long Island course he won the Vanderbilt Cup race, each time driving an old stock Alco car. He is the only driver who ever won two Vanderbilts in succession. One other driver, Ralph De Palma, has won two Vanderbilt Cup races. Grant is survived by his wife.

Wm. T. White
Pres. Mercer Automobile Co.

Harry C. Stutz
Pres. and Gen. Man. Stutz Motor Car Co.

Chas. Clifton
Treasurer Pierce-Arrow Motor Car Co. and Pres. N. A. C. C.

Samuel A. Miles
National Show Mgr.

Alfred Reeves
General Manager of N. A. C. C.

N.A.C.C. Allots Show Space

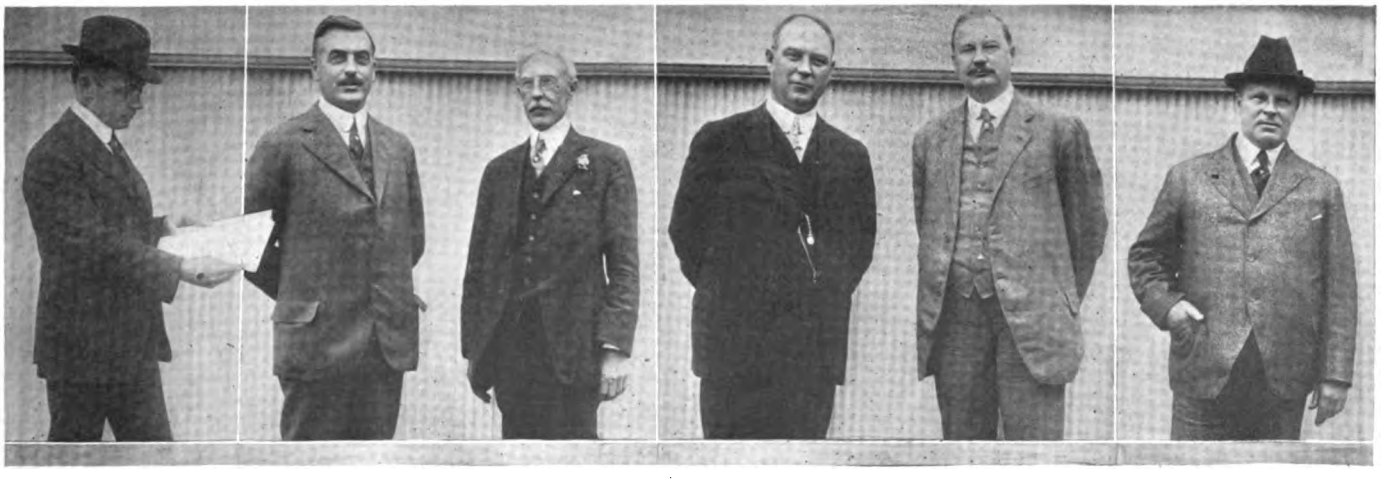
NEW YORK CITY, Oct. 8—The meeting of the National Automobile Chamber of Commerce, Inc., for the drawing of exhibit spaces at the New York and Chicago shows proved one of the biggest from number point of view of the year. Practically all the members of the association had their representatives present to look after the drawing of space, and when the members had drawn an opportunity was given non-members to secure whatever space was remaining at the Palace and Coliseum shows. Before the drawing took place a spirited discussion occurred as to whether the order of drawing should be in proportion to the total amount of sales made by the different companies during the year ending June 30, 1915, or whether the order should be based on the volume of passenger car business only, truck business being excluded. Heretofore the drawing has been in proportion to the total volume of passenger car and truck business. When the vote was taken it was found that majority favored including a passenger car business only as passenger cars only are on exhibition. Truck manufacturers contended in the debate that according to precedent the trucks should be included. The new ruling made considerable difference in the drawing and placed several concerns whose truck business is greater than the passenger car business some distance down on the list, whereas formerly they were up in the first ten.

The honor of selecting the first position for both shows fell to C. S. Jameson, of the Willys-Overland Co., the report showing this company the leader in the volume of business for the year, a position it has now held for the third season. Following Overland came Buick, Studebaker, Cadillac, Maxwell, Hudson, Reo, Dodge, Chalmers, Hupmobile, Packard, Pierce, Paige, Franklin, Chandler and Saxon.

Electric cars allotted space were Anderson, Baker, R. & L., Ohio, Milburn, Waverley and Woods.

In all seventy-five different car concerns secured space at New York, these not including probably six electric makes which will occupy a prominent space in one group on the second floor. Compared with the drawing a year ago, the number of makes is not quite so large, ninety-five makers securing space at that time. Practically all of the available exhibit spaces have been taken with about three exceptions, this number of spaces remaining open on the third floor.

There are a few new names in the show



W. C. Marmon
Pres. Nordyke & Marmon Co.

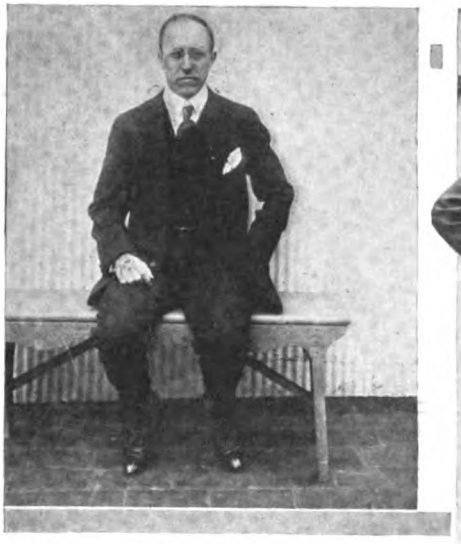
Wm. E. Metzger

J. C. Schmidt
Pres. Pullman Motor Car Co.

W. H. Vandervoort
Pres. Moline Automobile Co. and Pres. S. A. E.

C. C. Hanch
Treas. Studebaker Corp. and Director N. A. C. C.

E. S. Jameson
Vice-Pres. Willys-Overland Co.



Left—
Harry W. Ford
Pres. Saxon Motor Co.

Right—
H. M. Jewett
Pres. Paige-Detroit Motor Car Co.

In Oval—
H. W. Hayden
Vice-Pres. and General Manager Pullman Motor Car Co.

Right—
F. C. Chandler
Pres. Chandler Motor Car Co.

this year including All-Steel, Empire, Grant, Sterling, Sun and Trumbull. While these new names have appeared others have dropped from the list. Among those missing for the 1916 show being Cartercar, Crawford, Krit, Lyons-Atlas, S.G.V., Speedwell, Herreshoff, McIntyre, Partin-Palmer, Sphinx, Cresson-Morris and Mack.

There are sixty-three members of the association who were in on the original drawing, their order of drawing being in proportion to the amount of business done. After these came five members who have recently joined the organization and when these had secured space, non-members were given an opportunity, among those drawing being All-Steel, Davis, Empire, Enger, Herff-Brooks, Lewis, Metz, Owen, Remington, Standard, Sterling, Sun and Trumbull.

Practically the same space arrangements will prevail in Grand Central Palace, New York, as have been used in the past. The main floor second floor, and a goodly portion of the third floor of the building will be used for car exhibits. Accessories will be on the third and fourth floors. In Chicago the show will be held in three buildings, the Coliseum, Coliseum Annex and the First Regiment Armory, the cars having practically the same space as formerly.

The complete list of car exhibitors at the New York and Chicago shows follows:

Car Exhibitors at New York

Main Floor—Automobile Section

Briscoe Motor Co.....Jackson, Mich.
Buick Motor Co.....Flint, Mich.
Cole Motor Car Co.....Indianapolis, Ind.
Chalmers Motor Co.....Detroit, Mich.
Cadillac Motor Car Co.....Detroit, Mich.
Chandler Motor Car Co.....Cleveland, Ohio
Chevrolet Motor Co.....Flint, Mich.
Dodge Brothers.....Detroit, Mich.
Franklin Machine Co.....Brooklyn, N. Y.
Hudson Motor Car Co.....Detroit, Mich.
Hupp Motor Car Co.....Detroit, Mich.
Haynes Automobile Co.....Kokomo, Ind.
Jeffery Co., Thos. B.....Kenosha, Wis.
Kissel Motor Car Co.....Hartford, Wis.
King Motor Car Co.....Detroit, Mich.
Locomobile Co. of America.Bridgeport, Conn.
Mitchell-Lewis Motor Co.....Racine, Wis.
Nordyke & Marmon Co.....Indianapolis, Ind.
Maxwell Motor Co.....Detroit, Mich.
Oakland Motor Co.....Pontiac, Mich.
Willys-Overland Co.....Toledo, O.
Olds Motor Works.....Lansing, Mich.
Paige-Detroit Motor Car Co...Detroit, Mich.
Pierce-Arrow Motor Car Co....Buffalo, N. Y.
Packard Motor Car Co.....Detroit, Mich.
Regal Motor Car Co.....Detroit, Mich.
Reo Motor Car Co.....Lansing, Mich.
Saxon Motor Co.....Detroit, Mich.
Studebaker Corp.....Detroit, Mich.
Velie Motor Veh. Co.....Moline, Ill.
Winton Motor Car Co.....Cleveland, Ohio
White Co.....Cleveland, Ohio

Second Floor—Automobile Section

Apperson Bros. Auto Co.....Kokomo, Ind.
Allen Motor Co.....Fostoria, Ohio.
Auburn Automobile Co.....Auburn, Ind.
Case T. M. Co., J. I.....Racine, Wis.
Cunningham Son & Co., Jas..Rochester, N. Y.
Fiat Co.....Poughkeepsie, N. Y.

Artemus Ward, Jr.
Pres. King Motor Car Co.

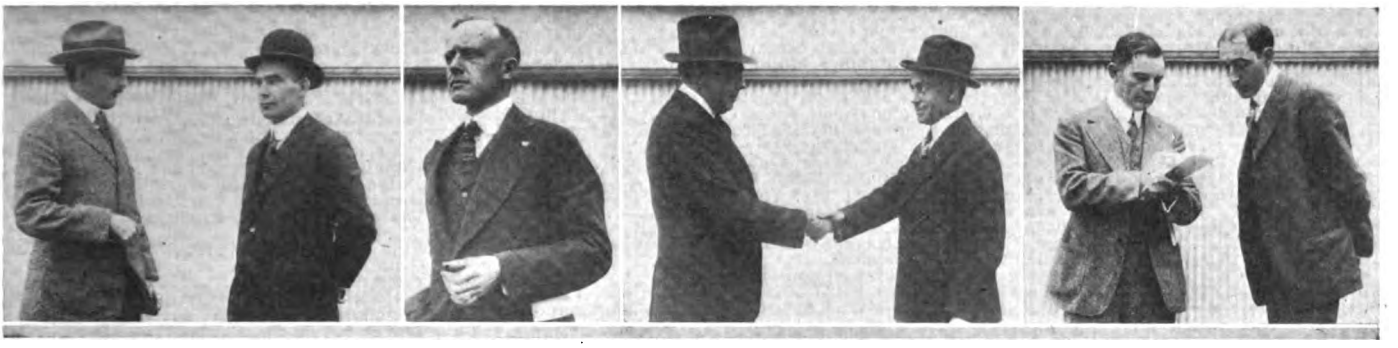
Roy D. Chapin
Pres. Hudson Motor Car Co. and Sec. of N. A. C. C.

Hugh Chalmers
Pres. Chalmers Motor Car Co., Vice-Pres. Gasoline Division N. A. C. C.

J. W. Moon
Pres. Moon Motor Car Co.

Ezchas Syrmz

R. E. Olds
Pres. Reo Motor Car Co.



Lincoln Reimer
Sterling Auto Mfg. Co.

Chas. Chambers

H. P. Mammen
Westcott M. C. Co.

O. C. Friend
Mitchell-Lewis M. Co.

Carl Page
Mitchell Agent

A. B. Poertner
N. Y. National Agent

G. M. Dickson
General Manager National M. V. Co.

E. P. Chalfant
Anderson Elec. Car Co.

B. W. Twyman
Inter-State M. Co.

V. E. Gustavson
Woods Motor Veh. Co.

H. A. Martin

W. H. Schwartz
Sales Manager Metz Co.

J. S. Clarke
Vice-Pres. Autocar Co.

F. H. Dodge
Milburn Wagon Co.

F. C. Carter
Herff-Brooks Corp.

C. H. McCausland
Kissel M. C. Co.

Wm. Graham
McFarland M. C. Co.

C. A. Emise
Vice-Pres. Chandler M. C. Co.

Benjamin Briscoe
Pres. Briscoe M. Co.

Paul Smith
Gen. Sales Manager Chalmers M. C. Co.

Horace Dellsser
Vice-Pres. Briscoe M. Co.

A. Holmes
H. Franklin Mfg. Co.

A. Fisk
Remington Motor Co.

Guy Monihan
Mutual Motors Co.

Inter-State Motor Co.....Muncie, Ind.
Jackson Automobile Co.....Jackson, Mich.
Kline Motor Car Corp.....Richmond, Va.
Lozier Motor Car Co.....Detroit, Mich.
Lexington-Howard Co.....Connorsville, Ind.
Mutual Motors Co.....Jackson, Mich.
Mercer Automobile Co.....Trenton, N. J.
Moline Automobile Co.....E. Moline, Ill.
Moon Motor Car Co.....St. Louis, Mo.
McFarlan Motor Car Co....Connersville, Ind.
National Motor Veh. Co....Indianapolis, Ind.
Premier Motor Mfg. Co....Indianapolis, Ind.
Pullman Motor Car Co.....York, Pa.
Paterson Co., W. A.....Flint, Mich.
Peerless Motor Car Co.....Cleveland, Ohio
Pathfinder Co.....Indianapolis, Ind.
Stearns Co., F. B.....Cleveland, Ohio
Scripps-Booth Co.....Detroit, Mich.
Stutz Motor Car Co.....Indianapolis, Ind.
Westcott Motor Car Co.....Richmond, Ind.

Third Floor—Automobile and Accessory Section

American Elec. Car Co.....Saginaw, Mich.
Austin Automobile Co...Grand Rapids, Mich.
All-Steel Motor Car Co.....St. Louis, Mo.
Consolidated Car Co.....Detroit, Mich.
Davis Motor Car Co.....Richmond, Ind.
Empire Automobile Co.....Indianapolis, Ind.
Enger Motor Car Co.....Cincinnati, Ohio
Grant Motor Co.....Findlay, Ohio
Herff-Brooks Corp.....Indianapolis, Ind.
Lewis Spring & Axle Co.....Jackson, Mich.
Metz Co.....Waltham, Mass.
Owen & Co., R. M.....New York City
Remington Motor Co.....New York City
Standard Steel Car Co.....Pittsburgh, Pa.
Sterling Motor Car Co.....Brockton, Mass.
Sun Motor Car Co.....Buffalo, N. Y.
Trumbull Motor Car Co....Bridgeport, Conn.

Car Exhibitors at Chicago

Coliseum Main Floor—Automobile Section

Allen Motor Co.....Fostoria, Ohio
Apperson Bros. Auto Co.....Kokomo, Ind.
Briscoe Motor Co.....Jackson, Mich.
Buick Motor Co.....Flint, Mich.
Cole Motor Car Co.....Indianapolis, Ind.
Chalmers Motor Co.....Detroit, Mich.
Chandler Motor Car Co.....Cleveland, Ohio
Cadillac Motor Car Co.....Detroit, Mich.
Case T. M. Co., J. I.....Racine, Wis.
Chevrolet Motor Co.....Flint, Mich.
Franklin Mfg. Co.....Syracuse, N. Y.
Hupp Motor Car Co.....Detroit, Mich.
Haynes Automobile Co.....Kokomo, Ind.
Hudson Motor Car Co.....Detroit, Mich.
Jeffery Co., Thos. B.....Kenosha, Wis.
King Motor Car Co.....Detroit, Mich.
Kissel Motor Car Corp.....Richmond, Va.
Locomobile Co. of America.Bridgeport, Conn.
Moon Motor Car Co.....St. Louis, Mo.
Maxwell Motor Co.....Detroit, Mich.
Mitchell-Lewis Motor Co.....Racine, Wis.
Nordyke & Marmon Co....Indianapolis, Ind.
Olds Motor Works.....Lansing, Mich.
Oakland Motor Co.....Pontiac, Mich.
Willys-Overland Co.....Toledo, Ohio
Packard Motor Car Co.....Detroit, Mich.
Pierce-Arrow Motor Car Co....Buffalo, N. Y.
Paige-Detroit Motor Car Co...Detroit, Mich.
Regal Motor Car Co.....Detroit, Mich.
Reo Motor Car Co.....Lansing, Mich.
Saxon Motor Co.....Detroit, Mich.
Stearns Co., F. B.....Cleveland, Ohio
Studebaker Corp.....Detroit, Mich.
Velie Motor Vehicle Co.....Moline, Ill.
White Co.....Cleveland, Ohio
Winton Motor Car Co.....Cleveland, Ohio

Coliseum Annex

Auburn Automobile Co.....Auburn, Ind.
Crow Motor Car Co.....Elkhart, Ind.
Detroiter Motor Car Co.....Detroit, Mich.
Dodge Bros.....Detroit, Mich.
Inter-State Motor Co.....Muncie, Ind.
Mercer Automobile Co.....Trenton, N. J.
Mutual Motors Co.....Jackson, Mich.
National Motor Vehicle Co.Indianapolis, Ind.
Pullman Motor Car Co.....York, Pa.
Peerless Motor Car Co.....Cleveland, Ohio
Stutz Motor Car Co.....Indianapolis, Ind.

First Regiment Armory—Main Floor

Austin Automobile Co...Grand Rapids, Mich.
American Electric Car Co....Saginaw, Mich.
Consolidated Car Co.....Detroit, Mich.
Cunningham Son & Co., Jas..Rochester, N. Y.
Davis Motor Car Co.....Richmond, Ind.
Empire Automobile Co.....Indianapolis, Ind.
Elkhart Carriage & Harness Mfg Co., Elkhart, Ind.
Fiat Co.....Poughkeepsie, N. Y.
Grant Motor Co.....Findlay, Ohio
Bartholomew Co.....Peoria, Ill.
Jackson Automobile Co.....Jackson, Mich.
Lexington-Howard Co. ....Connorsville, Ind.
Lozier Motor Co.....Detroit, Mich.
L. P. C. Co.....Racine, Wis.
Moline Automobile Co.....E. Moline, Ill.
Metz Co.....Waltham, Mass.
McFarlan Motor Car Co....Connorsville, Ind.
Paterson Co., W. A.....Flint, Mich.
Pathfinder Co.....Indianapolis, Ind.
Premier Motor Mfg. Co....Indianapolis, Ind.
Scripps-Booth Co.....Detroit, Mich.
Westcott Motor Car Co.....Richmond, Ind.

Coliseum Basement

All-Steel Motor Car Co.....St. Louis, Mo.
Dort Motor Car Co.....Flint, Mich.
Elgin Motor Car Corp.....Chicago, Ill.
Enger Motor Car Co.....Cincinnati, Ohio
Farmac Motor Car Corp.....Chicago, Ill.
Herff-Brooks Corp.....Indianapolis, Ind.
Cummins Auto Sales Co.....Columbus, Ohio
Owen & Co., R. M.....New York City
Remington Motor Co.....New York City
Sun Motor Car Co.....Buffalo, N. Y.
Standard Steel Car Co.....Pittsburgh, Pa.

95 Accessory Firms To Exhibit

NEW YORK CITY, Oct. 8—The Motor & Accessory Manufacturers through its show committee to-day allotted exhibit spaces to ninety-five of its members for the New York and Chicago shows. The list is practically the same as heretofore, showing eighty-seven exhibitors at New York, and eighty-three at Chicago. There are seventy-five concerns that will exhibit at both shows, twelve will exhibit at New York only, and eight at Chicago only, the complete list showing this division.

There are some familiar names which appeared on the list last year, but are not on this year. Some of these are: Standard Welding Co., Springfield Metal Body Co., Coes Wrench Co., Gemmer-Detroit Starter Co., National Coil Co., Dunlop Wire Wheel Co., Bearing Co. of America, Bock Bearing Co., Golde-Patent Co. On the other hand there are some new concerns that did not appear on the list last year including John O. Heinze Co., Brunner Mfg. Co., National Screw & Tool Co., and others.

The list this year contains practically no names of tire makers, a very few of the manufacturers of magnetos, axles, steering gears, and not so many manufacturers of starters as heretofore. The names represented include the accessory field thoroughly. This list will undoubtedly be supplemented when the allotments are made to manufacturers who are not members of the Motor & Accessory Manufacturers.

In addition to allotment of space four concerns were admitted to membership, these being: Brunner Mfg. Co., manufacturer of air compressors, Utica, N. Y.; E. A. Laboratories, Inc., manufacturer of automobile electric and hand horns, Brooklyn, N. Y.; General Bakelite Co., manufacturer of Bakelite, New York, N. Y., and Leece-Neville Co., manufacturer of electric starting and lighting systems, Cleveland, Ohio.

The complete list of exhibitors at both the New York and Chicago shows, at New York only and at Chicago only is as follows:

New York and Chicago

American Bronze Co.....Berwyn, Pa.
Apple Electric Co.....Dayton, Ohio
Automobile Supply Mfg. Co..Brooklyn, N. Y.
Benford Mfg. Co.....Mount Vernon, N. Y.
Blackledge Mfg. Co., John W....Chicago, Ill.
Brown, William H.....Cleveland, Ohio
Brown-Lipe Chapin Co.....Syracuse, N. Y.
Brown-Lipe Gear Co.....Syracuse, N. Y.
Brunner Mfg. Co.....Utica, N. Y.
Buda Co.....Harvey, Ill.
Byrne, Kingston & Co.....Kokomo, Ind.
Carr Co., F. S.....Boston, Mass.
Champion Ignition Co.....Flint, Mich.
Cowles & Co., C.....New Haven, Conn.
Cramp & Sons Ship & Engine Building Co., Wm.....Philadelphia, Pa.
Detroit Lubricator Co.....Detroit, Mich.
Dixon Crucible Co., Joseph.Jersey City, N. J.
Doehler Die Casting Co.....Brooklyn, N. Y.
Double Fabric Tire Co.....Auburn, Ind.
Dyneto Electric Co.....Syracuse, N. Y.
Eclipse Machine Co.....Elmira, N. Y.
Electric Storage Battery Co.Philadelphia, Pa.
Findeisen & Kropf Mfg. Co....Chicago, Ill.
Gabriel Mfg. Co.....Cleveland, Ohio
Garford Mfg. Co.....Elyria, Ohio
Garage Equipment Co.....Milwaukee, Wis.
General Bakelite Co.....New York City
Globe Machine & Stamping Co.Cleveland, Ohio
Gould Storage Battery Co....New York City
Gray & Davis, Inc.....Boston, Mass.
Halladay Co., L. P.....Streator, Ill.
Harris Oil Co., A. W.....Providence, R. I.
Hartford Suspension Co....Jersey City, N. J.
Hassler, Inc., Robert H....Indianapolis, Ind.
Hayes Mfg. Co.....Detroit, Mich.
Heinze Electric Co.....Lowell, Mass.
Heinze Co., John O.....Springfield, Ohio
Herz & Co.....New York City
Houk Mfg. Co.....Buffalo, N. Y.
Hydraulic Pressed Steel Co...Cleveland, Ohio
Kellogg Mfg. Co.....Rochester, N. Y.
Kent Mfg. Works, Atwater..Philadelphia, Pa.
Kokomo Electric Co.....Kokomo, Ind.
Lovell-McConnell Mfg. Co.....Newark, N. J.
Mosler & Co., A. R....Mount Vernon, N. Y.
Motometer Co., Inc.....New York City
North East Electric Co.....Rochester, N. Y.
Oakes Co.....Indianapolis, Ind.
Pantasote Co.....New York City
Perfection Spring Co.....Cleveland, Ohio
Pittsburgh Model Engine Co..Pittsburgh, Pa.
Rose Mfg. Co.....Philadelphia, Pa.
Royal Equipment Co.....Bridgeport, Conn.
Sager Co., J. H.....Rochester, N. Y.
Schrader's Son, Inc., A.....Brooklyn, N. Y.
Schwarz Wheel Co.....Philadelphia, Pa.
Shakespeare Co. .....Kalamazoo, Mich.
Shaler Co., C. A.....Waupun, Wis.
Sparks-Withington Co. .....Jackson, Mich.
Spicer Mfg. Co.....Plainfield, N. J.
Splitdorf Electrical Co.....Newark, N. J.
Springfield Metal Body Co..Springfield, Mass.
Standard Thermometer Co.....Boston, Mass.
Stewart-Warner Speedometer Corp.....Chicago, Ill.
Stromberg Motor Devices Co....Chicago, Ill.
United States Light & Heating Corp.....Niagara Falls, N. Y.
Vacuum Oil Co.....Rochester, N. Y.
Van Sicklen Co.....Elgin, Ill.
Veeder Mfg. Co.....Hartford, Conn.
Voorhees Rubber Mfg. Co..Jersey City, N. J.
Waltham Watch Co.....Waltham, Mass.
Westinghouse Electric & Mfg. Co.....East Pittsburgh, Pa.
Wheeler & Schebler.....Indianapolis, Ind.
Willard Storage Battery Co..Cleveland, Ohio
Zenith Carbureter Co.....Detroit, Mich.

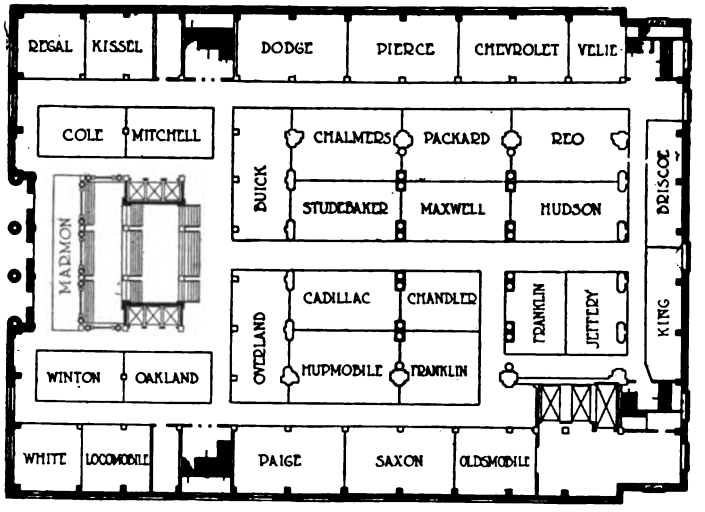
New York Only

American Ever Ready Works.New York City
Bosch Magneto Co.....New York City
Budd Mfg. Co., Edward G..Philadelphia, Pa.
E. A. Laboratories, Inc.....Brooklyn, N. Y.
English & Mersick Co.....New Haven, Conn.
Hartford Machine Screw Co..Hartford, Conn.
J. M. Shock Absorber Co., Inc.Philadelphia, Pa.
Janney-Steinmetz & Co.....Philadelphia, Pa.
Light Mfg. & Foundry Co.....Pottstown, Pa.
Motor-Compressor Co.....Newark, N. J.
Nokoloyd Signal Co.....New York City
Ward Leonard Electric Co..Bronxville, N. Y.

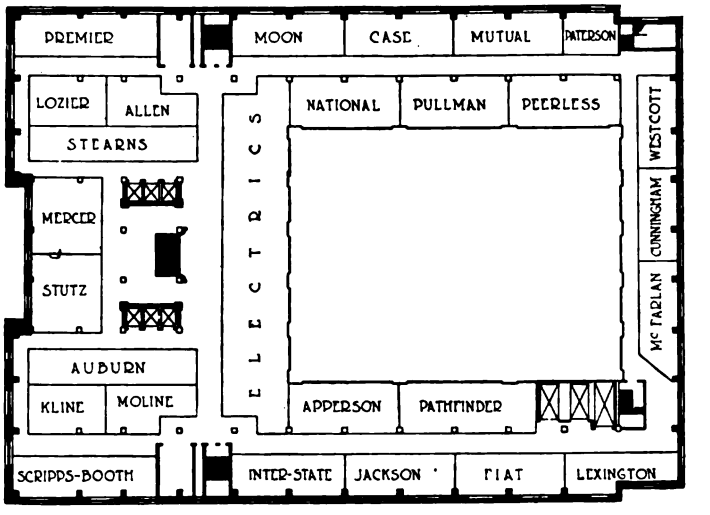
Chicago Only

Badger Brass Mfg. Co.....Kenosha, Wis.
Continental Motor Mfg. Co....Detroit, Mich.
Imperial Brass Mfg. Co.....Chicago, Ill.
Remy Electric Co.....Anderson, Ind.
Sulzberger & Sons Co.....Chicago, Ill.
Vesta Accumulator Co.....Chicago, Ill.
Warner Gear Co.....Muncie, Ind.
Waukesha Motor Co.....Waukesha, Wis.

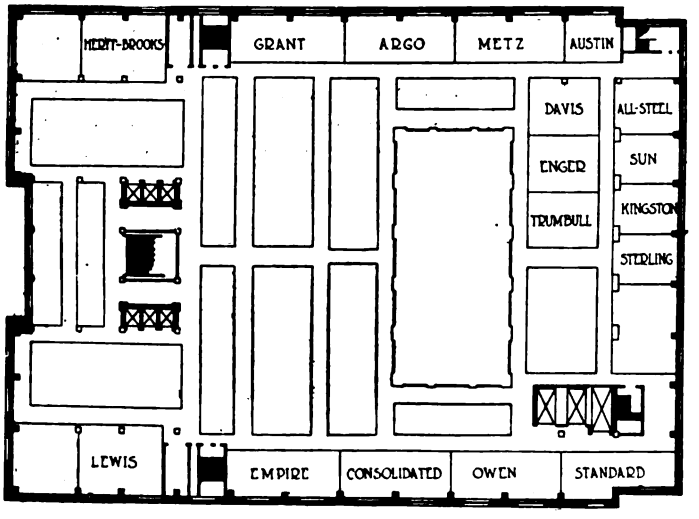
Exhibitors and Plans of New York and Chicago Shows



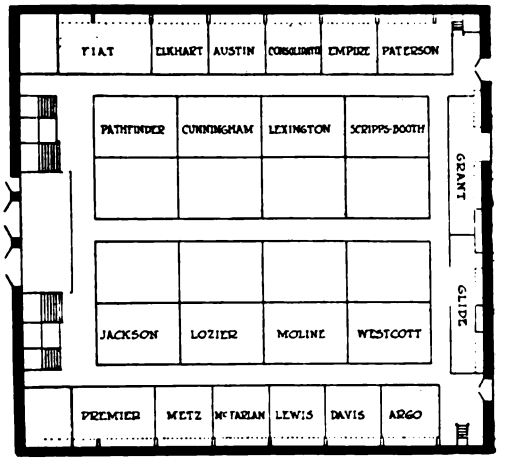
MAIN FLOOR GRAND CENTRAL PALACE, NEW YORK



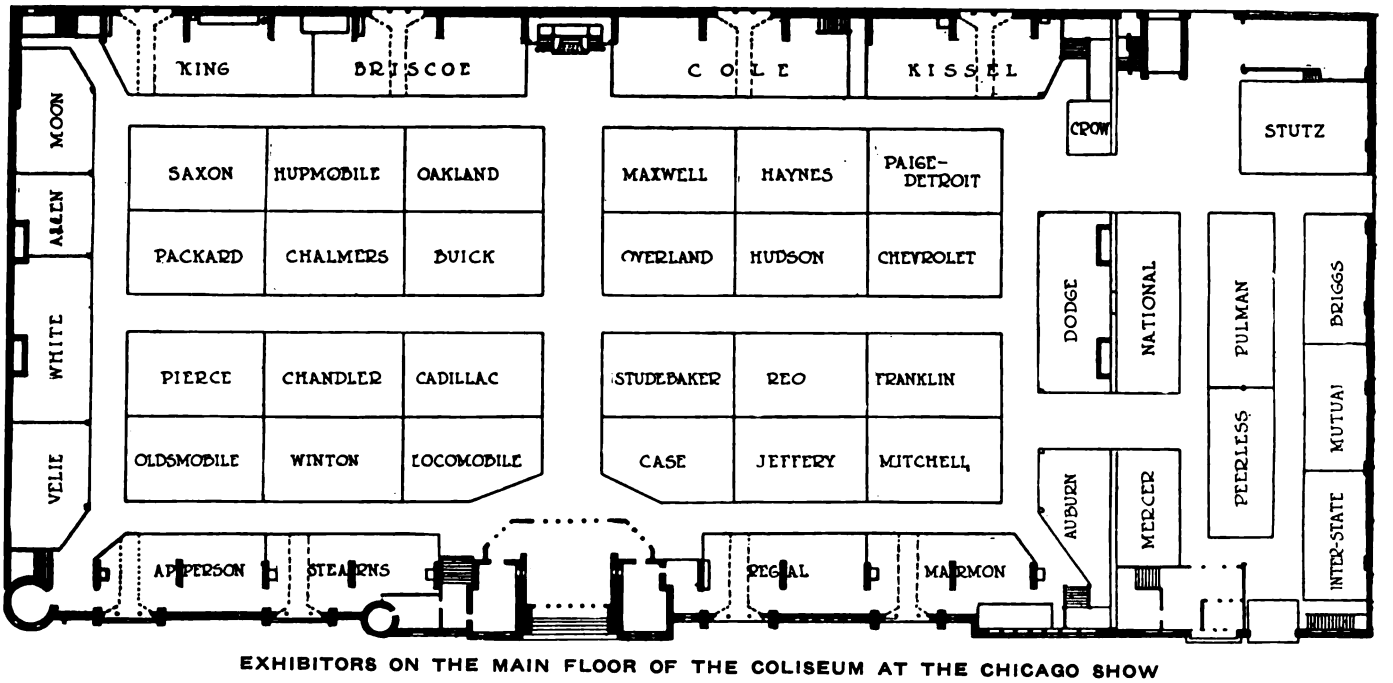
SECOND FLOOR GRAND CENTRAL PALACE, NEW YORK



THIRD FLOOR GRAND CENTRAL PALACE, NEW YORK



FIRST REGIMENT ARMORY, CHICAGO



EXHIBITORS ON THE MAIN FLOOR OF THE COLISEUM AT THE CHICAGO SHOW

The Engineers' Forum

Aluminum Pistons for Racing and High-Speed Work—Connecting-Rod Stresses Complex—Four Valves Per Cylinder—Rotary Motors

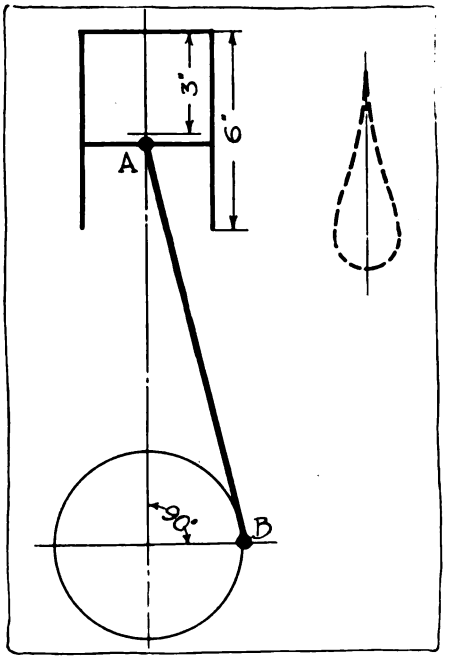
By Charles Vivier

ARCADIA, CAL.—Editor THE AUTOMOBILE:—The phenomenal crankshaft speeds attained by the modern racing motor have convincingly demonstrated the importance of the rôle played by the reciprocating parts. In the ordinary four-cycle motor, these parts are: the pistons, the connecting-rods and the valve mechanism. As the inertia forces and stresses increase rapidly in function of the speed and the weight of the moving parts, the problem is therefore to reduce their weight to the smallest possible minimum, taking into consideration of course the safe limits of the tensile strength of the parts subjected to the hardest work. This solution is no easy one, it being a fact that the motor invariably fails first under fast work. Yet great progress has been accomplished in the last few years in motor manufacture, thanks to the valuable help of modern metallurgy and the careful designing and machining of the delicate parts.

Regarding the pistons, remarkable strides have been made. Their weight is now considerably reduced in comparison to the cast iron product. Nickel alloy steels, with low co-efficient of expansion, are sharing honors with the aluminum pistons, which won both San Francisco races in Resta's Peugeot.

The aluminum piston has one great advantage over the steel piston: it radiates its imparted heat readily. If properly designed, the aluminum pistons will remain relatively cool under heavy work, thus eliminating the trouble of pre-ignition due to red-hot pistons, a danger ever-lurking around a high-compression motor. A well-known western firm specializing in aluminum pistons claims that its pistons will not melt zinc after a motor has been allowed to reach its greatest heat; if the same motor is run under identical conditions with steel pistons, the zinc will be promptly melted. Every racing driver knows that high compression is a valuable desideratum for power, but pre-ignition mercilessly dictates its limitations. In the Lyons Grand Prix, which was run on a warm day, much trouble was experienced from super-compressioned motors. The winning Mercedes had a geometrical compression not exceeding 6 kilograms per square centimeter, or 85 pounds per square inch.

With regard to the connecting-rod, no part of a motor is subjected to a more complex combination of forces and stresses. Referring to the illustration, the line AB represents the connecting-rod. Points A and B, the centers of the wristpin and the crankpin respectively, can be considered integral with the rod. Laying aside all explosion, compression, etc., stresses, point A is subjected to a reciprocal rectilinear, non-uniform accelerating and decelerating action, while B is subjected only to an uniform centrifugal action. Everybody knows that, owing to the angularity of the connecting-rod, the piston travels faster on the upper end of its course than on the lower one. This peculiarity is in favor of the efficiency of the motor because the piston can offer a more rapid expansion to the gases on the upper part of the explosion stroke. On the line AB, in one revolution of the crankshaft, every point of the connecting-rod below and near A, describes a figure like that at the right of the illustration resembling an elongated pear, which gradually shapes itself nearer a perfect circle in proportion as we get nearer to point B, which follows a circular path. In other words, on line AB, no two points describe the same course, identical either in shape or length, and yet, all motions between A and B are accomplished in the same length of time, the period necessary for one complete revolution of the crankshaft. In our case, if the stroke is 6 inches, the point A will travel 2 feet, at singularly variable speed, while B travels 3.1416 feet, at uniform speed, in the same length of time. One can easily imagine how, at racing speeds, the center of mass of the connecting-rod is somersaulting around its center of gravity.



Layout of connecting-rod

This state of affairs, which is inherent to the reciprocating parts mechanism, occasions tremendous strains, at high speeds, to the wristpin end of the connecting-rod, where fracture generally takes place. Most racing cars are put out of the running through the failure of one connecting-rod, and such accidents often play havoc with the motor.

Regarding the valve mechanism, great efforts have been made to reduce the weight of the reciprocating parts to a minimum, hence the idea of four valves per cylinder, and the overhead camshaft in combination with short valve stems. In a motor turning at 3,000 r.p.m., with the conventional valve lift, the energy necessary to lift the valves amounts to about 3 horsepower per pound of valve weight, which is no small item to be transmitted by the camshaft.

Rotary motors of the Gnome type offer a different aspect as regard the piston and the connecting-rods. In these motors, the cylinders revolve, the crankshaft being stationary. To one single crank is attached the main connecting-rod to which all other connecting-rods are articulated. Be-

sides, the explosion stresses, the piston and the rods are subjected only to the action of the centrifugal force. The pistons travel their stroke in the cylinders, because of the eccentric position of the crankpin in relation to the crankshaft. All intake and exhaust valves must be carefully counterbalanced with weights in order to overcome the effects of the centrifugal force. As these motors are intended for aeronautical work, they are made exceedingly light. Their massic efficiency is high, but their thermic efficiency is not. They are not suitable for automobile work; they are wasteful of oil and gas, and their large cubic inch displacement and enormous prices condemn them at the very start for terra firma work. The prices for the different Gnome models range from $2,600 for the 50 horsepower, seven-cylinder, weighing 135 pounds to $8,800 for the eighteen-cylinder, 200 horsepower weighing 550 pounds.—CHARLES VIVIER.

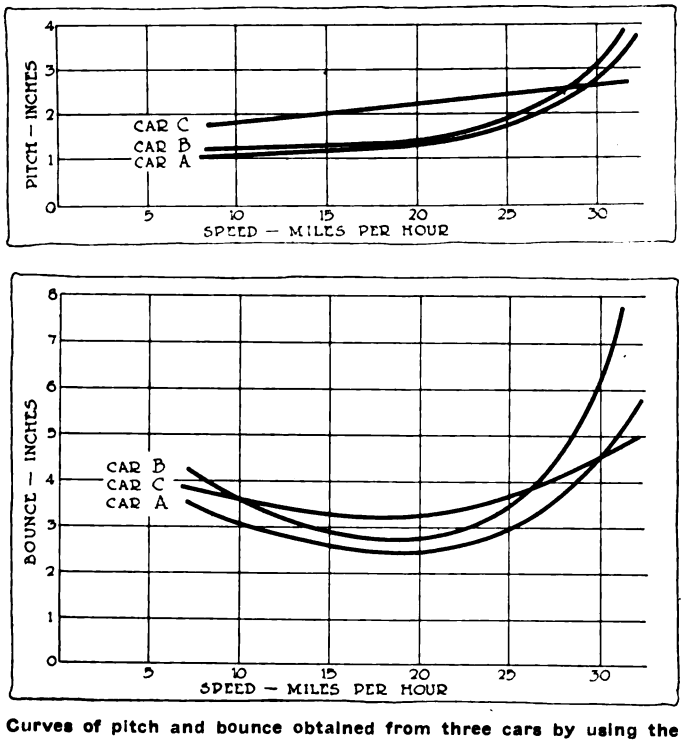
Simple Machine for Comparing Spring Action

By Hugh Pastoriza

EDITOR THE AUTOMOBILE:—The riding quality of an automobile is a somewhat indefinite thing, and is judged, by the average motorist, merely from the feel of the car as he rides in it. Obviously such a method of judgment cannot give close comparative results and the simple device described below was got up to afford a more exact method of comparison and one that any car owner can readily install in his machine.

The device as used is shown opposite. The fixed portion consists of a light pine board, 1 ft. wide by 2 ft. long, with a row of nails driven in it near each edge, and a plate of tin nailed to its center. From four of these nails, the moving element is suspended, by means of four ¼-in. rubber bands, stretched in as many directions. This moving element consists of an iron washer weighing about 1 lb., into the center of which a pencil is wedged. Obviously, any jolt will cause the pencil to move relative to the board and to make a mark on the piece of paper which is thumb-tacked over the tin plate in the center of the board. The arrangement is, it will be noted, extremely simple, and may be made up with almost no expense or trouble.

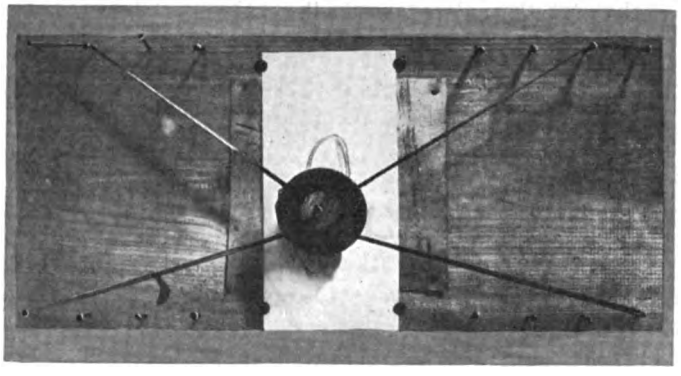
As ordinarily used, it is held in a vertical plane with its length parallel to the length of the car. To get a record of spring performance only, it may be set on the floor of the car, but as the effect of cushions ought ordinarily to be included, it should rather be held firmly upon the lap of someone riding in the car, so as to move with him. If, now, the car be run at a given speed, over a given stretch of rough road, or better still, over a standard "bump" (as, for example, a 2 by 4, with corners rounded, set out on a smooth road), then the moving element will draw a series of oval curves on the paper, differing for each car or other change in conditions. To get best results, the tension of the rubber bands should be adjusted, by moving from one nail to another, so that the largest curve drawn during the tests will not be over 3 in. high.



Curves of pitch and bounce obtained from three cars by using the apparatus

Reading the Results

The interpretation of these results is simple. Evidently the greater the horizontal width of the ovals, the more violent is the back and forward motion, or pitch of the car; and the greater their vertical height, the more violent the up and down motion, or bounce. For an ordinary road run, the average of the three largest throws in each direction should be taken for comparison, rather than the absolute maximum. The car giving the smallest ovals when run at a given speed over a given road, will, of course, be the easiest riding.



The complete apparatus for measuring spring quality

If the side movement, or roll of the automobile, is to be studied, the device may be held crosswise of the car and the horizontal width of the oval drawn will then correspond to roll instead of to pitch. Ordinarily, however, this movement is slight and of minor interest.

Records for several cars at different speeds have been measured up and the results plotted showing that:

Bounce is generally more than twice as violent as pitch.

Bounce is large at low speeds, falls at medium speeds and rises very rapidly above 30 m.p.h.

Pitch is nearly constant at low and medium speeds but rises at high speeds.

Actual magnitude and the effect of speed varies with the car, as might be expected.

The ease of riding of a car is dependent on a number of conditions: the springs; the shock absorbers; the frame; the cushions; the weight of the car; the number of passengers carried; the roughness of the road; the skill of the driver; the speed of driving.

In the ordinary case, as above described, the last four conditions would be kept constant and the results would show the comparative efficacy of mechanical design on the different cars tested. It is evident, however, that the effect of any one of the above factors alone may be studied by keeping the others constant. The effect of speed is thus found, as shown plotted. In a similar way, the relative value of different types of shock absorbers may be studied or a proper adjustment arrived at on a given type. Finally, the skill of drivers, or the roughness of roads can be tested in the same fashion. In short, with this device, one may study exactly a number of effects that he was only able to note roughly before and may find out a number of new things about his car.

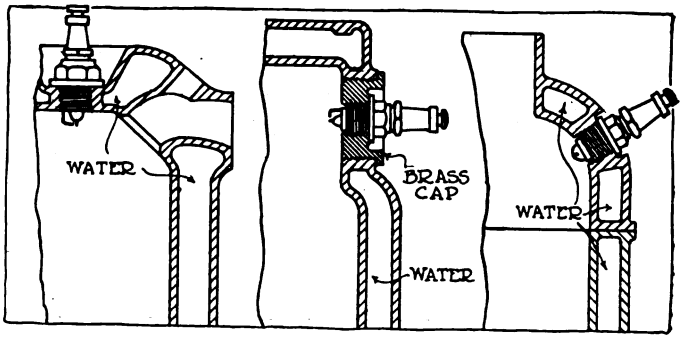
Spark Plug Should Be Vertical

Racing Experience Shows That This Is Best Position—Advocates Open End Type

By Gregory Flynn
Rajah Auto Supply Co.

EDITOR THE AUTOMOBILE:—With reference to the proper mounting of spark plugs in racing motors, our observations along this line tend to prove that placing the plug vertically through the water jacket accomplishes the best results. Although all modern racing motors are not so constructed that the plug can be placed vertically, all the designers of late have located the plug through the water-jacket, whether placed vertically or horizontally, and such mounting is essential in these days of prolonged running at maximum engine speed.

The one exception of modern practice is found in the Duesenberg motor where the plugs are placed horizontally through brass valve caps. This mounting has caused some plug trouble but not nearly as much as might be expected considering the consistent performance of Duesenberg racing cars. However, the new sixteen-valve Duesenberg motor has plugs placed vertically through the water-jacket.



Three possible positions for spark plug mounting. Left—Vertically through the water-jacket, the best position from the plug maker's viewpoint. Center—Horizontally through brass valve caps, least desirable of the three from the same viewpoint. Right—At an angle through the water-jacket, a position which has proved satisfactory

Experience shows us that our standard open-end plug has proved most satisfactory in the Peugeot, Delage and Mulford Special, having plugs mounted vertically through the water-jacket, whereas in the Maxwell racing cars where plugs are water-jacketed but placed horizontally, Mr. Harroun has found that our closed-end plug does not become fouled while in some cases the open-end type would.

As we have always advocated an open-end single-point plug we arrive at the natural conclusion that the vertical water-jacketed mounting of plugs will produce the best results.

Materials Increase 5% to 700% in Price

Small Increase in Iron and Cheap Steel—More in Good Steel and Other Metals

WITH reference to the cost of materials used in automobile construction, it has been threatened by some of the parts manufacturers that their prices for completed assemblies will rise next year, unless there is a drop in the cost of raw material.

Of course, it is not possible to estimate what an automobile maker pays for raw material simply by noting the quotations, because so much depends upon local conditions and so forth, but the market averages for the present time, and for a year ago show a general rise which translated into percentages gives a fair indication of how much more per cent the automobile trade will have to pay for materials as standing contracts are used up and new ones have to be made.

Iron Little Dearer

Ordinary iron and steel are not much more costly. Casting iron, such as is used for cylinders, is about 7 per cent dearer, and sheet steel in some sizes 5 per cent to 10 per cent dearer. Better steel such as is used for crankshafts and the more vital parts, appears to have increased much more, even to 20 per cent. Of course 20 per cent on the steel in an automobile motor does not represent much money per unit product, but 20 per cent on the total of steel bought by such a concern as the Continental Motor Co. for example, must be a staggeringly big sum.

It is when we come to the non-ferrous metals that the big differences show up in raw material costs, aluminum 250 per cent up, zinc 700 per cent up, copper 50 per cent up. Seeing that these are metals of which the market prices are sufficiently high to be quoted in pounds instead of tons, the increase on aluminum and brass is enough to make itself felt on the price of the unit article, and more than enough to make all the difference between profit and loss to a parts manufacturer bound to his present prices for selling.

A side effect upon the cost of all machine shop products is the immense increase in the cost of high speed steel, upon which all modern tools depend to provide the cutting edges. Owing to a shortage of tungsten, which is mainly an imported material, the high-speed steel price has risen rapidly from 50 cents to $1.25 per lb., and it shows every indication of going much higher. Of course this again, is not a big item in the cost of a car, but it represents so many more thousands of dollars per annum which *somebody* has got to pay.

Price Cuts Unlikely Next Year

What may be the effect on the cost of the complete car to the consumer? It is a question that cannot be answered, but if markets hold their present tone for another three months it will probably mean that 1916 will see the new 1917 models put out without much further price reduction. Improving methods of manufacture were undoubtedly the main reason for the big cuts made this year, and next season still greater economies are to be anticipated. With materials rising, however, the amount saved by manufacturing method will very likely have to go to offset the cost of the metal.

Data on Mixed Motor Fuels of Interest for American Export Trade

¶ *Nothing in the following records of results obtained in Germany by using mixtures of benzol and alcohol as motor fuel is of immediate practical interest for motor car users in the United States. But they are important for manufacturers, who figure on export trade and must build for foreign fuel conditions or tropical climates. They also deserve to be placed on file for ready reference by all who are interested in having an active competition with gasoline established in this country sooner or later, so as to hold prices in check and satisfy the ever-increasing demand for motor fuels without courting too-early exhaustion of the petroleum supply. That this demand will increase at a phenomenal rate after the war is everywhere taken for granted, considering the necessity for motors to serve in the energetic production of wealth after a gigantic campaign of waste and destruction. The United States can produce benzol from coal in any desired quantity as soon as it is wanted and also an unlimited supply of alcohol at low cost if legislative restrictions are eventually removed. The utility of the records therefore applies to possible developments in the American fuel market as well as to actual constructive requirements in motors for export. Earlier tests relating to the use of other fuels than gasoline have forfeited most of their importance through the fact that the motors and carbureters employed were specially designed or that it was necessary at least to adjust the carbureter differently for each kind of fuel. Von Loew's much more practical object is to determine the results obtainable with a motor of an accepted automobile type which by a few minor modifications is enabled to work with a variety of fuels without special adjustment for any of them.*

Before this was done no industrial results could be expected, since the designing and making of motors for any special fuel had to await the practical marketing of the fuel and no effort for organizing such marketing could be expected before the motors for it were created. Von Loew's work seems a happy contribution toward the solving of this deadlock which has long obstructed progress.

The first part of his report was rendered in substance in THE AUTOMOBILE *of August 12, pages 288 to 291 and 298 and includes a descriptive mention of the (90 mm. bore, 140 mm. stroke) motors used for the tests and the arrangements made for starting with a volatile fuel and heating the heavier fuels when necessary, as well as descriptions of carbureters which can be used.*—M. C. K.

Driving Tests with Benzol and Benzol-Alcohol Mixtures by Baron Von Loew

CONTINUING the tests previously reported, I selected mainly warm days during the spring of this year for experimenting with mixtures containing large proportions of alcohol. At the tests in the fall of 1914 it had been shown that a mixture of 1 part benzol with only 3 parts alcohol caused certain troubles when the fan behind the radiator was kept going (and subsequently the same results appeared during the cold days of last July). A sudden load would stop the motor, and it was therefore always necessary to open the throttle slowly. In other words, the motor had to be warmed up before it was safe to tackle a hill. In order to keep the motor at a higher temperature I disconnected the fan from October to April, and with this provision the motor worked again normally with the 1 to 3 mixture. Through the winter I used, nevertheless, the 1 to 2 mixture which gave excellent results. In April the fan was again connected. The 1 to 3 mixture worked then, with the fan running, equally as well as it had worked in the fall with the fan stationary. Mixtures of 1 to 4 and 1 to 5 were now also tried, and finally the car was driven on alcohol without any benzol. For all these trials the carbureter was still adjusted as for gasoline, as the principal object was to determine what fuels and mixtures will produce an efficient and economical operation of the motor without any re-adjustment of the carbureter. In the trials with unmixed alcohol the motor worked however so poorly and used so much fuel that no account in figures was kept, a change in the carbureter being evidently desirable. The figures obtained with the mixed fuels are best explained with reference to the appended tables.

Over table 1 there is drawn the profile of a road used for the tests specified in tables 1 and 4. The car was always driven at point *A* with a speed of 40 kilometers per hour and thereafter with its maximum of power. The highest tachometer reading was taken at the point *B* and the lowest at *C*, and the actually observed figures are those entered in the tables under *B* and *C* respectively. That the 1 to 2 mixture and the 1 to 3 mixture in table 1 seem of equal value may be due to some accidental factor, such as a variation in the wind resistance. All the values in tables 1, 2 and 3 were noted on the afternoon of April 30, 1915, when the temperature averaged 17 deg. C., and have not been improved by comparison with figures obtained at numerous other trials. All the figures in tables 4 and 5 are likewise those noted at trials on Nov. 1, 1914, when the temperature averaged 4 deg. C. The fan was in operation, however, on April 30, but not on Nov. 1.

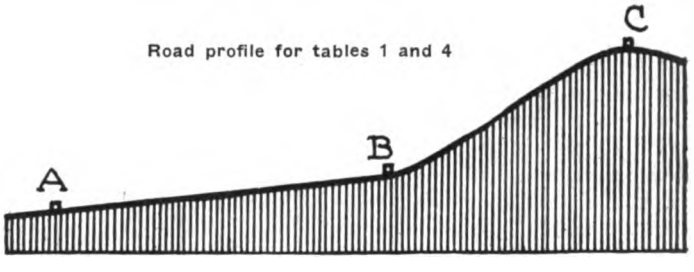


Table 1

SPEED RESULTS WITH SUMMER TEMPERATURE 17 DEG. C.

Benzol	*Alcohol*	*at B*	*at C*
Pure	none	67 km./hour	65 km./hour
1 part	+ 1 part	66 "	64 "
"	+ 2 parts	65 "	61 "
"	+ 3 "	65 "	61 "
"	+ 4 "	63 "	57 "
"	+ 5 "	60 "	56 "

Table 4

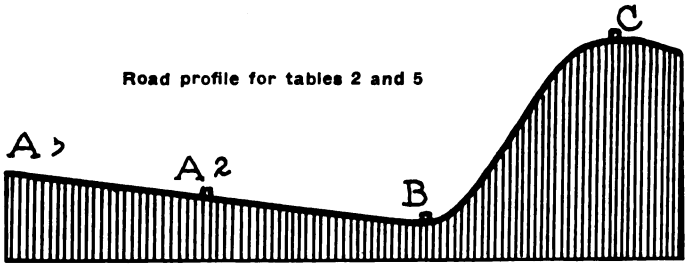
SPEED RESULTS WITH WINTER TEMPERATURE 4 DEG. C.

Benzol	*Alcohol*	*at B*	*at C*
Pure	none	65 km./hour	62 km./hour
1 part	+ 2 parts	62 "	56 "
"	+ 1 part	64 "	60 "

Tables 2 and 5 refer to tests on the stretch of road whose profile is shown over table 2, but the later tests (table 2) were started considerably nearer to *B* than those of last Fall (table 5) in order to save fuel which had become scarce. For the same reason the fuel consumption tests were conducted with only 1 liter of fuel for each, giving the figures in table 3, while the corresponding tests from Nov. 1, 1914, recorded in table 6, were made with 1½ liters for each, this being the full contents of the auxiliary fuel tank, and the original fig-

ures for table 6 have therefore been reduced one-third in order to have a direct comparison with table 3.

Table 2 shows plainly the marked drop in car speed at *C* which is characteristic of the mixtures rich in alcohol. With the 1 to 5 mixture it was at many other trials even necessary to change to the third gear speed shortly before reaching *C*, but the figures in the tables refer only to results obtained on the high gear. Table 2 illustrates how much better the car pulls with pure benzol than with the mixtures. A numerical comparison in this respect with gasoline could unfortunately not be established, for lack of this fuel, but it is well known that gasoline is considerably inferior in this particular.



Road profile for tables 2 and 5

Table 2

SPEED RESULTS WITH SUMMER TEMPERATURE 17 DEG. C.

Benzol		*Alcohol*	*at B*	*at C*
Pure	+	none	68 km./hour	50 km./hour
1 part	+	1 part	68 "	51 "
"	+	2 parts	68 "	46 "
"	+	3 "	63 "	42 "
"	+	4 "	62 "	39 "
"	+	5 "	58 "	34 "

Table 5

SPEED RESULTS WITH WINTER TEMPERATURE 4 DEG. C.

Benzol		*Alcohol*	*at B*	*at C*
Pure	+	none	82 km./hour	56 km./hour
1 part	+	2 parts	78 "	48 "

Table 3 shows much greater difference in the fuel consumption in the two opposite directions than table 6. The reason is that the morning of Nov. 1, 1914, was calm, while on April 30, 1915, a mild western wind favored the "going." And the road in that direction also has a very slight average down grade. The influence of the wind was not only plainly noticeable, but often proved a disturbing factor in the trials. With an eastern wind one could drive farther on a liter "returning" than "going," and on days when gusts of wind alternated with spells of calmness comparative figures could scarcely be established.

Table 3

DISTANCE RUN ON 1 LITER, SUMMER TEMPERATURE

Benzol		*Alcohol*	*Going*	*Return*
Pure	+	none	7.4 kilometers	7.1 kilometers
1 part	+	1 part	8.6 "	7.5 "
"	+	2 parts	8.0 "	7.2 "
"	+	3 "	7.8 "	7.0 "
"	+	4 "	7.7 "	6.6 "
"	+	5 "	7.2 "	6.0 "

Table 6

DISTANCE RUN ON 1 LITER, WINTER TEMPERATURE

Benzol		*Alcohol*	*Going*	*Return*
Pure	+	none	7.1 kilometers	6.9 kilometers
1 part	+	1 part	7.1 "	— "
"	+	2 parts	6.7 "	6.9 "

Two reasons can be assigned for the peculiarity in table 3 that the alcohol mixtures show a more favorable consumption than pure benzol. (1) The runs were made, one immediately after another, without any re-adjustment whatever—not even of a hot-air valve—and therefore the temperature of the carbureter on the unusually warm spring day was somewhat too high for benzol and more favorable for the alcohol mixtures. (2) All the runs for tables 3 and 6 were made at 40 kilometers per hour, and at this relatively low speed the carbureter furnishes a gas which is rather too rich in benzol. This conclusion is confirmed by the results recorded in tables 7, 8 and 9, referring to trials made on Nov. 5, 1914, and in June, 1915.

The intake manifold on my principal test car is provided with two air cocks, as at *HH* in the accompanying diagram, reproduced from my first report [see THE AUTOMOBILE, Aug. 12, page 289]. On the afternoon of Nov. 5, 1914, four trial runs were made with this car at 20 kilometers per hour over a stretch of road which averages level. For two of the runs the air cocks were closed and for the other two they were opened. The results, as given in table 7, show a considerable fuel saving with the cocks open.

Table 7

DISTANCE RUN WITH 1 LITER BENZOL AT 20 KILOMETERS PER HOUR

	Going	*Return*
With air cocks closed....	6.4 kilometers	6.2 kilometers
With air cocks open....	7.9 "	7.5 "

Also on runs where the motor was operated under heavy load on a mixture of about two parts benzol and one part alcohol—such runs being made June 8, 9 and 17 of this year—was it shown that the open air cocks had a favorable influence when the carbureter float was weighted with a perforated disk of lead; but, on the other hand, an unfavorable influence was noticed when the float was not weighted. The builder of the car had sent me two leaden disks together with the auxiliary tank and other things, when I began experimenting with the alcohol mixtures, and one of these disks I had on the float, as a rule, from Sept. 26, 1914, to June 17, 1915. Since this date I have generally not made use of it. Before discussing further the necessity or superfluity of weighting the float, however, the results obtained with open and closed air cocks both with and without float weights, as recorded in Tables 8 and 9, should be explained.

Table 8—Hill Climbing

EACH RUN ON 1 LITER OF FUEL COMPOSED OF 2 PARTS BENZOL AND 1 PART ALCOHOL. ALL RUNS MADE ON THE SECOND GEAR SPEED AND WITH THE FLOAT WEIGHTED

Date.	*Distance and Location*	*Air Cocks*	*Car Speed*
June 8, 1915.....	From 3.9 to 6.8	Closed	20 km.-hr.
"	" " 6.7	"	" "
"	" " 6.92	Open	" "
June 9, 1915.....	" " 7.0	"	" "
"	" " 6.9	"	" "
"	" " 6.95	"	" "
"	" " 6.96	"	30 km.-hr.
June 17, 1915.....	" " 7.0	"	" "

These runs, as referred to in Tables 8 and 9, were made on the longest and steepest hill in the neighborhood of Wies-

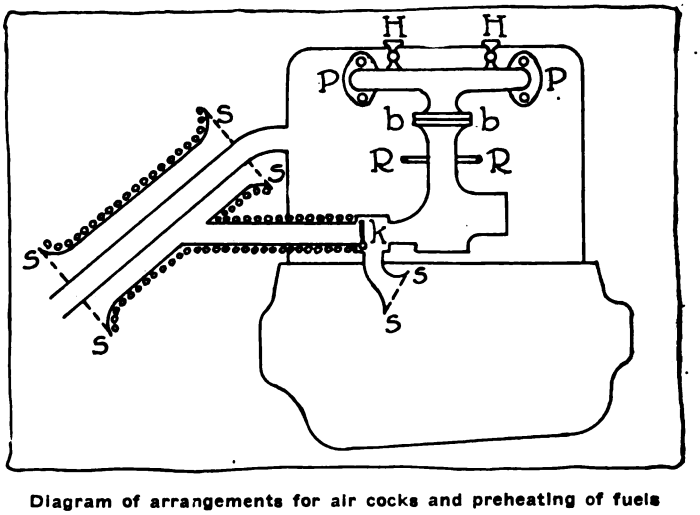


Diagram of arrangements for air cocks and preheating of fuels

baden, which is the road running to Hohe Wurzel, 619 meters above sea level, with an average grade of 1 in 10 from kilometer-stone 3.9 to 7.04. The distances in the tables are indicated by the kilometer-stones between which each run was made. On this road the car could generally work with full motor load. The tables show plainly that the effect of opening the air cocks is much less pronounced than under the conditions of Table 7, with the car running lightly on a level road at 20 kilometers per hour.

Table 9—Hill Climbing

EACH RUN ON ½ LITER OF FUEL (2 PARTS BENZOL AND 1 PART ALCOHOL). ALL RUNS ON THE SECOND GEAR SPEED AND AT 20 KM./HOUR

Date	*Distance and Location*	*Air Cocks*	*Float*
June 17, 1915.....	From 5.5 to 6.9	Closed	Weighted
"	" " 7.06	"	Not Weighted
"	" " 7.05	"	"
"	" " 7.04	Open	"
"	" " 7.04	"	"

The specific gravity of benzol is .88, of alcohol .82 and of gasoline .72. If one wants these fuels all to stand at the same level in the jet, a float intended for gasoline must carry a thick leaden disk when benzol is used and a thinner one when the fuel is to be alcohol. On the other hand, benzol requires more air for its combustion than gasoline does, and it is therefore better to have it stand lower in the jet. The two properties of benzol, namely (1) its higher specific gravity and (2) its greater need of air, have thus opposite effects, and in accordance herewith it is in my experience generally better not to weight the float.

With alcohol the situation is different; it requires less air for its combustion. Therefore the weighting of the float is more desirable with alcohol than with benzol, although its specific gravity is lower. The Pallas Carbureter Company says: "Our carbureters work without any change equally well with gasoline and with benzol." But it furnishes carbureters intended for alcohol fuel with a float weight which is soldered on.

After investigating the influence of air cocks and float weights on the steep road to Hohe Wurzel, I returned to comparative tests of different benzol-alcohol mixtures, and the results of these are shown in Table 10.

All runs of Table 10 began at kilometer-stone 5.5 and were made with full power. As seen from the first column of figures, the first three runs were made on July 3 with a mixture of 1 to 5, and the half-liter was used up at kilometer-stones 6.51, 6.49 and 6.49 respectively. On July 9 the same mixture reached in the first run only to roadstone 6.3, as the motor worked so poorly, owing to unusually cold weather, that a portion of the distance had to be covered on low gear. The figures of this table reveal a few small irregularities, as, for example, that on July 9 the 1 to 4 mixture worked less well than the 1 to 5 mixture. These irregularities are not due to any effect of wind resistance, as in the case of Tables 1, 2 and 3, but depend on whether the runs were made between 2 and 3 o'clock in strong sunshine on the steep hillside or under other conditions. At that hour the sun stood just in the direction of the main stretch of this very broad road, while at other times the road was shaded by the adjacent forests. Table 10 shows also a great difference in the two runs which were made on July 9 with a 1 to 2 mixture, one of these runs being made on second and the other on third gear. It has been ascertained by comparison with other subsequent trial runs that the difference in the present instance became so large only because the motor with a 1 to 2 mixture and on second gear reached an enormously high speed and could not be throttled on account of the purpose of working with full power.

The table further accounts for two runs with unmixed gasoline, which I have kept for extraordinary occasions since before the war, and a run with a mixture of benzol and kerosene has been added for comparison. I expect to report later on some additional trials with different benzol-kerosene-alcohol mixtures.

When average values are computed from Table 10, the figures listed in Table 11 are obtained. The showing for the mixtures which are rich in alcohol are here considerably less favorable than in Table 3. The reason lies in the shortcomings of these mixtures under heavy motor load—the same as noticed at point *C* in Table 2. This shortcoming can however be met with excellent results by narrowing the carbureter channel, as later trials have shown which will be included in my next report.

Table 10

HILL-CLIMBING TRIAL RUNS WITH ⅓ LITER OF FUEL AND HIGHEST SPEED. FIGURES REPRESENT KILOMETER-STONES REACHED, STARTING FROM STONE 5.5. HEAVY FIGURES INDICATE THAT SECOND GEAR — AND IN ONE CASE LOW GEAR — WAS USED

Fuel	*July* 3	*July* 6	*July* 9
1 benzol + 5 alcohol.....	**6.51**	....	**6.3**
	6.49	....	**6.5**
	6.49	....	**6.53**
1 benzol + 4 alcohol.....	....	**6.62**	**6.52**
	....	**6.57**	....
	....	**6.5**	....
1 benzol + 3 alcohol.....	6.75	6.72	**6.54**
	....	6.68	....
1 benzol + 2 alcohol.....	6.82	6.8	**6.59**
	6.83	....	6.83
1 benzol + 1 alcohol.....	6.84	6.83	6.86
	6.85	....	....
Pure benzol	6.89	6.87	6.9
	6.9	....	....
Pure gasoline	....	6.75	6.76
1 benzol + 2(?) kerosene.....	....	....	6.83

Table 11

AVERAGE VALUES IN METERS COMPUTED FROM TABLE 10

1 benzol + 5 alcohol.....	5.5 to 6.5	= 1000 meters
1 " + 4 "	" " 6.6	= 1100 "
1 " + 3 "	" " 6.7	= 1200 "
1 " + 2 "	" " 6.8	= 1300 "
1 " + 1 "	" " 6.85	= 1350 "
Benzol pure	" " 6.9	= 1400 "
Gasoline pure	" " 6.75	= 1250 "
Benzol-kerosene	" " 6.8	= 1300 "

[Von Loew here adds a table showing how far 1 mark's worth of each of the fuels and fuel mixtures will take a car at the present German fuel prices, which are 38 pfennig per liter for gasoline, 37.5 for benzol, 34 for denatured alcohol and the mixtures according to their proportions, but this table is here omitted as the prices during the war are artificial. As they are, the greatest mileage and therefore the greatest economy are credited to the equal mixture of benzol and alcohol, while unmixed alcohol is fully as economical as gasoline if the carbureter channel is narrowed, as above referred to.]

One defect attaches of course to all the figures in all the tables; namely, that they were all obtained with one car. I have, to be sure, also made trial runs with both my older cars, using benzol-alcohol mixtures up to the proportion of 1 to 2 with good success. But I have not taken note of numerical values with them, as little troubles easily arise with cars of the older types. When a spark plug misses fire even only for a few moments during a trial run, or a carbureter float sticks, the run is of course numerically without value. With the new cars these interruptions have so far not occurred; only once, on a trial run with solutions of naphthalene, some peculiar phenomena were observed which probably should be ascribed to crystalline precipitations of the naphthalene in the auxiliary jet.

[Translated from *Automobil-Rundschau*, September, 1915]

Stewart Adds Ford Starter

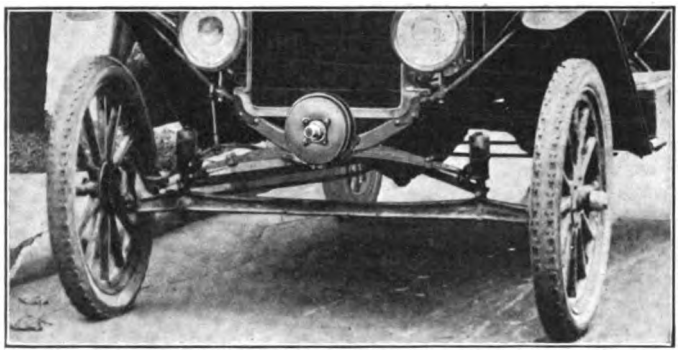
Is of Pneumatic Type, Combining Tire Pump—No Machine Work Necessary in Installation—Outfit $40

A PNEUMATIC starter designed specially for quick installation on the Ford car is the latest addition to the line of the Stewart-Warner Speedometer Corp., Chicago, Ill. The outfit consists of an air compressor, similar in design to the Stewart tire pump with modifications made necessary by the necessity of storing compressed air, an air motor having a rotating piston, a tank for the storage of the air under pressure, and lastly an automatic distributing or regulating valve and an automatic starting clutch. In addition to this the only two parts are the pedal push button with its linkages to the regulating valve and the sliding clutch, and a pressure gage on the dash, and the hose and pipe connection for the transfer of the air.

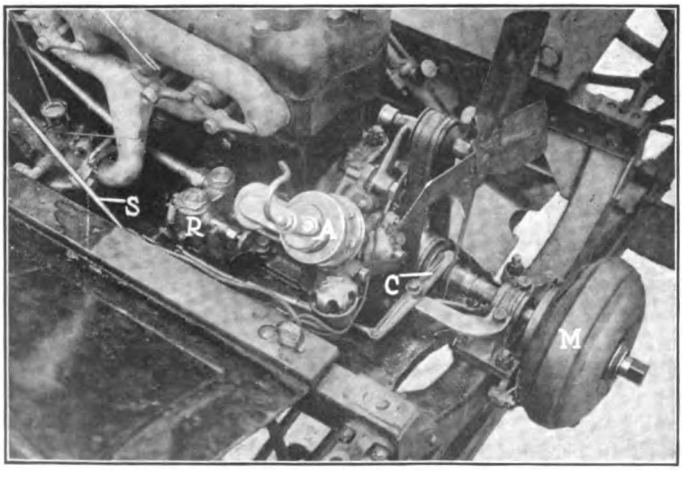
No Machine Work Necessary

The outfit ready for installation, which requires no machine work and can be done by any owner in a few hours' time, sells for $40. The starting motor, or cranking unit, is an air-tight cylinder, circular in form and which replaces the old crank handle. Passing through this cylinder is a shaft which engages the motor shaft, the same as the crank-handle shaft formerly did. Within the cylinder is a stationary head or vane *V*, also a piston *P*, or bat-wing valve, which is attached to the shaft. This valve or piston is attached to a collar through which the starter shaft passes, and inside of the collar is a pawl which engages the groove or teeth in the starter shaft. A driving clutch *C* is attached to the end of the starting shaft, the driven member being installed on the end of the motor shaft.

Stewart air motor with cover plate removed, showing rotating piston P and stationary vane V



How the Stewart pneumatic starter appears on a Ford car



Stewart air starter for Fords. S is control rod from floorboard, R regulating valve, A air compressor, C sliding clutch, and M air motor

In operation the driving clutch engages with the driven clutch at the same instant that a charge of air enters the starter cylinder. This air pressure causes the piston and shaft to make one complete revolution, but it spins the motor shaft up to as many as eight or ten revolutions.

In order to make a steady yet easy installation of the air pump, or compressor, it is an integral part of a timing gear case cover which is substituted for the cover already on the motor. The piston of the air pump is driven from an eccentric installed on the end of the timing gear shaft, and is running at half the engine speed whenever the motor is running. The air pump is designed to maintain pressure of 200 lb. in the air reservoir. When this pressure is reached a diaphragm valve in the pump closes the air intake and prevents pressure rising above 200 lb. When air is used for starting, or inflating tires, thus reducing the pressure in the reservoir, the pressure on the cut-out diaphragm is relieved and the intake valve opens, permitting the pump to force air into the reservoir until the 200-lb. limit again is reached. Thus the pressure in the tank is automatically maintained.

Tested for 600 Lb. Pressure

This tank, or air reservoir, is suspended underneath the body of the car and is carried in brackets which are attached to the frame. It is tested for 600 lb. per square inch pressure, so that the factor of safety is adequate.

The passage of air from the reservoir to the starter motor is controlled by the pedal through an outlet valve which is a part of the air control, or regulating valve. Pressing the pedal opens this outlet valve and permits a charge of compressed air to enter and operate the starter motor.

The outlet valve, which is operated by the pedal, also is connected with a lever which engages the driving clutch with the driven member, thus connecting the starter motor with the crankshaft of the car. There are two stages in the operation resulting from a pressure on the pedal. During the early part of the movement of the pedal the clutch is engaged in just the same way that the old hand starter crank is engaged with the shaft before the actual cranking is started. When the clutch is engaged further movement of the pedal opens the outlet valve, admitting compressed air from the tank to the starter motor, which spins the crankshaft.

For Winter Starting

For winter starting, the choker wire, normally connected with the carbureter and passing through the radiator, is replaced with a choker lever installed on the dash. Tire inflation is provided for by a valve and nipple on the air-controlled valve, and hose connection with tire pressure gage. The starter complete, with pump, tank, motor and connections, adds 42 lb. to the weight of the car.

THE AUTOMOBILE

PUBLISHED WEEKLY

Vol. XXXIII Thursday, October 14, 1915 No. 16

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
T. B. Van Alstyne, Advertising Manager
231-241 West 39th Street, New York City

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United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Wanted! Racing Cars

THE racing year which has just closed with the Sheepshead Bay contest for the Astor Cup has concluded a series of demonstrations that the speedway event can become a part of our national life; that it is a popular sport and as a business, well worth following. But if it is to continue to be successful and popular we need, in fact we *must have*, some more cars. Even this year, despite foreign importations, we have not had enough cars of the first rank, and there has been but one big event to each speedway.

We have seen good racing from four teams. the Peugeots, Stutz, Duesenberg and Maxwell. What have we had outside these capable of sustained speed at meeting after meeting? Now it would appear that the Peugeots are tiring, just as a racehorse will tire and go stale after a few big contests. De Palma's Mercedes is giving such trouble that he and it have disappointed the public who had paid their money partly to see this combination on more than one occasion. What have we got left as next year's prospect?

A car of the first rank of speed is fit for only two or three hard, long races, especially a car that is far from its parent factory. American built machines have the advantage over the invader that they have their factory permanently behind them, and it is a matter of days only to get new parts or to try new schemes of detail design. Europe can send us no more cars to race with, and those we have will slowly but surely get worse and worse. Look at the performance of the Delage cars on the speedways this year and contrast it with their form two years ago.

Whatever help our big-minded manufacturers are able to give to owners of foreign cars in the way of factory facilities, whatever resources they have in repair shops and depot stocks are as nothing beside the advantage of a factory of origin close at hand.

We want five or six teams of three or four cars each from the leading factories of America. If the makers do not care to race, then let them build cars for sale to the many private sportsmen who have hitherto bought foreign productions. There are plenty of buyers for the proper class of car, and the prices paid in the past for alien machines were big enough to tempt the American manufacturer to consider the affair as a business proposition.

Here we have a great and prosperous business in the speedways, which have given pleasure to hundreds of thousands of spectators, and we have a far greater and far more prosperous industry in the automobile manufacturing field. Surely the greatest automobile producing country in the world can profitably care for the building of a few dozen racing cars a year. The foolish old idea that a manufacturer stands to lose by racing ought to be fairly well exploded now. The most ignorant man knows that the racing car and the passenger machine are as far apart as the racehorse and the mule. If a manufacturer does well in racing it advertises his name and is an advantage, but a firm with an established name in the touring car field would never miss an order by reason of failing in a race or two.

Any first-class factory can build a fairly good racing car, so widely has the knowledge of the principles and practice been spread, and so many are the existing good machines for study. A car of good material and sound design may not be a world-beater, but it could not fail to make a good showing and to provide good racing anywhere. Mere *presence* in the racing field is a sign that the organization is alive and progressive. It shows that the engineering force behind the touring car of standard production are men of intellect and experience, and, moreover, the knowledge to be gained, that is of value in everyday work, is much more than anyone could guess without actual trial.

America, thanks to the efforts of just two or three firms, is in a position in the racing world which it is worth while holding for the sake of our trade abroad. It is up to our manufacturers to realize that there is no market for American automobiles where the speeds made in the last few races here will not have an effect in raising the reputation of "made in U. S. A."

Furthermore, automobile racing when it is safe and sane and well conducted, as it is on our great speedways, is a magnificent advertisement for the motor car and motor-car using. The races without doubt have a potent effect in selling automobiles of all grades. So from the wide outlook of the whole industry the speedways are worthy of a proper support, a support that manufacturers should be quick to give.

Couzens Resigns from Ford Co.

Organizer of Great Business Finds Ford's Peace Propaganda Unendurable

DETROIT, MICH., Oct. 12—James Couzens, vice-president, treasurer and general manager of the Ford Motor Co., and who has been generally recognized as the great force back of the business end of the organization, resigned to-day from all active connection with the Ford organization, the reason given being that he could not agree with the recent public utterances of Henry Ford on the national question of peace and unpreparedness. Mr. Couzens' resignation comes as a sequel to the division between Henry Ford and the Dodge Brothers, which resulted in the starting of the Dodge factory over a year ago. It has been understood that there have been differences between Couzens and Ford for several years, these differences dating to some time before the Ford announcement of his profit-sharing plans, and also before the break with the Dodge Brothers. It is claimed that the split, however, is a direct result of the use of the Ford Motor Co.'s publication, the *Ford Times*, for the expression of Mr. Ford's views on war and preparedness.

Mr. Couzens' connection with Henry Ford dates back to the early part of 1902 when he first met Ford and became interested in the building of a sample car. Couzens, Ford and another associate followed the development of this particular sample, or experimental car until the spring of 1903 when they set about to form the present Ford Motor Co., which was organized in June of that year, and Mr. Couzens became business manager and secretary.

Couzens the Organizer

In the Ford organization it has always been recognized that Henry Ford was the man who was responsible for the early cars of 1902, as well as practically all models and designs of the company since, but that James Couzens has been the organizing, business, and financial moving spirit of the concern. The extent to which Mr. Couzens has profited from the Ford organization is practically indicated last June when the directors of the company increased the capital stock from $2,000,000 to $100,000,000, and when it was announced that Mr. Couzens received 1¼ per cent. At that time when the $48,000,000 new stock was distributed among the eight stockholders as a dividend, Mr. Couzens share was $4,800,000.

In speaking of his separation with Mr. Ford, Mr. Couzens said:

"I disapprove of Mr. Ford's views on preparedness, which proved of such serious moment to me that I was compelled to rupture my business relations with him. The friendly relationships between us that have exisited for twenty-two years have been changed of late, our daily differences increasing."

Although no definite information can be gained yet as to the changes to be effected in the Ford organization due to the resignation of James Couzens, it is stated on good authority that no one man will step into the position left vacant. Undoubtedly Frank L. Klingensmith, present secretary of the company will receive promotion, although Henry Ford states that several men will be advanced in order that each can take a part of the work. Ford states that the reorganization will be entirely among the present officials, the policy being to develop the concern's own men rather than seek department heads from outside. Among the men who will undoubtedly share in the change is C. H. Wills, the present production manager, who has been materially responsible for the great developments of the company, and Sales Manager N. A. Hawkins.

—

Hudson to Concentrate on Six-Cylinder Types

DETROIT, MICH., Oct. 11—Rumors that the Hudson Motor Car Co. intended to bring out a twelve-cylinder motor have been heard many times during the last few months. There was even talk about a Hudson eight. To set everybody at rest, the Hudson company has now made a definite announcement to the effect that it will confine all its energy to the Hudson six, believing this to be the best motor.

In its announcement the company says: "The refinement and development of the six-cylinder type of motor leads us to believe that it surpasses in simplicity, low cost of upkeep, performance and general adaptability any other type of motor so far developed for use in pleasure vehicles."

—

Michelin Brings Out Non-Skid

NEW YORK CITY, Oct. 9—The Michelin Tire Co., Milltown, N. J., has brought out a non-skid tire with rubber elevations which is known as the Michelin Universal tread. This is the first time this concern has manufactured a rubber non-skid tire. It has the flat tread of the Michelin racing tire, and on the tread is a raised pattern consisting of the letter M in a continuous series; the interstices between the rows of letters form a suction against the road and tend to hold the tire from slipping.

Sizes and prices of the new tire are:

32 x 4	$22.00	35 x 4½	$30.00
33 x 4	22.50	36 x 4½	30.75
34 x 4	23.00	37 x 4½	31.50
36 x 4	24.75	37 x 5	36.25

56 In. To Be Standard Tread

N. A. C. C. Directors Vote for Uniformity in This Respect, Beginning July 31, 1916

NEW YORK CITY, Oct. 7—At the meeting of the board of directors of the National Automobile Chamber of Commerce, Inc., held here it was decided to standardize the treads in motor vehicles at 56 in. after July 31, 1916. This will bring into line many vehicles which heretofore only varied from the given measurement by a fraction of an inch. A large majority of cars now in use has the 56-in. tread. The Chamber will hold its usual banquet during show week.

The traffic department's report indicated continued record shipments of motors cars. This has resulted in a shortage of freight cars, but the makers are co-operating with the railroad companies to avoid any serious delay in shipments.

Regarding the deliberations leading up to the adoption of the 56-in. tread, the committee on treads met in Detroit not long ago and prepared its recommendations. The trade had been broadly canvassed with the idea of securing the viewpoints of the manufacturers and the result was that it was decided to drop the practice of making 60-in. tread for the Southern trade. It was discovered that only in very few sections of the country were the roads in such a condition that the 56-in. tread offered any difficulty and the result was that they have all agreed to the 56-in. standard. One of the difficulties said to be in the way of the 60-in. tread is that the manufacturers concentrate their minds on the 56-in. standard with a result that orders for 60-in. tread are side-tracked until the factories are under less pressure.

—

Collins and Hibbard Resign from R-C-H

DETROIT, MICH., Oct. 11—After having been connected with the re-organized R-C-H Corp. since February, 1914, A. H. Collins, vice-president and assistant general manager, and V. S. Hibbard, sales and advertising manager, have resigned. No successors have been named. Messrs. Collins and Hibbard will shortly announce their connection with a new concern now in course of organization.

—

Hood Visits Detroiter Dealers

DETROIT, MICH., Oct. 11—Wallace C. Hood, general sales manager of the Detroiter Motor Car Co., is on an extensive trip through Illinois, Minnesota, Iowa, Wisconsin and Missouri, where he will visit Detroiter dealers and distributors.

August Exports Are $9,567,348

Over $2,000,000 Less Than in July—Cars Lower and Trucks Higher

	August, 1914 No.	Value		August, 1915 No.	Value
Cars	385	$441,879	Cars	3839	$3,121,834
Trucks	68	124,016	Trucks	1614	4,387,193
Parts	...	196,527	Parts	....	2,038,321
Total		.....$562,422	Total		....$9,567,348

WASHINGTON, D. C., Oct. 11—Exports of passenger cars and trucks together with parts, during August last amounted to $9,567,348, as compared with $562,422 for August, 1914, and with $12,302,345 in July last. Passenger car exports in August, 1915, were lower than the previous month, the August figures being 3839 cars valued at $3,121,834, compared with 2469 cars valued at $6,803,001 in July, 1915. During August, 1915, 385 cars valued at $441,879 were exported. Trucks numbering 1614 and valued at $4,387,193 were exported in August, as compared with 4118 valued at $3,835,347 in July last. Truck exports during August, 1914, numbered only sixty-six, valued at $124,016. Parts exports during last August, amounted to $2,038,321 as compared with $1,663,997 in July last and with $196,527 in August, 1914.

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Continental to Increase Capital

DETROIT, MICH., Oct. 12—A special meeting of the stockholders of the Continental Motor Mfg. Co. has been called for Oct. 19, the purpose being to propose an increase of the capital stock of the company in order to declare a stock dividend. While officers of the Continental company are not willing to make any statement as to this dividend, it is rumored that it will be of 100 per cent.

The present capitalization of the company is $1,500,000. Its fiscal year ends June 30. At the end of the 1914 fiscal year the company had a surplus of $754,227.51. Its assets and liabilities totaled $3,075,388.97. The paid par value of its stock is $100. During the last two weeks it has gained more than 40 points on the local stock exchange. The business of the company is said to be between 25 and 40 per cent larger at this time than it was at the same period in 1914.

—

Perfection Spring Raises Capital

CLEVELAND, OHIO, Oct. 11—The Perfection Spring Co., this city, will increase its capital stock, now consisting of $500,000 7 per cent cumulative preferred and $1,000,000 common to $1,000,000 7 per cent cumulative preferred and $1,500,000 common. Of the new issue there will be issued at this time up to $250,000 preferred and $1,000,000 common, but no offering will be made to the public at this time.

Application has been made to the secretary of state at Columbus, for a charter for the Perfection Spring Co. of Cleveland with the above new capital. The company will take over the assets and business of the present company of that name.

The directors of the new company are: F. F. Prentiss, C. C. Bolton, T. E. Borton and Attorneys Horace Andrews and Benjamin Gage. This is a temporary organization. The permanent board will be elected later.

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Zimmerschied Talks Metallurgy Before Detroit S. A. E.

DETROIT, MICH., Oct. 12—Before 200 members of the Detroit section of the Society of Automobile Engineers and guests, K. W. Zimmerschied, chairman of the Standards Committee, gave a talk here to-night on the Influence of Metallurgy on Design. The question always has been, he said, whether a part should be large or of better material and smaller in section. There are limits to the development in reducing of size by the use of better materials and great progress has been made in the last five years regarding the cause of steel failures.

Zimmerschied touched upon the mechanism of failure and dealt with the theories of molecular and crystalline structure of steels. He advised the avoidance of sharp corners or abrupt changes in section of parts, as they localize stresses. He refers to sharp edges in keyways, splines, etc. Scratches and tool wounds also have this effect. Vibrational stresses are also to be guarded against.

A very interesting series of moving pictures illustrating the evolution of steel pipe from ore to finished product was shown by the National Tube Co.

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Naval Engineers to Attend Metropolitan Section Meeting

NEW YORK CITY, Oct. 13—Twenty naval engineers who are studying this year at Columbia University are expected to be in attendance at the meeting of the Metropolitan Section of the Society of Automobile Engineers, Oct. 21. The papers are of broad interest and should attract considerable attention. Prof. William Campbell of Columbia University, who is a widely recognized authority on metallurgy, will deliver a short address on the elements of metallography and this will be followed by a series of motion pictures showing the manufacture of steel tubing from ore to tube, with a lecture on the processes of manufacture.

France to Have 45% Duty

Plans to Secure Russian Market For Entente Powers, Excluding Neutrals

PARIS, Sept. 24—American automobiles entering France are to be met with a 45 per cent tariff. This information is given on the very highest authority. Negotiations are already well in hand between the united body of French automobile manufacturers and the Government which will lead to a complete revision of the tariff. Before England had decided on a 33 1/3 per cent import duty, and while this move was unknown in France, it had been decided in France to raise a protective tax. Either the American tariff wall as regards automobiles must be cut down to the French level, or the French wall will go up to the American height. As rapid action may be expected in this matter as shown by England. The French industry, which has the full support of the Government, is determined that American manufacturers shall not step in and grab its markets during the after-the-war interval when the demand will be strong and the home factories will be unable to meet it.

Makers' Union Excludes Germany

There is a more important phase of this protective campaign. The various automobile manufacturers' associations of Europe are united in an international union. Germany is a member of that union, but she will be struck off, and will remain off, when the war comes to a close. France, England, Belgium and Italy, will remain the leading members of that union. Russia will not be in, for she has no automobile industry; she will be considered, however, on the same footing as the active members. By means of the union, reciprocal preferential tariffs will be established among the Allied nations and prohibitive tariffs erected against neutral and the present enemy nations. This means that the Russian automobile market will be open to England, France, Italy, and Belgium, but will be protected against other countries by high tariffs. The Russian market is the most important, for it offers infinite opportunities of development. What applies to Russia is applicable to the other Allied nations. France, England, Italy and Russia do not fear one another's competition. France and England are fully aware that the war will find their automobile factories swept clean of both automobiles and automobile parts and faced with a transition period during which they must transform their works from war to peace requirements.

Indianapolis Race to Be 300 Miles

Next Speedway Contest on Hoosier Track May Be for $30,000 Instead of $50,000

INDIANAPOLIS, IND., Oct. 8—Carl Fisher, president of the Indianapolis Motor Speedway has announced, this week, that the next Speedway race slated for the Indianapolis speedway would be 300 miles instead of 500, as has been the custom heretofore.

"I am convinced that the shorter race will be more popular with the race going public, for experience has taught us that 500 miles is a little too long to be enjoyed fully by the spectators," said Mr. Fisher.

Mr. Fisher said that he believed all contests next year would be 300 miles and that purses would be reduced accordingly to $30,000 instead of $50,000. When asked if the race May 30 would be for $30,000 instead of $50,000, Mr. Fisher said that he would be in a position later to make a statement on this angle of the race. He left the impression, however, with his auditors that the purse would be $30,000.

—

Predicts Lower Gasoline Prices

PHILADELPHIA, PA., Oct. 11—Speaking before the Franklin Institute of this city Dr. Benjamin T. Brooks, in charge of petroleum research in the Mellon Institute of Industrial Research at Pittsburgh, predicted that the price of gasoline would in the future be lower by reason of the methods which are being found for its extraction from the heavy crude oils. In his subject, The Decomposition of Petroleum Hydrocarbons by Heat and Its Application to the Motor Fuel Problem, Dr. Brooks pointed out that the automobile industry had increased out of proportion to the gasoline supply of the country. He had among his hearers chemists, engineers, oil and gasoline experts, and automobile owners.

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German Control of Benzol Ends

NEW YORK CITY, Oct. 9—The prediction was made last night at the first fall meeting of the local section of the American Chemical Society at the Chemists' Club, 50 East Forty-first Street, that at the end of the European war benzol would find extensive use as a substitute for gasoline as the motive power for automobiles. It was pointed out that whereas before the European war this country was producing only 3,000,000 gal. of benzol, the large steel works, many of which did not recover their benzol, are now producing about 15,000,000 gal.

It was also predicted that the German domination in this product, existing before the war, will probably be a thing of the past.

I. F. Stone, president of the National Aniline & Chemical Co., and speaker of the evening, stated that benzol could be produced now and sold at the same price as gasoline if it were necessary to do so. It is being largely used in Europe in place of gasoline, and the only reason it has not been used here has been the limited production and the high price, it normailly being about double the cost of gasoline.

Careful experiments for automobile purposes show that benzol has a motive power about 25 per cent greater than gasoline.

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To Build More Gasoline Plants in Texas

DALLAS, TEX., Oct. 8—Several plants for the manufacture of gasoline from natural gas will be built in Texas within the next few months, according to the statement of James Howard, the representative of one of the companies that is preparing to engage in the industry. It is stated that there are now about fifty plants in Oklahoma that manufacture gasoline from what is known as casinghead gas, or that gas which comes direct from the well with crude oil. The total output of these Oklahoma plants is about 80,000 gal. of gasoline daily. They are located at Tulsa, Bartlesville and other points and are being constantly increased in number. The gas which is now utilized for the manufacture of gasoline was formerly a waste product. In California there are said to be about twenty plants of this kind and they have a total daily capacity of about 35,000 gal. Some gas runs higher in gasoline than others. It takes about 500 cu. ft. of gas to yield 1 gal. of gasoline.

The grade of gasoline that is obtained from natural gas is more volatile than that which is obtained from crude oil. It grades all the way from 75 to 90 deg. gravity, and it is then reduced to a gravity of about 60 deg. by treating it with naphtha.

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Independent Gasoline Companies Meet in Chicago

CHICAGO, ILL., Oct. 9—Western independent oil jobbers are meeting here to appropriate funds for prosecution of independent refiners who, they say, are in subterranean agreement with the Standard Oil Co. to hold up gasoline prices.

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Twin City Gasoline Higher

MINNEAPOLIS, MINN., Oct. 9—The price of gasoline in the Twin Cities has advanced to 12½ cents, following a recent advance of 1 cent to 11½ cents per gallon.

100-Mile Race for Sheepshead

Tentative Plans Outlined for Special Race of Leading Drivers—$12,000 Prizes

NEW YORK CITY, Oct. 12—Tentative plans have been outlined for a special race on the Sheepshead Bay Speedway here Election Day, Nov. 2, at which probably six of the leading winning drivers of the year will compete. It is purposed to have $12,000 in prizes. $1,000 will be given as a guarantee of expenses to each of the six cars entering. The $6,000 remaining will be divided between two races, one of 50 miles with $2,000 in prizes and the second race of 100 miles with $4,000 in prizes. Harry Stutz has announced that none of his cars will be in the contest although there is a possibility that Cooper or Anderson may drive other makes. The drivers assured are Resta, Rickenbacher, Aitken, Oldfield, Burman, and perhaps Anderson or Mulford. It seems probable, however, that few if any of the winning cars will be available.

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New York Gasoline Up to 23 Cents a Gallon

NEW YORK CITY, Oct. 11—The price of S. O. gasoline in this city has been raised to 23 cents a gallon retail. This is the third advance in the last three days. Refiners on Thursday sent out notice of an advance in the wholesale price to 17 cents per gallon, making the fourth advance in price in the past three months. Retailers were selling at 21 cents on Thursday. On Friday the price went up to 22 cents, and on Saturday still another cent. Other oils, excepting kerosene, were advanced in sympathy with gasoline.

The dealers ascribe the advance to the enormous demand made upon American refiners by the European war and the largely increased consumption at home. Most of the companies suffered severely by the recent storms in the South. The producing facilities of several of them have been so crippled that they were obliged to buy from competing companies at a sacrifice in order to meet the demands of their trade.

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Velie Adds Four-Passenger Coupé

MOLINE, ILL., Oct. 8—The Velie Motor Vehicle Co., this city, has added a new body to its line mounted on the model 22 six-cylinder chassis. It is a four-passenger coupé with the driver's seat mounted slightly ahead of the passengers' seat which has a capacity of two. The seat for the fourth seat is mounted on a stationary pedestal capable of being

revolved in any direction. This provides a large, roomy car and there are drop windows which can be opened in seasonable weather. The car sells for $1,750, trimmed in dark blue whipcord.

The Velie 22 chassis has a 3½ by 5 block power plant, 124-in. wheelbase, 34 by 4 front tires and 35 by 5½ rear, dry plate clutch, four-speed gearset and is fitted with Gray & Davis electric lighting and starting.

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Jones Motor Car Co. Formed with $500,000 Capital

WICHITA, KAN., Oct. 9—A charter incorporating and authorizing a capital stock of $500,000 for the Jones Motor Car Co., this city, to manufacture the Jones Six, has been granted. Of the entire capital stock, $200,000 is taken by J. J. Jones, founder of the company, which began less than a year ago to build cars in a local plant here. The Jones six sells for $995.

With the granting of a charter, a reorganization in the local company takes place. Mr. Jones turns over the plant which he owned privately to the new company. But two Wichita men are named as incorporators, they being Mr. Jones and J. W. O'Neill, former treasurer, Kansas Casualty & Surety Co.

W. A. King, for fourteen years connected with the Detroit plants, will take charge of the local shops as chief engineer and superintendent of production.

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New All-Year Car for Mitchell

NEW YORK CITY, Oct. 9—The Mitchell-Lewis Motor Co., Racine, Wis., has brought out a new demountable Sedan top selling for $165 and furnished on both the five- and seven-passenger models. The interior is lined with whipcord and a large electric light is concealed in the top of the car. The windshield is built-in with ventilating features. The side windows are removable.

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Lynch, Hollier Production Manager

JACKSON, MICH., Oct. 9—The Lewis Spring & Axle Co. has appointed Leight Lynch production manager. Mr. Lynch was formerly a member of the Studebaker Corp.'s organization and more recently general manager of the American Top Co., Jackson.

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Pfeffer Off for Coast

DETROIT, MICH., Oct. 12—Vice-president and assistant general manager C. A. Pfeffer, of the Chalmers Motor Co., is en route for the Pacific Coast, to call upon Chalmers dealers and distributors. He will make stops at Chicago, Los Angeles, San Francisco, Portland, Seattle, Salt Lake City, Denver, Kansas City and several other important distributing places.

Perrin Is Timken Axle Engineer

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Alden Continues as Vice-President—Baldwin Service Manager—Other Changes

DETROIT, MICH., Oct. 8—J. G. Perrin has joined the Timken-Detroit Axle Co.'s organization in the capacity of chief engineer. Mr. Perrin was the designer of the first Lozier automobile and remained as chief engineer of the old Lozier Motor Car Co. for nineteen years. Last March he became a consulting engineer for the Continental Motor Mfg. Co. He has specialized on axle and chassis construction and is a member of the standards committee of the Society of Automobile Engineers, and also of the Detroit section of that organization.

H. W. Alden, who was chief engineer and vice-president of the Timken company, remains as vice-president.

G. O. Baldwin has been appointed service manager of the company. He formerly held a similar position with the Cadillac Motor Car Co., also with the Studebaker Corp.

J. M. Ready, formerly assistant to Leslie Williams, manager of accounts of the Timken-Detroit Axle Co., Clark Avenue plant, has been changed to the Timken-Detroit Axle Co.'s Metal Products plant, on the East side of Detroit.

F. H. Maisonville has been appointed assistant to W. H. H. Hutton, Jr., director of purchasing. He was formerly assisting purchasing agent with the Packard Motor Car Co.

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Materials Only Handicap of Detroit Factories

DETROIT, MICH., Oct. 12—The factories here continue to turn out cars in as large quantities as they are capable of, due to a demand which seems insatiable. Here and there curtailment of output is noticeable but this is not chargeable to lack of orders, but solely to inability to get the parts and raw materials necessary.

Although in some quarters it has been predicted that there would be improvement in the materials market, no such betterment of conditions has yet made itself evident, and the situation is causing no end of worry all along the line. Concrete evidence of the scarcity of certain standard forms of raw stock is easy to find. At one carbureter factory where they were formerly making float counterweights out of brass stock already rolled into circular form, they have been obliged to turn the pieces out of solid square stock. This is just an instance of what the shortage has meant and does mean. In many instances the inability to get the kind of material required has forced the working out of new methods of manufacture of certain parts.

Those concerns which did not have contracts placed months ago for their present requirements are the worst sufferers. Where foresight and money have made it possible, the slowness of parts delivery is not felt as badly as in cases where a concern's output is small, and it was impossible for it to tie up large sums in parts which were not to be used for several months later.

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Chalmers Shipments Gain 302%

DETROIT, MICH., Oct. 9—Shipments of the Chalmers Motor Co. for the quarter ended Sept. 30 showed a gain of 302 per cent over the same period of 1914. The company sold 154 more cars in July, August and September this year than were sold in the first nine months of the fiscal period ended June 30 last.

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1-Ton and 2-Ton Superior Trucks to Be Built in Atlanta

ATLANTA, GA., Oct. 8—E. G. Willingham's Sons, this city, will build the Superior truck in this city, as announced in THE AUTOMOBILE for Oct. 7. G. E. Whiteside, formerly with the E. R. Thomas Motor Co., LaSalle Niagara Auto Co. and the American Locomotive Co., is chief engineer. One and 2-ton type trucks will be built.

The truck is equipped with three-point suspension, valve-in-head motor, with offset crankshaft, multiple disk, Raybestos faced clutch and a unit power plant driving to internal gear-driven rear axle.

The rear axle construction is a feature. The drive is in the rear and does driving duty alone, as the load is carried on a solid I-beam member.

The company expects to make deliveries on its 1-ton truck, costing $1,350, by Nov. 1. An express body will cost $50 additional.

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Plan Climb to Pike's Peak

DENVER, COL., Oct. 8—The Pike's Peak Highway Association is planning to hold a hill climb next year over the 17 miles of road from Cascade to the top of Pike's Peak. One feature of the program, which will cover several days of competition, according to present plans, will be a truck contest, a result of the climb to the peak by the Wilson truck at the time of the highway opening.

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Parish & Bingham Buy Land

CLEVELAND, OHIO, Oct. 11—The Parish & Bingham Co. contemplates increasing its plant at West 106th Street and Madison Avenue, N. W., by 10 acres. A 10-acre tract at West 106th Street and Madison Avenue has been bought. The plant of the company covers a ground space of 22 acres.

Australia with Record Crops To Be a Leading Automobile Buying Power

American Automobile Manufacturers Benefited by Stoppage of European Exports to that Country—Majority of Cars Use American Tires—N. S. W. Imports Lower

SYDNEY, AUSTRALIA, Aug. 20—Australia, as an automobile buying power, promises to be a leader. Trade conditions throughout the whole of that country are at present very good, considering the expense the country is now undergoing on account of the war.

In Victoria, South Australia and Western Australia, the farmers will enjoy one of the finest and most prosperous seasons. The visible wheat at the present time constitutes a record crop.

The rise in value of the pound sterling in that country, which is at present well over par, means that the farmers will be able to clear off all debts on their holdings and will be in the fortunate position of having plenty of money.

Much difficulty during the first six months of 1915 was experienced with freight, many houses having much stock lying for four and five months on the wharves, especially in San Francisco. The effect of this was to throw trade into a state of confusion. This was offset, however, on account of a number of houses being stocked with last year's models, through the effects of the war, and business kept on going in a fairly prosperous manner. The present outlook of freight conditions is not very promising.

The stoppage of European vehicles being sent to this country has especially benefited the American makers. American trucks are fast finding a market and the outlook for large sales is very promising.

There are one or two things the truck makers will have to watch closely, and one is that all vehicles will have to be right drive. The position of the gear levers in the center does not matter a great deal as far as trucks are concerned.

New Truck Agencies

A number of the truck makers are taking advantage of the present demand by establishing Australian agencies. The Jeffery Co. recently established agencies throughout the whole of the Commonwealth, and one of the largest catering firms in Australia is now using those trucks. The Kellys Motor Garage of Sydney has taken on the Federal and the Sanford. Larke, Hoskins & Co., Sydney, who have never handled American cars before, have taken on the Republic. Dalgety & Co., of Sydney, Melbourne and Perth, have added the Willys-Overland and the Anderson electric. Murray, Aunger & Co. of Adelaide, have also taken on the Willys-Overland. V. Lewis, Ltd., of Adelaide, has taken on the Signal truck. McIntosh & Sons, Ltd., Sydney, recently added the G. M. C. line of trucks.

The best agents in the Commonwealth are now representing the American trucks. There are a number of other agents, not doing quite the same bulk of business, still availble for agencies.

In the passenger car field, the Ford leads in prosperity with Overland and Buick next. The Studebaker car is also doing a good business. The Hupmobile is doing well with the firm of Evers Bros. in Brisbane, and also with Denys, Lascelles of Melbourne, and Phizackerleys of Sydney. Another newcomer on the market is the Pullman, which has been established throughout all the capitals in the hands of new agents.

50 Per Cent Tires American

More than 50 per cent of the cars are using American tires, as the importation of European tires is practically stopped. American tires are finding a large market. At the present time the Goodrich, Goodyear and U. S. tires are being handled in Australia.

N. S. W. Imports Drop

Imports during the first six months of 1915 into New South Wales, the leading automobile buying State in Australia, dropped 43 per cent under those of the same period in 1914. $927,550 in chassis, parts and bodies were imported into that State in the first half of 1915 as compared with $1,649,085 in the same period of 1914.

The United States led all the other countries with a total import on its chassis and bodies of $374,010 against $304,735 for the United Kingdom, its nearest competitor. The American im-

Tabulation of Car, Chassis and Parts Imports into Australia in the First Six Months of 1915 and 1914

FIRST SIX MONTHS, 1915

Chassis and Parts

Country Whence Imported	Value	Country of Origin	Value
United Kingdom	$297,675	United Kingdom	$252,670
Canada	171,020	Canada	89,845
New Zealand	9,820	Belgium	18,705
Fiji	3,610	France	28,190
Belgium	2,840	Germany	7,104
France	4,470	Italy	72,615
Germany	2,445	U. S. A.	289,555
Italy	64,855		
India	455		
New Caledonia	10		
U. S. A.	202,670		
Total	$759,870	Total	$759,870

Bodies

United Kingdom	$51,075	United Kingdom	$52,065
Canada	46,630	Commonwealth	330
New Zealand	2,145	Canada	23,095
Belgium	875	France	1,510
Fiji	105	Germany	1,280
Germany	500	Italy	4,945
Italy	4,945	U. S. A.	84,455
India	330		
U. S. A.	60,175		
Total	$167,680	Total	$167,680

FIRST SIX MONTHS, 1914

Chassis and Parts

Country Whence Imported	Value	Country of Origin	Value
United Kingdom	$528,150	United Kingdom	$445,555
Canada	284,990	Canada	182,675
New Zealand	24,310	New Zealand	50
Belgium	96,335	Belgium	32,320
Ceylon	1,020	France	10,415
France	13,935	Germany	147,645
Germany	86,800	Italy	84,530
Italy	73,840	U. S. A.	496,170
U. S. A.	363,670		
Total	$1,473,050	Total	$1,473,050

Bodies

United Kingdom	$89,375	United Kingdom	$89,140
Canada	71,565	Canada	41,630
New Zealand	5,045	New Zealand	245
Belgium	3,965	Belgium	550
Ceylon	140	France	3,090
France	120	Italy	7,880
Fiji	4,410	Germany	8,070
Germany	5,130	U. S. A.	125,450
Italy	6,695		
U. S. A.	89,590		
Total	$276,035	Total	$276,035

ports, however, fell off considerably from those of 1914, which amounted to $621,620, over 39 per cent higher.

It will be noted by the accompanying table that quite a few of the American cars were sent either through Canada or England, probably on account of the poor freight conditions at San Francisco, from which place they could be sent direct.

Sales conditions in New South Wales may be reflected in the latest registration figures. During the first half of 1915, there were 1415 new cars registered. Commercial vehicles numbered 109 and motorcycles 1371. The total number of cars in use on June 30, 1915, was 10,570. The commercial vehicles numbered 639, taxicabs 236, and motorcycles 6461.

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$7,054,897 in Imports to Canada During 1915 Fiscal Year

DETROIT, MICH., Oct. 9—During the fiscal year ending March 31, 1915, Canada imported automobiles and parts having a total value of $7,054,897. This is a drop of $4,124,857 from the 1914 record which showed imports to the value of $11,179,754. Canadian made automobiles and parts exported during the fiscal year show a total value of $2,954,453 or $853,266 less than in 1914 when the total was $3,807,719.

Of the total value of the imported cars and parts the United States is credited with $6,734,077 out of the total of $7,054,897 for the past fiscal year while during the 1914 fiscal year the total credited to the United States was $10,454,163 out of the total of $11,179,754.

The details as to the imports and exports are shown in the accompanying tables:

IMPORTS

AUTOMOBILES AND MOTOR VEHICLES

From United States	1915	$4,591,182
From United States	1914	6,528,086
From Great Britain	1915	252,898
From Great Britain	1914	621,979
Other countries	1915	44,624
Other countries	1914	63,310

AUTOMOBILE PARTS

From United States	1915	$2,142,895
From United States	1914	3,926,077
From Great Britain	1915	22,337
From Great Britain	1914	31,981
Other countries	1915	961
Other countries	1914	8,321

EXPORTS

AUTOMOBILES AND MOTOR VEHICLES

To the United States	1915	$97,013
To the United States	1914	138,978
To Great Britain	1915	76,050
To Great Britain	1914	320,407
To other countries	1915	2,472,761
To other countries	1914	3,112,477

AUTOMOBILE PARTS

To the United States	1915	$35,558
To the United States	1914	36,341
To Great Britain	1915	130,001
To Great Britain	1914	1,895
To other countries	1915	243,070
To other countries	1914	197,621

Blaze Dixie Highway Trail

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Many Cars in First Official Inspection Tour from Chicago to Florida

FRENCH LICK, IND., Oct. 11—*Special Telegram*—French Lick was the objective to-day, there being 120 miles of stone and gravel roads between Indianapolis and the Hoosier Spa. It was a corkscrew journey, the roads winding in and out among the hills, but the most delightful day of the tour so far.

The run to French Lick took the tourists through the most scenic section of Indiana, over rolling hills, past fertile fields picturesque with the weather-worn rail fences of our grandfathers.

The same enthusiasm over the Dixie Highway marked to-day's run as that of the two previous days. Groups of farmers gathered at the crossroads to watch the cars go by. Pupils of the district schools answered the screech of motor horns with yells of welcome. There were throngs of people in the village squares of the various towns to promise their support of the great project that is to make North and South better friends and neighbors.

Brass bands blared at Martinsville, Bedford, Orleans and Paoti, and many were welcome signs strung across the road. At Bloomington, the noon stop, the officials of the Dixie Highway Association were showered with flowers as the Miami bound cars passed down the Main Street, which for more than a mile, was lined on both sides by residents. The bugle and drum corps of Indiana University marched in front of the motorcade and played martial music.

Highway Officials Join Party

Before the start of the run, four more notables joined the party, Tom Taggart, feudal baron of the Indiana Democrocy and vice-president of the Dixie Highway Association; Carl G. Fisher; Charles Bookwalter, former Mayor of Indianapolis and speechmaker extraordinary, and Kin Hubbard, the Hoosier philosopher and cartoonist. The skill of the drivers was put to a test as well as the cooling and accelerating powers of the cars, for the grades on the trip were steep and gear shifting was imperative. The roads were fine, especially on the afternoon run from Bloomington, and very little work will be necessary on this link of the highway to put it in first class condition.

On the outskirts of Martinsville, a 2-mile stretch of brick road is partially completed and other improvements, including the elimination of several sinuous turns, will be made in the spring in that vicinity. Tuesday morning is to be a half day of rest and recuperation, a meeting the directors being scheduled at that time.

A ribbon of dust hung over the road that joins Chicago and Danville on Oct. 9, as the cars, participating in the first official inspection tour of the Dixie Highway, covered the first leg of the 1800-mile journey. The start was made from Chicago at 9 o'clock and the pilgrims reached Danville shortly before 6 o'clock.

Governor Edward F. Dunne of Illinois, was the guest of honor on the trip to Danville and, before the cars checked out of Chicago, dedicated the motor thoroughfare that is to link the Great Lakes to Florida. The dedication ceremonies were held in front of the Lorado Taft statue, at the south end of the Art Insitute.

The first 25 miles of the trip was over the Chicago boulevards and the improved roads that connect the Illinois Metropolis with Blue Island and Chicago Heights. The motorcade of more than 100 cars was given an ovation at both these points.

Good Dirt to Danville

After leaving Chicago Heights, fair dirt roads were encountered as far as Momence. Here the tourists ran into a whirlwind of dust through which they rode for 28 miles. When they reached Watseka, the noon control, they were so full of dust that they had no appetite for the luncheon tendered them by the Watseka Commercial Club. In fact, they relished the promises of the Watseka citizens that this stretch would be improved inside of another year, far more than the corn beef and cabbage that was set before them.

Watseka county, the seventh richest county in the United States, is planning to vote a $1,500,000 bond issue this spring and by this time next year, a ribbon of concrete will replace the sand and dust trail between Momence and Watseka. At least, this is the pledge that the residents of the county have made and they say that it will not be repudiated.

More dust, but better roads were encountered on the afternoon trip to Danville, a distance of 65 miles.

Dedicate New Road

Upon arriving at Danville, the Dixie Highway tourists participated in the dedication of a 3-mile stretch of brick road that has just been completed, and in the evening, a banquet was held at the Elk's Club where Governor Dunne and Joseph Cannon, former Speaker of the House of Representatives, were the principal speakers.

The following officials of the Dixie Highway Association were in the motorcade that left Chicago: Judge M. M. Allison of Chattanooga, president; M. E.

Temple and T. R. Preston of Chattanooga, directors; W. S. Gilbreath, field secretary; and V. D. L. Robinson, assistant secretary.

The cars that will make the entire trip, are Field Secretary Gilbreath's Franklin; the official Cole; President Allison's, Cadillac; W. M. Dilsaver's, Hudson; J. H. Friberg's, Hudson; the Standard Oil Co.'s Overland, and George Scarborough's, Chevrolet.

Crawfordsville Meets Pilgrims

Eleven miles outside of Crawfordsville, the noon stop on Oct. 10, more than 100 cars met the Dixie Highway pilgrims and escorted them into the city that boasts of being the birthplace of Lew Wallace, the author. Luncheon was served there, the members of the Crawfordsville Commercial Club and the Montgomery County Automobile Club being hosts.

Before entering Indianapolis, the tourists made a circuit of the Indianapolis motor speedway at the invitation of Carl G. Fisher, who will be a member of the inspection party when it leaves here for French Lick to-morrow morning.

A Change of Program

ELIZABETHTOWN, KY., Oct. 12—On the original schedule Louisville was the night stop of to-day's run, but at a meeting last night the directors decided to extend the tour to this place in order to reduce the mileage of Wednesday's trip to Nashville because of the poor roads that will be encountered. This revision necessitated an early getaway from French Lick. Good dirt roads were traveled all the way to-day with the exception of a 10-mile stretch late this afternoon, when the cars would have had trouble had the day been stormy instead of fair. On the morning run from French Lick to Louisville the grades were not as steep as those of yesterday although we were among the knobs of Indiana. The roads were of stone and gravel.

Michigan Joins Union

At a directors' meeting held at French Lick last night, Michigan was admitted into the union of eight States that have pledged themselves to make the Dixie Highway an improved road from Chicago to Miami. It is the intention of the Wolverines to build a loop around the State, extending north from South Bend through Niles and Kalamazoo to Mackinack and South via Detroit and Monroe to Toledo, Dayton and Cincinnati. P. T. Colgrove and Frank Hamilton were elected directors from Michigan. The directors also adopted the Dixie Highway marker, which is to be a blue bale of cotton on a white field with the words Dixie Highway, in red.

1,006,835 Ford Cars Built

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Up to Oct. 1 the Combined Production of All Plants Reached That Total

DETROIT, MICH., Oct. 11—There are now a great many more than a mere million Ford cars in operation throughout the world. On the first day of October car No. 1,006,835 had been manufactured and sold. Thus the dream, as well as the hope, of Henry Ford, that some day a million Ford cars would be in the hands of the people has been realized.

It should be stated, however, that this colossal production and sales record is not the result of the activities of the main or parent Ford plant here in Detroit alone. That production record of 1,006,835 cars represents the combined output of the main plant, the twenty-five assembling plants throughout the United States, the Canadian Ford plant and the British or Manchester plant.

Just what the total output of the plant here was in the grand total is not given, but it is safe to assume that 750,000 or more Fords were built in Detroit.

The Canadian Ford plant made and sold 57,352 Ford cars from 1905 to the end of the fiscal year 1915, which was July 30.

The Manchester plant has an annual output capacity for 15,000 cars. It is not known how many have been made there, but it is said that more than 30,000 Ford cars are now in operation in England.

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Rayfield Motor Co. Petitioned

CHRISMAN, ILL., Oct. 7—A petition for involuntary bankruptcy for the Rayfield Motor Co., Chrisman, which has been engaged in the manufacture of small automobiles of the runabout type, was filed in the United States District Court at Danville this week. A. E. Schuckter, secretary and treasurer, and who claims to be one of the principal creditors, filed the petition. Other creditors are C. R. Livingston and W. M. Newkirk, all of Chrisman. Due to the failure of the Bonner Wrench Co., with which the company had been closely affiliated, it has been in financial trouble for the past year.

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Disco to Announce New Starter—Increases Capital $40,000

DETROIT, MICH., Oct. 11—The Disco Electric Starter Co., will increase the capital stock from $60,000 to $100,000, the extra $40,000 being subscribed by the present stockholders.

It is said that this is a preliminary for a still larger increase which will become necessary to enable the company to build larger factory accommodation and to install the special machinery necessary for large production.

At the present time the company has contracts which are said to amount to $1,000,000 and is running night and day. Mr. Hackett, general manager, expects to put on the market very shortly a new and improved type of double unit starter and generator. It will be cheap enough to be within the reach of the car manufacturer making a low-priced car and powerful enough for cars of the $5,000 class. The machine was electrically designed by Prof. Benjamin F. Bailey of the University of Michigan, the mechanical features being the work of F. M. Guy.

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Delco 1915 Output Will Be 125,000 Systems

DAYTON, OHIO, Oct. 12—During the month of September, the Delco factory at Dayton, produced 14,515 complete systems of starting, lighting and ignition equipment, in addition to many separate ignition systems.

This was the largest month's business the company has ever produced, and brings the number since Jan. 1 up to nearly 100,000 systems. The factory is still behind its schedules, and will build upwards of 125,000 systems this year.

In the meantime, the work on the new building is progressing. It is a concrete, brick faced structure and five stories have been poured. The brick facing has already begun to appear, and will be completed within a very few weeks after the concrete part is done.

This new building will more than double the floorspace of the Delco plant. It is an entire block in length, 420 ft. to be exact, and 88 ft. in width.

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Disco Starter on Denby Truck

DETROIT, MICH., Oct. 11—The Disco Electric Starter Co. has been awarded the contract for electrical equipment for use by the Denby Motor Truck Co.

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$500 Fines in Crown Co. Case

LOUISVILLE, KY., Oct. 9—In the Federal Court here to-day, technical pleas of guilty to a charge of using the mails to defraud were entered by C. H. Lambert, A. B. Lambert and B. F. Lambert, and fines of $500 each were assessed by Judge Walter Evans. The cases against the Lamberts grew out of transactions in which they, as representatives of the Crown Motor Car Co. of New Albany, Ind., accepted orders for automobiles when they knew, according to the District Attorney, that there were no cars available for sale.

176,428 Cars Registered in Ohio

Nearly 50 Per Cent Increase Over 1914 Total—13,600 Chauffeurs Register

COLUMBUS, OHIO, Oct. 9—Up to Oct. 8 of this year the Ohio Automobile Department registered 176,428 automobiles, which is almost 50 per cent increase over the total registration last year, when 121,400 cars were registered. It is figured that the increase of 50 per cent will be reached before the end of the year as the total registration will probably surpass 181,250, which is the figure to show the 50 per cent increase.

Chauffeurs to the number of 13,600 have been licensed. This is only a small increase over last year, but the constitutionality of the chauffeurs' license law is attacked in a suit now pending in the Franklin County Court of Appeals and the department is not enforcing the law at present. An effort will be made to have the law amended in case the Ohio Legislature is called in special session during the winter.

222,025 Automobile Owners in New York State

ALBANY, N. Y., Oct. 9—Registrations of automobiles in this State up to Oct. 1 this year amounted to 222,025, compared with 164,438 in the same period a year ago. Total registrations for 1914 were but 170,171.

This registration compares with a population in this State, according to the June census, of 9,250,000, an average of an automobile for every forty-four persons in the State.

Receipts of the Automobile Bureau thus far this year have amounted to $1,824,315, all of which will be expended in maintaining and building the roads of the State.

Three-Wheeled Tractor, $945

LOS ANGELES, Oct. 11—The Union Tool Co., Torrance, Cal., is placing on the market a three-wheeled agricultural tractor which is to sell for $945. It is provided with a two-cylinder motor and weighs complete 4000 lb. The overall length is 13 ft. 1 in., the width 6 ft. 7 in., and the height 3 ft. 11 in. This is the first model and is marketed after three years of experiments.

Wisconsin Registrations Gain 25,008

MILWAUKEE, WIS., Oct. 8—Wisconsin's 1915 registration up to Oct. 2 showed a gain of 25,008 over the total registry of 1914, bearing out predictions made early this year that the Badger State would absorb no less than 25,000 new cars from Jan. 1 to Dec. 31, 1915. The total registry on Oct. 4 was 78,169, compared with 53,161 on Dec. 31, 1914. Not only is the prediction of a gain of 25,000 in Wisconsin registrations borne out, but prospects are for a total registration of not less than 80,000 by the end of the year. On Saturday, Oct. 2, for instance, the secretary of state issued 101 new licenses and the daily average is from seventy-five to eighty. The effect of the show given by the Milwaukee Automobile Dealers, Inc., at the annual State fair in Milwaukee, Sept. 13 to 17, seems to be evident in the rush of applications for licenses during the four weeks immediately following the fair, and present indications show no abatement of the demand.

Iowa Cars Average $800 to $900 in Value

DES MOINES, IA., Oct. 9—Figures from the state automobile department of Iowa show that Iowans are not dodging the income tax although the purchase of 50,000 automobiles by Iowans in one year while the income tax returns show more wealthy inhabitants in the District of Columbia than in Iowa leads a Washington, D. C., newspaper to believe otherwise.

The Iowa secretary of state estimates that only 10 or 12 per cent of the 150,000 automobiles in Iowa cost in excess of $2,000 each, that only 20 per cent cost $1,500 or over, that over 50 per cent are cars costing from $400 to $500 and that the average value of all cars in the state is between $800 and $900. This seems to refute the assumption of the Washington paper that the ability to own an automobile is evidence of a $4,000 income. The fact is that most of the car owners in Iowa are farmers and salaried men with incomes ranging from $1,500 to $3,000 a year. A census taken of the automobiles owned by persons connected with a Des Moines newspaper shows that ten out of sixteen cars owned are the property of workers in the mechanical departments—printers, pressmen, stereotypers, etc.—who make on the average about $1,200 a year as governed by the union scale. These facts free Iowans from any suspicion of income tax dodging, for it shows that most of Iowa's automobiles are owned by people of moderate means.

New Danger Signals at Long Island Grade Crossings

NEW YORK CITY, Oct. 11—As a further safeguard against the recklessness of automobile drivers at grade crossings the Long Island Railroad is adopting a new form of watchman's danger signal. It has the word "stop" painted in large white letters on an 18-in. red disk.

Standard Tractor Under $700

To Be One-Man Outfit of Good Size—Some Features of Construction

DETROIT, MICH., Oct. 11—The farm tractor to be made by the Standard-Detroit Tractor Co., is to sell at under $700, and to be a one-man outfit, but not too small in size, the officers of the company believing that economy of labor demands that even on the smallest sized farms a tractor should be used as large as one man can operate satisfactorily.

As reported briefly in last week's issue of THE AUTOMOBILE, prominent men in the automobile industry are connected with the new concern. The stockholders are principally officers of the Federal Motor Truck Co. It is the object of the company to build tractors in every way up to the present truck standard as to materials and workmanship.

G. S. Jacobs is the designer of the tractor. He was formerly connected with the Oakland Motor Car Co. and the Rapid Motor Vehicle Co., Pontiac, Mich., also the Rumeley Co., La Porte, Ind. The first experimental models were brought out in 1914 and tests have been going on with different models ever since in various parts of the country.

Although the final specifications have not all been decided upon, the constructional features of the tractor will be four-cylinder block motor of 30 to 35 hp.; two front wheels with 8 in. steel tires, two rear drive wheels each with 24 in. wide tires, a gearset fully inclosed and running on roller bearings and final drive by chain. The chassis will be of special design, but many standard automobile parts will be used.

The officers of the company are: M. L. Pulcher, president; Charles F. Mellish, vice-president; L. W. Goodenough, treasurer; F. G. Jacobs, secretary. G. S. Jacobs is manager. Edward P. Hammond, president of the Gemmer Mfg. Co.; Thomas E. Reeder, president of the Federal Motor Truck Co. together with the officers, form the board of directors.

In last week's issue of THE AUTOMOBILE it was erroneously stated that Edward P. Gemmer, was one of the incorporators.

2487 Tractors in Kansas

TOPEKA, KAN., Oct. 8—J. C. Mohler, secretary of the State Board of Agriculture, has completed a census showing 2487 tractors in the State on March 1. Barton county, the leading wheat producing county, has the largest number, 123. The larger number of tractors is in the corn belt. Thirty-seven counties in that district have 1209 tractors.

Chevrolet Changes Name

Current Earnings are at Rate of $2,500,000 Per Annum or 12½% on Stock

FLINT, MICH., Oct. 8—The Chevrolet Motor Co. has changed its name to that of Chevrolet Motor Co. of Michigan.

NEW YORK CITY, Oct. 9—The constituent company of the new Chevrolet Motor Co., it is stated, shows earnings in the twelve and one-half months ended Aug. 14 last of $965,000, which is equivalent to 4.8 per cent on the capital stock outstanding. Current earnings are at the rate of $2,500,000 per annum, or 12½ per cent on the capital stock of $20,000,000.

With the introduction of funds raised from the sale of capital stock the company's balance sheet, as of Aug. 14, 1915, will show as follows:

ASSETS	
Cash in banks and on hand	$5,346,111
Accounts and notes receivable less reserves	359,992
Inventories of finished cars, merchandise on hand and in transit, and work in process	1,475,394
Investments	748,500
Charges deferred to future operations and suspense items	69,438
Invested—real estate, buildings, fixtures, equipment, tools, patent rights, developments, good will, etc.	13,237,242
Total	$21,236,677
LIABILITIES	
Accounts payable and accrued liabilities	$1,141,677
Mortgage on Beekman Avenue plant at Tarrytown, N. Y.	95,000
Capital stock	20,000,000
	$21,236,679

New Company to Continue Making Randall-Faichney Products

BOSTON, MASS., Oct. 9—The property of the Randall-Faichney Co., has been disposed of at auction, the sale taking place at the property, 76 Atherton Street, Jamaica Plain. The entire property was bought by the creditors' committee for $150,000. Under the plan of reorganization which will now be carried out a new company to be called the Randall-Faichney Co., Inc., with new cash capital and a conservative board of directors will at once be formed and take over the property.

The property consists of a building and 33,609 ft. of land.

Rubber Shortage in Berlin

LONDON, ENG., Oct. 9—According to a report received in this city from a person who recently left Berlin, there is a great shortage of raw materials. Rubber has been smuggled in in the form of sausages. The scarcity is so great that no private individual in Berlin is allowed to use his automobile, except the doctors. Rubber floors have been taken up and every scrap in any shape or form has been used.

Austria Confiscates All Tires

ZURICH, Oct. 9 (via London)—The Austrian Ministry of War is reported to have confiscated the entire supply of pneumatic and other rubber tires in Austria, including those of private ownership, new or old. The owners of the tires are required to deliver them up within twenty-four hours under penalty of a year's imprisonment.

Three Market Changes

NEW YORK CITY, Oct. 12—Markets this week made but two gains and one loss. The trading was normal, but the buying was dull. The steel markets ranged very low with but a few sales taking place. The copper markets opened the week firm on a good inquiry from war material manufacturers, but a steady recession in standard copper at London caused prospective buyers to withdraw from that market. There are many stocks of copper afloat from all over the country. The total supplies on Sept. 30 were 23,628 tons against 29,519 tons in the same period last year, with total deliveries 28,759 tons, against 30,518 tons. Antimony is receiving fair support. Aluminum was very active during the week, with several increases in prices recorded. The demand continues in excess of the supplies and holders at the close asked 50 and 55 cents per pound in carload lots. There was not much new business in the local rubber market last week and buyers were inclned to allow matters to shape their course a little more definitely for a few days. Up-River fine quoted at 57½ cents. The oil and lubricant markets were a bit unsteady during the middle of the week but returned to normal. Pennsylvania crude oil advanced 5 cents in the middle of the week, but the following day closed at its normal price. There was also an advance in gasoline of 1 cent. It is expected that within a month the price will have advanced to 25 cents to consumers.

Porto Rico Increases American Car Purchases

SAN JUAN, PORTO RICO, Sept. 23—The past year has shown a large increase in the number of automobiles purchased in the island, 548 cars having been imported during the twelve months ending with June 30, 1915. No foreign cars have been sold here in recent years. There are approximately 2000 cars in the island, most of them in constant use.

There is no demand here for high-priced cars. Automobile tires showed a falling off during the past year as compared with the previous fiscal year. Tire imports for 1915 were $251,426; for 1914, $296,201, and for 1913, $241,714.

The automobile here is used as the chief means of passenger transportation, both private and public, about the island. There are regular motor lines running from this city to all sections of the island. Mail to about half of the towns is delivered by automobile, and most of the established motor lines operate an express and parcel-delivery service.

Recently the jitney has made its appearance here in competition with an interurban railroad running 5 miles between the towns of Catano and Bayamon. The railroad has carried 500,000 passengers a year and the fare has been 10 cents until the arrival of the jitney. Then the railroad cut the fare to 5 cents, but the jitney continues to get many passengers at the old fare of 10 cents.

Indiana Mutual Insurance Co. Formed

SOUTH BEND, IND., Oct. 9—The Indiana Mutual Automobile Insurance Co., with home offices in Laporte, Ind., has been organized. Articles of incorporation have been filed with the secretary of state and have been approved by the auditor of state. The company has been organized for the purpose of insuring against fire, but the policy will also provide an amount of $50 to be paid in case

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.50	.49	.48	.50	.50	...	...
Antimony	.27½	.27½	.27½	.27½	.27½	...	...
Beams and Channels, 100 lb.	1.56	1.55	1.55	1.56	1.56	...	...
Bessemer Steel, ton	24.50	24.50	24.50	24.50	24.50	...	...
Copper, Elec., lb.	.18	.18	.18	.18	.18	...	...
Copper, Lake, lb.	.18¼	.18¼	.18¼	.18¼	.18¼	...	...
Cottonseed Oil, bbl.	7.33	7.19	7.15	7.57	7.73	...	+.20
Cyanide Potash, lb.	.23	.23	.23	.23	.23	...	...
Fish Oil, Menhaden, Brown	.42	.42	.42	.42	.42	...	...
Gasoline, Auto, bbl.	.16	.16	.16	.17	.17	...	+.01
Lard Oil, prime	.85	.85	.85	.85	.85	...	...
Lead, 100 lb.	4.52½	4.52½	4.52½	4.52½	4.52½	...	...
Linseed Oil	.58	.58	.58	.58	.58	...	...
Open-Hearth Steel, ton	25.00	25.00	25.00	25.00	25.00	...	...
Petroleum, bbl., Kans., crude	.80	.80	.80	.80	.80	...	...
Petroleum, bbl., Pa., crude	1.75	1.70	1.70	1.75	1.75	...	...
Rapeseed Oil, refined	.77	.77	.77	.77	.77	...	...
Rubber, Fine Up-River, Para	.57½	.57½	.57	.57	.57	...	...
Silk, raw, Ital.	4.05	...	...	...	...	...	...
Silk, raw, Japan	3.77½	...	...	...	...	...	...
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	...	...
Tin, 100 lb.	32.75	33.00	31.87½	32.50	32.50	...	—.25
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¼	...	...

of theft. The officers of the corporation are: Frank J. Cook, LaCrosse, president; Dr. F. H. Henderson, vice-president; Fred C. Brewer, treasurer; Clay M. Donner, secretary. The last three named reside at El Paso, Ill.

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Insurance Assn. in South Dakota

PIERRE, S. D., Oct. 9—For the first time since the law was passed March 10 advantage has been taken of the possibility of forming an automobile insurance company. F. H. Johnson, F. H. Reed, G. C. Cottan, L. C. Nichols and A. B. Fairbank have incorporated the American Auto Indemnity Assn. of Sioux Falls.

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Bosch Magneto Wins Contracts

NEW YORK CITY, Oct. 8—The Bosch Magneto Co. has signed contracts as follows: Chandler Motor Car Co., Brewster & Co., Stewart Motor Corp., R. M. Owen & Co., W. Irving Twombly, Atterbury Motor Car Co., Blair Motor Truck Co. and Brockway Motor Truck Co.

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Berger New York Lozier Manager

DETROIT, MICH., Oct. 9—L. B. Berger, who was sales manager of the Lozier Motor Co., has been appointed manager of the New York branch.

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Stutz Has Running Board

NEW YORK CITY, Oct. 13—Owing to an engraver's mistake the advertisement of the Stutz Motor Car Co., which appeared in THE AUTOMOBILE for Sept. 30, included a photograph of the Stutz Bulldog Special which showed no running board. This was removed accidentally when trimming the cut.

Securities Markets Dull

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Sharp Declines in Many Issues—Losses Small—Trading Normal

NEW YORK CITY, Oct. 11—The securities markets remained dull throughout the whole of last week. There were very few changes. A few small losses occurred. Trading conditions were at a standstill and there were but a few bidders in sight. There were a few exceptional good closing prices. Firestone closed at 575, or 15 points higher than last week. This tire issue was the only one to make a high gain, the rest making either minor gains or losses. The specialties markets were a bit firmer, making many good gains and but few losses. The he viest gain took place on Saturday when at the closing Packard was quoted at 139, a gain of 13 points. Then followed closely to that Chalmers, with a gain of 11 points. General Motors also made a few points gain, when it closed at 341. The rest of the issues remained dull.

Detroit Quotations Active

The Detroit issues were a bit more active last week, there being no decline made during the whole week. Continental Motor featured the market there when on Saturday it closed at the high mark of 325, a total gain of 30 points. Chalmers closed at 157½, or 18 points gain. Packard's closing bid was 137, making the gain 11 points. These were the main gains, the rest of the issues in the active stocks closing a little above the average mark of last week's rating. The inactive stocks made no changes. The trading conditions in Detroit were very firm and many shares changed hands.

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To List Chalmers Common Stock on New York Curb

NEW YORK CITY, Oct. 9—The Chalmers Motor Co., Detroit, has applied to list 50,000 shares of common stock of par value $100 on the New York curb. Action will be taken at once to list it on the Philadelphia Stock Exchange.

The Chalmers company has outstanding $5,000,000 common stock, paying 10 per cent dividends, and $1,185,500 7 per cent cumulative preferred. The original issue of preferred was $1,500,000, and $313,500 has been retired.

The company is free of bonded debt. Its balance sheet shows that cash on hand alone considerably exceeds the company's current liabilities. It is stated that after making allowances for paying off all liabilities and the preferred stock at par, the assets, without taking into any consideration the item of good will, would equal over $120 per share on the $5,000,000 common stock.

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R-C-H Creditors Receive Dividend

DETROIT, MICH., Oct. 9—A fourth dividend of 10 per cent, representing about $34,000, is being mailed by the Security Trust Co., trustee, to the creditors of the old R-C-H Corp. This brings the total paid in dividends to about $312,500, and it is possible that a further dividend payment will be forthcoming later.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			..	..	..
J. I. Case pfd			78	81	—1
Chalmers Motor Co. com			151	156	+11
Chalmers Motor Co. pfd			98½	101	+ ½
Chevrolet Motor Co			104	108	..
Electric Storage Battery Co			70	74	—3
Firestone Tire & Rubber Co. com			575	..	+15
Firestone Tire & Rubber Co. pfd			112	..	..
General Motors Co. com			341	343	—7
General Motors Co. pfd			111	113	..
B. F. Goodrich Co. com			73½	75½	—3½
B. F. Goodrich Co. pfd			108½	109½	— ½
Goodyear Tire & Rubber Co. com			338	345	+3
Goodyear Tire & Rubber Co. pfd			108½	109½	— ½
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			27½	29	—1½
International Motor Co. pfd			55	60	—3
Kelly-Springfield Tire Co. com			215	230	—5
Kelly-Springfield Tire Co. 1st pfd			90	92	+1
Kelly-Springfield Tire Co. 2d pfd			225	235	..
Maxwell Motor Co. com			55½	57	+2½
Maxwell Motor Co. 1st pfd			93	95	+1
Maxwell Motor Co. 2d pfd			46	48	+2
Miller Rubber Co. com			198	202	..
Miller Rubber Co. pfd			109	110	..
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			139	143	+13
Packard Motor Car Co. pfd			101	..	+1
Paige-Detroit Motor Car			..	445	..
Peerless Motor Car Co. com			122	130	..
Peerless Motor Car Co. pfd			92	94	..
Portage Rubber Co. com			54	56	..
Portage Rubber Co. pfd			92	94	..
Regal Motor Co. pfd			..	21	..
*Reo Motor Truck Co			19½	21½	+1½
*Reo Motor Car Co			38½	40	+4
Splitdorf Electric Co. pfd			..	..	..

No quotations available at this time on account of war.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Stewart-Warner Speed. Corp. com			73	74	—3
Stewart-Warner Speed Corp. pfd			106	..	..
Studebaker Corp. com			142	143½	+2
Studebaker Corp. pfd			109	110	..
Swinehart Tire & Rubber Co			87	90	..
Texas Co			167	169	+3
U. S. Rubber Co. com			53	55	—1
U. S. Rubber Co. 1st pfd			107	108	—1
Vacuum Oil Co			218	221	+7
White Co. pfd			110	..	..
Willys-Overland Co. com			231	233	+8
Willys-Overland Co. pfd			107½	108½	— ½

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com	..	97	157½	172½	+18
Chalmers Motor Co. pfd	..	..	97½	102½	..
Continental Motor Co. com	155	180	325	..	+30
Continental Motor Co. pfd	..	75	83½	90	..
General Motors Co. com	67	..	340	350	—5
General Motors Co. pfd	83	..	112	114	+1½
Maxwell Motor Co. com	11	..	56	59	+3½
Maxwell Motor Co. 1st pfd	29	..	94	97	+3¼
Maxwell Motor Co. 2d pfd	..	..	47	49	+2¼
Packard Motor Car Co. com	..	..	137	155	+11
Packard Motor Car Co. pfd	90	94	100	..	..
Paige-Detroit Motor Car Co	..	..	..	450	+5
*Reo Motor Car Co	19¾	20	37¾	39	+2¾
*Reo Motor Truck Co	..	11¾	19¾	20	+1⅛
Studebaker Corp. com	..	..	143	145	+2¼
Studebaker Corp. pfd	..	..	..	120	+10

INACTIVE STOCKS

*Atlas Drop Forge Co	21	..	..	29	..
Ford Motor Co. of Canada	..	500	..	1550	..
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	21	..	..
Regal Motor Car Co. pfd	25	..	..	21	..

*Par value $10; all others $100 par value.

11,000 Maxwell Cars in 2 Months

August and Sept. Earnings Estimated at 15% on Common Stock

DETROIT, MICH, Oct. 9—August and September earnings of the Maxwell Motor Co. are understood to have been better than 15 per cent on its $12,778,000 common stock, compared with 6½ per cent the previous year. The company for August and September delivered nearly 11,000 cars, or at the rate of better than 65,000 cars a year, which is substantially 100 per cent in excess of the production for the fiscal year to July 31.

Newcastle Plant a Unit

INDIANAPOLIS, IND., Oct. 8—After a little more than two years' operation as an independent enterprise, the Newcastle, Ind., plant of the Maxwell Motor Co., Detroit, Mich., again reverts to the parent company and will be operated as one of the units of the company itself. As is well known, the Newcastle plant has been largely devoted to the production of parts for Maxwell cars and replacements for products of several older companies that were merged in the Maxwell organization several years ago. For this purpose the Maxwell-Newcastle Manufacturing Co. was organized, which took over the plant under lease. The larger and growing demands of Maxwell car production at the present time, however, have necessitated a rearrangement in which is involved resumption of responsibility for the plant.

Ford Tractor Building to Be Enlarged

DETROIT, MICH., Oct. 11—The building upon the property of Henry Ford in Dearborn, near here, where the first Ford tractors were built, is to be greatly enlarged so that the building of experimental tractors on a large scale may be started. It is said that many changes will be made in the new demonstrators and that a long time will probably elapse before the final model for actual marketing purposes will be selected. It is also stated that the domonstrations given by the tractors at the recent Michigan State Fair led to many suggestions for their improvement.

Ford Buys More Indianapolis Land

INDIANAPOLIS, IND., Oct. 8—To increase its real estate holdings in Indianapolis for what is thought to be further development, the Ford Motor Co. has announced the purchase of ground immediately west of its plant on Southeastern Avenue.

The ground has 161 ft. frontage on Southeastern Avenue, is 270 ft. deep on the east side and 239 ft. on the west. The ground was purchased at different times from several different owners.

Attaches of the Ford branch are refusing to say at this time, what the ground is to be used for, except a general statement that it will be added to the Ford business. The present Ford building is unable to answer the demands of local business, although there is a square frontage of more than 200,000 sq. ft.

The Ford production for 1916 in the local branch will be more than 19,000 cars, and this will tax to the extreme the production facilities. However, it is safe to assume that this ground was acquired for building purposes and that a large addition is soon to be built to the Ford plant.

The idea of the Ford tractor is now obtaining shape, and the Ford agents are asking when this tractor will be available for selling. A. H. Smith, manager of the local Ford branch, refuses to say anything very definite as to when the Ford tractor will be announced. However, it is understood that these Ford tractors will be assembled in Indianapolis.

Norma Bearings Now Made in America

NEW YORK CITY, Oct. 9—The Norma Co. of America has started active manufacture of its ball bearings in this country. As early as 1912, the Norma company had anticipated the necessity for making its bearings in this country and a small shop was established for preliminary and experimental work. The results of these experiments were so successful that the shop activities of the company were gradually extended and the facilities enlarged, primarily with a view to meeting emergency demands where the imported bearings were not immediately available.

The outbreak of the war and the subsequent inability to obtain its goods from the plant at Cannstatt, Germany, promised to seriously affect the business of the company. Fortunately, however, the company was well stocked, which sufficed to tide over the situation until the American factory could be enlarged sufficiently to meet the demand. The company now has a completely equipped plant being steadily enlarged and increased in capacity.

S. A. Machine Co. Formed

DETROIT, MICH., Oct. 9—The S. A. Machine Co. has been formed by A. W. Sorensen, formerly president and general manager of the Trio Mfg. Co. and J. B. Allen, formerly of the Olds Motor Works, to make automobile parts and specialties. The plant is located at 518 E. Woodbridge Street.

New Overland Office Building

Will Be Seven Stories, 373 by 63 Ft.—Dodge Office Building Completed

TOLEDO, OHIO, Oct. 8—The old Overland administration building, formerly the Pope plant, is to be torn down to make room for a new factory structure. This latest addition to the production end of the business will compel the Willys-Overland Co., to vacate its present quarters and the entire office staff will be moved into a larger building as soon as it is completed.

The new office quarters will be located on Willys Park Boulevard. The building will be seven-stories high, 373 ft. long and 63 ft. wide. It will contain 165,000 sq. ft. of floorspace and will be made fireproof throughout.

McGraw Rubber to Open Factory Branches on Coast

EAST PALESTINE, OHIO, Oct. 11—The McGraw Tire & Rubber Co. will open direct factory branches on the Pacific Coast in San Francisco, Los Angeles and Portland, these to be under the district management of S. L. Warner, formerly superintendent of branches; C. K. Whittaker, formerly Kansas City manager, will be sales manager. C. H. Connelly, formerly Buffalo manager, will be in charge of the Kansas City branch; G. J. Marshall, formerly assistant branch manager in Buffalo, will take charge of the Kansas City branch; R. G. Nelson has been made superintendent of branches. At the annual meeting of the stockholders the officers and directors were re-elected.

To Build Cars in Pittsburgh

PITTSBURGH, PA., Oct. 9—A company formed by prominent local men and headed by E. E. Gregg, will build popular priced touring cars and roadsters in this city. Options have been secured on two plants said to have a yearly capacity of 10,000 cars. Production is scheduled to begin Jan. 1.

Dodge Administration Bldg. Completed

DETROIT, MICH., Oct. 7—The enlarged and rearranged administration building of Dodge Bros. was completed a few days ago. It is now one of the largest in the city, being a four-story structure, 80 by 400 ft. The first three floors are practically entirely taken up by offices, either for executives or for departments, such as the sales and advertising departments, which occupy most of the main floor. The fourth floor has the various dining rooms and rest and lounging rooms, there being one private din-

ing room for the Dodge brothers, a cafe for the executives and heads of departments, a cafeteria with room for 500 for the office employees, a smoking room and a large rest room for women.

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Detroit Commercial Car Co. in Pontiac Chassis Plant

PONTIAC, MICH., Oct. 7—The Detroit Commercial Car Co., which was recently organized in Detroit, to make the Detroit package delivery wagon, which is selling at $690 and $745, according to the style of body, will occupy part of the factory building of the Pontiac Chassis Co., which concern is making the chassis for the truck company.

According to President W. D. Paine, of the latter company, schedules have been laid out for an output of 5000 trucks the first year.

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Bowser Suit Against Wayne Oil Tank Withdrawn

FORT WAYNE, IND., Oct. 11—S. F. Bowser & Co., this city, has withdrawn its suit in the U. S. district court of Chicago, brought against the Wayne Oil Tank & Pump Co., also of this city, for alleged infringement on two patents on fill pipe caps. Both companies are manufacturers of gasoline and oil storage systems and fuel and oil dispensers. One patent in question involved the Red Sentry outfit, a sidewalk type of fuel dispenser. The other patent covered important features in wheeled pumps for serving gasoline to automobilists and for handling other volatile oils.

Judge Carpenter gave the Bowser company the option of answering some thirty interrogatories propounded by the defendant or withdrawing its suit.

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Wells Adds New Products

FOND DU LAC, Wis., Oct. 8—The R. C. Wells Mfg. Co., Fond du Lac, Wis., manufacturing the Wells starter-generator and other electrical devices for the motor car industry, is ready to market numerous new inventions, including a three-step dimmer switch which will be made in large quantities. The company also has contracts for 15,000 to 20,000 automatic fuel economizers to be delivered each month for the next six months. R. H. Mansfield, for many years with Cutler-Hammer Mfg. Co., Milwaukee, recently purchased the Wells company.

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Eight-Hour Day for Stewart-Warner

CHICAGO, ILL., Oct. 11—All the plants of the Stewart-Warner Speedometer Corp. were placed upon an 8-hr. basis, beginning last week, and rates were increased so that the men receive the same per day that they received under the previous 54-hr. schedule.

Carriage Factories May Build Cars

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$2,000,000 Canadian Co. May Enter Moderate-Priced Car Field in Spring

MONTREAL, QUE., Oct. 8—Carriage Factories may enter the automobile field. It is understood that very shortly Brockville will be selected for the manufacture of a light, moderate priced car, which will be ready for the trade next spring. The concern which is entirely a Canadian one, represents a consolidation of the principal Canadian companies manufacturing carriages and sleighs, including the Canadian Carriage Co., Brockville; Munroe & McIntosh of Alexandra; Tudhope Carriage Co. of Orillia and the Heney Carriage and Harness Co. of Montreal. These four companies are understood to produce about 75 per cent of the carriages, sleighs and light vehicles used in the Dominion of Canada. The company has an authorized capital of $2,000,000 common stock; $2,000,000, 7 per cent accumulative preferred stock and $1,000,000 first mortgage 6 per cent bonds. There is now outstanding $1,200,000 of preferred, $1,200,000 of the common, and $500,000 of the bonds. Directors of the company include, J. P. Tudhope, W. F. Brock, of the Royal Bank of Canada; W. F. Heney, W. J. Sheppard, director of the Royal Bank of Canada; J. A. MacKay, Hugo Munroe and T. J. Storey, president of the Atlas Motor Co., Brockville, Ont.

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Blowout at 86 M.P.H. Kills Tester on Indianapolis Speedway

INDIANAPOLIS, IND., Oct. 8—Albert Johnson, twenty-five, of Detroit, Mich., driver of a Packard test car, was fatally injured and his mechanician, Ross Robinson, twenty, was seriously hurt when the car traveling 86 m.p.h. turned turtle on the Indianapolis Motor Speedway, Monday afternoon, Oct. 4. Johnson died on the operating table at the Methodist Hospital Monday evening. Robinson may recover.

The accident occurred when the car blew a tire on the south turn into the back stretch of the track.

Robinson, Johnson and two other Packard experts have been at the speedway two weeks testing the Packard Twin Six which developed a high speed and they were making the last lap of a twenty-five mile spin when the car overturned. Coroner Poole investigated the accident and found Johnson's death was caused by shock following the accident.

The Packard experts had driven the car thousands of miles at the speedway and it was the object to give the car as much testing in a few weeks as an owner would give it in several years. Special attention had been given to the tires and the drivers were instructed to change tires whenever one showed any signs of wear. The tire that blew was on the right front wheel, the car turning over several times.

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Farmers See Cars at Western Washington Fair

PUYALLUP, WASH., Oct. 6—The Western Washington Fair held this year Sept. 28 to Oct 3 proved an excellent advertising medium for the Tacoma and Seattle automobile dealers, who occupied upward of twenty booths in the new automobile building on the grounds. While but few actual sales were made during the exhibition, considerable interest was manifested in the new models and the dealers were placed in touch with many of the small truck farmers, who will purchase cars this year in greater numbers than ever before.

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Two Killed in Columbus Race

COLUMBUS, OHIO, Oct. 11—Two fatal accidents occurred at the Columbus Driving Park, Oct. 10, when a 100-mile automobile race was run with a good field of cars entered. The accidents did not occur in the race but were the result of trial heats made to test a Stutz racing car. The car had been acting badly and driver Douglas Gray, 23, of Lima, and his mechanician, Clarence Robinson, colored, of Columbus, were both almost instantly killed when a tire blew on the front wheel and the car was overturned. The car was making about 50 m.p.h. when the tire burst and it was turned over twice.

Dr. Harry E. McCord, a practicing physician of Cincinnati, driving a Cino was declared a winner in 1 hr. 42 min. and 12 sec., but this was protested by Harry McNay, also in a Cino, who was said to have finished 9 sec. later. McNay protested that a mistake had been made in the signal system and that he was the winner. Until the dispute is settled the $1,000 prize money is withheld from any of the drivers.

In third place was Charles Mowery, of Loudenville in a Stutz, and fourth place went to W. G. Lake, of Mt. Vernon, in an Everitt.

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Marshall with Remington Arms

NEW YORK CITY, Oct. 13—W. C. Marshall, treasurer of the Metropolitan Section of the Society of Automobile Engineers, has taken a position in the production department of the Remington Arms Co., Bridgeport, Conn., and will resign from the governing committee of the section.

Service Assn. Scope Broadened

Indiana Managers to Include Repair and Distributing Heads—Plan National

INDIANAPOLIS, IND., Oct. 10—Members of the Indiana Automobile Service Managers' Assn. at their regular meeting at the Hotel Severin, Saturday afternoon, voted to include in the organization the service managers of repair and distributing agencies in addition to those of manufacturers and accessory houses. They heard a series of addresses on the purposes of the organization and discussed the probability of an early national organization into which the sectional agencies similar to Indiana organization will be incorporated.

To Meet Regularly

The Indiana organization will meet regularly on the second Saturday of October, January and April of each year, and each summer will have an outing. H. W. Drew of the Nordyke & Marmon Co., president of the Service Managers' Assn., in his opening address outlined the purpose of the organization.

A well-adjusted system of co-operation among all service agencies must be obtained, and in the furtherance of this the Indiana organization expects to do pioneer work, he said.

Four other papers were read, each of which was a report on some phase of the National Automobile Chamber of Commerce Service Managers' Convention in Detroit, Mich., last June. The papers were presented by O. W. Williams of the Inter-States Motor Co., Muncie, Ind., G. E. Drawe of the Pathfinder Motor Car Manufacturing Co., Indianapolis, J. O. Myers of the National Motor Vehicle Co., and E. W. Cotton of the McFarlan Motor Car Co., Connersville, Ind. Among the members from outside of Indianapolis who attended were: E. W. Cotton of the McFarlan Motor Car Co., and F. R. Leeds of the Lexington Howard Co., Connersville, G. B. Braithwaite of the Apperson Automobile Co., and H. R. Perry of the Haynes Automobile Co., Kokomo, R. J. Ellston of the Westcott Co., Richmond and J. H. Hopper of the Remy Electric Co., Anderson.

All local factories were represented at the meeting. The association will assist in a movement to standardize service policies.

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Safety Men Meet in Detroit

DETROIT, MICH., Oct. 12—The Safety First Federation of America will meet here in convention Oct. 19 and 20. More than 100 delegates from many states are expected, and many matters of direct interest to the automobilist will be considered. Among the men who are to address the convention are Henry B. Joy, president of the Packard Motor Car Co.; William McAdoo, chief magistrate of New York City; Job H. Lippincott, former commissioner of motor vehicles of New Jersey; Charles M. Talbot, director of streets, St. Louis; Harry P. Coffin, chairman of Public Safety Commission of Portland, Ore.; Alonzo P. Erwing, president of the Greater Detroit Safety First Organization; Ralph Folks, public welfare commissioner, New York; Charles C. Healy, superintendent of police, Chicago; John Gillespie, police commissioner, Detroit.

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Los Angeles Garagemen Busy Making Cars Into Speedsters

LOS ANGELES, CAL., Oct. 7—A new field has been opened up to the garagemen of Los Angeles by the craze for rebuilt cars which has taken southern California. The Ward Motor Car Co., which has opened a large garage at 1788-98 West Washington Street, is making a specialty of rebuilding. Used cars are cut down and transformed into speedster types. This garage handles a stock of accessories and supplies and does some general repairing, but the rebuilding is the main work of the corps of mechanics.

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U. S. L. Convention Oct. 12-15

NIAGARA FALLS, N. Y., Oct. 11—The annual convention of the United States Light and Heat Corp., this city, will fall on Oct. 12 to 15. The branch managers and salesmen from all sections of the country will be in attendance. Business sessions will be held and daily addresses by President J. Allen Smith, vice-president and general manager Harry Ackerman and sales manager, C. C. Bradford will be made. New sales and advertising policies will be explained to the visiting salesmen.

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Must Prove Chauffeur Negligent

LANSING, MICH., Oct. 9—The Supreme Court of Michigan has ruled that in cases of accidents to children, which occur on the streets, it must be plainly shown or proven that the chauffeur or automobile driver is negligent, before damages can be allowed the injured.

In the opinion written by Judge Steere, the latter says: "Drivers upon highways are not held as insurers against accidents arising from negligence of children or their parents, and though in law such negligence in a particular case may not be a defense as contributory negligence, for a driver also guilty of negligence, the fact of an accident does not establish liability or raise a presumption that the driver is negligent."

The ruling was made in the case of six-year old Orilla Barger, Detroit. She was struck by an automobile owned by Edward R. Russell on Gratiot Avenue, in 1911. In the Wayne County Court, a jury allowed the child, through her mother, $975 damages. An appeal was taken to the Supreme Court which now has sent the case back for a new trial, with the above mentioned ruling.

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National Safety Council to Meet in Philadelphia

PHILADELPHIA, PA., Oct. 13—The fourth annual safety congress of the National Safety Council will be held at the Bellevue-Stratford Hotel in this city on Oct. 19, 20 and 21. There is to be an elaborate exhibition of safety devices of all sorts, and special lectures will be delivered on the use of safety appliances in the various industries.

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Good Market for Light Cars in India

NEW YORK CITY, Oct. 9—There is a good market for light cars in India, according to a report given out by a local man. A reply, given him by a friend in India who had been asked for information in regard to the sale of automobiles in that country, stated that there are already many light cars in that country and that it is probable that a good market could be made there for the right car at the right place. It would be used daily for journeys between the bungalow, club and office.

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20,555 Cars in Virginia

RICHMOND, VA., Oct. 9—From 4020 automobile licenses issued by the Secretary of the Commonwealth for the year 1911, netting a revenue of $40,000, the number of license taxes sold has increased to 20,555 for the nine months of 1915, with a revenue of $170,000, all of which goes to the State Highway Commission for road improvement. Including the revenue from 1911 to date the State has received more than $479,000 from the sale of license tags to automobiles.

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Wisconsin Association Improves Laws

MILWAUKEE, WIS., Oct. 9—The Wisconsin State Automobile Association spent $465 at the 1915 session of the Wisconsin Legislature. The association succeeded in retaining the former excellent automobile code on the statute books, besides adding several amendments to increase the safety of motoring.

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Highway Engineering in U. of M.

ANN ARBOR, MICH., Oct. 9—A graduate fellowship to be known as the R. D. Chapin Fellowship in Highway Engineering has been given to the University of Michigan by Roy D. Chapin, president of the Hudson Motor Car Co. The fund donated provides an annual payment of $500.

Tulsa Co. to Make Oils—Cosden & Co., Tulsa, Okla., J. S. Cosden, president, will build a plant costing $200,000 for manufacturing wax, automobile oils and cylinder oils.

Miles Co. Making Trailers—The Miles Mfg. Co., 306 East Franklin Street, Jackson, Mich., which has been making concrete machinery is now also making the Miles automobile trailer.

Beardsley's New Plant—The Beardsley Electric Co. will build a plant at Culver City, Cal., near Los Angeles, to make electric passenger cars.

Motor Specialties Adds—A new boiler room, 50 by 60 ft., and a machine shop are being erected for the Motor Specialties Co., Muskegon, Mich., the expenditure on the buildings being estimated at $10,000.

Sterling Truck to Aid—The Sterling Motor Truck Co. Forty-sixth Avenue and Rogers Street, West Allis, Milwaukee, has awarded contracts for a factory addition which will practically double its capacity.

Carriage Co. to Make Automobiles—The Cortland Cart & Carriage Co., Sidney, N. Y., increased its capitalization from $75,000 to $225,000 to take up the manufacture of automobiles. It expects to continue its carriage business as usual.

To Make Sight Feed Oilers—Harvey Strong and L. C. Perkins of the Des Moines Fuel & Lime Co., has organized the Perkins Mfg. Co., for the manufacture of a sight feed oiler for Ford cars. They have established a plant at 51 Mulberry Street, Des Moines. The initial order is for 50,000 oilers to Zinke & Co., Chicago, Ill.

Detroit Welding Opens New Shop—The Detroit Welding Co., which started in business eighteen months ago at Leib and Larned Streets, Detroit, Mich., has opened a new shop at 814 West Jefferson Avenue. The shop is fitted out to take care of welding of cast iron, aluminum steel, brass, brake rods, steel tanks, and do general welding work.

Allen Dedicates New Plant—The new plant of the Allen Motor Co., Fostoria, Ohio, has been completed. The new structure, composed of concrete and steel, covers a floorspace of 150 by 100 ft. It will be used for the testing of Allen-Sommer motors. With the completion of this plant the annual output of motors is expected to be tripled.

Aluminum Castings New Building—The new machine shop of the Aluminum Castings Co., Detroit, Mich., is now complete and in use. It is 176 by 105 ft. The company is now making a specialty of the machining of bronze bushings from any one of its forty to fifty Lynux alloys, and also to handle a large quantity of bronze back babbitt lined bearing work.

Hancock Co. Rushed—The Hancock Mfg. Co., which makes parts and now has 130 men on its payroll, is working nights three days a week till 9 o'clock, being unable to turn out orders on schedule by working by day only. Orders on the books now will keep the plant busy all winter. Although a large addition was put up this summer a further extension may be necessary.

To Make Tires in San Jose—A tire plant employing 800 to 1000 men will be established in San Jose, Cal., by the Aero-Cushion Tire Co. The plant will be established on a site near the corner of First and Maple Streets. It is expected that the company will be turning out tires within ninety days. The tire itself is made up of 65 per cent porous rubber, 30 per cent air and 5 per cent of chemicals. It is placed inside the casings, and, it is claimed, practically indestructible.

Auto Wheel Triples Production—Since last April the Auto Wheel Co., Lansing, Mich., has almost tripled its production capacity through the erection of an addition, 60 by 180 ft., partly two stories high, a new boiler room, ten new dry kilns, a large hydraulic hub press, new boilers and other additions. At that time about fifty men were employed, while now more than 150 are on the pay roll. The daily output is now forty sets of truck wheels and 225 sets of other automobile wheels. Orders on hand are said to enable the company to keep the plant busy for the next twelve months.

The Automobile Calendar

Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 11-16.....Kansas City Dealers' Tour.
Oct. 16.....Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 16-23.....Pittsburgh, Pa., Show, Motor Square Garden, Automobile Dealers' Assn.
Oct. 17.....Twin City Speedway Match Race.
Oct. 18-19.....Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Oct. 18-24.....Troy, N. Y., Show, State Armory, Troy Automobile Dealer's Assn.
Oct. 18-25.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 20-21-22.....Excelsior Springs, Mo., National Assn. of Automobile Accessory Jobbers' Meeting.
Oct. 21.....New York City, Met. Sec. S. A. E. Meeting at Automobile Club of America.
Oct. 24.....Fort Worth, Texas, Race Meet.
Oct. 25-27.....Columbus, O., Garage Owners' Convention.
Oct. 29.....Indianapolis, Ind., Claypool Hotel, S. A. E. Meeting of Ind. Section.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 2.....New York City, Sheepshead Bay Speedway, 100-Mile Race.
Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

1916

Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19.....Newark, N. J., Show.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Langworthy Resigns—M. B. Langworthy has resigned as president of the King Motor Sales Co. of New York, Buffalo, N. Y.

Grady Succeeds Bush—J. E. Grady has succeeded W. T. Bush as general sales manager of the Studebaker Corp. of Canada. He will devote all his time to the retail trade.

McKenny Resigns—J. A. McKenny has resigned his position with the Dayton Buick Co., Dayton, Ohio, to become sales manager of the Standard Motor Car Co., Dayton, agent for the Chalmers.

Swinehart Tire Moves—The Swinehart Tire & Rubber Co. branch at Boston, Mass., has moved into its new quarters at 62 Brookline Avenue.

Robinson Makes Change—Percy Robinson, formerly manager of the Moline Knight branch in Boston, Mass., has resigned to join the sales force of the Premier and Westcott cars in that city.

Sowers Reno Mgr.—Cuyler Lee, distributer of the Maxwell and Packard lines in California, has opened a branch establishment in Reno, Nev., and has appointed George Sowers as manager.

Royce Louisville Tire Mgr.—The American Tire Co., distributor for the American tire, has opened a salesroom at 525 South Third Street, Louisville, Ky. J. W. Royce is manager of the concern.

Promotion for Flinn—C. W. Flinn, for the past year identified with the Chevrolet Motor Co. of New England at the Boston, Mass., branch, has been promoted to be manager of the company's branch at Stamford, Conn.

White Joins Curtiss—H. C. White has accepted a position with the Curtiss Aeroplane Co. as production engineer. He was formerly connected with the Pierce-Arrow Motor Car Co. as superintendent of the assembling departments.

Dealer

New Baltimore Tire Co.—The Gilson Sales Co., 213-215 Guilford Avenue, Baltimore, has become the Maryland distributor for the tires of the Canvas Tread Tire Co., Utica, N. Y.

Free Tire Service in Dayton—The Free Tire Service Co. is the name of a new concern, opened at 208 West Third Street, Dayton, Ohio. C. R. Connor, formerly of Huntington, W. Va., and O. R. Rowe compose the firm. Free tire service will be given to owners within a radius of 5 miles from Dayton.

Motor Men in New Roles

Mathews Mohawk Tire Sales Mgr.—C. C. Mathews, formerly with the United States Tire Co., has taken on the representation of the Mohawk tire, and will handle the sales in the southern part of Indiana, with headquarters at Evansville.

Boland Is Expanding—H. M. Boland, Worcester, Mass., agent for the Hupmobile and proprietor of the Kelly-Springfield Tire Co., has bought out also the Forer & Danziger Co., that had the Johns-Manville service station at 703 Main Street.

Herron Joins Springfield Body—Murray Herron has joined the Springfield Metal Body Co., Springfield, Mass., in the capacity of comptroller. He was formerly a branch and service manager in Detroit for the Stewart-Warner Speedometer Corp.

Allan Burd District Branch Mgr.—Robert Allan has been appointed district branch manager for northern California by the Burd High Compression Ring Co., Rockford, Ill. His headquarters will be at San Francisco, at 847 Phelan Building.

Avery Packard Service Head—L. C. Avery has been appointed technical manager of the Packard-Cleveland Motor Co., Cleveland, Ohio, succeeding A. P. Welburn, who has returned to Boston. J. J. McCauley, former assistant to Mr. Welburn, has been promoted to the Packard truck sales department.

Schaefer with Goodyear—W. H. Schaefer, who was a member of the truck specification department of the Packard Motor Car Co. for the past three years, is now with the sales department of the Goodyear Tire & Rubber Co., Akron, Ohio, where he will give special attention to the foreign business of that concern.

Andress Heads Cleveland Truck Agency—H. D. Andress, formerly division sales manager of the Chase Motor Truck Co., Syracuse, N. Y., has been appointed general manager of the Safe Motor Sales Co., 6504-06 Euclid Avenue, Cleveland. This company handles the Vim light delivery car, the Chase truck and the Simplex trailer.

Bolland Made Pres.—J. B. Bolland of St. Louis has been made president and general manager of the Bittel-Leftwich Service Co., Springfield, Ill. He succeeds A. Turner, who has been transferred to St. Louis to take up a new berth with the same firm in that city. The company will handle automobile supplies and accessories of all kinds.

Boston Dodge Enlarges Organization—The Henshaw Motor Co., Boston Dodge distributor, has materially enlarged its organization. The additions include W. L. Shepard, formerly treasurer Shepard Mfg. Co., Melrose; W. A. Maynard, formerly Chalmers dealer in New Haven, Conn.; T. A. Guild, I. W. Sibley, F. W. Bailey, F. H. Lewis and E. A. Walker.

Duffy Heads N. Y. Standard—S. G. Duffy is president and L. J. Goldman vice-president of the Duffy Motors Corp., 1895 Broadway, New York City, to handle the Standard Eight in that city.

Schiller on Pacific Coast—J. P. Schiller, Jr., has been sent to the Pacific Northwest as special service representative of the Willard Storage Battery Co., Cleveland, Ohio. He will make his headquarters in Seattle.

Wicks Heads Milwaukee Westinghouse—The Westinghouse Lamp Co., New York, on Oct. 15 started operation in its new Western lamp works at Milwaukee, where a maximum output of 500,000 globes per month is ultimately planned. The company has previously operated large works at Bloomfield, N. J., and New York City, but has long felt the need of a large plant in the Middle West. Accordingly, the company purchased the former Milwaukee plant of the Kissel Motor Car Co., Hartford, Wis., at Thirty-first and Center Streets, and since then has been equipping it for the production of lamps of all voltages and sizes. Five hundred girls are employed at Milwaukee. F. W. Wicks, formerly of the New York plant, is general manager at Milwaukee.

Dealer

Holtzer-Cabot Offices Moved—The executive offices and factory of the Holtzer-Cabot Electric Co., Boston, formerly located in Brookline, together with the Boston factories of the company, have just been removed into the company's new plant in Roxbury, Mass.

Cleveland Overland Leases—The Overland-Cleveland Co., 6604 Euclid Avenue, Cleveland, Ohio, branch distributor for the Overland company, has purchased the 99-year lease on an extensive piece of land in the immediate rear of the sales and service station. The property has 95 ft. frontage on Carnegie Avenue, extending 584 ft. deep.

VOL. XXXIII. NEW YORK—THURSDAY, OCTOBER 21, 1915—CHICAGO No. 17

THE AUTOMOBILE

French Plants Make V Motors

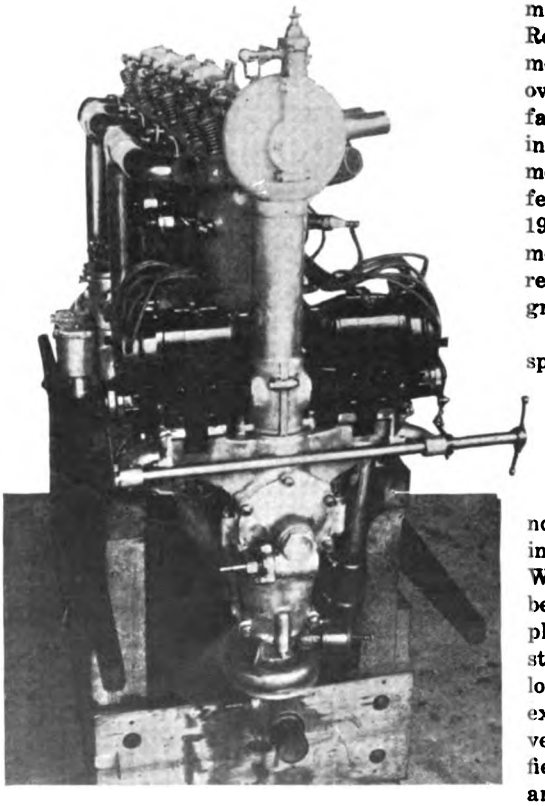
War Proves Star Type Aero Engines Useless—Eights and Twelves of Automobile Design Replace Freaks—May Affect European Car Practice

By W. F. Bradley
Special Representative of THE AUTOMOBILE *with the Allied Armies in France*

ONE of the many unexpected results of the war has been that automobile manufacturers have become aeroplane engine makers. One of the after-results will be the greater development of the six-, eight- and twelve-cylinder automobile. This is explained by the fact that all the new motors for aeroplanes are of the fixed cylinder, water-cooled type, and although specially made for service in the air, are of the same general design as the motors used in a car. The end of the war will see the French manufacturers with much of experience on multi-cylinder engines directly applicable to their car work.

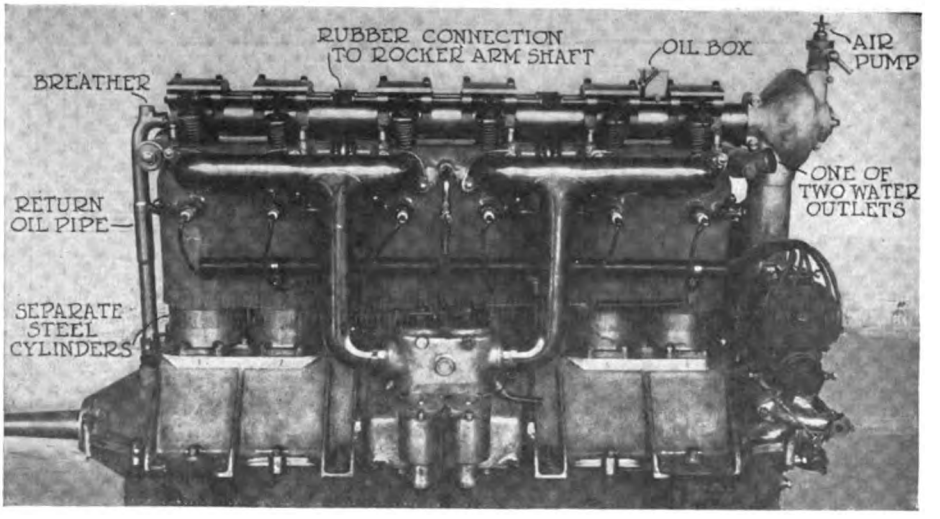
Renault is building sixes, eights and twelves; Lorraine-Dietrich is producing sixes and twelves; Hispano-Suiza has an all-aluminum eight-cylinder motor; Darracq is supplying a successful piston valve six, and an overhead-valve six; Peugeot is interested in an overhead-valve eight; Engineer Henry, late of Peugeot racing department, is supplying the army with a twin four of the same general design as his famous racing motors; Panhard is interested in sixes and eights; De Dion Bouton specializes in eights; Sunbeam is delivering twelves to both the British and the French armies.

There has been a revolution in the French aeroplane motor world since August, 1914. When the armies went forth to war, France had staked her reputation on rotary, air-cooled motors, or motors of the star type, most of them air-cooled. The only largely used motor which at all approximated the automobile type was the Renault eight-cylinder air-cooled model. When France was delirious over flying every automobile manufacturer in the Republic set his drawing office staff to work on aeroplane motors, and every factory produced a few engines for air service. But in 1909 the Gnome rotary air-cooled motor came into the field, and by reason of its low weight, secured a great advantage over all rivals.



End view Mercedes aviation motor, showing vertical shaft operating water pump, revolution counter, two magnetos, camshaft and gasoline pressure pump located on top of housing

At that time flying was merely a sporting proposition, and flights were of comparatively short duration. Under these conditions the Gnome, despite its inherent defects, gave better results than any fixed cylinder water-cooled motor, and was not long in obtaining a predominating position in the aeronautical world. When interest in the sport of flying began to wane, and when the aeroplane became a purely military instrument, the French manufacturers lost interest in their aeroplane motor experiments, and individual inventors turned their energies to other fields. In France alone between 100 and 150 different makes of aeroplane motors were designed and built between 1908 and 1912. It would be quicker to give the names of the fac-



Carbureter side Mercedes six-cylinder aviation motor, showing features of design

tories which have not dabbled in aviation than to quote those having produced and abandoned a special aero engine.

For several years aeroplane and automobile engine development has been on entirely different lines. The men who built for the air took no interest in engines for the road; and, with the single exception of Renault, no automobile manufacturer had any interest in the aerial business. In consequence, the automobile high-efficiency development of the last four years has had no counterpart in the aerial field.

Testing Aero Types

This was evident to close observers before the war, and has been made apparent to the entire world since the outbreak of hostilities. In 1913 the Automobile Club of France decided on an aeroplane motor competition, the essential condition of which was that the motors should run for 100 hr.—twelve days of 8 hr. each, and one day of 4 hr.—half an hour being allowed each day for starting and minor adjustments, consumption above a certain maximum being penalized by a reduction of the theoretical number of hours run, and consumption below that maximum being compensated by an increase in the calculated hours of operation. Thus of two motors having operated 100 hr., one might have its time increased by reason of gasoline economy, and a second might have its time decreased because of excessive consumption.

No automobile manufacturer entered this competition. The interested parties were aeroplane motor specialists. The eight motors entered comprised Gnome types, fixed cylinder air-cooled, star type motors, and one nine-cylinder water-cooled engine of the star type. Not a single engine actually ran 100 hr. without mechanical trouble. The best was the water-cooled engine, which was in operation for 98 hr., 58 min., 30 sec., the balance of time being lost in changing a magneto distributer. This motor was the only one consuming less than the official allowance of 350 grams gasoline and oil per horsepower-hour, and in consequence was credited with 123 hr. running. No. 1 Gnome type had six stops for mechanical failures, during which pistons, balance weights, and valves were changed and the motor entirely overhauled. It ran 98 hr., but as its fuel consumption was 494 grams per horsepower-hour, its theoretical running time was reduced to a little less than 56 hr. Two other motors from this factory had to be withdrawn owing to mechanical defects. A similar rotary type had five stops on the first day and went out with a cracked cylinder. A second and similar motor averaged four stops for each of the four days it was running.

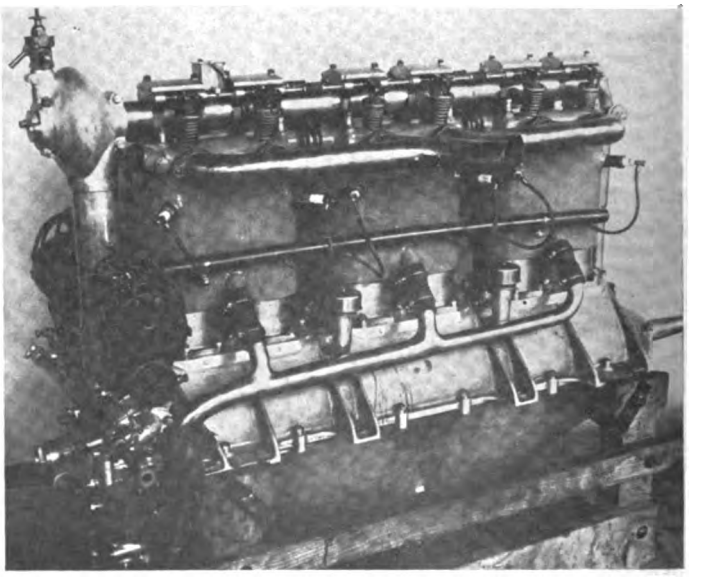
The excessive gasoline and oil consumption of the air-cooled rotaries was really alarming. The Gnome which ran for 98 hr. had an oil consumption practically 30 per cent of its gasoline consumption, while some of the more recent automobile type aviation engines have an oil consumption only 0.057 of the gasoline supply. Ignoring fuel, the Gnome type is undoubtedly the lightest motor in existence. Also on a basis of 5 hr. operation, and with units up to 100 hp. this motor is lighter than any other type. But for higher powers, and for longer non-stop runs the fixed cylinder automobile type is superior.

Considering the Gnome and the nine-cylinder water-cooled motor taking part in this competition, estimating on 60 hp. for one hour, the weight of the Gnome is 249 lb., and of the water-cooled engine 480 lb. With fuel and supplies for 10 hr. running the Gnome weighed 807 lb. and the water-cooled engine 777 lbs. For 100 hr. operation the weights are 6387 for the Gnome and 3747 lb. for the water-cooled rival.

Another comparison, in which the Gnome, the nine-cylinder water-cooled motor and one of the latest eight-cylinder water-cooled engines are compared on the basis of 100 hr. running and the same horsepower developed, works out as follows:

Motor	Lb.
Gnome type	2,841
Nine-cylinder water-cooled aviation motor	2,203
Eight-cylinder water-cooled automobile type	1,366

Up to 100 hp., and for flights not exceeding 4 hr., the Gnome type motor is equal to any other, when considered on a weight basis. Thus it is satisfactory for single-seaters used for observing the effects of artillery fire. The development of long range heavily armored aeroplanes has called for motors of 150 to 250 hp. For this class of aeroplane the rotary is useless. Its high gasoline and particularly its high oil consumption make it one of the heaviest motors in existence. It fails also on the score of reliability, for military statistics, prepared during the first year of war, show that one make of rotary motor averaged 4 hr. useful flying and another 12 hr. effective service, before going to the scrap heap. Inaccessibility is another defect of the rotary, and is largely responsible for the short average life. Under peace conditions skilled mechanics were always in attendance. On war service unskilled hands have to be trusted with these very delicate pieces of mechanism, and succeed in considerably shortening their lives. It is difficult to silence the rotary air-cooled motor, while the fixed-cylinder water-cooled motor

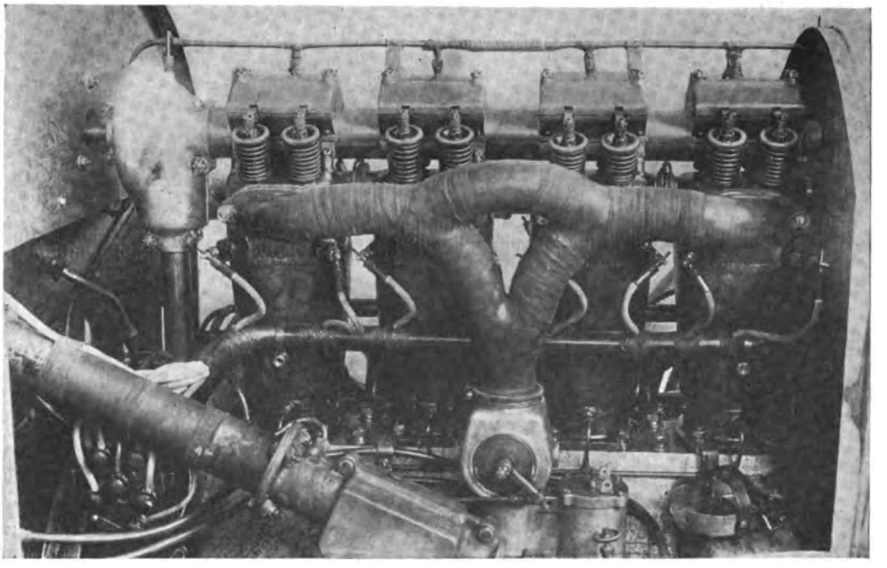


Exhaust side Mercedes aviation six which uses separate steel cylinders but a common waterjacket for each pair

can be silenced as effectively as the engine between the frame members of a car. Now that aeroplanes are built with engines totalling from 500 to 1000 hp., silence is an important feature.

Car Makers Take Responsibility

Very early in the war it was recognized that the rotary type in which France had specialized was not the best kind of engine for active service conditions. Gradually the contracts for this type of engine were reduced until they are now approaching the vanishing point, and at the same time automobile manufacturers were encouraged to build for aviation purposes. At the present time all the automobile factories are busy and the aero-motor specialists are transferring their attention to fixed cylinder types. The elimination of the nine-cylinder water-cooled star-type motor, which was mentioned in connection with the automobile club competition, has been due to the tendency to catch fire in the air. This is a defect almost inherent to this class of design, and is not found in the automobile-type engine. When seven machines were burned in seven days owing to this motor defect, the manufacturer found himself cut off the army lists.



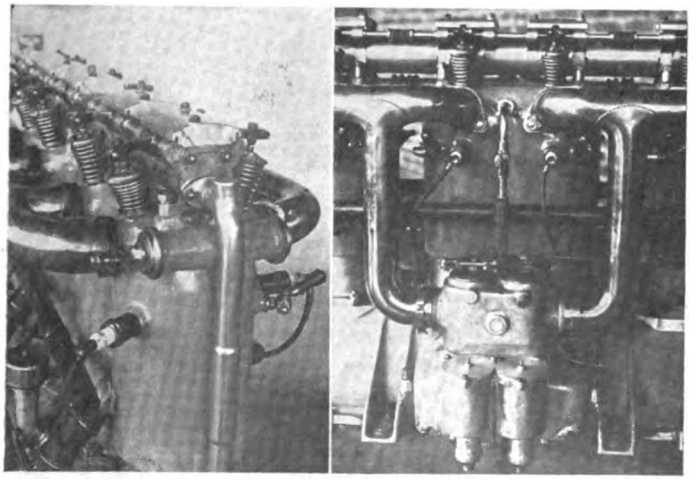
Mercedes racing motor. Compare this with aviation type on opposite page

Effect on Automobile Uncertain

It is not safe to predict a wholesale reversal to sixes, eights and twelves for car purposes, as the result of the experience French automobile manufacturers have acquired in the aviation field. When, after examining his twelve-cylinder water-cooled aviation motor, the remark was made to Louis Renault: "I suppose you will use this type of motor in your cars." Renault replied, "It would be anti-commercial." Despite this reply, there is reason to believe that after the war many of the high-grade cars built in France, and also some in England, will have eight and twelve-cylinders.

Germany's aeroplane motor experience is in striking contrast to that of France. It was not until 1911 or 1912 that Germany began to doubt the efficiency of her Zeppelins and to turn her attention to the creation of an aeroplane fleet. At that time she was dependent on France for her aeroplane motors, and the rotary-type Gnome figured largely in German sporting events. The change was rapid. Under military direction the automobile factories of Germany devoted themselves to the task of producing a strong, reliable, water-cooled fixed-cylinder motor of the automobile type. The government regulations put out of consideration anything in the nature of a copy of the French Gnome, and the automobile factories left to their own resources naturally adapted their automobile experience to aviation work and built engines which had much in common with their standard, or racing design.

The past year has shown that the German military authorities were more far-seeing than those of France, for they adopted a type of motor which has proved satisfactory under war conditions, while, since the war began, France has made a transformation which would have been considered miraculous under ordinary conditions. The war has also shown the thoroughness with which Germany has tackled the aviation motor problem. Benz and Mercedes were the two most interested German factories. Benz produced six-cylinder overhead valve motors, with push rods and rockers, and Mercedes developed a six-cylinder type with overhead valves and overhead camshaft.

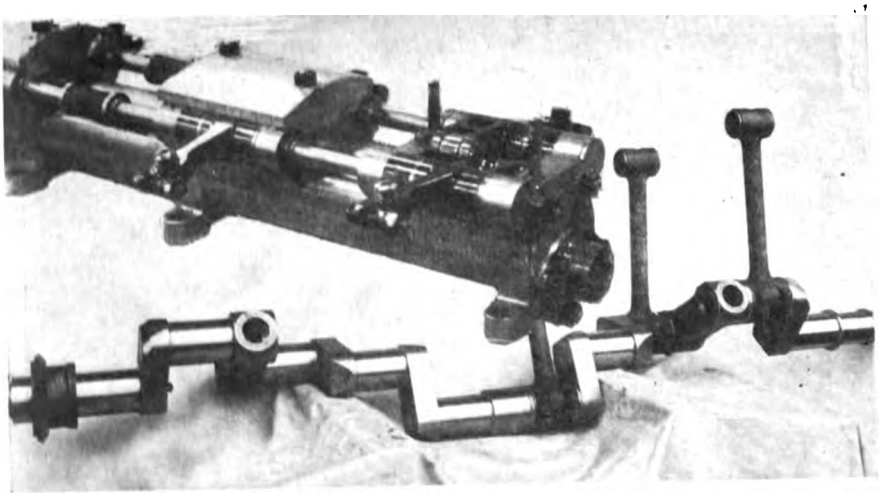


Left—Mercedes overhead camshaft gear. Note overflow oil pipe with breather on top. Right—Detail of Mercedes waterjacketed duplex carbureter

Germany Showed Most Forethought

It is now evident that Mercedes' sudden interest in French automobile racing was due to her anxiety to perfect the aviation type of motor the German army wanted in big quantities. After winning the Grand Prix race in 1908, Mercedes took no interest in French automobile races for a period of five years. In 1913 she refused to be drawn into the French Grand Prix run under limited fuel rules. But in the autumn of that year she suddenly appeared at an open race at Le Mans with a fleet of five cars the existence of which nobody had suspected. The cars arrived late on the course and they went back to Germany the morning after the race. But for the driver of one of the cars shedding his hood while traveling at speed, no foreigner would have obtained a glimpse of the power plants of these cars. It was difficult to find a reason for Mercedes suddenly deciding to participate in a secondary French road race, the winning of which could not have brought much credit, and which was certainly costly. It was finally concluded that the Belgian agent, Pilette was instrumental in getting the cars together, and the matter was forgotten.

It is now clear that the factory itself was decidedly interested in those cars, for they carried the new Mercedes aviation motor, and the race was taken advantage of to subject them to a more searching test than it was possible to give them in the air. Only one of these cars was allowed to leave the German factory. It was purchased by E. C. Patterson of Chicago, and was driven in the 1914 elimination



Above—Overhead camshaft in housing of Mercedes aviation motor with one of rocker arm covers removed, showing rocker. Below—Six-cylinder four-bearing hollow crankshaft used in Mercedes aviation motor. Note size of wristpins, bushings of which are made from good cast iron and are drilled for lubrication

trials at Indianapolis by Ralph De Palma. The car did not start in the race. This motor had been designed for a maximum of 1400 r.p.m. in the air, and when made to approach 2000 on the track periodic vibration developed. This was known to the Mercedes factory before the French race was run, and the necessity of studying balance at high engine speeds was the important lesson learned by the Mercedes engineers.

Last Grand Prix Was Final Test

At the last French Grand Prix at Lyons, run a couple of weeks before the declaration of war, Mercedes again put in a full team of cars. Complete mystery surrounded the motors of these cars. The Mercedes engineers and officials allowed members of the technical press to walk around, crawl under, or crawl over their racing cars, but they allowed nobody to peep under the hood. Precautions against peeping Toms comprised a 10-ft. wall, a watch dog and a night and day watchman, an oak door to the garage, a couple of mechanics sleeping by the side of the cars, and a chain and padlock around each bonnet. Persuasion and cajolery were alike powerless to extract information regarding the motors, and the meager facts finally obtained were mainly secured by strategy. French offers to buy these cars were refused. Only one machine was sold, this being the car with which Ralph De Palma won the Indianapolis race this year.

While these Mercedes motors were specially built for the French Grand Prix, their design was that of the Mercedes aviation engine. It is rather a bitter reflection for the French that only a few days before war was declared, a German firm was making use of French road races to test and perfect military aeroplane motors. It was declared at the time of the race that the German Emperor sent a personal telegram of congratulations to the Mercedes team at Lyons. This is not surprising, now that it is realized the winning of the race was a matter of military importance.

Mercedes motors, which are found on about 80 per cent of German aeroplanes, are considered the best from across the Rhine. Other makes, even when captured in good condition, are not used on French machines. At the suggestion of the French military authorities the Renault and Lorraine-Dietrich factories now build duplicates of the German Mercedes motor and fit them to their own biplanes. Parts built in these French factories are interchangeable with the German motors, so that every machine captured in a reasonably good condition means not only a loss to the enemy, but a gain to the Allies.

Details of Mercedes Motor

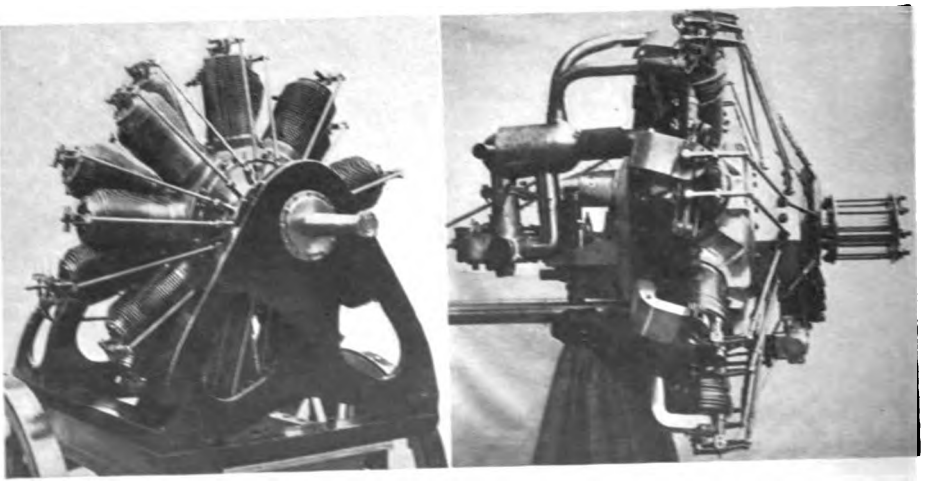
Germany's leading aviation motor is a six-cylinder Mercedes measuring 4.7 by 5.5-in. bore and stroke. As is fairly well known, the cylinders are separate and machined from steel forgings, with inclined valves mounted in the head. The same general design is found throughout the aerial engines and those used for speed work on the road and track. The illustrations of the aeroplane motor give the impression of cylinders cast in pairs. This, however, is not so, the cylinders being separate, as in the case of the four-cylinder racing model, but with a common waterjacket for each pair on the six.

In the last French Grand Prix race at Lyons, Mercedes was alone in the use of separate steel cylinders, every other competitor—French, English, Italian and Swiss—seeking rigidity by means of a compact block casting. The radical difference between the two types of motors led to some discussion at the time as to which school held the balance of advantages; the German partisans maintained that the more careful machining, both inside and out, rendered possible with separate steel cylinders, outweighed whatever rigidity advantages there might be with a block casting as developed by the French and Italian schools.

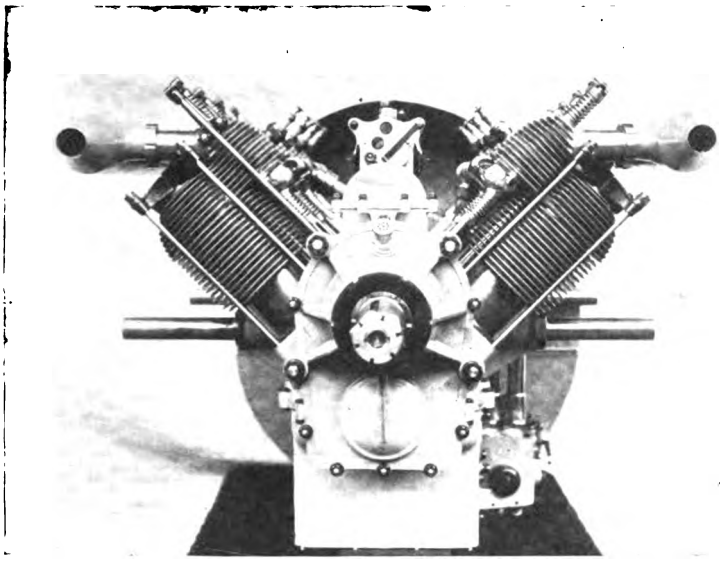
It is now seen that Mercedes had another reason for adopting separate steel cylinders. Her motor had primarily been designed for aeroplane work, in which weight was an important consideration, and road racing was only indulged in to test the design and construction of the aeroplane engine. Her engineers were thus bound to the use of separate steel cylinders.

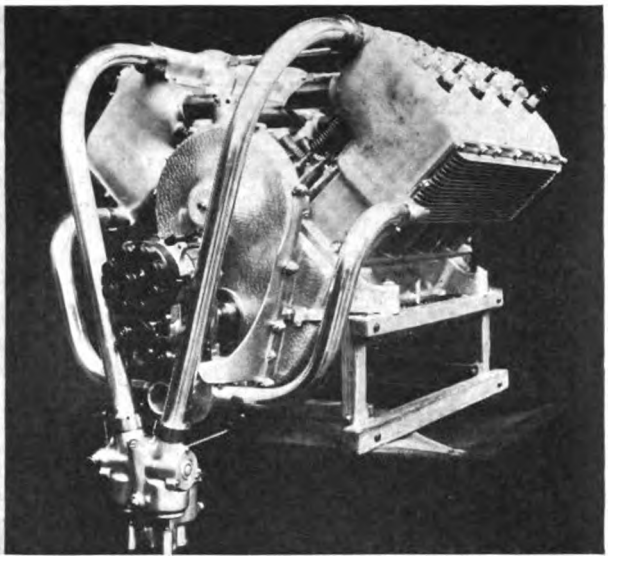
Cylinders Are Complicated

With a view to weight reduction, cylinder walls are made as thin as possible, but the necessary rigidity is obtained by a series of four circular ribs around the barrel of each cylinder. Valve seats and guides are screwed into the head of the cylinder and then acetylene welded in position. A steel waterjacket is welded to the cylinder or cylinders, there



Left—Eighteen cylinder rotary, Gnome type motor. The war has proved the death knell of this design. Right—Nine-cylinder water-cooled Salmson motor which has a tendency to catch fire





Left—Renault eight-cylinder air-cooled aviation motor with housing removed. Note propeller is mounted on end of camshaft. This is the only successful air-cooled motor in France. Right—Panhard eight-cylinder water-cooled type

being a jacket per cylinder in the racing type and a jacket for two adjacent cylinders in the aeroplane engine. Each cylinder is held to the aluminum crankcase by eight bolts. Despite the apparent external dissimilarity, the cylinder design and construction is identical in the two types of motors.

The aeroplane motor has but two valves per cylinder, whereas on the racing four pair intakes and exhaust are employed. Valve diameter on the six is 2⅛ in., with a valve lift of 5/16 in. It will be observed that the valve area is small compared with the area on this and other makes of racing motors, but it is not desirable that the number of revolutions in the air should exceed 1400.

The crankshaft is a very fine piece of work, entirely hollow, and not merely bored for oil leads, attached to the upper half of the crankcase in four white metal bearings. The diameter of the shaft is 2⅛ in. and the four bearings have a uniform length of 2¾ in. I-section connecting-rods, machined all over and drilled in the webs were used on the original Mercedes motors, but it has been possible to save weight without any loss of strength by the use of hollow circular section connecting-rods. Four bolts are used for each connecting-rod end. Wristpins are hollow, with a diameter of 1 5/16 in. The upper end of the rod carries a cast-iron bushing drilled with a large number of lubrication holes of about 3/16 in. diameter.

At one end of the crankshaft is a bevel pinion driving an inclosed vertical shaft by means of which power is transmitted to all the accessory organs. At the upper end of the shaft a bevel pinion engages with a gear on the end of the overhead camshaft; at the extreme lower end is the water pump; the revolution counter is mounted just below the crankshaft. Just above the crankshaft, and to left and right of the vertical housing, two Bosch high-tension magnetos are mounted and driven by bevel gearing. The current is led to two plugs in each cylinder, mounted horizontally just below the valves. The magnetos are synchronized, the advance and retard mechanism being common to the two units. Mounted on the top of the vertical housing containing the camshaft drive pinion is a gasoline air pump driven by eccentric off the end of the camshaft.

Overhead Camshaft Very Light

The overhead valve mechanism is a very fine example of careful designing and skilled construction. A light steel housing attached to the cylinder heads by means of twelve vertical studs, carries the hollow camshaft, the rocker arms, and their hollow shafts. It has not been possible to get the exact weight, but judging by the feel the entire structure cannot weigh more than 4 or 5 lb. Detailed structure can easily be gathered from the illustrations.

It will be seen that the inner end of each rocker is forked and receives a roller in contact with the face of the cam. The outer end is split and also threaded to receive a stud, the hardened end of which is in contact with the extremity of the valve stem. The stud allows of tappet adjustment and can be locked in its correct position by tightening up the bolt going through the two split ends of the rocker. Very elaborate oiling arrangements are provided. Lubricant is carried up the vertical shaft housing, through the hollow camshaft to the main camshaft bearings and also through the hollow rocker arm shafts to the rocker arm bearings. At the end of the camshaft housing opposite the drive, there is a steel return oil pipe leading into the base chamber, and a breather is mounted on the top of this pipe.

Provision for Splash

Although the rockers are lubricated internally, provision is also made for a supply by splash. On the inner face of the cast aluminum cover mounted on the top of each pair of rockers are two thin aluminum splash guards which cause the oil splashed up by the cams to be thrown into an oil duct in the body of each rocker and from here it flows to the bearings. The rocker arm shafts are common to two rockers, but are joined up by means of oil-resisting rubber connections. This gives two continuous hollow shafts fed with oil flowing by gravity from an oil box on the top of the housing. On the racing model the rocker arm shafts are not hollow, the delivery being entirely by splash, with level maintained by means of hand pump and overhead pipe.

The supply of oil is contained in the base chamber, which has its greatest depth in the center. There are aluminum baffle plates placed horizontally at both front and rear end of the crank chamber to prevent the tilting of the engine in either direction throwing the oil into the end cylinders. The oil pump is in the bottom of the central well and can be withdrawn independently of the crank chamber. Power is transmitted to the oil pump off the vertical shaft by means of a horizontal shaft in the base chamber, and worm gearing.

A duplex Mercedes carbureter is fitted, supplying respectively the three forward and the three rear cylinders. Although the pair are cast together, each carbureter has its own float chamber and its own main and pilot jets; the two throttles are connected and operated together. The carbureter, which is of cast aluminum, is bolted close up to the base chamber and obtains a jacket of water from the central pair of cylinders.

British Duty Threatens French Exports

$11,000,000 Trade with England Before War May Be Rendered Impossible After Peace Is Declared by 33⅓ Per Cent Tariff

PARIS, Sept. 24—When Chancellor of the Exchequer McKenna announced a British import duty of 33 1/3 per cent on all foreign automobiles, the first instinct of the French manufacturer was to utter a cry of despair. In the last year for which complete figures are available, France exported automobiles to the value of $43,500,000; of this amount $11,000,000 represented trade with England. A 33 1/3 per cent duty is prohibitive. There is not a French manufacturer who could stand up under it. The best equipped firms would seek to minimize the duty by shipping bare chassis without tires, wheels, magnetos, carbureters, etc., finishing the machines in England, and would make arrangements for the establishment of erecting and body shops. For the bulk of the French trade the British market would be completely closed. There are at least fifteen factories in France sending from 40 to 65 per cent of their output into England. For these the conditions looked hopeless.

Since the announcement the situation has been examined more calmly, and the dominant feeling is that the tariff is a war measure to be repealed as soon as peace has been declared. It ought to be explained that it is more a hope than a belief that England will abolish the tax after the war. No official announcement has been made by the English authorities, and until the newspaper publication of the budget proposals the leaders of the French automobile industry had no idea of a British tax on foreign cars.

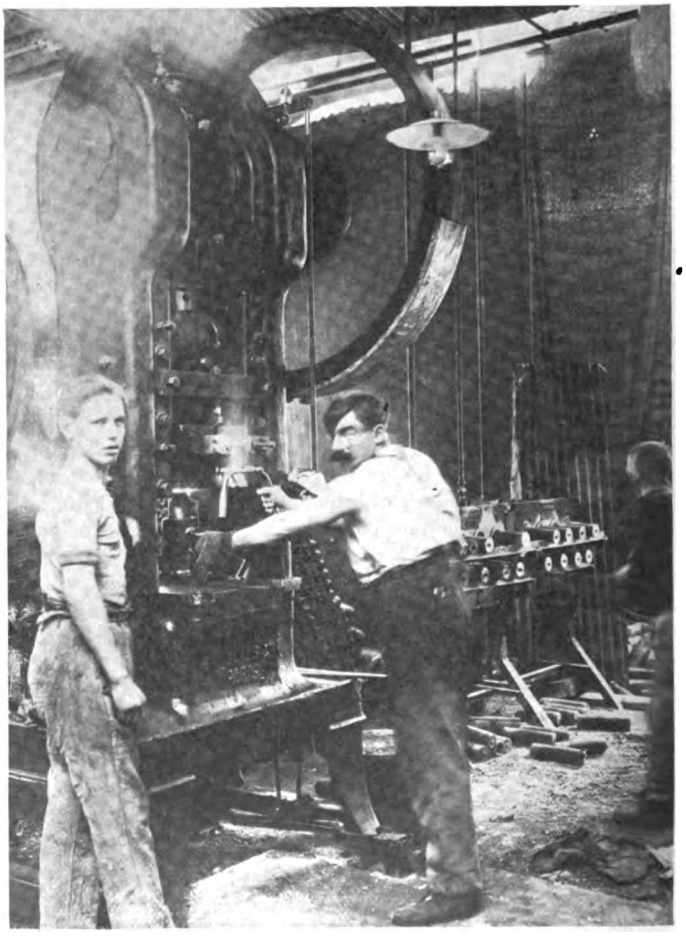
The belief is expressed that the import duties have been adopted as a protection against America, and that later preferential treatment will be given to France and her Allies. As the French automobile factories are able to export but a minute number of cars, the tax does not at present seriously touch this country. With wonderful unanimity the French manufacturers declare that it is inconceivable for England to maintain a tariff barrier against French goods, and particularly against such an important industry as the automobile. Nevertheless, those firms having important interests in England, and particularly those French factories registered under the English limited liability law, will continue to feel very nervous until they have obtained definite assurance that England's action is directed against neutral countries and not against the Allied nations. When ideas have taken concrete form, it is more than likely there will be an understanding between France and England on the matter of tariffs, and that joint action will be taken to prevent America getting hold of the European automobile market in the interval immediately after the war.

Factories Deal Direct

Up to the present France has been apparently indifferent to the danger of American competition, for it is practically impossible to sell any automobiles in that country except to the government. This business, too, must be done direct. The most skilled and persistent intermediaries have been forced out, and all business is now being done direct between the French Government and the American factories, or between the factories and the official banking representatives of the French State. A few enterprising dealers have made arrangements to put American cars on the French market as soon as ever there was a possibility of selling, which means as soon as ever the war was over, but they have not imported or sold any cars up to the present. Among the American firms having entered into arrangements with French dealers are Buick, Overland, Studebaker, Chalmers and Saxon. These dealers recognize that when the war comes to a close it will be impossible to find a new French automobile anywhere in the country, and that no factory will be in a position to produce in any quantities in less than six months. Thus, the man who can deliver at once will certain do business. As the end of the war is not immediately in view, it was not surprising that public attention was not drawn to these preparations for capturing a slice of the French trade. Nevertheless, the authorities have kept a close watch on the situation, and there is every reason to believe that they are prepared to take drastic measures to protect their industry against invasion from any source immediately following the war.

Conditions Different in England

In England conditions are different, for during practically the whole fourteen months of the war there has been a certain private market for foreign cars. It is no exaggeration to say that the British manufacturers are enraged at the possibility of their market being seized by an outsider while they are busy working for the army. Certain manufacturers have led a serious campaign against foreign cars, although the word foreign might best be translated by "American,"



How the French automobile factories are occupied in making war munitions. Stamping a 75-mm. shell. Note the gas furnace heating sixteen shells at the right of the illustration and also pile behind the machine

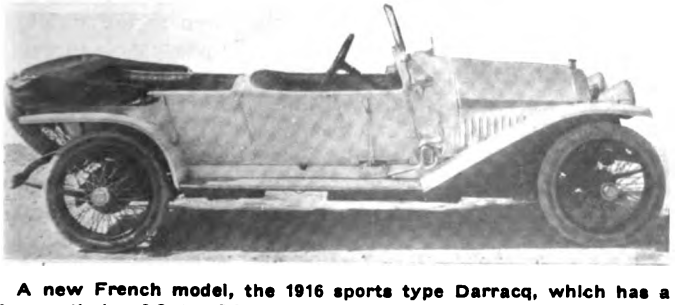
for the only automobiles entering England are those from across the Atlantic. Until only a few days ago, the great majority of the British automobile factories had been requisitioned as a whole by the government and were not in a position to furnish a cent's worth of goods to the private client. Quite recently there has been a slight relaxation and a small portion of the output can go to approved private firms having government contracts and needing automobiles. This applies particularly to trucks. The complaint is not that the factories are losing money, for they are all making as much, if not more than in the most prosperous peace times, but that when the war finished they would find their own market in the hands of the American.

Resentment Against French Factories

The realization that their position was as bad as it possibly could be, tended to raise a little resentment against the French factories, which have never been absolutely forbidden to supply private orders. Dealing with this point, the English manager of a French company declared it was the fault of the Englishmen themselves if their whole business organizations had been seized by the army. "When the threatened march on Paris was averted last September, the entire automobile industry of France was called to a joint meeting with the military authorities. When we were asked if we could make shells, we decided to place the whole of the automobile factories of France at the disposal of the war department. At that time not a single factory was running; most of us did not possess more than 2 per cent of our staffs. Some of our men had already been killed or made prisoners. Nevertheless, within fifteen days we were producing shells. Within a month most of us had as big a payroll as before the war, and since then there has been a steadily progressing output. Where it was possible to do so without interfering with army contracts, we were allowed to fulfill private orders. As we all had a few men not under military obligations, and we all had some raw material in stock, it has been possible throughout the war to produce a small number of private cars. The output is really insignificant compared with peace times, but our initial action saved us from being taken over lock, stock and barrel by the military authorities.

"England unfortunately made the mistake of supposing that the war would be over in six months, or a year at the most, and that the best policy was to 'carry on as usual,' so as to be ready to take advantage of the after-the-war boom. Many British manufacturers declined to accept army contracts, or accepted contracts of an insignificant nature not likely to interfere with their general organization. In consequence there was serious delay in getting the British factories to work on the production of munitions. In several cases it was necessary for the authorities to interfere, militarizing the entire factory, and refusing to allow any private work to be done. The trade realized its mistake at a rather late hour, and is now completely and efficiently organized for helping on the war."

French army automobile drivers carrying out a wayside repair on car damaged by the enemy's guns



A new French model, the 1916 sports type Darracq, which has a four-cylinder 3.3 by 5.5 motor, giving 50 hp. and capable of 65 m.p.h. with four passengers and full equipment

Duty Useless as Protection for British Automobile Manufacturer

LONDON, ENGLAND, Oct. 3—The import duty on American cars has caused no little upheaval in the trade and no doubt will take some little time before it gets back into its normal condition. It is not expected to have a very severe effect on the sale of American cars; the Cadillac being likely to feel it most of all. The Overland people have advanced their price by $250, the Oakland four, $350, the small Oakland six, $225, the Oldsmobile four, $350. I expect the Studebaker four will go up about $325 and the Studebaker six $400.

The American trade have had a large number of meetings and a deputation has waited upon the Chancellor of the Exchequer just to prove to him how ruinous such a tax would be upon the dealers dotted all over the country. There is a distinct feeling that the tax will never be made law, as the amount of money to be collected from it, and also the amount of money that it would prevent going out of the country, is not worth much attention by the government. As a tax to assist British manufacturers, of course it is useless; to do any good it wants to be something like 100 per cent. Probably it will hit the American tire manufacturers very much more than the car people.

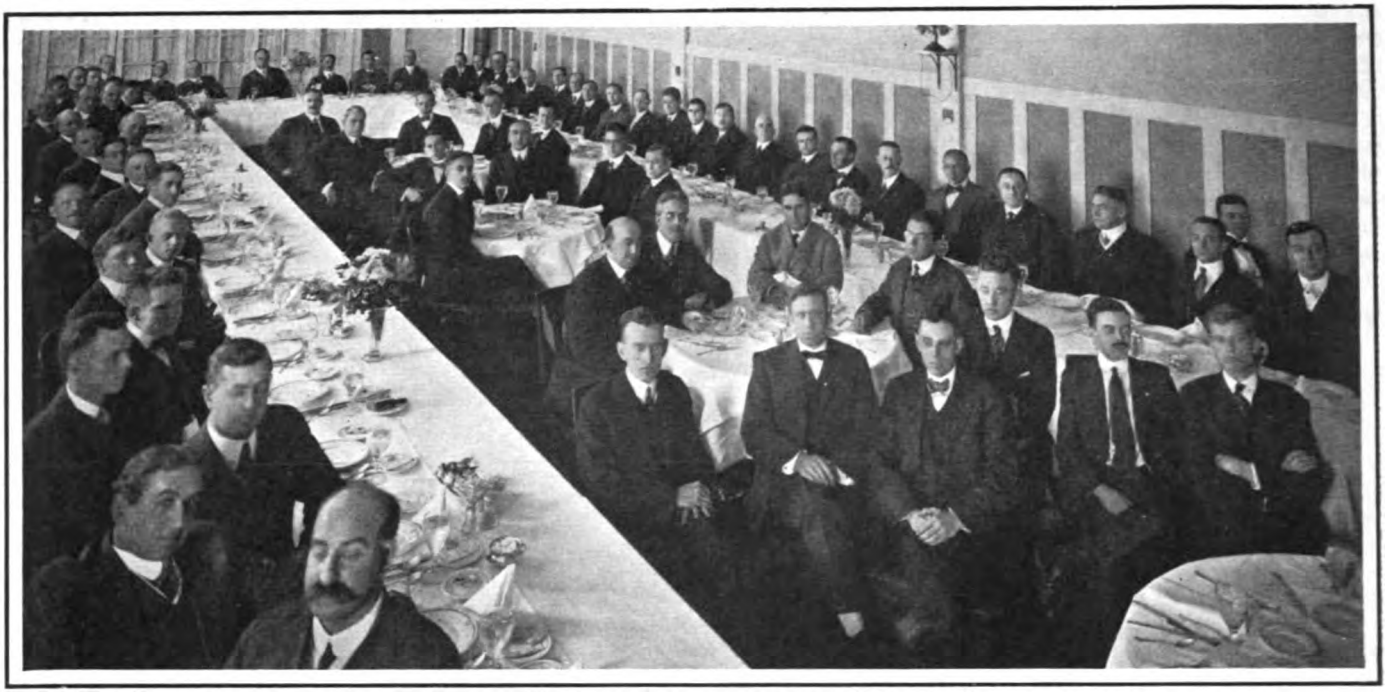
From current advertisements appearing in the English journals it is seen that the government has given some of the commercial vehicle manufacturers a limited release which will enable them to supply vehicles to firms employed upon government work, and it is likely that it will assist the car manufacturers in a similar way.

May Reduce Our Trade with England One-Third

DETROIT, MICH., Oct. 13—George Hutton, representative for Dodge Bros. at Dublin, Ireland, who is at the Dodge plant, in commenting on the new automobile import tax of 33 1/3 per cent just decided upon by Great Britain, said that it will probably cause a reduction of one-third in the importation of American cars, and possibly a greater percentage.

"The new import tax has stirred up a great deal of discussion in England and Ireland and there has been some feeling that it has been directed against the United States. My opinion is that the real purpose was to keep as much money as possible in England. The people generally are living more economically.

"If there was any real passenger car buying in Great Britain now, the reduction in sales would be still greater, but for the past six months we have been selling practically no cars for pleasure only. The people still buying cars are doctors, salesmen, farmers and similar persons.



Banquet of the S. A. E. Standards Committee and Mid-West section held at the Chicago Automobile Club, Thursday evening, Oct. 14

Mid-West S. A. E. Section in Chicago

Many Members from Wisconsin and Indiana—License Brackets and Pump Bases Among a Number of New Standards Ready for Approval of Society—Committee Reports

CHICAGO, ILL., Oct. 15—A Chicago section was added to the family of the Society of Automobile Engineers at the time of the quarterly meeting of the standards committee held here yesterday. In fact, the formation of this section was one of the reasons that the committee held its meeting at Chicago rather than at its Detroit headquarters. The temporary organization took place at a dinner held at the Chicago Automobile Club following the business session of the committee.

For some time, it has been felt that the engineers on the west side of Lake Michigan should get together more often, and a Chicago section has been talked of for more than a year. The name Mid-Western section was adopted, however, as it fits the territory better, than would the name of the city, for it developed at the dinner that the section could draw upon over fifty S. A. E. members in Milwaukee alone to say nothing of those in the other adjacent Wisconsin and Indiana automobile cities.

The work of the temporary organization will be carried through by William H. VanDervoort, president of the S. A. E., as chairman; Mark A. Smith, Standard Oil Co., vice-chairman; Daniel Roesch, Armour Institute, treasurer, and Darwin S. Hatch, *Motor Age*, secretary. As soon as a charter has been granted by the council, the Mid-West section will complete its permanent organization. Indicating the decided interest which is being manifested in the new body was the attendance of seventy-five members at the organization dinner.

Among those who spoke in favor of the Mid-Western section and who gave valuable suggestions to this newest member of the S. A. E. family were David Beecroft of THE AUTOMOBILE, K. W. Zimmerschied, General Motors Co., Herbert L. Connell, Milwaukee Central Continuation School, George W. Dunham and G. H. Conant, chairman and secretary respectively of the Detroit Section S. A. E., W. P. Kennedy, New York City, Prof. P. B. Woodworth, Stevens Institute and Russell Huff.

Iron and Steel Division Reports

On the preceding day several of the divisions of the standards committee held meetings which resulted in reports presented to the committee as a whole yesterday. The first report at the morning session was given by Mr. Zimmerschied and dealt with the work of the iron and steel division. This division has been one of the mainstays of the standards committee and, in the past year, has been engaged in reconciling its early recommendations with the changes which have come about in the industry. At last summer's meeting an extremely complete and comprehensive report was given to the society, and the work now in hand is a still further ironing out of the specifications and recommendations already enforced.

Among the suggestions which will be given to the society next winter is the raising of the limits for phosphor and sulphur content of steel to 0.045 and 0.054 respectively, in order to meet present commercial conditions in the steel industry. Mr. Zimmerschied pointed out that the S. A. E. specifications now cover steels for practically all parts of the car except the very special cases such as ball-race material, etc.

The data relative to test pieces also are being refined and sheets will be issued in the near future covering a modified 2-in. test piece, the flat strip and gray iron test pieces which have been adopted by the American Society for the Testing of Materials and also a standard method of conducting the hardness test. The division also is working to adapt all the

test specifications of the S. A. T. M. to the needs of the automobile industry. The recommendations in these various matters will be ready for presentation to the society in June. There was no discussion.

Among the points of greatest general interest that were made at the meeting of the standards committee was the statement that a properly-designed license plate with figures 3 in. high could be read as distinctly at the usual legal distance as the one with figures 6 in. high. Another was the recommendation by the same division that tail lights be placed centrally over the rear license number.

No Dimmers Recommended

A startling announcement was that by the electrical equipment division that there were no dimming devices on the market that could be recommended by the S. A. E. The committee adopted a uniform location and size for distinguishing marks on the chassis of motors which will be a benefit in the prevention and apprehension of theft of cars. As to the strictly technical work effected by the committee meeting there was a great deal of value in it to the engineers of motor car plants and part makers which also is indirectly valuable to owners as well, such as the standardization of wire sizes, tire pump basis, clutch housings and other features of design which make for uniformity and accessibility of the product.

A very detailed report was given by John G. Utz as chairman of the hard-working miscellaneous division. Considerable progress has been made toward recommending standards for license plate and holders, which subject is now in a very chaotic condition, since the legislature of each State has followed its separate whim in the matter of the size and shape of licenses.

The committee is not attempting to fix a standard for the size of the plate, but believes it is possible to reach a standard on the location of the four holes for attaching which will be acceptable to all the States. Fig. 3 shows the location of these holes in both license pads and in the holders for attaching them to the front and rear of the cars. For the rear bracket, the committee believes that a central light placed at the top of the pad is the most feasible and most efficient.

In relation to this subject, the division has made a study not only of the license plate in use throughout the country but also of legibility. In this regard the report goes quite fully into the standard tests of opticians and gives some interesting data showing that characters 3 in. high with ½-in. strokes can be used for car numbers with the best results:

Miscellaneous Division

At a meeting held in Detroit on Oct. 8 the work of the July meeting of the miscellaneous division was reviewed, and some slight changes made under each head. The following minutes therefore summarize the entire work of the division since the June meeting of the society:

License Plates

It is proposed to standardize the location of four holes for attaching license plates to their supporting brackets. These holes to be located symmetrically with respect to the vertical center line of the plate, and preferably also with the horizontal center line. The horizontal distance between hole centers is to be 7 in. and the vertical distance from 3½ to 5 in. Holes are to be ¼ in. in diameter, and located on centers preferably ½, not over ⅝ in. from the upper and lower edges of the plate. The horizontal distance was changed from 8 to 7 in., because wide brackets often cause interference with radiator studs, and to accommodate the few extra short tags.

Discussion of the size and number of characters required brought out the suggestion that one prefix letter with four digits provided characters for 200,000 cars, without using letters like I, O, C. G and Q, which might cause confusion. This will probably be a sufficient number for any state for some time yet, and it is more easily read, as well as shorter, than a number with six digits.

Figures 4 in. in height are used by many states, the height being often specified by law. In order to get the long numbers on a plate of reasonable length it has been found necessary in many instances to crowd the digits both as to width and spacing. It is thought that characters 3 in. in height, with strokes of ½ in. and at least the same amount of opening between strokes and space between letters, will make numbers which can be read at fully as great a distance.

A careful statement of the reasons for adopting the standard as suggested has been prepared for the purpose of influencing state officials and legislatures, probably through the various automobile clubs, to adopt license plates in accordance with the proposed standard. Another statement has been prepared concerning brackets for supporting these tags, for circulation among motor car manufacturers.

Makers' Number Location Recommended

At present the finding of the makers' identification number is very liable to be a wild-goose chase as there now is no uniformity as to its location. The National Automobile Chamber of Commerce, Inc., has brought this matter to the society's attention and the miscellaneous division recommends that the number for the car shall be placed on the outside flap of the right frame member as far forward as possible and stamped in in letters ¼ in. high.

The division wishes to discourage the use of plates instead of letters stamped into the frame because of the ease with which these plates may be lost on old cars. Of equal importance to owners, dealers and police department is the location of the motor number, and the division recommends that this mark be stamped on the top of the crankcase as far forward and as near the middle as possible. The recommendation was made as follows:

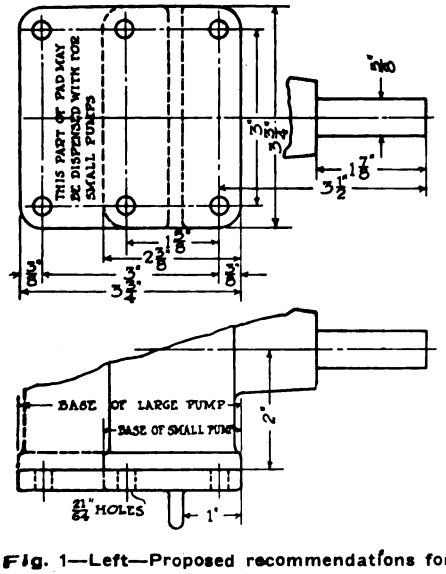
Location of Makers' Identification Number

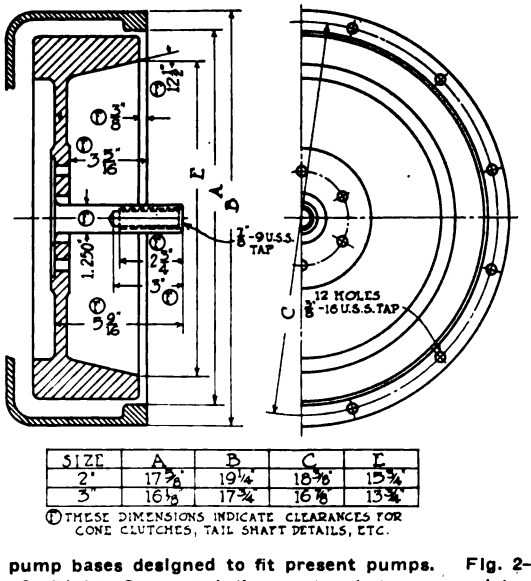
It is recommended that the standard location for the car, chassis, or frame number (whichever is used for identification) shall be on the outside flat of the right hand frame member as far forward as possible; and that such number shall be heavily indented in the frame side member in characters not less than ¼ in. high Where this location is inaccessible, it should be approximated.

The use of attached plates in lieu of numbers stamped as specified is discouraged by the division, because of the ease with which a plate can be removed.

Location of Motor Number

It is recommended that the standard location for the motor num-





SIZE	A	B	C	E
2"	17⅞"	19¼"	18⅞"	15¾"
3"	16½"	17¾"	16⅞"	13¾"

① THESE DIMENSIONS INDICATE CLEARANCES FOR CONE CLUTCHES, TAIL SHAFT DETAILS, ETC.

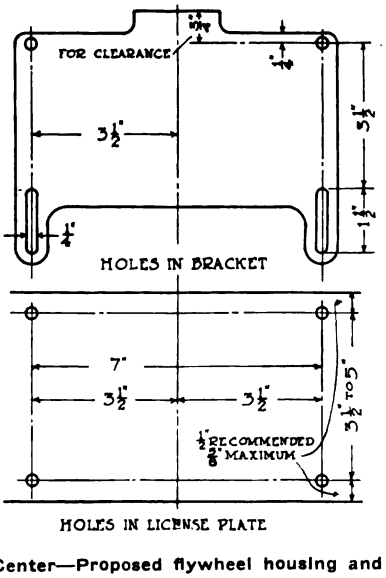


Fig. 1—Left—Proposed recommendations for pump bases designed to fit present pumps. Fig. 2—Center—Proposed flywheel housing and cone clutch details. Fig. 3—Right—Suggested license bracket proposed by miscellaneous division

ber be on the crankcase proper, as far forward, on top, and as near the middle as practical crosswise, preference being given to the right side. Consideration should be given to accessibility in the completely assembled car. The number should be deeply indented in the crankcase in characters at least ¼ in. high.

In stating the weight of the car, the division specifies that this shall mean the actual scale weight of the car complete with catalog equipment less fuel and water.

Standard Weight of Car

It is recommended that the S. A. E. standard weight of a car shall be the actual scale weight of the car with complete catalog equipment, less fuel and water.

Tire Pump Base Recommended

Once before the subject of tire pumps has received the consideration of the committee, but the standards developed at that time became obsolete with the changes made at the time that starting and lighting equipment was added by the manufacturers. Recommendations now made are for standardizing the bases and location of holes in same rather than standard dimensions for the mechanical tire pumps themselves. Fig. 1, shows the proposed recommendations, and it is stated that although this base or pad does not exactly conform to any one pump on the market it has been laid out so that it will carry any design now made. In some cases, however, an adapter plate must be used in fitting a pump to such a base. The recommendation was as follows:

Tire Pump Bases

It is recommended that engines be fitted with pads for tire pumps 3¾ in. square, having six 21/64 in. holes located as shown in the accompanying sketch. If a rib is used at the under side of the pad it should be located as shown.

It is recommended that tire pumps be made to conform to four of the six holes, using two on each side of the location shown for the rib. Shaft height is to be 2 in. and total projection of the shaft is to be 3½ in. from the center line of the nearest pair of holes in the base. The exposed end of the shaft is to be 1⅞ in. in length and ⅝ in. in diameter.

These matters of license plate, car and motor numbers, weights and tire pump basis were all accepted by the committee for presentation and action at the next meeting of the society in January.

Miscellaneous Division Progress

Progress was also reported by the miscellaneous division on the subject of piston rings, hose and hose clamps and speedometer drive connections. Screws for cowl boards were before the section but it appears that all the cowl fastenings are to be out of sight on the new cars and it is probable therefore that this subject will be dropped. The matter of specifications for hydrocarbons will be referred to a special committee having expert knowledge on the subject. Specifications for clutch facing and V-belt and pulleys for fan will probably be referred to the new motor and transmission committee. The matter of thread tolerances is awaiting the action of the American Society of Mechanical Engineers in order to save a possible duplication of work in this regard. There was no discussion.

Progress reports were given for the international standards ball and roller bearing, pleasure car wheels, and research division. The propaganda for an international standard for solid tire sizes is receiving very favorable support, and it is expected that our government, the British consular service and the British trade organizations will all lend aid to the formation of such a standard.

Work on Taper Roller Bearing Eyes

At present the ball and roller bearing division is gathering data looking to the standardization of taper roller bearing sizes and although it will be several years before all parties are able to come to an agreement on the subject, a standard in this direction looks hopeful at this time. Besides the investigation relative to tap drill sizes the research division has recently been assigned work of developing a standard method of carrying out acceleration tests.

In the report of the truck standards committee W. P. Kennedy said that his section had voted against the branding of solid tires with their equivalent millimeter dimensions. The section, however, is developing a table for the S. A. E. hand book which will give a conversion between the American and European sizes of tires. The addition of a 32-in. truck wheel has been suggested to the division for use on small, cheap cars, but as no special demand seems to have arisen for this size the committee men do not believe it is advisable to add it to the standard. In relation to industrial truck sizes, the division feels that due to the unsettled practice in this field, it is only warranted in recommending standards for wheel diameters which are as follows: 10, 16, 20, 22 and 27 in.

Another of the very complete reports submitted was that of the automobile spring division which was presented by W. M. Newkirk in the absence of Chairman McKinley. This report dealt largely with notes on the basis of purchase and the chemical and physical tests to be given by buyers of springs. Sketches were submitted showing the proposed method of making tests upon the different classes of springs which will be presented to the society in January.

The proposed tentative specifications for automobile springs appear below:

Basis of Purchase

1—(a) These specifications cover all leaf springs for automobiles.

(b) Springs shall be made of carbon steel bars, conforming to the requirements of the Standard S. A. E. Specification No. 1095 for Carbon-Steel bars, unless alloy steel bars are specified by the purchaser.

(c) When alloy steel bars are specified, the manufacturer and the purchaser shall agree upon the type and grade of the bars, which shall conform to the Standard S. A. E. Specifications for Silico-Manganese-Steel bars, No. 9250 or 9260, or to the specifications for Chrome-Vanadium-Steel bars No. 6145 or 6150.

(d) Other steels shall be a matter of agreement between purchaser and manufacturer.

SEC. I. CHEMICAL PROPERTIES AND TESTS

Check Analyses

2—(a) A check analysis may be made by the purchaser of each size of spring steel bars involved. This analysis shall conform to the requirements specified in Section 1 (b), (c) or (d).

(b) In case samples for analysis from finished springs are required, such samples shall be taken from the unworked (referring to hot work) portion of the plates and shall represent the full cross-section after rejecting any decarbonized material.

SEC. II. INSPECTION, PHYSICAL TESTS AND REQUIREMENTS OF ELLIPTIC SPRINGS

Workmanship

3—(a) The purchaser or his representative may examine all springs in each lot for workmanship, general dimensions and capacity.

(b) The springs shall be submitted for inspection complete, in the condition required by the drawings and shall conform to such drawings, within the variations allowed by these specifications. Dimensions which affect the contour only and do not affect the interchange or service of the springs need only be approximate.

(c) The springs shall have the leaves uniformly graduated in length, properly bent, and fitted reasonably true to curves given in the drawings.

Test Springs

4—(a) From each lot of springs which has met the requirements of Section 3, the purchaser or his representative may select for physical tests, at least 25 per cent, to be tested preferably in accordance with the "Compression" Method of Section 6.

(b) If any of the springs representing a lot fail to meet the requirements as to physical properties specified in Section 6 or Section 7 as required, but at least half of the springs representing a lot do meet these requirements, each spring shall be tested and those which meet the requirements, shall be accepted. If more than half of the springs representing a lot fail to meet the requirements as to physical properties specified in Section 6 or Section 7 as required, the lot represented may be rejected. The number representing the lot must be at least 25 per cent of the lot.

Method of Support and Measuring

5—(a) Full elliptic springs shall be tested in the upright position, while one-quarter elliptic, half-elliptic, three-quarter elliptic, and cantilever springs are to be tested in the inverted position and must be so supported as to give free lateral movement on compression.

(b) The anvil or pressure block of the testing machine shall be formed to sketch shown.

(c) Unless otherwise specified, all measurements of height are to be made as follows: In half-elliptic springs, between the surface of the pressure block and a line joining the centers of the eyes; in full and three-quarter elliptics, between the surfaces of the upper and lower pressure blocks; in one-quarter elliptics, between the center of the eye, and the supporting pad of the spring, measured at right angles to the surface of the latter.

Compression Method

6—(a) Free Height:—The spring shall be placed in the testing machine, as specified in Section 5 and a test load of 150 per cent of the specified working load shall be applied (provided the deflection corresponding to this load does not exceed the maximum possible on the car, in which case the load corresponding to maximum deflection shall be used), then fully released and the height measured. This shall be known as the "free height."

(b) Loaded Height—The specified working load shall then be gradually applied and the height measured without rapping or

otherwise disturbing the spring. This shall be known as the "loaded height" and in the case of pleasure cars shall not be less but may be ¼ and ⅜ more than that specified for front and rear springs respectively.

Note: Loading Precautions—Should the specified working load be accidentally exceeded in conducting the test for loaded height, the measurement of height should not be made after merely releasing the load to the specified figure but the load should be removed to not over one-half the specified working load, after which it is to be again brought up to the specified figure at which measurements are to be made.

(c) Permanent Set—When the loaded height has been determined the spring shall be fully released and then its height at 75 per cent of the rated load measured as in the previous method. Following this the spring shall be compressed to 200 per cent of its rated load or to limit of possible deflection on the car, fully released and the 75 per cent load again applied and the height of the spring again measured. Any difference between the first and last heights thus found is the permanent set and this shall not exceed 1/16 in. If there is a permanent set which does not exceed 1/16 in., the spring shall be loaded twice to 200 per cent of the specified working load or to limit of possible deflection on the car, released, and the permanent set again measured. There shall be no increase in the permanent set.

Rate per Inch or Flexibility

7—(a) When the rate per inch, or the flexibility is specified, this should be given in pounds per inch. This should be determined by taking the height at 75 per cent of the rated load and at 125 per cent of the rated load and by dividing the difference in load by the difference in height, the resulting figure gives the average rate in pounds per inch, or flexibility.

This figure shall not vary from that specified more than 5 per cent plus or minus.

Reworking

8—Any springs which fail to meet the requirements of these specifications as to dimensions or tests may be again submitted after being remade by the manufacturer, such remaking to consist of insertion of new leaves or of annealing, reforming, and retreating of old leaves. No springs shall contain cold reworked leaves.

SEC. III. MARKING

Marking

9—(a) The name or brand of the manufacturer, the year and month of manufacture, and if specified, the purchaser's class or grade number, shall be legibly stamped on each spring at a place not detrimental to the life or service of the spring.

(b) Any stamping by the inspector shall be so placed as not to be detrimental to the life or service of the spring.

SEC. IV. INSPECTION AND REJECTION

Inspection

10—The inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the springs ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the springs are being furnished in accordance with these specifications. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection

11—Unless otherwise specified, any rejection based on tests made in accordance with Section II, shall be reported within a reasonable time from the receipt of samples.

Rehearing

12—In case of dissatisfaction with the results of the test, the spring manufacturer may make claim for a rehearing within two weeks. Samples tested in accordance with Section II, which represent rejected springs, shall be preserved for this length of time.

Report of Electrical Equipment Division

The report of the electrical equipment division was made by W. H. Conant, chairman. He stated that at the last meeting the division took up the work of establishing the standard sizes of wire for motor cars in the endeavor to select four sizes for starter motors and three separate sizes for generator and lighting equipment. The division is deferring the make-up of the wire and is not submitting recommendations on that at the present time.

It has appointed a sub-committee on insulation so that it will be possible to specify by number or letter the exact installation size as well as the exact size of the wire and later perhaps the make-up or stranding of the wire. The sub-committee also is reporting on uniform tests for wires to check up the specifications as provided by the Railway Signal Association and the Institute of Electrical Engineers. On the subject of bulbs and bases it was found that most manufacturers booked their favor on the S. A. E. recommended practice.

It was decided by the division to attempt to standardize the application of starting motors; also to proceed with the matter of wire installation.

Glare Remedy Is Improved Design

In presenting the findings of the division on the subject of headlight glare, Chairman Conant touched on a point of wide interest to motorists, accessory men and manufacturers. He stated that the division was convinced that there was no such thing as a successful dimming device, that the only remedy for headlight glare was to improve the focusing of light, to improve the sockets, reflectors and the lenses and properly to standardize the height and tilting angle of the lamp; that is, that the beam of light should strike the ground at a certain distance in front of the car and should be of a certain width.

In dilating on this it was stated that the division did not recommend dimming devices; that the root of the solution was so arranged in the lamp that the rays be projected forward in a parallel beam and not as a cone. This was a progress report only.

Visit Standard Oil Refineries

After a vote of thanks to the Chicago Automobile Club for hospitality to the standards committee meeting the standards committee returned to accept the invitation of Mark A. Smith of the Standard Oil Co., to go through the refineries at Whiting, where they watched the transformation of crude oil into high-test gasoline, lubricating oils, greases, benzol, medicine and even wax candles.

Standards committee of the Society of Automobile Engineers inspecting the refineries of the Standard Oil Co. at Whiting, Ind.

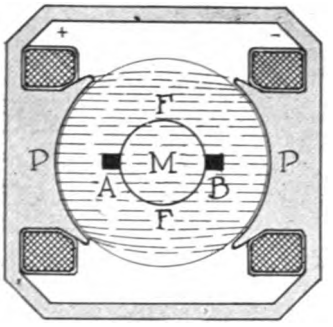


Fig. 1—Position of brushes AB for drawing maximum current from armature M. P are the poles of the generator and F the magnetic field In this position the brushes connect that particular wire in the armature which is cutting or crossing the magnetic field at the maximum speed. The true state of affairs is a little different as field is never parallel.

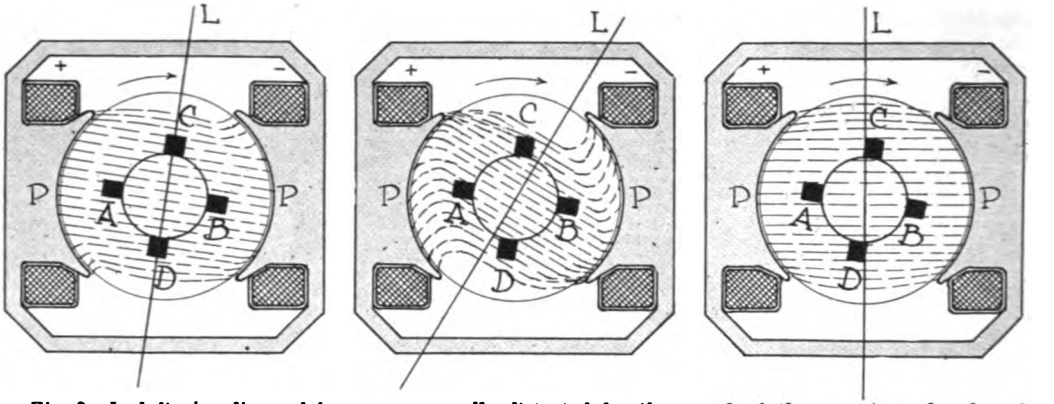


Fig. 2—In left view lines of force are normally distorted by the speed of the armature, brushes A and B are the main brushes and are drawing full current since they are at right angles to the lines of force. C and D being parallel with the lines are at zero potential and no current passes between. Center. Field is more distorted by greater speed of armature so that middle or neutral line of field L is moved so that brushes C and D come to left and right of it. Then current will flow from C to D say, but it will be smaller than the current between A and B because the brushes are closer to the neutral line. Right. Armature has slowed down till distortion has gone from field; which brings neutral line L to left of brush C. Then current will flow from D to C while the direction of flow between A and B remains unchanged, since neither A nor B has passed the neutral line L. This action is just as though the left and right sides of the dynamo were plus and minus, the dividing line being the neutral line of the field. Any brush to the left is plus and any brush to the right is minus say, while on the line is neither plus nor minus but simply zero

Automobile Electricity

The Theory and Practice of Different Lighting, Starting and Ignition Systems Explained and Considered

By A. Ludlow Clayden

IN the early days of motoring it was necessary for a driver to be more than a little of an electrician. Then came a time when, thanks to the perfection of the magneto, electricity seemed a thing of the past and one might forget that there was such a thing as a spark in the makeup of a chassis. Again, times changed and the storage battery erstwhile losing in favor, returned to service, and dynamos, motors, fuses and cutouts returned to worry the engineer and occasionally to perturb the user of a car.

We have been and are still in a period of transition, for the automobile of today is certainly as little like the car of 1920 as it bears resemblance to the car of 1910. What way the coming development will trend no man living can foretell, but it is safe to assume that electricity, which now takes a part in the daily life of every civilized man, is far more likely to strengthen its grip upon the gasoline automobile than it is to loosen the grasp it has already. If this be true, and there is little doubt of it, then it is important that every engineer and every user of a car who aspires to get the best service from it should see to it that his understanding of electrical development is thorough.

The magneto displaced dry cell or battery ignition not because it was simpler—for it is vastly more complicated—but because it was more reliable and *less trouble to look after;* similarly the electric lighting outfit came into favor because it was less trouble than gas lamps. Having the dynamo and the battery for lighting it was natural evolution to add the cranking motor, and then to eliminate the magneto which was no longer essential with an ever-charged storage battery at hand. Furthermore, the lessons taught by the magneto as to the construction of high and low-tension current distributing apparatus were not lost upon the present-day manufacturers of ignition timers, so that the modern equipment combines the mechanical excellence of the magneto with the electrical simplicity of a battery system.

The Return of the Timer

In changing from magneto back to battery and coil—even though these units may be, and are, of a vastly improved character—we lose one thing only, and this is the natural tendency for the magneto spark to intensify as the speed rises. The natural advance of ignition point, the greater heat of the discharge at high speed and the absence of mechanical parts to produce this result are the outstanding advantages of the magneto. Automatic advancing timers, and timers which cause the contact at high speed to be of longer relative duration, can overcome the natural shortcom-

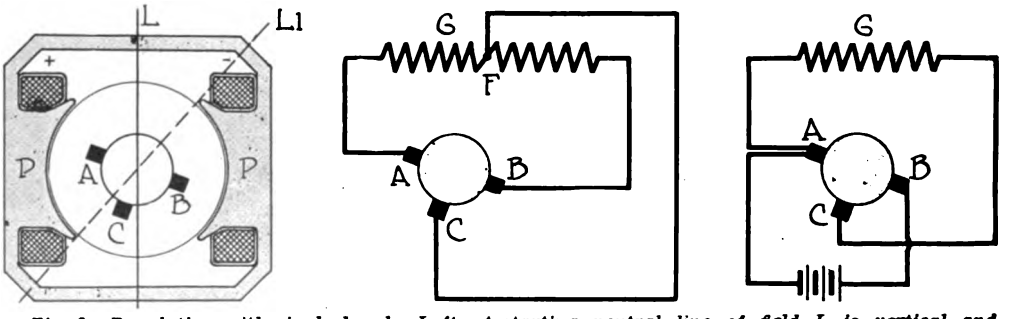


Fig. 3—Regulation with single brush. Left, at starting neutral line of field L is vertical and brushes A and C are to left of it on plus side while brush B is alone on minus side. When speed increases neutral line L first comes into line with C so that the third brush becomes inoperative, and when speed is still higher line L comes into the dotted position. Then C is on minus side and current from it tries to flow back to A instead of to B. Right—Connections for system. As long as C is plus current flows from F to B along with current flowing from A to B. As soon as C is minus its current tries to flow back to A. G is the field coil or shunt winding of the pole pieces

ings of battery ignition, so it is reasonable to suppose that the day is not far off when electrical knowledge will have reached a point which will allow of complete modification of the magneto *as we know it to-day*. It may be some time before everyone is satisfied that the day is here, but come it must sooner or later.

In considering the necessary output for the dynamo we have to remember that it has:

To furnish enough current to serve the ignition.

To provide enough electrical energy to light the lamps for a reasonable average length of time per 100 miles run.

To give the maximum possible output for the minimum possible weight.

To absorb the minimum possible power to drive.

The last two requisites mean that the current must be of a character that best suits the conditions of battery charging, that the dynamo must be operative over the widest possible range of engine speed and that the electrical and mechanical detail must be of the highest class.

There are a variety of things which make the electrician's task especially hard. First, the machine has to be able to withstand a great amount of abuse, it has to be fool proof in the most literal sense of the term.

Secondly, the machine has to be able to bear extremely high rates of revolution, extreme variations of temperature and excessive vibration or shock.

Thirdly, it is necessary to introduce some means of keeping the voltage constant at armature speeds from something like 1,000 to nearly 10,000 r.p.m.

Lastly, these, and a variety of lesser conditions, must be observed and provided for effectually at a minimum of cost.

There is as much difference between designing a dynamo to run in a power station and a generator for an automobile as there is between a gas engine for stationary service and an automobile motor. That the trade has risen so nobly to the demand is positively wonderful, that the generators in common use are so good is little less than a miracle and redounds to the credit of those who have been responsible for the development.

Methods of Control

Descending (for a moment only) into elementary electric theory, a definite voltage will drive different amounts of current through different circuits, according to the resistance thereof. Suppose we have two terminals like the terminals of a dynamo that is running at a constant speed, and suppose we connect two different circuits to those terminals, the circuit with the smaller resistance will take a current greater than that passed through the circuit of greater resistance; the currents will be in inverse proportion to the resistances. This is expressed by the law that the current in amperes flowing through a circuit is always equal to the voltage, divided by the resistance of the circuit measured in ohms.

In an electrical system for automobile lighting we are bound to have a practically constant voltage in the main circuit because the lamps will operate only within narrow limits of voltage. But we need different amounts of *energy* according to the state of affairs at the moment. Electrical energy is the product of the voltage and current. Suppose that we have only the small lamps in use, we need a definite voltage but only a small current, but if we now switch in the large lamps we need more current at the same voltage. Again, if the battery is low we need current to bring it back to the fully charged state, and the nearer it approaches to the fully charged condition the less current do we need. This means that the *energy* demand on a car is always fluctuating while the voltage demand is constant.

If we have a generator with constant voltage regulation and constant current regulation also, it means that however fast we drive it, the energy given out cannot exceed a definite amount. If there is no regulation of current it is possible to increase the output in watts of electrical energy to meet the conditions of the moment. In some systems there is a good deal of energy wasted by conversion into heat—the output is kept down by the absorption of part of the current. In others the power used to drive the generator is more or less directly proportional to the current being used. There are reasons for and against each system, for the power used to drive the generator is so small that a little wastage is worth while if we obtain some other advantage such as simplicity of construction.

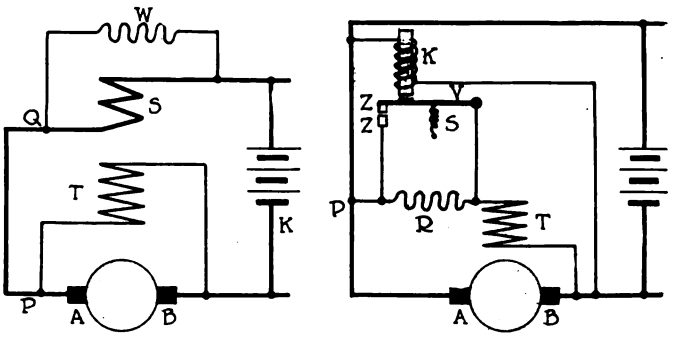


Fig. 4—Left—Bucking Coil Regulation. Current flows from A through the shunt coil T and so back to B all the time. Also some of the current divides at point P and goes through the opposing series coil S and thence to the battery, through the latter and back to B that way. But the current which takes this circuit has also a choice of routes at Q; it can go through the iron wire W as well as the series coil S. The greater the current the hotter does the iron wire get and the less current will it pass, so more and more goes through the series coil S, so acting against the magnetism due to the shunt coil T and preventing the field magnets from becoming too strong

Fig. 5—Right—Vibrator Voltage Control. T is the shunt coil of the field magnets. Current from A flows round the outer circuit through the battery and divides at P, part going through the shunt winding. Also there is a branch across the outer circuit through the little coil K. There is a spring reed V, which is pulled down by a little spring S so that the two contact pieces ZZ come together and then current flows from P to Z and thence through T back to B. When the current through K is strong enough this pulls apart the contacts Z, forcing current to go from P through the resistance R and so to T. This cuts down the current in T by reason of the resistance of R, the voltage drops and K lets go of V. Whereupon voltage rises again and the process is repeated thousands of times every minute

It is necessary to remember that a fixed voltage delivers a current in inverse proportion to the resistance of the circuit. This means that if the regulating resistance is part of the *main* circuit it regulates the current available for battery charging as well as regulating the exciting current in the field coils. If, on the other hand, the regulating resistance is interposed simply in the *shunt* circuit the current flow in the main circuit depends upon the resistance therein, and upon nothing else.

Of course there is no such thing as an absolutely constant current generator or an absolutely constant voltage one either; both vary a little as speed rises and falls, but the best machines approximate closely to fixed values.

However a generator has its field coils wound the voltage will increase as the speed of the armature rises, as long as conditions in the outer circuit remain unchanged. Our ideal for automobile work is a machine which will produce a voltage of unvarying degree and an amount of current to suit the demand of the moment.

The first idea was to do this by means of a mechanical governor which would prevent any current from flowing till the dynamo was running fast enough to give the desired potential, and then to keep it at just that speed whatever the speed of the engine. This scheme seemed to have the merit of simplicity, but it soon showed the demerit of susceptibility to wear, dirt and maladjustment.

Meanwhile a kindred problem that had engaged the attention of electrical engineers was the lighting of railroad trains and a type of dynamo which became popular for this purpose was the third brush regulator. This was soon taken up for automobile purposes and is still largely used.

If we put the brushes in such a position that they are in line with the lines of the magnetic field as in Fig. 1 we shall obtain the maximum current, but if we shift them round, the voltage difference will drop to nothing when they are at right angles to the original position, and in line with the magnetic lines of force. At any intermediate position the difference of potential between the brushes is in proportion to the angle they make with the inoperative position—the angle they make with the magnetic lines of force, that is.

Suppose now that we use four brushes on a two-pole dynamo and set a pair to give us the maximum current, then a pair placed in any other position relative to the armature will give a smaller current. By causing the excitation of the field magnets by a shunt winding between the main brushes we shall have too strong a field at high speeds and too weak a field at low rates of revolution. Just as the current at the main brushes rises and falls, so will the current at the subsidiary brushes; and, if we connect the latter by a magnet winding which *opposes* the main shunt winding, we can cause the excitation of the magnets actually to be reduced as the speed goes up.

There is another thing which helps us in this system of regulation; namely magnetic lag. The armature tends to drag the magnetic field after it, so the lines of force instead of passing straight from pole to pole really lie diagonally. The higher the armature speed the more are the lines of force pulled out of straight. But the maximum current is still to be had when the brushes are at right angles to the lines of force, for which reason the brushes are usually set a little "retarded" and not at right angles to the pole pieces.

This shifting of the magnetic field has a profound effect upon the current in the subsidiary circuit. Suppose we set the auxiliary brushes so that—at normal speed—they are at the position of no difference of potential; see diagrams in Fig. 2. If the speed falls off the lines of magnetic force will come more nearly into line with the pole pieces and a current will flow from, let us say, brush C to brush D. If on the other hand, the speed increases, so that the magnetic field becomes more instead of less distorted, then the lines of force will cross the line joining the two brushes in the opposite direction. It is easy to see that this is equivalent to moving the brushes across the field and so *past* the position of no current. The effect will be to start a fresh current between the brushes but it will now flow from D to C.

In short, we can adjust the position of the subsidiary brushes so that the current between them will reverse its direction at any desired speed of armature revolution.

This means that if the subsidiary brushes feed a coil wound around the field magnets the current will first try to magnetize them so that the left—say—is a north pole and the right a south pole. As speed goes up, the current will decrease till it is nothing at all, and then it will flow backwards, tending to make the left pole piece a south pole and the other a north. But all this time we have the current from the main brushes flowing around the shunt winding in a constant direction, trying all the while to make the left pole of north magnetism and the right of south. Therefore, the current from the auxiliary brushes first helps that from the main brushes, and then, after a certain armature speed is passed, it *opposes* the main shunt winding. Of the two, the latter is always the stronger, so that the polarity of the machine does not change, and the windings are proportioned to keep the excitation at such a pitch that the voltage remains practically constant.

There is an ingenious way in which the fourth brush can be dispensed with, by connecting a third brush in the middle of the main shunt winding. The potential of this brush will decrease, reverse, and then increase again exactly as though the second subsidiary brush was opposite to it. This means that if current flows from A to B when the armature is running slowly, the current from C flows through half the shunt coil to B and helps the main brushes. When the polarity of the brush C is reversed, current from it tries to flow back to A against the current coming from A to B. This weakens the A to B current and so weakens the field; just as in the four brush machine, we can set the neutral speed by adjusting the brush C moving it a little one way or the other around the commutator. This is shown in Fig. 3.

Another method is to wind the magnets with a plain shunt coil between A and C which leaves B unconnected with the field winding. Of course, current between A and C varies with the changing potential of the brush C. This method is usually preferable to the original scheme of a divided field coil described above.

Bucking Coil Regulation

In order to maintain a constant voltage at the main terminals of the dynamo there are two things which must be controlled in proportion, namely the speed of the armature and the density of the field. The determining factor in voltage is the number of magnetic lines cut by the armature coils per unit of time. If the armature speeds up we can prevent voltage rise by reducing the strength of the field, and if the armature slows we can keep up the voltage by increasing the field density.

Now, the mechanical attempts to make the armature speed constant so that the field might be kept constant too were not successful, and the next step was to let the armature speed vary as in the engine speed and to introduce purely electrical means to vary the strength of the field magnets, reducing this steadily as the speed rose. One of the most popular ways of doing this (apart from the extra brush systems just described) is to arrange the shunt coils of the field magnets so that they are supplied with current from the *battery* and not directly from the armature. This gives a practically constant field such as we could get from a permanent magnet.

Having this constant field we need means for reducing its strength as the armature speed goes up, and to provide this a separate coil is wound on the fields of the opposite hand to the shunt coils, so that current flowing through it will oppose the magnetism induced by the shunt circuit. At low speeds we desire very little current in this series coil and at high speeds a good deal thereof. To vary the current in the series coil a short coil of iron wire (without any core) is connected in the circuit so that the current from the brushes has a choice of paths; it can go through the series coil or through the iron wire. When the total amount of current is small the resistance of the iron wire is low, as it is quite cold, but, if the current rises, the iron wire heats up instantly and offers a very high resistance indeed. Since the iron wire and the series coil are alternative circuits, and since the resistance of the series coil does not vary, it follows that any rise in resistance of the iron wire will cause more current to be sent through the series coil. We already know that the greater the current in the series coil the greater the opposition to the magnetizing action of the shunt coil, so by proportioning the iron wire to suit the conditions it is possble to keep the current output of the dynamo practically constant.

The voltage in this system is controlled by the battery, which means that the generator and battery together make up the supply station from which current is taken for the lamps. This point must be grasped because some other systems are different, having constant *voltage* generators instead of constant *current* machines.

Voltage Regulation by Vibrator

The most recent scheme for regulating output is to use a plain shunt winding and no auxiliary coils, but to have an external resistance that can be put into circuit with, or withdrawn from the shunt coils. This causes the excitation to vary. Now, if the current in the shunt coils varies

rapidly, the excitation will be that due to the average current. Thus, if we have a plain shunt winding and constantly put resistance into it and then take it out again, the excitation will be equivalent to the average current flowing in the coils. In the vibrator control there is a spring steel reed carrying contacts that either add the resistance to the shunt coils or take it out again. This reed is controlled by a small magnet that is a separate shunt circuit of its own—merely a bridge across the brushes, the resistance, of course, being high so that the current flow is small. The current in this branch will vary with the voltage at the brushes, so when this rises to a determined value the reed will be pulled down, and the resistance thus put into the shunt winding. The effect is to reduce the current in the shunt, to reduce the excitation and so to reduce the voltage at the brushes. As soon as this has dropped sufficiently, the little magnet lets go of the reed and the resistance is taken out of the shunt, the voltage rises again and in a small fraction of a second the resistance is again switched in. As a matter of fact the vibrator moves very rapidly, but its movement is uneven. If the armature speed is high the reed stays longer in the attracted position, when the resistance is *in* the shunt circuit, than it stays in the free position, when the resistance is out. As armature speed falls the time for which the reed stays in the "resistance in" position gradually decreases until the resistance comes to be more out than in.

This means that the average current in the shunt is controlled so that the voltage at the brushes of the generator remains constant. It will be understood that the vibrating reed moves so fast that it cannot be seen holding onto one contact or the other; the action is very sensitive indeed and extremely rapid.

It is also possible to utilize this vibrator system to control the current rather than the voltage; to limit the possible maximum of ampere output, that is. To do this the little coil which is called K in Fig. 5 is put in the main circuit instead of in parallel with the brushes and battery as shown in Fig. 5. The action is to switch a resistance in and out of the shunt circuit just as before and so limit the magnetization of the generator, but the presence of the coil K in the main circuit limits the amount of *current* that can flow therein.

In succeeding articles it is hoped to deal with the principal systems now in use, describing them in detail. It will be found that each of them, and there are a good many, depend for the regulation of their output upon one or other of the broad principles herein described and explained, although the differences in detail are great.

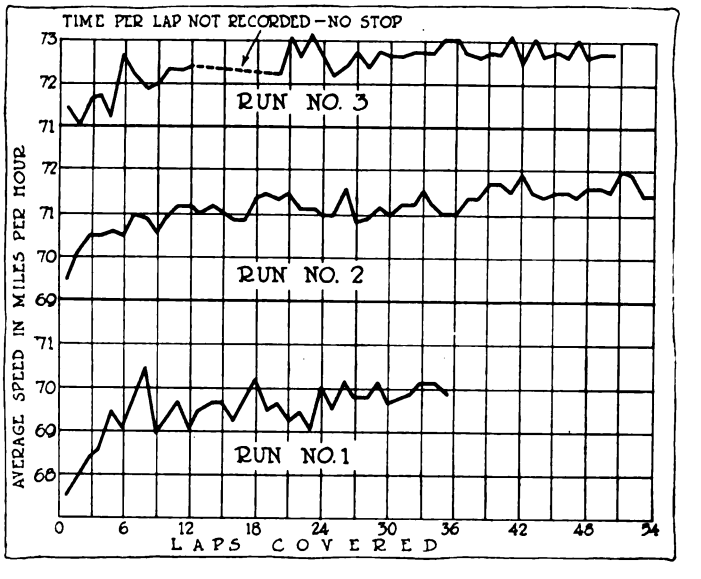
Cadillac 8 Averages 72.49 M. P. H. in A.C.A. Tests

NEW YORK CITY, Oct. 18—The technical committee of the Automobile Club of America has issued its report on the recently completed tests of two type 53 Cadillac eight-cylinder, seven-passenger cars. The object of the test was three-fold. First, to find what speed the car could maintain under varying conditions for a period of 1 hr. Second, what period of time would elapse while the car traveled 100 miles, and third, the gasoline and oil consumption measured for different rates of speed of the car.

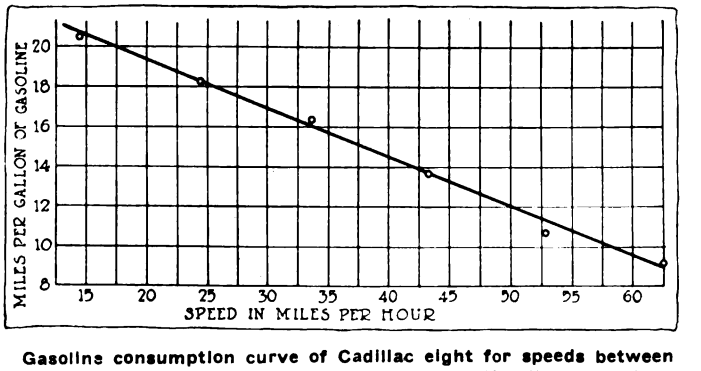
The runs for maximum speed were made on the Chicago Speedway, Sept. 21, and at Indianapolis, Oct. 5. Altogether there were four runs; first with the top and windshield, second, with the top and windshield down in both of which cases the car was driven by Philip Robertson; the third run was with the top and windshield down as in the second, but with W. J. Davidson driving. The fourth run was with the windshield and top up as in the first run with Sidney D. Waldon driving.

In the first run 70 miles were covered in 1 hr. and 25.4 sec. This is an average speed of 69.51 m.p.h. On the second run 72 miles were covered in 1 hr. and 47.4 sec., an average of 71.06 m.p.h. On the third run 100 miles were covered in 1 hr., 22 min., 46 sec., an average speed of 72.49 m.p.h., and on the fourth run to determine the miles per gallon of gasoline, the result shown on the chart herewith was obtained. At the ordinary touring speed of 14.5 m.p.h. the consumption was 20.6 miles per gallon.

Both cars used were equipped with stock motors 3⅛ by 5⅛, eight-cylinder V. The gear ratio was 4 to 1, and the tires used 36 by 4½ Goodrich Silvertown with Rudge Whitworth wheels. Both cars had seven-passenger bodies and carried extra wheels. The fuel gave a Baumè reading of 60 at 60 deg. Fahr. On all the tests the cars averaged but small fuel consumption. At the high speeds of 71 and 69 m.p.h. the oil consumptions were 114 and 173.7 miles per gallon. On the fuel economy test the miles per gallon of oil were 675. Both cars were equipped with Hartford shock absorbers and were standard stock in every way except that the muffler plugs were removed during the Chicago tests for speed, but not during the gasoline consumption tests. The results are shown in the curves herewith.



Speed per lap of Cadillac eight on runs 1, with top and windshield up; 2, with top and windshield down; 3, with top and windshield down on 100-mile run. The average speeds for the three runs were: 69.51, 71.06 and 72.49 m.p.h. for 1, 2 and 3, respectively



Gasoline consumption curve of Cadillac eight for speeds between 15 and 60 m.p.h. At 20 m.p.h. the car traveled 19 miles per gallon. This about equals touring speed

The Engineers' Forum

Aluminum Piston Critics Answered—Fresh Views Advanced on Heat Conduction Argument and Inertia Study

By Joseph Leopold and James E. Diamond

EDITOR THE AUTOMOBILE:—With all due deference to the author of Prefers Iron or Steel, printed in your columns, I would call your attention to the following: In the first paragraph the author states: "The piston proper is heated by convection and radiation; this heat is carried off mainly by convection to the cylinder lubricating oil film and the rate of convection depends upon the maximum temperature within the cylinder and the piston speed. This heat is again carried by convection from the lubricating oil film to the cylinder wall and in turn carried by conduction through the cylinder wall proper and finally by convection to the cooling water. It then results that the conductivity of the material employed for the piston is not of material consequence."

Heat Conducted Through Piston

If heat is transmitted through the cylinder wall by means of conduction why is it not also transmitted through the piston walls by conduction? It is quite true that after the heat has been carried through the piston wall it will be transmitted through the air within the piston by convection into the "crankcase air." But if this operation is to take place rapidly, it stands to reason that the piston material must possess a high ratio of thermal conductivity. Also in the construction of aluminum pistons it is possible to employ ribbing under the head without adding any appreciable weight, which I believe tends to encourage heat radiation, and carry off the heat from the head, distributing same through the walls of the piston, when the operation of convection through the oil film, etc., will take place. I therefore fail to realize why "the conductivity of the material employed for the piston is not of material consequence."

With regard to inertia forces the author states: "I believe that automobile motors are ordinarily designed on the basis of an initial indicated pressure of about 350 lb. If this pressure is taken as the basis of construction, it is clear that the values of the inertia forces are of little moment until they exceed the indicator pressure."

To illustrate a variance of theory in this matter we may start with the piston's movement at the ending of the first half of the stroke. Here it will be seen that exhaustion has occurred and the only force acting on the piston (disregarding gas inlet which is very slight) is the inertia force. Now it is quite within reason to assume that in reversing the piston to operate on the second half of the stroke, it will be necessary to overcome the inertia force stored in the piston. And while no other element enters into the matter, inertia force depends entirely upon the weight of the object and the speed at which it is traveling. No doubt, such energy as may be accumulated in the piston during the upward or final strokes, will be of material benefit in overcoming the resistance of the gases and aiding the operation of compression. However, this advantage is greatly over-balanced by the fact that the inertia energy at the ending of the first half of the stroke is so much in excess of same. Also where a heavy piston is used the energy stored up in the piston is oftentimes so great that it is sufficient to overcome compression, therefore reversing the stresses on the connecting-rod bearings and subjecting the connecting-rod to tension. This theory can best be substantiated by actual practice, as I find that the majority of high speed motor manufacturers using iron pistons, find their crankpins worn principally on the inner side.

Practical Advantages Proved

To deviate from theory entirely and dwell on practice for a period, the advantage of aluminum pistons can best be demonstrated. The author states: "The writer has tried various aluminum alloy pistons in automobile, stationary and aeronautical motors, and in every case where a motor was operated at maximum power for long-continued periods failure resulted." This is surely in contrast to the results we have seen demonstrated. In the case of the speed boat Disturber IV., it will be admitted that the 750 hp. motor installed in this operated at maximum power for quite a period, also the Stutz car which holds the record for the fastest track time ever made by an American car in competition. The mere fact that many of the foremost and highest priced cars in this country are using aluminum alloy for piston construction, should be convincing evidence of their durability and efficiency, for a car which is sold at a price ranging from $5,000 to $8,000 could not afford to install inferior material.—JOSEPH LEOPOLD, Engineer, Walker M. Levett Co.

Considerations Overlooked

EDITOR THE AUTOMOBILE:—Relative to E. H. Sherbondy's contribution published in the Oct. 7 issue of THE AUTOMOBILE concerning the aluminum alloy piston, and in which an endeavor is made to minimize the importance of the properties of lightness and thermal conductivity on which all claims of superiority of advance for the alloy piston must rest, it is quite true that the piston receives, both by convection and radiation, its heat from the gases of combustion, and further that the temperature assumed by the piston will be a measure of the intensity of heat of the aforesaid gases.

It seems to me that one or two important considerations have been overlooked in analyzing the next steps. That the aluminum piston alloy has much greater thermal conductivity than iron seems not to be questioned. It should at once follow that the heat absorbed by the alloy piston head from the hot gases will be diffused throughout the entire piston mass in a much shorter time than would be the case with an iron piston. Consequently the temperature of the piston head will maintain a lower average, while the mean piston temperature will be higher than in an iron piston. As a matter of fact experiment has shown the correctness of this reasoning, disregarding entirely the exact process in the extraction of heat from the piston successively by oil film,

cylinder wall and water in the jacket. Is it not true that the more quickly the heat from the head may be conducted down throughout the skirt, the greater the opportunity the piston has to rid itself of much of its heat, since the further away from the piston head it is possible to conduct the heat, the greater the difference in temperature between the piston, and the surrounding media.

Condition of Heat Ideal

This being the case it seems to me that we have an ideal condition for heat extraction—two masses of widely different temperature in contact. No matter how brief the existence of this condition, there is going to be an approach toward equalization of temperature, which of course will be very much nearer that of the larger mass, the cylinder, etc., than the relatively small piston mass. If the much greater thermal conductivity of the aluminum piston alloy does not explain what follows I would be very glad to be set aright.

More evidence is available in connection with a 5-in. bore motor. The iron pistons with which this motor was originally equipped required a skirt clearance of 0.012 in., but Lynite pistons are now standard equipment on the job, and it has been found necessary to allow but 0.008 in. skirt clearance. In the other case a large number of Lynite pistons were sent out in motors, the clearances being exactly the same as those allowed for the standard iron ones. Absolutely no trouble due to seizure occurred except at very high motor speeds. In considering these cases it must be borne in mind that the expansion of aluminum is nearly twice that for iron, and for the same temperature range twice the expansion should be expected. Must not the greater thermal conductivity of the alloy explain this state of affairs? In this connection, too, I have recently learned of a case where, due to the fact that the head of the alloy piston always runs cooler than the iron one, it has been possible to increase the compression considerably without danger of preignition, whereas, when iron pistons were tried preignition invariably occurred.

Considering now the question of inertia, it is quite true that at low engine speeds this is negligible in comparison with the explosion load, but I do not believe that it is a negligible factor, by any means, at high engine speeds, and I believe the great majority of engineers are with me relative to this. Possibly even with the modern high speed, long stroke motor the inertia force is much less than the explosion load in the power stroke, but we have the power stroke with us for but one stroke, while we have the inertia forces throughout the entire cycle; that is, for the other three strokes. These inertia forces certainly must be productive of bearing pressure if nothing else, and should be comfortably missed. The fact that the Lynite piston has been standardized on, as widely as it has been, would seem to show that engineers do wish to eliminate, or rather reduce to the minimum, these inertia forces. Relative to what has been written concerning restricted valve capacity, what is the explanation for the increase in motor speed of a well known aeronautical motor from 1350 to 1450 r.p.m. by the substitution of Lynite pistons for the iron ones that formerly were standard, if the decrease of the inertia forces is not a factor? Similarly, the determining factor in the conclusion reached, to standardize on Lynite pistons instead of iron ones, by a very prominent manufacturer, was the fact that merely by the substitution of the alloy piston for the iron one, a difference of exactly 5 m.p.h., from 60 to 65 miles, in the speed of a new model was obtained.

One large manufacturer building fours, sixes and eights has standardized on Lynite pistons for his fours and eights, simply to reduce the vibration occasioned by the unbalanced forces attributable to inertia conditions. I certainly hold that this matter of inertia is no minor problem.

Regarding piston friction, Mr. Sherbondy points out the ideal condition, the existence of a perfect oil film. This is, in my own opinion, never attained, and the fact that pistons do show wear would, it seems to me, substantiate my opinion that there is metal to metal contact a goodly portion of the time. I still maintain that the mechanical efficiency of a motor will be higher with the alloy piston than with the iron one. We have done considerable experimenting relative to this matter of friction, and in spite of the fact that we have had every possible opportunity for maintaining a perfect oil film—an impossibility in the motor—there is a marked difference in the coefficient of friction measured by various combinations, iron on steel, aluminum on steel, etc.

Concerning strength is it not, after all, a question of sufficient strength, not maximum strength? Certainly sufficient strength, weight for weight, with the steel piston can be had with the Lynite piston alloy to answer the requirements of even the modern high duty motor, or rather the high duty motor that is forecast by Messrs. Porter and Sherbondy.

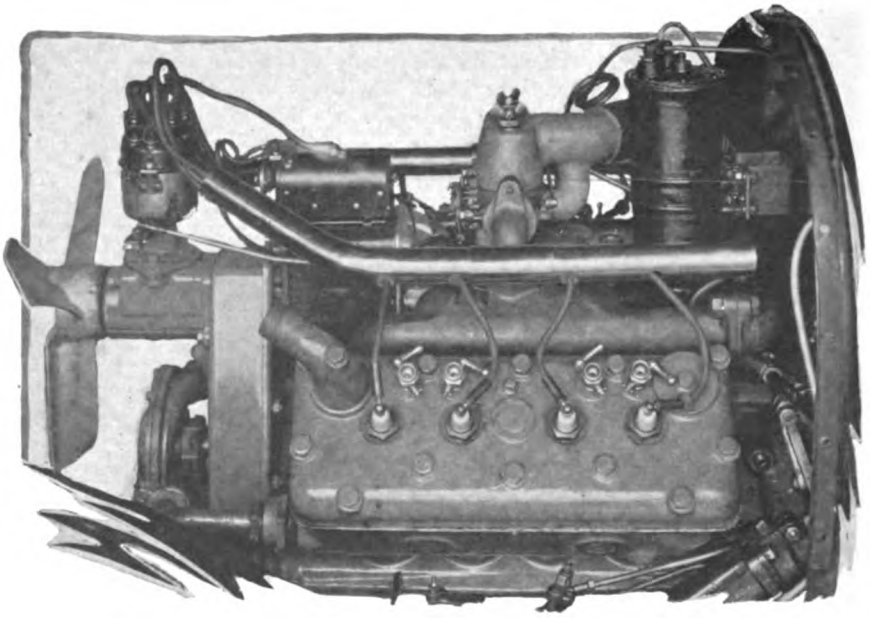
Possibly there are conditions in a two-cycle motor which do not exist in the four; my experience with two-cycle piston applications is exceedingly limited. In another contribution of mine published some few weeks since I stated that my company had in hand orders for a half million Lynite pistons. I take pleasure in advising that this number has increased to three quarters of a million.—JAMES E. DIAMOND, Engineer, Aluminum Castings Co.

The new Ward electric coupé exhibited at the electrical show in Grand Central Palace, New York City. This car sells for $1,295 and is fitted with a 4-5-passenger body with all the seats facing forward

Two-ton worm drive Wilson truck climbing Pike's Peak. It performed this feat four times within 6 days, and on three occasions with full capacity load

Oldsmobile Light 8 Is Ready

New Northway Motor Has Many Ingenious Features

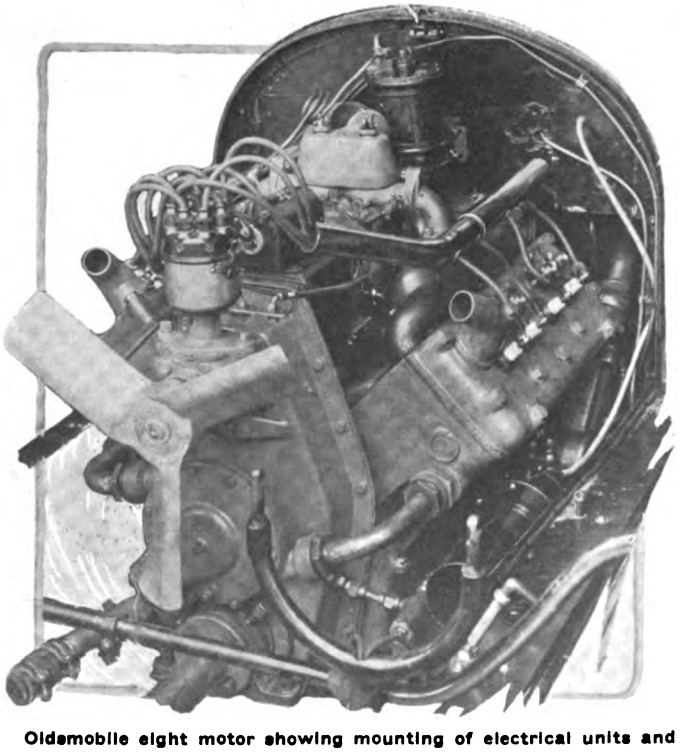


Left side of new Northway motor used in Oldsmobile light eight showing compactness of design. This motor is 2⅞ by 4¾ and although rated at 26.7 hp. it is claimed to develop 40 hp. on the brake at 1800 r.p.m.

AS has been announced briefly some months ago, the Olds Motor Works, Lansing, Mich., is now building an eight-cylinder model as a running mate for its four-cylinder car, a new type with much the same general body lines, and pronounced similarity in the mechanical construction to the four, but with its front end entirely different.

The price is $1,295, which in itself cannot but impress one as being extremely low for a car of the type. It is another instance of how the manufacturer is cutting the cost of production. Two or three years ago a car of the type at the price would have been regarded as nothing short of sensational, but to-day with all values appreciably on the up grade, the low price is less conspicuous, although the experienced man has only to examine the finish and general completeness of the job to realize that it has meant much careful planning and voluminous buying to make it possible.

Model 44, the new design, incorporates a V-type eight with cylinders 2⅞ by 4¾ in. 120 in., wheelbase, leather-faced cone clutch, floating axle, three-quarter elliptic springs, open drive shaft fitted with two universals and three-speed gearset. Thoughtful engineering has been applied in developing its ensemble. Rated at 26.7 hp. the engine is claimed to develop 40 hp. on the brake at 1800 r.p.m. It is a high-speed type with the maximum power at about 3300 r.p.m.



Oldsmobile eight motor showing mounting of electrical units and carbureter in the V. Note mounting of ignition distributer on timing gear case and Stewart vacuum fuel tank on dash

Materials entering into the construction of the power plant indicate a method to obtain maximum wearing qualities and utmost lightness. The aluminum pistons, having three cast-iron rings and one scraper ring, are relieved at the wrist-pin ends to prevent unevenness of piston expansion in the direction of the wrist-pin.

Externally the engine is very compact. Each cylinder group is integral with one-half of the crankcase, which is divided, not horizontally but vertically. The halves bolt together to give the complete engine, entirely inclosing the crankshaft with the exception of a bottom opening covered by a pan which forms the oil reservoir. The detachable cylinder heads carry the spark plugs, priming cocks and water-outlet connections.

The motor has a comparatively heavy crankshaft, supported on two bearings, a construction quite possible and feasible with a short motor where the balance is so well worked out. The main bearings are 2⅛ in. diameter and 3¼ in. long, and connecting-rod bearings are 2⅛ by 2 1.8 in. The forked-rod system is employed.

Inclined Valves Reduce Combustion Space

A single camshaft is used, it having sixteen cams, one for each valve, and to bring the ends of the tappets in direct contact with the cams, the valves are inclined at a greater angle than the cylinders, thus bringing them to the camshaft at their lower ends and swinging them in closer to the combustion chambers at the top.

The camshaft is driven by gears from the crankshaft, but outside of the camshaft gear, and on the same shaft, is a sprocket over which a silent chain runs to a sprocket on the generator, fan and distributer shaft directly above. The gears and chains are neatly inclosed by a stamping at the front and a compact appearance is the result.

One notable feature is the location of the ignition distributer, mounted on top of the support of the fan end of the upper shaft. The distributer is an entirely separate unit from the generator, and it is driven by spiral-gear connection with the fan and generator shaft. The position places it conveniently, from the standpoint of assembly and also of accessibility for adjustment.

The fan, by a nice bit of designing, is arranged for practi-

cally positive drive without noise and at a moderately high speed. Its drive is through a friction clutch, the tension in a coil spring on the end of the shaft serving to make the driving connection while the center portion of the fan acts as a housing for the spring as well as the friction part of the little clutch. The tension in this clutch is such that while the fan can be turned by hand when the motor is not running, still there is no slip when the motor is operative. This makes a flexible drive similar in action to a belt, though a more mechanical job.

Electrical System Has Three Units

Through the use of the Delco three-unit electrical system, it has been possible to dispose the electric apparatus without undue congestion of the V between the cylinder blocks, or the fitting of any unit into too small a space. By locating the generator at the rear end of the shaft that drives the distributer and fan, it has an accessible and logical position with provision for efficient drive. The starting motor is placed on the right side of the gearcase within easy reach through the front floor boards and gears to the flywheel through the Bendix drive with the shift forward. By this placing of the electrical apparatus, there is nothing in the valve-alley except the carbureter and the manifolds, besides the generator at the front end.

A good position is given the water pump which is of a double outlet type. It is mounted on the front end of the camshaft, outside the housing of the gears and chain, and this makes for the minimum of water piping, and at the same time gives a very simple direct drive for the cooling unit. A water connection runs from either side of it around the gear housing and chain to the front end of the adjacent cylinder block, while from the right side there runs the pipe connection to the radiator. This symmetrical arrangement of the pump with piping equidistant from either block of cylinders should make for very uniform cooling.

The force-feed engine lubrication uses a gear pump at the front of the motor under the timing gear cover plate. This pump oils the two main bearings under a moderately high pressure which reaches a maximum of 30 lb. to 40 lb. per square inch at maximum crankshaft speed. A check valve regulating the pressure, opens when the prescribed maximum is reached, the surplus then by-passing to the camshaft bearings and the front gears and chain. Through the drilled crankshaft the connecting-rod lower bearings are oiled and the overflow from these is sprayed up into the cylinders and the other bearing surfaces. There is an adjustment provided for regulating the tension of the spring of the check valve, this governing the pressure of the oil. The system is practically the same in principle as is working successfully on several other eights.

The Stewart vacuum fuel feed has the tank placed in the center of the back of the dash in the rear end of the engine V, which brings it close to the carbureter, making the fuel pipe very short. The gasoline tank is suspended at the rear of the chassis, as on the four-cylinder car.

Wherever possible, for the sake of standardization, the chassis of the new eight is the same as the four, but there are parts which must necessarily be heavier. There is really very little difference in the total weight of the two models, so parts that have only a weight-sustaining function did not need enlarging, whereas those taking the drive are necessarily stronger. For instance: while the two cars have the same frame and front axle, the eight possesses a heavier rear axle; the housing is a larger and heavier stamping and the driving shafts are increased, although of exactly the same general design. The gears are of nickel steel and are the spiral-bevel type to promote silence. The ratio is 4 5/12 to 1, so that the engine really has plenty of chance to handle the car well. Ball bearings are employed in the axle.

Hotchkiss Drive with Underhung Springs

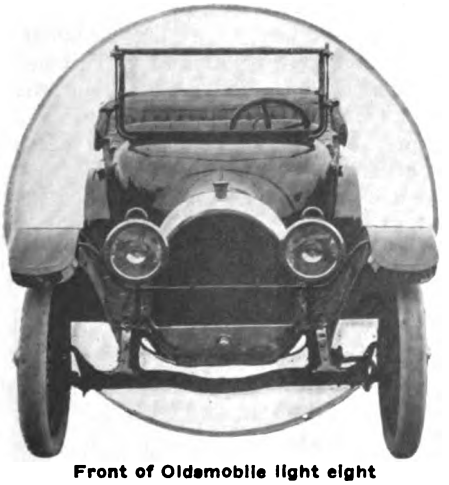
Transmission of the power from the motor is through a cone clutch and three-speed gearset in unit with the engine, and a tubular drive shaft of open type, fitted with two universals. The clutch form offers nothing radical, having engagement springs which admit of ready adjustment. It has a diameter of 12½ in. Compactness is notable in the gearset which is fitted with hardened steel gears with the transmission shaft mounted on ball and roller bearings.

In using the tubular drive shaft, the car has a stronger driving member than if it were solid, and whipping is reduced to the minimum. As in this year's four, the eight uses the Hotchkiss type of drive with the propulsion and torque taken through the rear springs, the master leaf of each being made to care for these added duties. This form of drive makes for lightness.

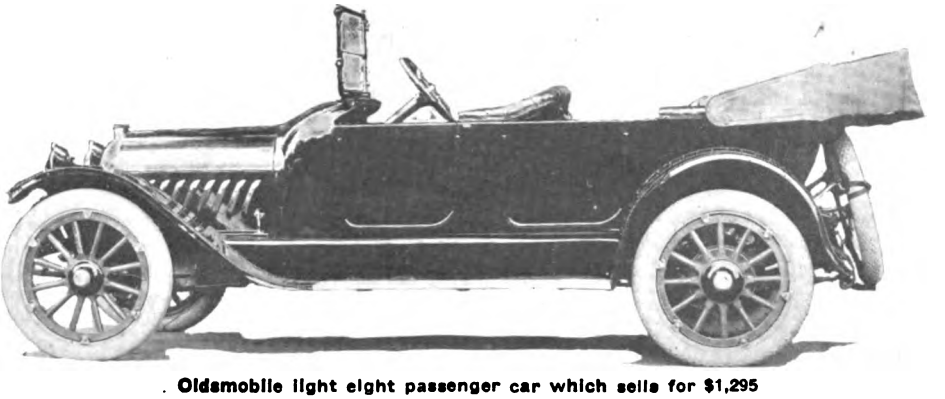
Rear springs are underhung, and like the fronts are mounted so as to be nearly flat under normal load, the idea being to promote easy riding along with good treatment of the springs. When normally flat, it is obvious that the spring action will be above and below the horizontal, making for uniformity of bending in either direction.

Every Inch an Olds

One could immediately tell the new eight as an Oldsmobile if familiar with the appearance of previous Olds' cars. The body and cowl are characteristic, although radiator and hood are more rounded than heretofore. The paneled doors, cast-aluminum running boards, Circassian walnut dash and steering wheel are all features possessed by the new model as well as the four. To afford some idea of the roominess of the body, a few of the dimensions will suffice: Doors are quite wide—23 in., and admit to a rear seat of 46-in. width; the distance from the back of the rear seat to back of front is 48 in.; the length from the back of the front seat to the clutch pedal is 41 in., and the clutch and brake pedals are adjustable.



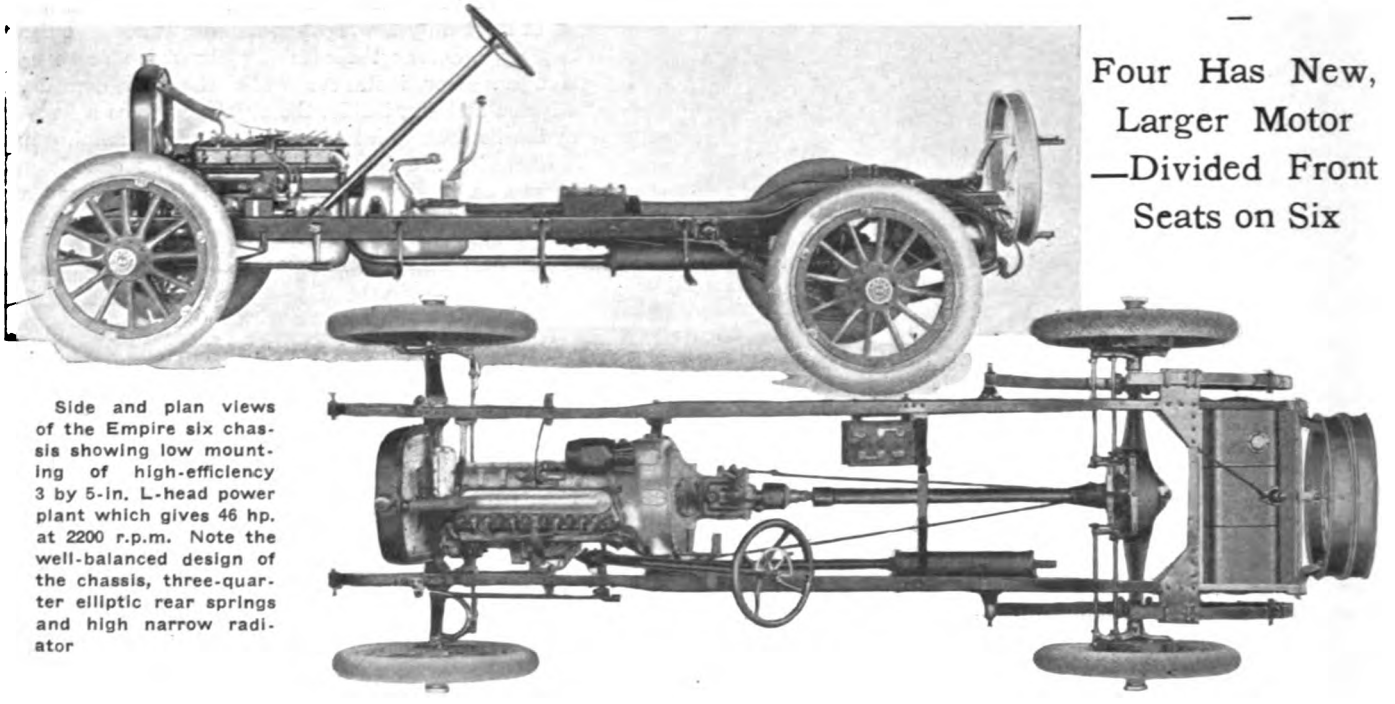
Front of Oldsmobile light eight



Oldsmobile light eight passenger car which sells for $1,295

Empire Six in Production

Four Has New, Larger Motor —Divided Front Seats on Six



Side and plan views of the Empire six chassis showing low mounting of high-efficiency 3 by 5-in. L-head power plant which gives 46 hp. at 2200 r.p.m. Note the well-balanced design of the chassis, three-quarter elliptic rear springs and high narrow radiator

IN the production of a six-cylinder touring car at $1,095, the Empire Automobile Co., Indianapolis, Ind., takes its first departure from the building of a four-cylinder car, all previous models having been of the latter type. The former four has been discontinued and a new model takes its place. Last year's four listed at $975, while its successor will sell for $895. As to wheelbase, frame, drive, axles and equipment the new four, which is a five-passenger, closely resembles its predecessor, but the power plant and body have come in for some changes.

Of the two models the six is the more attractive in point of appearance, giving the idea of massiveness with its long wheelbase of 120 in., its body with extreme roominess and a long, high hood. The body is of the curved cowl, convex-side design. There is a noticeable departure from this concern's seating arrangement in its four, the six having individual, parlor-car seats in front. The rear seat is 49 in. wide and accommodates three passengers. In the chassis of the six there is a close adherence to the previous Empire design, although it is longer and heavier than previous models put out by this company. Springs are attached the same as on the previous four, with bridge construction gusset plate at the rear, but an innovation is that the rear springs are underslung.

Another feature that has been adopted for the first time in Empire cars is the vacuum gravity fuel feed. Tires are larger than heretofore, 34 by 4 being standard equipment for the new six, with non-skid rear. The rear axle is new, being of the floating type with pressed steel housing and removable inspection cap.

Six Is High-Speed Motor

The power plant of the six is of the high-efficiency type with cylinders measuring 3 by 5 in., giving 46 hp. at 2200 r.p.m. The cylinders are of the L-head type with valves overhead measuring 1⅝ in. and having a 5/16 in. lift. A three-bearing crankshaft is used, the main bearings being split into upper and lower halves. All bearings are babbitt-lined with bronze shell. Connecting rods are 9 in. in length and the lower bearing has a diameter of 1¾ in. and a length of 2 in. Splash and plunger pump lubrication is incorporated in the Empire power plant. The camshaft is submerged in an oil reservoir, which is designed to give greater silence. Cooling is by a centrifugal pump and a Fedders high, racing-type cellular radiator.

Connecticut ignition and Schebler carbureter are standard equipment on the new six. Current is provided by an Auto-lite generator placed on the left side of the motor and is stored in an oversize, six-volt Willard storage battery. The motor is started by the Auto-lite equipment, operated on the flywheel through a Bendix drive, which marks the first time the Empire has used this type of starter on its cars.

Heavy Shafts Feature Gearset

In the power transmission all gears and nickel steel shafts are made extra heavy, while the main driving shaft is mounted on New Departure ball bearings. The universal is the Hartford, heavy car type, inclosed in a pressed steel housing to make it oil-tight and dust-proof.

The rear axle is a Weston-Mott, single-bearing, full-floating, with large housing and a 12-in. inspection cap. This has been designed to relieve the shaft of carrying weight, the housing taking care of the weight. Hyatt roller bearings are found in the axles, except behind the driving pinions where double rows of New Departure bearings are used. The front axle is dropped to give a lower center of gravity, but the standard 11-in. clearance is maintained.

Left drive with center control is found in the new six. Two sets of brakes are used, both on the rear wheel drum and the equalizer system is particularly well laid out. The hand-brake lever is connected to the equalizer by a steel cable.

Fenders are of the crown type, pressed steel, with close fitting shields. All fender edges are reinforced and the baked enamel process gives them a lasting luster. The running-boards are linoleum covered and aluminum bound. The body is among the cruiser types of the 1916 season, made in alumi-

noid steel with convex sides and rolled cowl. Semi-elliptic, 36-in. springs are found in front and three-quarter elliptic, 53-in., in the rear, while the upper main leaf of each rear spring is scrolled to do duty as a bumper plate. The frame is dropped, to lower the center of gravity, and narrowed in front to shorten the turning radius.

New T-Head Engine on Four

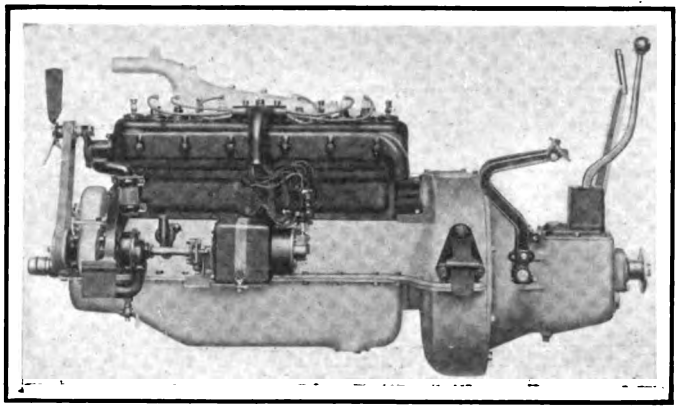
In the new four-cylinder model Empire the motor used in the previous model has been replaced by a Teetor, T-head power plant, 3⅞ by 5 in., which is considerably larger than the previous plant used, which was 3¾ by 4½ in. In this model the disk clutch has been discarded in favor of a cone. The gearset is a regular three-speed, made by the Detroit Gear and Machine Co. The new four uses Connecticut ignition system in place of the Remy found on last year's four, while the starting and lighting is by Auto-lite, two-unit, like the six. The steering post is a new one also, made by the Foster Gear Co., Columbus, Ohio. Tires are 33 by 4, instead of 32 by 3½.

The foregoing paragraph tells the principal changes to be found in the new four. Going back to the motor, the crankcase incorporates features of the barrel-type construction, giving rigidity to the bearings, of which there are three. The T-head construction allows unusually large valves with a 2-in. clear diameter. All valves are interchangeable and have cast-iron heads, electrically welded to nickel steel stems. The intake manifold passes through the cylinder block, which completely jackets it with hot water.

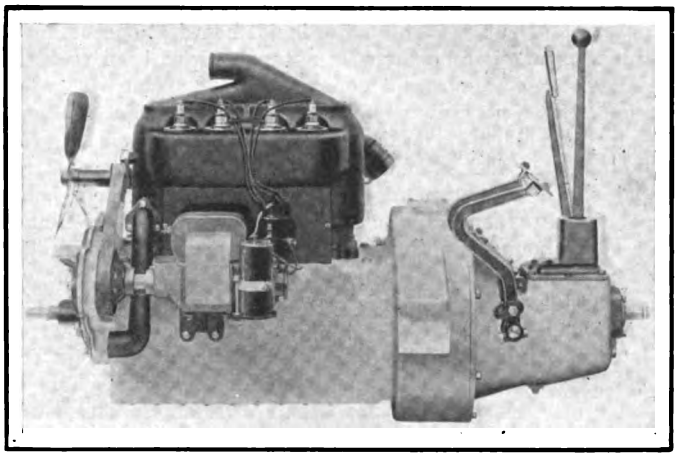
The lubrication system consists of two overflow oil basins located in the lower part of the crankcase. In the bottom of these basins holes are bored to admit a given quantity of oil. The lower ends of the connecting-rods pass through this oil, keeping a certain amount in circulation and directing excess oil to the reservoir; directly over each main bearing is an oil pocket, cast integral with the crankcase.

Cooling is by thermo-syphon in connection with a Fedders cellular-type radiator. Wheelbase is 112 in. and the body is of the conventional streamline design. Exceptional leg room is given by the wide, low-set seats. Upholstery is of leather throughout. The gravity system of fuel feed is employed in the four, from a 14-gal. tank under the front seat. Semi-elliptic springs in front and three-quarter elliptic in the rear are used, the latter being also underhung.

Equipment for both the four and six is practically the same, and includes combination head lamps with powerful searchlights for country driving, tail and tonneau lights, one-man top with curtains operated from inside the car, rain vision, ventilating windshield, Stewart speedometer, Stanweld demountable rims with one extra, dash carbureter adjustment, twin spare tire carrier, rubber shock absorbers for front and rear springs, robe and foot rails, motor-driven horn on the six and an electric horn on the four, extension inspection lamp, tool kit, jack, etc. The six is finished in Brewster green, or royal blue body, with black running gear, striped with white, and vermillion wheels, the four in Brewster green or French grey, with black running gear and wheels.



Left side of unit power plant used in the Empire six



Left side of Teetor T-head motor used in new Empire four

Cotton Advance Booms Sales In South

ATLANTA, GA., Oct. 16—The rapid advance in cotton prices has boomed the sales of automobiles in the South. Dealers in this city are at present getting more orders than they can fill. At present there is a large shortage of cars here. Some of the agents are offering bonuses to agents in other sections if they will divide the machines allotted to them.

Business conditions throughout the South are picking up with a consequent demand for cars. Several of the automobile manufacturers are taking advantage of the recent boom and are establishing headquarters in this city.

Automobile agencies in this city report large increases in business over that of 1914. The Buick agency shows an increase of 350 per cent. Reports from the various Buick agencies throughout the South state that they are nearly 1000 cars short on their orders.

Some of the Southern people are preparing to buy pleasure cars who had never thought of such a thing before. Instances are known where people have saved exactly enough money to buy an automobile.

The agency for the Maxwell, Mitchell and National has more orders than it can hope to fill on time. The manager of the concern states that the southern companies are going to have the best automobile year ever known in the history of the South. It is claimed that the action taken by the banks all over the country to remedy the depression of several months ago has had a wonderful effect.

The Cadillac agency is thirty cars behind in orders. Many sales are being made to farmers.

The Haynes company has established headquarters in this city at 239 Peachtree Street as a result of better business conditions.

Maine Spends $6,516,000 for Cars

PORTLAND, ME., Oct. 16—Maine people have spent $6,516,000 for automobiles during the past year, according to Secretary of State J. E. Bunker's estimate. This estimate includes 360 trucks, costing $226,000. Automobile taxes have yielded to the State treasury $258,665, and 24,326 operator licenses have been granted. The receipts for the entire year of 1914 were only $192,000, or $66,665 less than for 1915.

The Rostrum

Loose Connecting-Rod Causes Knock

EDITOR THE AUTOMOBILE:—I have an elusive knock in my Buick six model D-45 which seems to baffle local experts and, as usual, I turn to THE AUTOMOBILE for assistance. The knock has always been present in this car, which has been run 1200 miles, but seems to increase the farther I run it. This noise is not heard at speeds under 25 m.p.h., and is of a metallic nature. Have been over the tappets several times and am satisfied the trouble is not in them. Have not investigated the bearings, but it seems hardly possible to have a loose bearing in a brand new car, although the knock is of that nature.

The noise is not heard with the spark retarded, being present only when fully advanced. I have been told that it is a spark pound and that I must run with a later spark, but this results in reduced efficiency and heating up of the engine, besides being contrary to the instruction book which says to run with spark lever fully advanced on the sector. I have also been told that this noise is characteristic of this car, being caused by the automatic spark advance mechanism, but I fail to see why this centrifugal governor should cause a knock.

I might add in conclusion that there is no difference in the intensity of the knock whether running on the level or ascending a grade, it being present at all speeds above 25 m.p.h. regardless of the position of the throttle.

This knock is very annoying and has resulted in much ridicule being cast upon the car and the driver, and anyone who can locate the trouble and suggest a remedy will earn my everlasting gratitude. D. C. C.

East Canaan, Conn.

—From your description of the symptoms, it seems quite certain that this knock is due to a loose connecting-rod. This can be corrected by removing the lower half of the crankcase, loosening the connecting-rod cap and removing one of the thin metal shims on one side.

New Coil Would Improve Ignition

Editor THE AUTOMOBILE:—I have a 1913 Ford car which jerks a little whenever I run it at the rate of 9 or 10 m.p.h. I was told that such a jerk came from the differential gears because they have too much play. I really do not believe this could be the cause, as the motor pulls well. I do not think the differential should have any effect on the car even if it has much play. I installed a master vibrator because I thought the coils were too weak and once in a while the motor would miss fire. The man who told me about the differential said that there is no use in using the master vibrator, because if the coils are too weak, I should replace them with a new set. Would like your opinion on this. J. T.

Houston, Tex.

—Misfiring of the Ford motor at low engine speeds may be the result of a number of conditions. The most probable causes of the trouble are: Poor compression on account of leaky valves; improperly adjusted carbureter, causing too rich or too lean a mixture; dirty spark plugs; coil vibrators improperly adjusted or points dirty or burned; air leak in intake manifold; weak exhaust valve springs; too great clearance between valve stems and push rods; too small gaps between spark plug points; or, possibly imperfect contact in the commutator.

It is certain that the condition of the rear axle assembly has no effect upon the irregularity of the motor. There is a Ford service station in Houston at which any repairs can be made. The Ford company does not approve of the use of master vibrators, though various ignition companies recommend them. It is certain, however, that if your coils are weak the replacement of your present coil with a new Ford coil would improve your ignition.

Missing Due to Sticking Valves

Editor THE AUTOMOBILE:—The two front cylinders in my car will run for days and weeks without causing any trouble and then, without apparent cause, will cease firing, the cylinders flood with gasoline and the motor will heat up. On these occasions, the plugs give good fat sparks every revolution—I have tried them with a screwdriver—but there is no explosion in the cylinders. What do you think is the trouble, its cause and its remedy? N. R. F.

Mauch Chunk, Pa.

—The trouble with your two front cylinders seems to be sticking valves. The fact that you state that the motor overheats at the same time would lead to the belief that this is a cause and not an effect. The probabilities are that the motor starts to become overheated, causing the valves to stick, which in turn gives rise to misfire. You should look carefully to see that the valve stems have proper clearance, that they are not bent and that the cooling system is clean and in good order. The latter can be aided by flushing out with a saturated solution of common soda.

To Time Four and Magneto

Editor THE AUTOMOBILE:—Kindly let me know the quickest way to time a four-cylinder motor and also the magneto.

Red Bank, N. J. J. P.

—The quickest way to time a four-cylinder motor is to take advantage of the markings on the flywheel. You will note that the point of intake opening and exhaust opening for each cylinder is marked on the flywheel, the mark, for instance, of intake opening No. 1 cylinder being 1.0. No. 1 indicating intake opens for No. 1 cylinder when this mark registers with the mark attached to the engine frame. The camshaft gear and the magneto gear should be taken out of mesh and the flywheel brought around so that this mark registers with the mark on the engine frame or indicator as is sometimes used. The camshaft should then be turned, and when it is in such a position that the function indicated by the flywheel mark is taking place, the camshaft gear should then be slipped into mesh.

In timing the magneto the mark on the flywheel is carried around to upper dead center at which position the spark for that cylinder should be taking place with the magneto set at full retard. The timing of the magneto itself will depend upon the make and model. The armature shaft of the magneto is always arranged so that a spark of maximum intensity is provided at the moment of breaking the circuit in the breaker box. The means for attaining this end varies with

the different makes of magnetos and should be learned from the manufacturer's instructions or will be furnished through the Rostrum if you will give the name and model of the magneto.

Glycerine for Anti-Freeze Solution

Editor THE AUTOMOBILE:—Will you kindly tell me of some practical way to filter cylinder oil to remove the carbon after it has been used in the engine?

2—Are there different grades of glycerine and what grade is best to use in the radiator to form an anti-freezing solution?

Winchester, N. H. H. B. H.

—THE AUTOMOBILE has no record of any practical way to filter cylinder oil to remove the impurities after it has been used in the motor. Some people use this old oil for gears and state that it has proved quite satisfactory.

2—There are several grades of glycerine, depending upon the purity. The C. P. or chemically pure grade should be used in the radiator.

Maximum R.P.M. of Long Stroke

Editor THE AUTOMOBILE:—Is a long-stroke motor capable of turning over faster than a short-stroke?

2—Would a 4½ by 6-in. six-cylinder motor turn faster than a 4½ by 5½ motor of the same design?

3—How fast will the highest speed motor turn? What are the dimensions of one of these?

Beaver Falls, Pa. E. S.

—No, not so fast, limiting speed is piston speed in feet per minute, not revolutions per minute.

2—No, not quite so fast, if of equivalent engineering standard of design.

3—The highest speed motors in commercial use will turn at about 3000 r.p.m. The dimensions would be about 3 in. by 5 in.

Installing Ammeter on 1912 Buick

Editor THE AUTOMOBILE:—Will you please give me instructions through the Rostrum department of THE AUTOMOBILE regarding the proper way of installing an ammeter on a Buick car B-25, 1914 model?

Williamsport, Ohio. C. E. H.

—In order to properly install an ammeter on a B-25, 1914 Buick car it will be necessary to remove the motor generator from the car and take it apart. When the motor generator is taken apart it will be noted that there is a brass strip connecting the larger and smaller terminals on the side of the motor generator frame. This strip of brass must be removed and the motor generator reassembled. Then by attaching one terminal of the ammeter to the larger terminal on the side of the generator frame, and the other terminal of the ammeter to the smaller terminal on the side of the generator frame, the ammeter will be correctly connected except as to its polarity. This can readily be determined and the leads to the ammeter reversed if necessary.

The Delco company recommends that where installations are made, that an ammeter having a zero center and a range of 30 charge and 30 discharge be used. The installation is shown in Fig. 2 as regards the strap connection between the terminals and a wiring diagram is also given in Fig. 1.

Rebuilding 1909 Cadillac for Speed

Editor THE AUTOMOBILE:—I have an 1909 model Cadillac which I am going to convert into a two-passenger raceabout and I would like to have you answer the following questions through the Rostrum columns of THE AUTOMOBILE.

1—Is there any method by which the steering column can be lowered?

2—It has a Bosch magneto and would like to know how often it should be overhauled, and what should be done?

3—Kindly show by drawings, etc., a body with bucket seats, gasoline tank in rear seats, tire carrier, tool box, etc., under rear deck.

4—Offer any suggestions that would tend to increase the speed and what should the speed be with a gear ratio of 3.5 to 1 and 33 by 4 tires? A. T.

Wenatchee, Wash.

—There is no method of lowering the steering column used on the 1909 Cadillac. It is possible, however, that the steering gear used in the 1909 roadster could be placed in this car, and as the roadster steering gear makes a smaller angle with the horizontal than the touring car steering gear, the desired result might be obtained in this manner. This, however, would be considerable work, as it would be necessary to secure an entirely new roadster steering gear as well as making it necessary to secure parts in order to fit the steering post to the front of the car at the point where it passes through the dash. Special brackets are necessary for this purpose, and besides this considerable fitting would probably be necessary.

2—There is no rule by which you can go in the number of times a Bosch magneto has to be overhauled. THE AUTOMOBILE has record of a certain Franklin car which has traveled 150,000 miles without having the magneto touched other than occasionally cleaned. There are a great number of cars

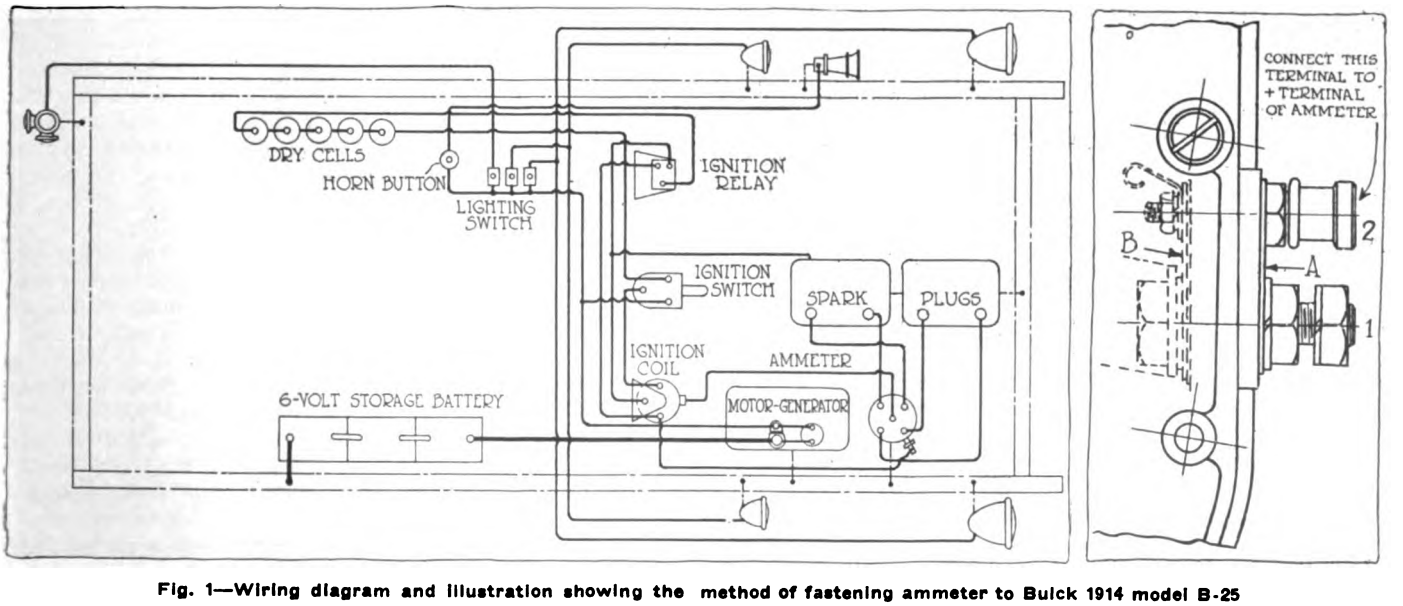


Fig. 1—Wiring diagram and illustration showing the method of fastening ammeter to Buick 1914 model B-25

which have gone five or six seasons without even having the magnets charged.

3—By referring to your file of back copies of THE AUTOMOBILE, you will find a large number of bodies which coincide with the outline you give.

4—As to what speed this car should make with 3.5 to 1 ratio, and 33 to 4 tires, this of course would depend upon the possible r.p.m. of the engine. This is a matter which is rather indefinite and difficult to ascertain on a car of this model. The standard 1909 gear ratio for the touring car was 3½ to 1, and for the roadster 3 to 1. If one is looking entirely for speed, the higher gear ratio should of course be used. The standard tire on this car is 32 by 3½, the effect of putting on 33 by 4 tires is the same as would be obtained by putting on a higher gear ratio; that is, while the ultimate speed is higher, the acceleration is decreased.

Calculating Horsepower of Gears

Editor THE AUTOMOBILE:—Would you kindly supply me with a formula for calculating the horsepower of cast iron and steel gears?

Brooklyn, N. Y. L. H.

—The method for calculating the horsepower which can be safely transmitted by cast iron and steel gears is the same. The following formulae are based upon cast iron and for steel it is only necessary to multiply the result by 2.5:

F = Breadth, or face of tooth in inches.
T = Thickness of tooth at pitch line, inches.
V = Velocity at pitch line in feet per minute.
L = Length of tooth, from root to point, in inches.
C = Co-efficient.
Hp. = Horsepower transmitted with a factor of safety of eight; ultimate tensile strength 30,000 lb. per square inch.

FORMULAE

(1) Horsepower of Spur Gears = $\frac{F \times T2 \times V}{L \times 53}$

(2) Horsepower of Bevel Gears = $\frac{F \times T2 \times V}{L \times 77}$

(3) Horsepower of Miter Gears = $\frac{F \times T2 \times V}{L \times 82}$

(In formulae for bevel and miter gears, the factors T and L express the pitch at large end of tooth.)

For bevel and miters, thickness and length of teeth have been computed at center of face. With a view, however, of facilitating calculation, the proportions of factors T and L in formulae (2) and (3) have been taken at large end of tooth, thus giving same dimensions as for spur gears; hence the spur gear formula has been utilized, with the exception of co-efficient, which has been determined by averaging the proportions of teeth of bevel and miter gears having the largest and smallest number of teeth in general use. The resultant horsepower is consequently less than in the case of spur gears of like pitch.

For mortise wheels and pinions use thickness of pinion tooth. If different margin of safety is desired, multiply above result by 8 and divide by factor of safety desired; 2200 ft. per minute at pitch line for iron gearing and 3000 ft. for wood and iron, are excessive velocities, and should be avoided if possible.

Farm Tractor Field Widens

13,000 in Operation in States West of the Mississippi— 7,000 Is Estimate for East

FARM power, exceeding in extent and cost that for any other purpose, even manufacturing in all branches, is to-day the only great field of power consumption which depends upon animal power in the main. Phillip S. Rose, editor *The American Thresherman* and the *Gas Review*, Madison, Wis., in an address delivered before the International Engineering Congress at San Francisco last September, made the prediction that this giant among power-consuming industries would also adopt mechanical power for the greater part, and that soon.

Mr. Rose points out that the preferred use of horse and mule power by American farmers, in spite of its greater cost per unit of energy, is due to the greater "activity" or versatility of the animal as against the engine. He further states that the 24,042,882 horses on farms in 1910, have grown to 25,411,000 up to Jan. 1, 1915, by estimates of the Department of Agriculture, of which 20,328,800 are mature work animals. Each horse develops 7/10 hp. so that the animal power on farms is estimated by Mr. Rose to aggregate 14,230,000 hp. The value of these horses is $2,842,655,000 and their harness, $203,200,000, a total of $3,045,855,000, or $214.05 per horsepower. He quotes Professor Gebhart of Armour Institute, Chicago, to show that steam power plants cost $200 to $175, the cost varying inversely as the power of the plant.

The number of farm horses has increased from about 7,000,000 in 1870 to about 21,000,000 in 1914, and the acreage worked has increased from 185,000,000 in 1870 to 500,000,000 in 1914, so that though the increase in power available and work to be done has kept approximate step, the actual acreage worked per horse has decreased from 20.3 in 1870 to about 19.2 since 1900. This greater power expended per acre is explained by two things; namely, deeper plowing and scarcity and rising cost of farm labor. The draft on a plow in ordinary soil increases about in proportion with the depth of the furrow in inches, so that deeper plowing, which all authorities indorse, requires more power. The scarcity and dearness of farm labor has given rise to heavier machines, such as gang plows, combined harrows and grain drills, larger harvesters, etc., so that each unit of labor is able to compass a greater amount of work per day or so that each farm requires a smaller number of hands.

This has led to the breeding of heavier and heavier draft animals for the farm until the limit has about been reached. Further development along the above lines requires that the horse with his limitations be discarded and the limitless power of the internal combustion engine employed in his stead. Concerning this, Mr. Rose says:

Mechanical Farm Power

"Available mechanical farm power consists of steam engines, internal combustion engines, wind mills and water power. Electric power, generated either by steam plants or hydro-electric stations, is used to a limited extent in some favored localities, as along the Pacific seaboard, in Montana and in some of the Central States, but, as yet, it has not come into serious competition with any of the other powers.

"Small water-power plants are available in only a few favored localities, and then the cost of the dam and power equipment is exceedingly high, so this kind of power may be left out of general consideration.

"The use of windmills has been on the decline for a number of years. The principal objection to their use is the

smallness of the power units and the uncertainty of obtaining power when needed.

"This, then, leaves only two sources of power for serious consideration, namely the steam, gas or oil engine. The former has been in use in this country since about the year 1830. Steam did not come into very extensive use until after the Civil War, and then only for operating threshing machines, running small saw-mills and for grinding feed. Experiments were made in this country, along in the seventies and eighties of the last century, with steam plowing outfits but not with much success, either because the engines were not designed rigidly enough, or because the country was too poor to invest in such costly machines. Probably both causes had an influence on the situation.

"About the year 1898, however, when the Western prairies were being opened up so rapidly, a demand arose for heavy power outfits to break up the virgin sod and within the next five years a number of excellent steam rigs were put on the market. Practically every threshing outfit sold throughout the West in the early nineties was sold not only for threshing but for plowing also. Thousands of acres were broken by these rigs, but their great weight and the difficulty of getting water to them on the dry Western plains created a demand for something different and better.

The Gas Tractor Appears

"It was these conditions, together with the rising price of horses, that paved the way for the gas tractor. The first of these machines came out about the year 1900, but it was not until six years later that they became practical machines. Two companies divide the honor of being the pioneers in this new industry, the Hart-Parr Co. of Charles City, Iowa and the Kinnard-Haines Co., Minneapolis, Minn. The success of these machines brought into the field a host of competitors among the old threshing machine manufacturers, and by 1912 the tractor industry had grown to considerable proportions. That was the banner year. It was freely predicted by many enthusiasts that the horse was doomed and that in a very short time all farm work would be done with tractors. They practically crowded the steam plowing outfits off the market and thousands of farmers bought them.

"A considerable number succeeded with the tractor, but a larger number failed. In some cases, the cause of failure was due to the failure of the machine, but in the majority of cases it was due either to the ignorance of the operator or to the fact that his style of farming was not adapted to power machinery. It was also found that the heavy outfits that were used to break up the prairies were not adapted to general field work, and so the industry has suffered a partial collapse during the last two years. Another factor that contributed to the general slump in business was the faulty methods employed by most of the companies in doing business. The market was not well sold. Farmers were induced to buy, who could not possibly make a success with a tractor, and there was not enough care given to the instruction of the operators. The tractor has suffered in comparison with the automobile because the latter has had the help of countless garages to help keep them in good working order. The tractor, on the other hand, has had to get along generally without any expert attention. Invariably, those who have made a success have been good mechanics. In fact, failures among mechanics or those of fair mechanical ability have been rare.

Demand for Light Type

"At the present time there is a decided revival in the use of the light-weight tractor that sells for a few hundred dollars and will take the place of a half dozen horses. There are perhaps fifty companies that will bring out a light-weight tractor this spring in response to a demand by the farmers of the corn belt and wheat belts. This demand is not one that has been worked up by ingenious and persistent advertising but comes from the farmers themselves, who realize the limitations of animal power and who desire to do a better grade of farming than they have done in the past. Just how the light-weight tractor will develop is difficult to forecast at this time, but where such a genuine need exists there seems little doubt that the manufacturers who have had a number of years' experience will be able to produce a machine that will be able to supplement the horse and the mule, even if it does not displace them. The present tendency toward very light machines, weighing only 3000 or 4000 lb., probably marks the extreme swing of the pendulum toward light weight. The tractor that appears, to the writer, to have the best chance for ultimate success will weigh from 6000 to 8000 lb., and have about a 30-hp motor.

"A careful canvass of the States west of the Mississippi made last winter by A. P. Yerkes, a government agent connected with the Bureau of Farm Management of the United States Department of Agriculture, shows that there are something like 13,000 tractors in operation. There are probably not to exceed one-quarter as many east of the river, making something less than 20,000 tractors in use in the entire country. These tractors vary greatly in size, but will doubtless average close to 40 brake horsepower each.

"The possibilities for the use of tractors are, however, almost unlimited when the number of farms of large size containing 175 acres or more, is considered. Each one of these farms would appear to be large enough to make profitable use of some form of mechanical power for general farm use, provided one can be built and sold for a price at which the farmer can afford to make the investment.

"Steam traction engines are still used as the principal source of power for threshing, and it does not seem likely that they will be displaced entirely for a great many years. From the best information available, which, by the way, the writer has checked over in several ways, it is estimated that there are a total of close to 100,000 steam tractors in this country used for threshing and other agricultural work. The average brake horsepower of these machines is probably about 40. Quite a large number are used for plowing, for filling silos, grading roads, grinding feed, shredding and husking corn and for operating small portable saw-mills.

Automobiles Fill a Mission

"There is still left the automobile and the farm truck to consider. The latter is used very little, but of the former the number is very large, running into hundreds of thousands. In the State of Iowa alone it is estimated that there are 65,000 automobiles owned by farmers, and a number of other States are not much behind. Since these are primarily passenger machines rather than farm power machines, I shall not spend much time with their consideration. Suffice it merely to say that they are finding a rapidly increasing use in marketing light farm produce and paving the way for better roads and for the use of trucks.

"I said in the beginning that farm power exceeds in value and amount that is used in all manufacturing industries. The proof has been submitted, but to make it more apparent let us tabulate the results:

Kind of Power	Number	Average Value	Total Value	Total Power
Horses and mules	25,411,000	$111.85	$2,842,655,000	14,230,000
Harnesses	20,382,000	10.00	203,820,000	.....
Windmills	750,000	100.00	75,000,000	75,000
Steam tractors	100,000	.....	.....	4,000,000
Gas tractors	20,000	2,000.00	40,000,000	600,000
Gas engines	1,000,000	150.00	150,000,000	5,000,000
			$3,311,475,000	23,905,000

"The total power used in all manufacturing enterprises, according to the 1910 census, was 18,755,286 hp. Even allowing a large margin for possible error, it is thus seen that the farmer's power problem is a big one and involves millions of dollars. Mechanical power, as yet, is much smaller in amount than animal power, but it is rapidly increasing and within a few years will doubtless assume first place."

ACCESSORIES

New-Speed Carbureter

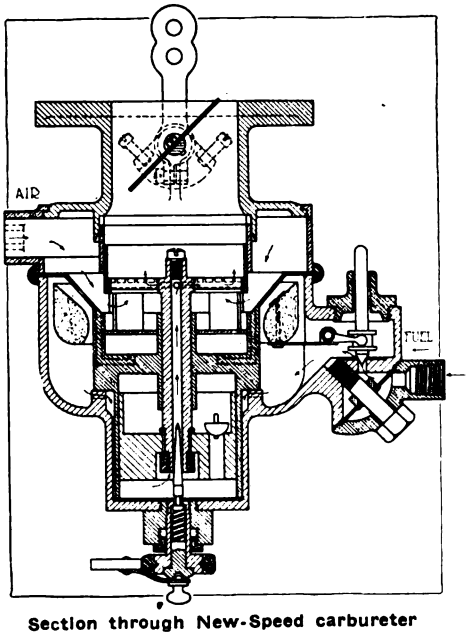
ALTHOUGH named the New-Speed carbureter this instrument is intended for all speeds, but takes its appellation from James Speed, its inventor. This is an automatic design and, as will be seen from the section, is controlled by a floating air valve which is raised by the suction of the motor. This valve, which the makers have called the elevator, is located in the neck of the carbureter and has ports cut in the sides, which correspond with ports in the passage in which the elevator travels.

Under normal conditions when the motor is idling the elevator is in its lowest position which closes all ports and only allows fuel to enter through a simple passage. Cross-wise in the top of the elevator is placed a row of jets which are designed to take care of the diffusion of the fuel.

There is also a piston placed in a separate compartment in the center of the float chamber directly beneath the fuel elevator, and attached thereto by a fuel stem. The piston being attached to the fuel elevator travels at the same distance as the latter and is of sufficient weight to insure proper balance and proper closing of the fuel elevator. It is through this fuel stem that the gasoline travels to the row of jets in the top of the elevator.

The amount of fuel flow is governed by a metering pin mounted vertically upward beneath the fuel stem. As the elevator rises, carrying with it the stem, the taper in the pin governs the amount of fuel admitted. The greater the suction the higher the floating valve lift, and therefore, the greater the amount of fuel and air. Since the meters are all straight tapers, it is only necessary to put the right taper pin for a given motor and to adjust it properly for idling. After this it will be automatically correct for every other speed.

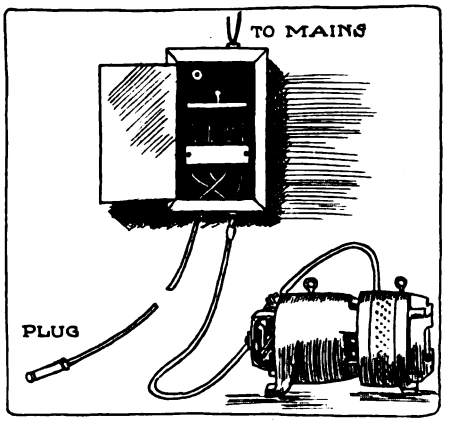
The combination dirt and water strainer is placed in the gasoline intake adjustment. There is no float adjustment as this is correctly placed at the factory. Prices vary from $20 for the ¾-in. size to $45 for the 2-in.—New-Speed Carbureter Co., San Francisco, Cal.



Section through New-Speed carbureter

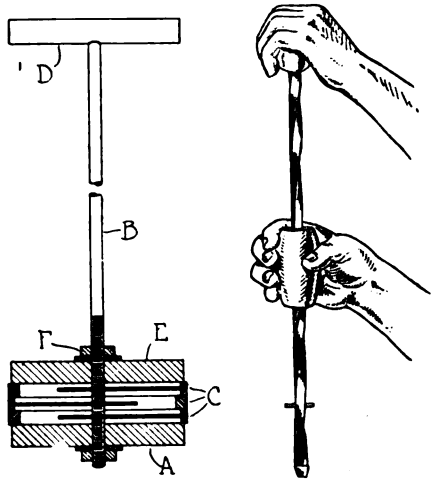
Milburn Light Electric Charger

A charging apparatus which any owner can use to charge the battery of his electric passenger car is now out under the name of the Milburn Light Electric Charger. It is designed especially to meet the needs of persons who desire to take care of their own batteries. With it the electric car owner need only turn the main switch in the car to charge position, insert the charging plug in its receptacle and close the switch in the wall panel provided with the apparatus.



Milburn light electric charger showing connections

The machine consists of a compound-wound-direct-current generator direct connected to a standard single-phase squirrel cage induction motor. The squirrel cage motor is non-self-starting and the outfit depends upon starting from the direct-current end. This is accomplished by a four-pole switch, the two middle prongs of which stick up higher than the others. After the switch is thrown in slowly, the shunt field is excited and then the armature of the direct current is thrown directly across the battery. The set then begins to revolve, the generator acting as a shunt motor, the series field being cut out by means of the clip. As the switch is thrown into the last step the alternating current is thrown onto the motor and the outfit starts to charge the battery. Being compound-wound, the outfit approaches a constant potential method of charging, the charge starting at a high rate and slowly tapering to a low finishing rate. This gives a charge which is non-gassing and will very materially increase the life of the battery. The outfit is made two-bearing, ball bearing so that all difficulties from bearing trouble are eliminated. The price varies from 110 or 220 volts, 60 cycle, $130, to 25 cycle, $140.—Lincoln Electric Co., Cleveland, Ohio.



Left—Peerless piston ring lapping tool for fitting new rings to worn or oval cylinders. Right—Michener valve grinding tool

Stevens Countersinks

This set of countersinks for fitting brake and clutch linings consists of 9/16, ½ and 13/32 in. countersinks for Nos. 7 to 11, inclusive, flat head rivets having countersunk heads as well as for all sizes of similar rivets. As the shank of the countersinks is 5/16 in. in diameter, they can be used in a hand drill or power press. These tools are said to cut a clean and accurate hole very rapidly. The set sells for $1, but single sizes can be obtained.

For garage and repair shop stocking the Stevens company is producing boxed assortments of iron and brass wood screws, machine screws with nuts, iron bolts and copper rivets with burrs. No. 10 assortment consists of the above named packed in a strong cardboard box. —Stevens & Co., New York City.

Peerless Lapping Tool

For fitting new piston rings to worn or oval cylinders the Peerless piston ring lapping tool has been brought out, to avoid running the car 100 to 1000 miles in order to lap in the rings with inferior results. The lapping tool comprises a handle, connecting-rod and disks

and nuts for holding the piston rings in position while lapping.

To lap in the piston rings, referring to the illustration, place the lower disk *A* with rod *B* in the cylinder. The rings *C* are slipped over the handle *D* on to the disk in the same position in the cylinder as they are to be used in the piston. The pins are then inserted and the upper slotted disk *E* is placed in position and held firmly by the clamping nut *F* which is lightly turned into position. The cylinder is then charged with piston ring lapping compound and about twenty-five strokes are made with the handle *D* or until the rings are lapped to fit the cylinders. The Peerless lapping tool for any size costs 50 cents. The extra disks per pair are 25 cents and the piston ring lapping compound is 25 cents.—Peerless Piston Ring Co., Newark, N. J.

Michener Valve Grinder

This tool consists of a steel shank with a spiral twist on which works an aluminum handle; moving the handle up and down causes the shank to turn first in one direction and then the other. At the top is a ball handle, of wood, with an anti-friction bearing, and at the other end a blade like that of a screwdriver to enter the slot in the valve head. Price, $1.50—E. S. Michener, New Castle, Pa.

Q. D. Tank Body

For quick oil transportation and for use with gasoline delivery wagons there has been put on the market a device known as the Q. D. or quick-delivery gasoline tank body for Ford cars. Oil companies whose service requires rapid delivery must provide a method of transportation of gasoline and oil which will quickly carry a supply to customers in emergency. This outfit is particularly designed to meet that requirement. A 100-gal. tank with extra cans of lubricating oil when required, as illustrated, provide a suitable load for the Ford car.

The tank complete can be attached the first time in about 2 hr., after that it requires not more than 5 min. to attach or detach it, thus providing a double-purpose car. The outfit is supplied with faucets, air vent, etc., and is used with or without box for measures, funnels, etc.—Ohio Welding & Mfg. Co., Cincinnati, Ohio.

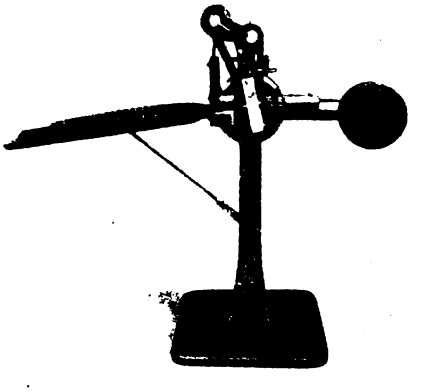
Automatic Radiator Machine

Two automatic machines which have recently been shipped to the Coventry Motor Fittings Co. of Coventry, England, which are suitable for radiator manufacture, are illustrated herewith. The tube drawing machine will form tubing or molding in any desired shape from flat ribbon material. It will draw the tubing with plain or lock seam and is capable of drawing enough tube to make 200 automobile radiators a day.

The other machine is an automatic self-feeding punch press, taking the place of an ordinary press with roll feed, and, according to the manufacturer, is faster and more accurate than the latter. The machine is adapted to the manufacture of radiator fins, folding over the edge, perforating and cutting off, all in one operation. The self-feeding press will make enough fins or plates for fifty radiators a day.—F. H. Stolp, Geneva, N. Y.

Magnalite alloy pistons. Note ribbing

Q. D. gasoline delivery tank for Fords



Stolp radiator fin punch press

No-Glare Nitrogen Bulbs

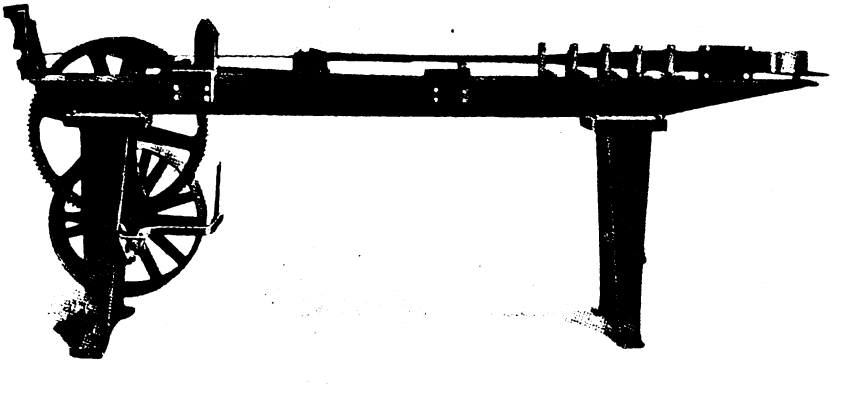
Opalescent nitrogen-filled bulbs are manufactured in 32-cp. and voltages to suit the various standard systems in use. The makers state that the lamp has been adopted by the States of New Jersey and Maryland and that it conforms with the anti-glare regulations of other States. Long life and high efficiency are claimed. Price, $1.—Vosburg Miniature Lamp Co., West Orange, N. J.

Maluminum for Parts

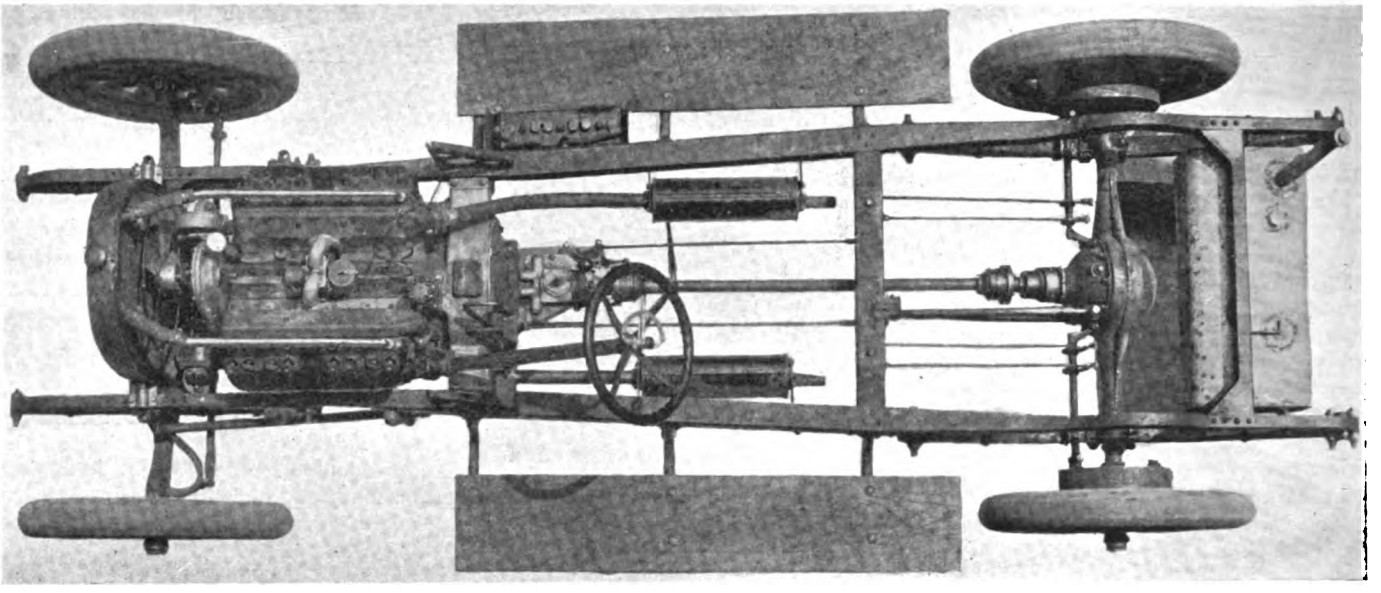
A malleable form of aluminum, called Maluminum has been developed for making car parts which must be light and strong. It is used for body molding, gearboxes, radiator frames, etc., and, according to the manufacturer, shows a tensile strength of 17,500 to 20,000 lb. per sq. in., and an elastic limit of about 16,000 lb. The metal is slightly heavier than some aluminum alloys now in use, but has the advantage that it is malleable, can be die cast and can be riveted in machine operations. It is also claimed that the metal is capable of taking a high polish.—Pioneer Brass Works, Indianapolis, Ind.

Grobet Spark Plug File

This file is designed especially to smooth the contact points of magnetos, coils and other ignition apparatus. It is claimed to cut smoothly without ripping or roughening the metal and without wasting platinum. The end of the file has a screwdriver point, the handle being round. The total length is 6 in., while the file surface is 3 in. long. The files sell for 15 cents each.—Montgomery & Co., New York City.



Stolp tube drawing machine for use in the manufacture of tubing for automobile radiators



Daniels eight chassis, showing mounting of unit power plant. Note twin exhaust manifolds and separate muffler for each cylinder block

Daniels Eight of Strong Construction

Uses Herschell-Spillman 3 1-4 by 5-In. Motor—Distinctive Body

AMPLE power is a characteristic of the Daniels eight, made by the Daniels Motor Car Co., Reading, Pa., which uses a 3¼ by 5-in. L-head Herschell-Spillman motor with Brown-Lipe gearbox in a unit power plant. The cylinders are cast in two blocks of four each with the inlet pipes integral and the exhaust pipes bolted on, the crankcase being an aluminum casting with the oil reservoir in the lower half; separate for easy accessibility. The valves are operated from a single camshaft with sixteen integral cams, or one for each valve. By staggering the cylinder blocks a distance equal to the width of the connecting-rod crankshaft bearing, the use of forked connecting-rod ends and of double concentric crankpin bearings is rendered unnecessary. The connecting-rods work side by side on crankpins and are interchangeable, being I-section drop forgings of two-bolt cap construction. The flywheel is of semi-steel with a machined steel starting gear ring bolted on. The formula rating of the motor is 37 hp. Twin exhaust lines and mufflers are employed.

Force-Feed Oiling

Lubrication is by force-feed, with regulation by a safety valve which discharges excess pressure of oil on the spiral gears in front that drive the camshaft and fan. Within the crankcase sump is located a geared oil pump which is driven by a vertical inclosed shaft and spiral gears. The crankshaft is drilled with oil passages and the connecting-rods are provided with oil pipes which permit the oil to be forced to the crankshaft, connecting-rod and piston-pin bearings. A Mayo cellular radiator is used for cooling in conjunction with duplex centrifugal pumps.

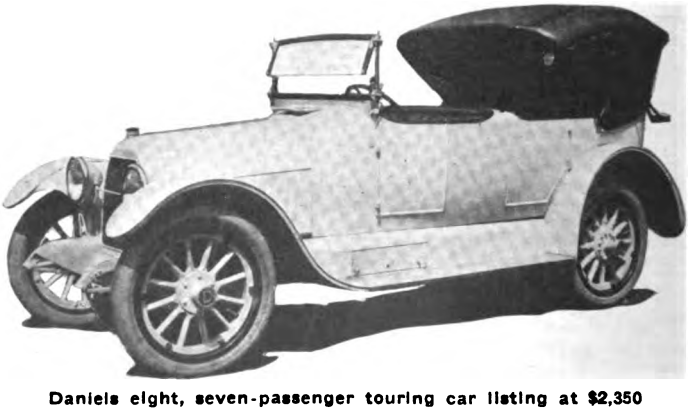
A 1¼-in. duplex Zenith carbureter is used with hot air intake and dash control for the strangler valve. Ignition is by the Westinghouse system in connection with a Willard 6-volt, 100 amp.-hr. battery, the interrupter being so constructed that the period of contact is practically the same at all speeds. The Westinghouse starter is also a feature in conjunction with a Bendix gear. The Westinghouse 6-volt generator for lighting and battery charging is driven by a cross shaft and spiral gears at the front of the motor. A vacuum fuel feed system is employed, the main tank having a capacity of 20 gal.

The three-speed Brown-Lipe gearset is secured to the motor by a bell housing, a multiple-disk, dry-plate clutch operating on ball bearings being used. The propeller shaft is equipped with a double universal designed to eliminate whip at highest speed. Drive is taken through the rear springs and torque through a torsion arm. Alloy steel, semi-elliptic springs are used, the rear ones being 2½-in. wide and slung under the axle.

Three-Quarter Floating Axle

A three-quarter floating rear axle is used, the shaft itself being of large diameter and the housing of pressed steel, other features of its construction being tapered roller bearings and spiral bevel gears. Brakes are of the conventional internal-expanding and external-contracting type, the drums being 15 in. in diameter.

Streamline design characterizes the body which has a double cowl finished with a heavy mahogany garnish around the top. Battery and tool boxes are set in the sides of the splash shields. With complete equipment the car sells for $2,350.



Daniels eight, seven-passenger touring car listing at $2,350

The Automobile

PUBLISHED WEEKLY
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Vol. XXXIII Thursday, October 21, 1915 No. 17

THE CLASS JOURNAL COMPANY
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Long Distance Telephone ---------- 2046 Bryant, New York

SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Mid-West Section

BY organizing a Mid-West section of the Society of Automobile Engineers, which will embrace not only Chicago but such Mid-West cities as Milwaukee with more than fifty-seven members of the society, Moline, Davenport, Rock Island, Kenosha, Racine, Peoria, Aurora, Rockford, Whiting, Ind., the great gasoline center, and Gary, Indiana Harbor, South Chicago and Waukegan, the great steel centers, a broader scope has been given to the society, which will unquestionably prove of peculiar value within the next year or so. By christening it the Mid-West section this latest baby has set a new example in section organization, and has demonstrated how it will be possible to extend the influence of the society and make it more of a living organism in places too small to support a section, than it has been heretofore.

The big, broad gage conceptions of Chicago and the Middle West are ideally set forth in this new thought, and instead of holding all of the meetings in Chicago, by holding some in Milwaukee and perhaps others in Racine or Kenosha, it will be possible to open new vistas of opportunity. Essentially the Mid-West section is going to make practical meetings and demonstrations a major part of its program. It will be disappointing if the "I Will" spirit of the Middle West does not achieve marked success in this new phase of section policy.

The Front Fender Fallacy

NEW YORK CITY is being introduced to a front-wheel fender campaign for motor trucks and automobiles in which it is apparently pre-supposed by many of the city officials that the front-wheel fender on trucks and passenger cars is going to eliminate accidents, whereas statistics show that the front-wheel fender is not so great a necessity as the rear-wheel guard or fender. More pedestrians are run over with the rear wheels than by front ones, many of these accidents being due to pedestrians walking into the side of vehicles, the fault resting with the pedestrian rather than the truck.

It is doubtful if the front-wheel fender would be of any value to prevent pedestrians being run over by the front wheels because coroner reports from some of our largest cities show that where pedestrians are struck by the front end of a truck or passenger car that death generally results from concussion of the brain due to the force of striking the pavement, and that quite frequently the wheels do not pass over the victim.

Exports 5 Per Cent

AUTOMOBILE securities should not be classed as war stocks. The remarkable increases in value of some of them are not due to any great war business, but to general prosperity at home. Whereas, Bethlehem steel is strictly a war stock, General Motors, which has had nearly as sensational a rise, is not a war stock, for the company has not sold a single dollar's worth of war material from any of its plants in this country; according to an authoritative statement.

The enormous automobile business now being enjoyed is not due to the war. For the fiscal year ending with June of this year, the country had produced automobiles and trucks to the value of $525,000,000. During that time the records show that some $60,000,000 of automobiles and trucks were exported. This means that only about 10 per cent of the total business done in automobiles in this country was on an export basis. More than half these exports of gasoline vehicles were trucks, so that the quantity of passenger cars sent out of the country was not over 5 per cent.

Electric Progress

THE convention of electrical men interested in all angles of electric vehicle usage again shows, if indeed such demonstration were needed, that the electric field has much room for development. The electric taxicab has many points of advantage and Detroit's example may reasonably be followed by other cities. That electric vehicles have never been popular in European towns is due mainly to lack of interest on the part of central station men. In America better storage batteries, better vehicles and improved charging facilities are consolidating the electric's position and guaranteeing its permanence as a factor in national life.

Huff Chief Engineer for Dodge

Next President of S.A.E. Had Been With Packard Since Early Days

DETROIT, MICH., Oct. 19—Beginning Nov. 1, Russell Huff, consulting engineer of the Packard Motor Car Co. becomes chief engineer of Dodge Brothers. Almost from the time the first Packard car was brought out, Huff has been connected with Packard development. He was the right-hand man, from the engineering end, of S. J. W. Packard, when the latter was making his first cars in Warren, Ohio, about 1900. Ever since he has been one of the big engineers, not only of the Packard organization, but of the country. He is to be the next President of the Society of Automobile Engineers.

Biddle Co. Enters Field

PHILADELPHIA, PA., Oct. 18—The Biddle Motor Car Co., which has been newly formed, is preparing to place on the market a line of four cars, two of which are now ready. These are a touring car to sell for $1,880 and a roadster at $1,700. The third will be a town car, to sell at $3,000, and the fourth a car of the same type and equipped with a Duesenberg motor. The present chassis is designated series D and is equipped with a three-point suspended Buda unit power plant, with four cylinders, 3¾ by 5⅛. Ignition, lighting and starting are Westinghouse and fuel is fed from a Stewart vacuum tank. The wheelbase is 120 in. and tires are 32 by 4.

Phelps Dodge Advertising Director

DETROIT, MICH., Oct. 19—George H. Phelps who has been assistant to George C. Hubbs, assistant general sales manager of Dodge Bros. has been appointed director of advertising. He will have charge of all matters concerning the advertising department and also of sales promotion work.

Davenport Off for Europe

DETROIT, MICH., Oct. 16—E. W. Davenport, export manager of the Maxwell Motor Co. is en route for Europe to look after Maxwell business in Great Britain and on the continent.

Lee Counselman Re-enters Field

DETROIT, MICH., Oct. 18—After nearly one year of retirement from activities, Lee Counselman, who in November, 1914, retired from the Chalmers Motor Co. as first vice-president and general manager of the company, has now re-entered the active world and has become associated with J. T. H. Mitchell, Inc., advertising agents, with offices in New York and Chicago. He will be with the Eastern headquarters, which are at 8 West Fortieth Street, New York.

Mr. Counselman, is well known in the industrial world, and more particularly in the automobile industry, having been connected for seven years with the Chalmers Motor Co.

Paul Smith Chalmers V.-P.

DETROIT, MICH., Oct. 15—The board of directors of the Chalmers Motor Co. to-day elected Paul Smith one of the vice-presidents of the company, to fill the vacancy left through the retirement from the concern of Lee E. Olwell.

Mr. Smith has been with the Chalmers company since last June, when he joined in the capacity of sales manager and was also given charge of the service department. He was formerly sales manager of the old E-M-F and Lozier companies, and last year started in business for himself on the Pacific Coast.

Harrison Resigns from Chalmers

DETROIT, MICH., Oct. 14—H. R. Harrison has resigned as advertising manager of the Chalmers Motor Co. and has been succeeded by Gail Murphy, formerly with the Art Metal Construction Co., Jamestown, N. Y.

$2,200,972 in Cars and Trucks Shipped First Week of October

NEW YORK CITY, Oct. 20—Heavy increases in the shipments of automobiles and trucks to European ports are shown in a detailed comparative statement showing the values of the respective commodities shipped out of the port of New York for the week ending Oct. 9, 1915, issued yesterday by the foreign trade department of the National City Bank. The statement shows that the total shipment of cars and trucks was over thirteen times that made in the same week of 1914, the respective figures being $2,200,972 against $161,174. The 1915 figure consists of $1,017,647 in passenger cars and $1,183,325 in trucks.

The greater part of these shipments were destined to English ports, with France second in order and Italy third.

Scripps-Booth Price Unchanged

DETROIT, MICH., Oct. 18—In an announcement just made by the Scripps-Booth Co., manufacturers of the Scripps-Booth roadster, it is stated that there will be no reduction in price for 1916.

Car Factory for Rochester

CINCINNATI, OHIO, Oct. 16—A new automobile company, being formed by Harry C. Ebert, formerly with the Cincinnati Car Co., and a group of local capitalists. will build a factory at Rochester, N. Y.

Importers' Salon Jan. 3-9

Number of Exhibitors at Hotel Astor Expected To Be as Large as Last Year

NEW YORK CITY, Oct. 20—The Automobile Salon in which several makes of foreign-made cars will be put on exhibition, will be held Jan. 3-9 in the Grand Ball Room of the Hotel Astor as heretofore.

The 1916 Salon will be conducted as usual by the Automobile Importers' Alliance, of which E. Lascaris is president; T. E. Adams, vice-president, and S. J. Kjeldsen, secretary. Mr. Kjeldsen will again manage this exhibition.

It is expected that the number of exhibitors will be on a par with last year's event which had nine foreign car manufacturers, three body builders, three tire makers and two American car makers. Allotment of space will be made in about ten days.

To Build Gersix Truck

PORTLAND, ORE., Oct. 18—The Gersix Co. which is headed by Edward E. Gerlinger, and which will produce an assembled truck rated at 2½ tons capacity and selling for $2,500, has secured a lease on the building formerly occupied by the Pierce-Arrow dealer, a two-story brick structure at East Third and Oregon Streets. A feature of the truck will be a six-cylinder Buda motor. It is stated that during the past week, orders for equipment totalling $175,000 and including 100 sets of Westinghouse starting and lighting apparatus, 100 Buda motors and a quantity of Sheldon worm gears and axles have been placed. In addition to assembling trucks, the company will also rebuild and sell used trucks.

Larrabee-Deyo to Build Two-Ton Trucks

BINGHAMTON, N. Y., Oct. 15—A new concern known as the Larrabee-Deyo Motor Truck Co., has been incorporated in this city with a capital of $80,000 for the manufacture of 2-ton trucks. This company is practically a re-incorporation of the Sturtevant-Larrabee Co., which has made wagons and sleighs in this city for the past forty years. The manufacture of the trucks will start at once.

Brown Joins Perfection Spring

DETROIT, MICH., Oct. 15—Ralph Brown, who was chief engineer of the Keeton Motor Car Co., and also the American Voiturette Co., later joining the engineering force of the Hupp Motor Car Co., is now a member of the engineering force of the Perfection Spring Co.

Page New Departure President

Elected by Directors to Succeed A. F. Rockwell, Founder of Company

BRISTOL, CONN., Oct. 19—*Special Telegram*—DeWitt Page was elected president of the New Departure Mfg. Co. of this city as successor to Albert F. Rockwell, founder of the concern, at a meeting of the board of directors held here late this afternoon. Mr. Rockwell retains his interest in the company but retires from its active management.

Houghton Enters Truck Field

MARION, OHIO, Oct. 16—The Houghton Sulky Co., this city, announces that it will start building 1-ton trucks, which will be designed principally for delivery purposes. It is to be known as the Houghton truck and the first of the trucks will be on the market about the first of the year. L. R. Wottering is the engineer in charge of the designing department.

The truck will be equipped with a four-cylinder motor developing 22 hp. It will have three speeds forward and a floating rear axle especially constructed to take care of overloads. The wheelbase will be longer than on most light trucks.

Republic Rubber Makes Changes

YOUNGSTOWN, OHIO, Oct. 15—As a result of certain changes recently effective in the working organization of the Republic Rubber Co., L. T. Peterson, first vice-president of the company, takes charge of all factory operation; A. H. Harris will occupy the position of manager of works and W. D. Morris takes charge of all tire departments.

During the month of September the company's output of tires exceeded by more than three times its similar output during September of last year. The output of this department during each of the three preceding months was more than double what it was during the same months of 1914. The production during October, up to this date, has exceeded anything in the history of the company.

Adult Must Accompany Child Driver

MADISON, WIS., Oct. 16—Accompanied by an adult person, whether or not such adult is competent to run an automobile, a sixteen-year-old boy or girl, or one younger, may run an automobile on the public highways of this State, according to an opinion recently given by Attorney General Owen to District Attorney G. H. Putman of Waupaca county.

The question arose over interpretation of the law which provides that no person under sixteen years of age, unaccompanied by guardian or other adult person, shall be permitted to ride or drive an automobile upon the public highways.

Attorney General Owen says there can be no other construction than that intended by the Legislature. The presence of an adult person, he states, would act as a deterrent of reckless driving or speeding and that it makes no difference who the adult person is or what his or her ability to drive an automobile.

Klingensmith Succeeds Couzens Nov. 1

DETROIT, MICH., Oct. 14—Frank L. Klingensmith, will, beginning Nov. 1, occupy the chair left vacant by the withdrawal from the Ford Motor Co. of James Couzens, who, as was reported briefly in last week's issue of THE AUTOMOBILE was vice-president, treasurer and general manager of the Ford Motor Co.

Mr. Klingensmith is at present secretary of the company. This position he will relinquish and Henry Ford's son, Edsel B, a young man of less than 24, will become secretary of one of the biggest and most prosperous industrial organizations in the world.

It might be added that about twelve or fourteen years ago Mr. Klingensmith was receiving $10 or $12 a week.

Couzens Out of Canadian Ford

FORD, ONT., Oct. 15—The resignation of James Couzens as vice-president of the Ford Motor Co., Detroit, also means his retirement from the Ford Motor Co. of Canada, Ltd., of which he was also vice-president. He has been succeeded by Gordon M. McGregor, who has been secretary, treasurer and general manager of the company and who will continue to act as treasurer and general manager, while assistant manager W. R. Campbell has been promoted secretary.

To Abolish Wheel Tax

LINCOLN, ILL., Oct. 16—Lincoln will shortly abolish the offensive wheel tax which requires all automobile owners to pay a city tax as well as one to the State. The city council this week received a petition with 1000 names, asking that the ordinance be repealed and as the sentiment is so strong in this direction, the council will act in accordance.

Sterling Auto Mfg. Co. to Exhibit

NEW YORK CITY, Oct. 18—In the list of exhibitors for the New York and Chicago shows appearing in THE AUTOMOBILE last week appears the name of the Sterling Motor Car Co., Brockton, Mass. This should have been the Sterling Auto Mfg. Co., New York City.

Stutz Quits Racing Indefinitely

Retires After 5 Years of Successful Competition on Road and Track

INDIANAPOLIS, IND., Oct. 17—After five years in road and track races, the Stutz Motor Car Co. has announced through its President Harry C. Stutz that it will quit the racing game indefinitely. In an interview Mr. Stutz stated that the company may quit for six months and then again it may be out of the game six years, or forever, depending on future developments.

Burman in Blitzen Benz to Try for Records at Sheepshead

NEW YORK CITY, Oct. 15—Harry S. Harkness has bought the Blitzen Benz from S. A. Fletcher of Indianapolis. Bob Burman, its driver in the Ormond Beach record trials, will pilot it at the Sheepshead Bay Speedway on Election Day, where he will attempt to set up new records for a circular course.

Ward Special Averages 70 Miles Daily

CLEVELAND, OHIO, Oct. 15—The Ward Special which left the New York Electrical Show at its opening bound for this city, arrived here to-night. The distance traveled between New York and Dunkirk was 554.6 miles, a daily average of almost 70 miles. Erie was reached Thursday night and the noon stop yesterday was made at Ashtabula, where the battery was given an hour's boost.

Atlas Forge to Add

LANSING, MICH., Oct. 16—The plant of the Atlas Drop Forge Co. is to be considerably enlarged, the stockholders having approved a contemplated expenditure of $40,000 to $50,000 to that effect. The present force of 140 men is to be doubled. At a recent meeting of the stockholders a 10 per cent cash dividend on the company's capital stock of $200,000 was declared.

Puritan Machine Gets Owen

DETROIT, MICH., Oct. 18—The Puritan Machine Co., which recently purchased the stock and parts of the Havers Motor Car Co., Port Huron, has just taken over the stock, and parts of the Owen Motor Car Co.

Splitdorf Gets Foreign Contracts

NEWARK, N. J., Oct. 16—The Splitdorf Electrical Co., this city, has received contracts for equipment for its Dixie magneto for the English Daimler, the Italian Fiat and Isotta, and the Renault.

E. V. A. A. Holds Successful Convention

Many Subjects Discussed—Get-Together Between Electric Vehicle Makers and Central Station Interests Advocated—Over 200 Present

CLEVELAND, OHIO, Oct. 18—Two hundred electric vehicle manufacturers, central station men and others representing allied branches of the Electric Vehicle Industry, are here to-day at the opening of the sixth annual convention of the Electric Vehicle Association of America, at which the keynote was the marked improvement in the co-operation between the vehicle makers and the central station people, with a view to a more general use of electrics in all kinds of service. The electric interests have all come to realize that they are not obtaining the recognition which the performance, economy and general utility of electric cars deserves, and the convention evidently intends to get at the root of the trouble and to rectify it at once.

Co-operation Wanted

Nearly every speaker of the day mentioned this co-operation in one way or another, and they were practically unanimous in their belief that this is the salvation of the business. Station men and makers must get together for their mutual benefit: It is still largely a question as to how far one faction must go in its assistance of the other.

Undoubtedly the most interest to-day centered around the talk by George H. Kelly, (Baker, R. and L. Co.) on the problems the electric vehicle industry is facing and how they may be met, and also the report by Chairman Walter H. Johnson of the central station co-operation committee, the remarks of both men being allied in that they struck the same sympathetic note of co-operation. Mr. Johnson's remarks were recommended for circulation throughout the country because they represent so well the views of the gathering.

It was the sentiment that central stations should maintain electric vehicle departments and use electrics wherever possible, although it is inadvisable to try to make them use such cars when other types of vehicles obviously pay better. It was brought out that the only way to make the co-operative idea pay is to reach the central stations which have not already been brought into line.

Progress Made in 1915

Mr. Kelly said that the past year has shown marked development in the co-operation between the different branches of the industry, but the two great problems are the creating of electric car demand, and how to care for the cars after they are sold. He said, that the electric car answers the service demands of 99 per cent of the people in cities, as it has greater speed than any city will permit, and its mileage possibilities are more than any one wants. These are the two big features on which the public must be educated and convinced. The tremendous problem, he said, is how to show the pubilc of what the electric is actually capable. First the electric vehicle people must sell themselves on the merits of the cars, and then the rest will follow.

Electric Taxicabs Coming

The electric taxicab received a great deal of interest, Mr. Kelly predicting, that in five years it will have completely displaced the gasoline type. I. S. Scrimger, Detroit Taxicab & Transfer Co., which is the pioneer in this field, gave some information regarding the successful operation of such vehicles, and the interest shown may be taken as most significant of the development that is to come.

Two cars are here after long cross-country runs, demonstrating that electrics can be run long distances. The Ward electric successfully made the 740-mile run from New York without mishap, and one of the Detroit taxicabs was driven from Detroit.

1916 Officers Appointed

CLEVELAND, OHIO, Oct. 19—Business sessions of the Convention were closed following the election of officers for the ensuing year. These will be as follows:

President, W. H. Johnson, Philadelphia Electric Co., Philadelphia; vice-president, E. S. Mansfield, Edison Electric Illuminating Co., Boston; treasurer, H. M. Edwards, New York Edison Co. Directors, W. H. Blood, Jr., Stone & Webster, Boston; P. D. Wagoner, General Vehicle Co., Long Island City; G. H. Kelly, Baker R. & L. Co.; J. F. Gilchrist, Commonwealth Edison Co., Chicago.

The incoming administration is therefore represented by four central-station men and two vehicle manufacturers. The attendance was over one-fourth central-station representatives and one-seventh car manufacturers. The keynote of to-day's business was the favorable reception of an invitation given by E. A. Lloyd, president of the National Electric Lamp Association, for co-operation with that body with possible future affiliation as the result. The discussion Tuesday emphasized the fallacy of trying to sell electric trucks for service better adapted to other types of vehicles, and the central station was designated as the most valuable influence in persuading municipalities to adopt electric vehicles. There was considerable interest in the new battery rental schemes that are coming into vogue, many seeing in this movement a helpful factor in relegating the most annoying battery worries to the discard.

Of the papers presented to the meeting all had special interest for different classes of membership, and two which bear particularly on the manufacturing end of the automobile industry are reprinted in but slightly abridged form below.

Why Electric Taxicabs Should Succeed

By I. S. Scrimger

Electric taxicabs were first considered by the Detroit Taxicab & Transfer company about two years ago, although, personally, I had considered the matter two years prior to the time my company took the proposition up.

I think everyone in the taxicab business will bear me out when I say that the life of a well made gasoline car in a hard service, such as the taxicab business is, could not be much over five years at the outside. My judgment is that a gasoline car to perform satisfactorily will cost $2,000 to $2,500. Using the five-year period as the maximum as the life of the gas car, it means that a taxicab company is replacing their equipment every five years.

In Detroit, we get 70 cents for our first mile and 40 cents for each additional mile; single tariff meters being used. In other words, it doesn't make any difference as to the number of passengers carried, whether one or four—the capacity of the cab—the rate is the same. Comparative figures between the Detroit Taxicab & Transfer Company and other companies in the United States show that the cost of operation per mile is between 30 and 35 cents. Taking the 30 cents per mile cost as the basis for figuring, if a cab covers 2 miles we receive $1.10. If the cab returns empty, we have covered a distance of 4 miles for

which we have received $1.10. The cost per mile being 30 cents shows that we have lost on this run, and the history of the taxicab business throughout the United States is that from 40 to 50 per cent of our distances covered are empty mileage. The revenue obtained from service rendered in Detroit is about 33 cents a mile. You will, therefore, see that very little profit is to be made with an expense of between 30 and 35 cents a mile and an income of 33 cents a mile. It, therefore, became necessary that we obtain equipment that could be operated more cheaply than gasoline cabs.

First Cab Successful

About two years ago, we decided to build one electric cab as an experiment, and the president of this company and myself consulted with the manufacturers of electric vehicles in Detroit, but they were all too busy to give us much thought, and claimed they could do nothing for us unless we were willing to accept the chassis for the pleasure car they were building. The taxicab business being a commercial business, we could see how a pleasure electric car could be made to serve our purpose. We, therefore, were compelled to build our first car. This we did under the supervision of our engineer, Mr. W. J. Behn. Our first car was placed in service at the Hotel Ponchartrain at 2 o'clcock in the afternoon, June 25, 1914, and up to the present time has been in continuous service about a year and three months. No advertising was done, nor an announcement of any kind made when this cab went into service. We thought it best to start the electric service, and allow the public to judge whether or not the electric cab would meet all requirements. It was only a short time when we commenced to receive letters of approval, and the cab met with such a signal success that we decided to build eleven more. These additional eleven electric cabs went into service last December and January, and have, therefore, been in service about eight months. We are just completing fifteen additional electric cabs, which will be completed between now and the 15th of October, and we have twenty more under way, which will be in service about the 1st of January. This will give us an equipment of forty-seven electric cabs.

Cab Field Neglected

It seems to me that the manufacturers of electric vehicles have not kept pace with the manufacturers of gasoline vehicles. I mean by this that the public demand better mileage and better looking cars than those that are now in service throughout the country. One of the first questions we are asked is—how many miles can you get on ane charge, and then—how fast will they go?

All of our twelve cabs now in service are being operated 24 hr. a day with two drivers; each man working 12 hr. To enable us to operate our electric cabs 24 hr. a day, we have had installed at the edge of the sidewalk at the Hotels Statler, Tuller, Griswold House, and Ponchartrain charging boxes, and our cabs, while standing idle, are on charge. The Edison Illuminating Company of Detroit have co-operated with us in every way possible, and has given us power wherever it was possible to do so.

We feel that we have constructed for our service a thoroughly up-to-date, practical electric taxicab. Some eight years' experience with the gasoline car taught us the weak points of the gas car, and we have tried to overcome them with our new construction.

Our cab has a 121-in. wheelbase, and the interior of the cab body proper has a space about 68 in. long and about 50 in. wide, which you will see enables us to carry from four to five passengers very comfortably. Our experience taught us that the limousine type of body was preferable to the landaulet type, and could be operated with less expense. We are using Silvertown Goodrich pneumatic tires, and have already made a wonderful mileage showing with these tires.

In conclusion, our operating cost per mile up to the present time has not exceeded 20 cents a mile. This cost includes drivers' wages, overhead, tire expense, garage expense, depreciation and every expense in fact which is incidental to the operation of the taxicab business. The only point on which we are uncertain is the life of the car. We feel that the car has been so well made that we may be able to depreciate this car over a period of ten years. This, of course, is a problem which time alone will tell whether or not we are correct.

Performance of Gas and Electric Trucks

By William J. Miller and Stephen G. Thompson

One of the many favorable arguments advanced by the electric vehicle salesman in his efforts to combat the more popular gasoline machine has been that in its field of application this type of vehicle can accomplish practically as much in a day as can the higher speed gasoline machine, and do so at a less cost.

This paper is compiled with the purpose of developing the statement from one of theoretical assumption to one of scientific fact substantiated by practical demonstration; and to do this clearly, recourse to several charts has been made, which not only makes for brevity in the paper itself but has the advantage of concise presentation.

In pursuing this argument several factors must first be ascertained, and their relation to the subject as a whole weighed to determine all the contributory causes for the existence of the belief at all. Of these factors the important ones are:

1. The speed of acceleration and of deceleration of the gasoline machine;
2. The speed of acceleration and of deceleration of the electric machine;
3. The probable frequency of stops expressed in stops per mile;
4. The effect of other traffic on the highway as it relates to stops and speeds;
5. The total time available for running the vehicle.

This last is so important that it might be the determining factor in deciding whether to use power wagons at all, because with a relatively high standing time the advantages of power wagon operation over those of horse-drawn vehicles entirely disappear, as the proportion of the day when the machine is running is insufficient to make an appreciable reduction in the total running time; hence the machine can do no more work.

Now, returning to the several factors bearing upon the subject in hand, the first two, relative to the speed of acceleration and deceleration of the gasoline and electric machines, are shown in the following:

TABLE I

Elapsed Time in Seconds	Speed M.P.H.		Total Distance Traveled (ft.)	
	Gas	Elec.	Gas	Elec.
1.....	1.5	2.5	1.10	1.84
2.....	2.0	4.2	4.40	6.98
3.....	4.4	5.4	10.03	14.33
4.....	4.4	6.0	16.79	22.78
5.....	5.0	6.6	23.84	32.04
6.....	5.6	7.2	31.63	42.33
7.....	6.8	7.6	40.59	53.35
8.....	8.4	8.0	51.61	64.81
9.....	9.0	—	64.39	——
10.....	8.8	—	77.43	——
11.....	8.5	—	90.10	——
12.....	9.6	—	103.51	——
13.....	10.6	—	118.79	——
14.....	11.2	—	134.96	——
15.....	11.5	—	151.79	——
16.....	11.8	—	168.91	——
16 2-5...	12.0	—	186.50	——

This shows a series of observations on the acceleration and deceleration of gasoline and electric trucks of equal load capacity and quality made under identical operating conditions, the gasoline vehicle, however, having a speed capacity of 50 per cent in excess of that of the electric.

It will be observed that for the first eight seconds of acceleration the speed of the electric machine exceeds that of the gasoline, at which time it has reached its maximum, and that the acceleration of the gasoline machine to a speed 50 per cent higher than that attained at this point requires practically the same time in seconds, the elapsed time, speeds in miles per hour and distance traveled for each type of machine being as follows:

Table II. is a record of a series of observations on a delivery service in a city

of 750,000 inhabitants and the surrounding towns, operating within a radius of 15 miles of the business center.

For purposes of segregation the statistics are charted in zones according to the mean distance from the delivery route to the store. The mean distance is one-half the sum of the distance from the store to the first delivery stop and from the last delivery stop returning to the store. The characteristics of the zones may be given as follows:

Zone 1—Business and city residential apartment house sections;

Zone 2—Residential apartment houses and flat sections;

Zone 3—3-apartment flat sections and private houses;

Zone 4—Private houses in suburban towns.

This Table II. requires close analysis, as in it is contained the factors controlling the operation of a delivery system and limiting the movement of the vehicles employed. These factors are here emphasized, as they are those usually overlooked in the ordinary course of power wagon application; and because they are overlooked the popularity of the gasoline machine sways the buyer toward it regardless of the practicability of its application.

These important contributory factors are enumerated in the title heads of the table, and establish the following:

1. Probable average stops per mile:
   Zone 1.....6 Zone 3.....5
   Zone 2.....7 Zone 4.....4

2. Time elements in proportion to the total consumed, as follows:

Time running on route..... 29.86 per cent
Time running off route..... 17.76 per cent
Time delivering..... 28.18 per cent
Time loading ..... 24.20 per cent

3. Relative values of the "miles off route" and the "miles on route" 36 per cent and 64 per cent respectively.

With all of this accumulated data, we have established the factors affecting the speed of movement as it relates to the total day's work performance of gasoline or electric machine, and by applying these to the different zones the efficiency of the two types of vehicles may be determined. Therefore, if we resolve all these factors to a comparative basis we will find that for equal work performance the gasoline machine will but slightly excel the electric, which difference is of little consequence when the time-saving effected is properly segregated into the different time elements of a 9-hr. day. For example, on the basis of the calculations in Table II, the time elements in a 9-hr. day would be as follows:

Time running on route... 2 hours 41 minutes
Time running off route... 1 hour 36 minutes
Time delivering..... 2 hours 32 minutes
Time loading ..... 2 hours 11 minutes

Of these only the first two are affected by the relative speeds of the machines, the first being partially governed by the frequency of stops and the second by the speed capacity of the machine.

On an average basis of six stops per mile and a daily work performance equal to that possible with the electric vehicle, deductions based upon the facts as presented in Tables I. and II. would determine the daily saving of gasoline machine over electric to be 73 min., which for increased performance must be segregated into the time elements as follows:

Time running on route..... 21.80 minutes
Time running off route..... 12.96 minutes
Time delivering..... 20.57 minutes
Time loading..... 17.67 minutes

It will be seen that all of the foregoing is based upon unimpeded traffic when the machines are able to reach their maximum speed between stops and when running off route. Now if we qualify these figures with a consideration of the effect of traffic stops and slow-moving traffic, we then find that this apparently increased efficiency of the gasoline machine will almost entirely disappear. For proof of this we have the record of 100 days' observation of two gasoline and two electric trucks of equal capacity operating in the service of the Central Stamping Company between Newark, N. J., and New York City. Here it was found that the gasoline machines could attain an average of only 58 per cent of its maximum speed, while the electric maintained 72 per cent of its maximum possible speed. Expressed in miles per hour, this amounted to 6.1 miles for the gasoline machine and 5.8 miles for the electric.

The value of this increased speed, or, for that matter, the increased efficiency as deducted in our calculations, is rather questionable when the cost of obtaining it is considered.

Table II

	Mean distance to route	No. of stops	Miles on route	Miles off route		Approx. stops per mile on route	Time factors					
							Running		Del'y min.	Load min.	Total	
				Out	In		On route min.	Off route min.			Hr.	min.
Zone 1	0.4	9	1.0	0.5	0.3	9.0	9.5	6.5	19.0	35	1	10
	0.45	20	4.3	0.6	0.3	5.0	42.0	14.0	39.0	34	2	9
	0.45	29	6.1	0.7	0.2	4.9	42.0	15.0	32.0	43	2	12
	0.5	23	4.3	0.7	0.4	5.0	35.0	15.0	46.0	53	2	29
	0.6	25	3.3	0.7	0.6	8.0	41.5	10.0	26.5	31	1	49
	0.6	21	3.75	0.6	0.6	6.0	27.0	9.0	34.0	69	2	19
	0.6	7	2.1	0.8	0.4	3.0	11.0	6.0	7.0	6		30
	0.7	11	2.5	1.1	0.4	4.4	18.0	18.0	18.0	50	1	44
	0.8	17	3.4	1.1	0.5	5.0	23.0	17.0	31.0	43	1	54
	0.85	24	3.1	1.1	0.6	8.0	38.0	23.0	48.0	38	2	27
	0.9	36	3.9	0.4	1.4	9.0	34.0	13.0	57.0	47	2	31
Zone 2	1.0	16	3.5	1.8	0.2	4.5	32.0	13.0	13.0	46	1	44
	1.0	50	8.0	1.0	1.0	6.0	93.0	35.0	111.0	30	4	29
	1.0	23	3.5	1.5	0.6	7.0	27.0	23.0	77.0	29	2	36
	1.1	40	9.0	1.0	1.3	4.5	76.0	34.0	46.0	64	3	40
	1.1	45	7.3	1.1	1.2	6.0	68.0	24.0	48.0	65	3	25
	1.1	22	3.3	1.5	0.8	6.6	25.0	18.0	33.0	44	2	
	1.1	25	2.2	1.1	1.2	11.0	27.0	24.0	48.0	44	2	23
	1.1	21	3.8	0.9	1.4	5.5	34.0	15.0	39.0	34	2	02
	1.1	20	4.0	1.7	0.6	5.0	38.0	21.0	57.0	58	2	54
	1.4	37	5.9	1.1	1.7	6.0	55.0	31.0	55.0	49	3	10
	1.6	26	5.1	0.7	2.5	5.0	28.0	31.0	41.0	46	2	26
	1.7	46	7.7	1.9	1.6	6.0	72.0	33.0	56.0	34	3	15
	1.7	30	2.4	1.6	1.8	12.5	25.0	26.0	39.0	44	2	14
	1.8	71	20.6	1.9	1.8	3.5	181.0	98.0	142.0	22	7	23
	1.9	35	3.7	3.2	0.7	9.3	30.0	27.0	43.0	52	2	32
	1.9	43	7.4	2.2	1.7	6.0	62.0	36.0	64.0	83	4	05
	1.9	42	7.0	2.2	1.7	6.0	59.0	34.0	85.0	77	4	15
Zone 3	2.0	31	8.0	1.9	2.1	4.0	64.0	38.0	34.0	25	2	41
	2.0	24	8.5	3.1	1.0	3.0	86.0	39.0	79.0	42	4	06
	2.1	51	12.2	1.7	2.5	4.0	117.0	50.0	142.0	125	7	14
	2.1	32	4.9	2.2	2.0	7.0	39.0	43.0	55.0	40	2	57
	2.1	51	11.3	2.0	2.2	4.4	97.0	30.0	87.0	48	4	22
	2.2	40	5.6	2.0	2.5	8.0	53.0	46.0	52.0	59	3	30
	2.6	27	4.2	2.3	2.8	6.5	40.0	45.0	34.0	19	2	18
Zone 4	2.9	59	10.8	2.6	3.3	5.0	92.0	50.0	81.0	34	4	17
	3.0	29	4.5	2.1	3.9	7.0	55.0	47.0	34.0	51	3	07
	3.25	27	7.7	3.3	3.2	3.5	68.0	53.0	45.0	30	3	16
	3.3	43	8.2	3.3	3.3	5.2	80.0	59.0	51.0	60	4	10
	3.4	44	9.1	3.3	3.4	4.8	80.0	54.0	58.0	58	4	10
	3.7	26	5.3	3.6	3.8	5.0	50.0	58.0	36.0	77	3	41
	6.8	67	25.1	6.8	6.9	2.6	183.0	91.6	136.0	35	7	25
	8.5	53	19.6	7.2	9.9	2.7	131.0	108.0	69.0	43	5	51
		1418	287.15	82.1	80.3		2488.0	1480.5	2347.5	2016	138	52

Continental 100% Stock Dividend

Motor Co. Increases Capital —$500,000—Surplus $500,000 Over 1914

DETROIT, MICH., Oct. 20—*Special Telegram*—At a stockholders' meeting held yesterday it was decided that the capital stock of the Continental Motor Manufacturing Co. be increased $500,000 or to $2,900,000. A stock dividend of 100 per cent was declared. The surplus for the fiscal year ending June 30, was over $1,200,000 or $500,000 more than in 1914.

10,548 Cars in Spain

MADRID, SPAIN, Oct. 16—The total number of private automobiles registered in Spain on Jan. 1, 1915, was 10,548. The Province of Madrid led with 2405 registrations. The population of Spain is about 20,000,000, giving a car-to-population ratio of one in every 1896 people. These statistics serve to indicate a large field apparently practically untouched. This is brought out by comparison with the United States, where there are over 2,000,000 cars to 100,000,000 population.

No Gasoline on Sunday in Elizabeth City

ELIZABETH CITY, N. C., Oct. 15—Automobilists who travel to or through this city on Sundays will do well to investigate their supply of gasoline and lubricants; they will not be able to get these needed supplies on a Sunday. This has been decided by the Board of Aldermen which has passed an ordinance to that effect. The ordinance also applies to cigars, cigarettes and tobacco, and the only commodities which can now be purchased on the seventh day of the week, are, drugs, milk and ice cream.

Change in D. C. License Board

WASHINGTON, D. C., Oct. 16—The District of Columbia automobile board has ceased to be a separate branch of the local government and has been amalgamated with the license branch of the assessor's office. W. H. Coombs, license clerk, is designated as its secretary.

Wisconsin Cars Average $480 Value

MILWAUKEE, WIS., Oct. 16—The average value of automobiles in Wisconsin, according to the computation of the Wisconsin tax commission, is $480, compared with a valuation of $635.52 used in 1914. The greater number of cars now owned in the State is responsible for the decrease in average valuation. At the same time the average valution of a horse has decreased from $104.32 to $101.93; a cow, from $37.22 to $36.94; a hog from $12.69 to $10.58. At the decreased average valuation, the total valuation of motor vehicles, exclusive of motorcycles, has increased $4,887,152, and the grand total valuation of motor vehicles for the 1915 tax roll is $29,792,879. Only 66,847 motor vehicles of the 79,000 registered are actually assessed.

Bad Pavements Make Dimmers Hardship in Akron

AKRON, OHIO, Oct. 16—Following the police crusade against motorists who drive with undimmed or without lights, which resulted in the arrest of twenty-eight automobilists, directors of the Akron Automobile Club called a meeting to extend the co-operation of the club to the police in enforcing the ordinance.

In enforcing the dimmer ordinance, however, the club urged upon police the use of discretion in making arrests for, it was held, the streets of Akron are in such bad condition in many sections that lights stronger than 12-candlepower are needed in avoid accidents in passing over them.

Depreciation Table for Assessors

OLYMPIA, WASH., Oct. 12—To assist county assessors in valuing automobiles, the commission is suggesting the adoption of a uniform depreciation table. According to the table an automobile originally costing $500 has depreciated in value 10 per cent when first put in service, and is worth only $370 at the end of six months. For the second year its value is $320, for the third year $270, fourth year, $220 and fifth year, $170 and after five years $140. Similar rates of depreciation are adopted for cars of higher values.

Seventeen Cars Deliver Cleveland Mail

COLUMBUS, OHIO, Oct. 16—Seven automobiles replaced horse-drawn wagons in the transfer of mail to and from local railroad depots recently, when the new contract for this work went into affect. There are now seventeen automobiles engaged in carrying mails for the Columbus postoffice. But two single-horse wagons, delivering parcel post matter in the business district, are now used by the local postal department.

Postmaster Kinnear said the mails were out 30 min. earlier in the morning as the result of the difference in speed of the cars over the horses.

Hunt Stromberg Detroit Manager

DETROIT, MICH., Oct. 19—George H. Hunt, formerly connected with the offices of the Stromberg Motor Devices Co., Chicago, has been appointed manager of the Detroit branch.

25,000 in Safety First Federation

N. Y. Accidents Reduced 4790 in Nine Months Due to Society's Work

DETROIT, MICH., Oct. 19—At to-day's first session of the first annual convention of the Safety First Federation of America, after the introductory address by President Darwin P. Kingsley, who dwelt upon the subject of permanent world peace, the first annual report was read by Executive Secretary Frederick H. Elliott. It showed that the combined membership of the federation is now about 25,000. Statistics were read showing what the Safety First Society of New York had accomplished within the rather short period it has been in existence, one striking example given being that of the reduction in the non-fatal accidents in the streets of New York between Sept. 1, 1914, to May 31, 1915, during which period the new ordinance suggested by the society and which provides for near side stop for surface cars, has been in effect. During that time there were 4790 less non-fatal accidents than in a corresponding period before the ordinance went into effect.

Urges Examination of All Drivers

Harold W. Newman, commissioner of public safety of New Orleans, La., spoke on the subject, Necessity of Examining All Motor Vehicle Operators. He urged that not only be it compulsory for chauffeurs to be examined as to their fitness to operate an automobile, but said that it is just as important that every car owner and car purchaser should be compelled to undergo a thorough examination.

Furthermore, it is suggested by the speaker that only those who pass the examination successfully be permitted to drive a car. Such action should be country-wide.

Co-operation on Behalf of the Automobile Manufacturers was the subject of J. Walter Drake, president of the Hupp Motor Car Co., who spoke as the representative of the National Automobile Chamber of Commerce, Inc. The keynote of his talk was that what is and will always be most needed in the safety first movement as well as other campaigns for betterment, is education of the people rather than legislation.

Zimmerschied to Speak

To-morrow Karl W. Zimmerschied, chairman of the standards committee of the Society of Automobile Engineers, is scheduled to address the convention, his subject being: The Contribution of Automobile Engineers to the Movement for Public Safety.

Ford Surplus Gains $10,308,738.59 in 10 Months—$43,788,151.23 Cash on Hand

Fiscal Year Changed—Cash on Hand Increased $16,346,682.44 Over 1914—Total Assets Are $88,535,840.41, an Increase of $26,903,583.25 for Year

DETROIT, MICH., Oct. 14—The Ford Motor Co. during its 1915 fiscal year, which ended July 31, and extended over a period of only ten months, instead of twelve, as in 1914 and former business years, was able to set aside the extraordinarily large surplus of $59,135,770.66. This is an increase of $10,308,738.59 over the surplus at the end of 1914, $31,011,507.66 more than the surplus was in 1913 and an increase of $44,390,675.09 over the 1912 surplus.

Even more astonishing is the cash on hand or in banks, which totaled $43,788,151.23 at the end of last July, or ten months, while at the end of September, 1914, or for twelve months, the total was only $27,441,468.79 which means that in the ten months of the 1915 business year the cash increased by $16,346,682.44. In 1913 the cash balance was $13,225,710.82 and in 1912 it totaled $6,400,100.66.

The total assets for the past year amount to $88,535,840.41 or an increase of $26,903,583.25 over 1914. On the assumption that the fiscal year had been of twelve months instead of ten, the total assets might have reached the enormous sum of $103,291,814.41 and the surplus might have totaled $73,891,744.66.

$14,335,767.87 in Merchandise

Among the different items mentioned among the assets the biggest is that of merchandise, which means raw and finished materials or products, inventoried at cost. This account figures for $14,335,767.87 on the balance sheet, which is an increase of $5,051,318.61 over the total of 1914.

Buildings and building fixtures are next on the assets list with a total of $12,931,884.45 or an increase of $2,216,856 over the 1914 total. The factory equipment account shows an increase of nearly $950,000 for the past year while for machinery and power plant there is shown an increase of more than $1,800,000. Another big item is that of real estate, which now has passed the $3,100,000 mark, an increase of nearly one million over the total shown in 1914.

The biggest item listed under the liabilities is $15,000,000 being the buyers' profit-sharing reserve. This is in reality a part of the profits of the company, a part of the total surplus, which is being returned to the purchasers of Ford cars during the fiscal year because the Ford company announced at the beginning of the fiscal year 1915 that if 300,000 cars were sold during the year the buyers of these cars would receive a rebate of from $40 to $60 per car.

$15,000,000 in Rebates

Thus it might be said that the 1915 surplus was actually $74,135,770.66, but, after car No. 300,000 of the 1915 production had been sold, $15,000,000 of the year's surplus was no longer to be considered as such, and became a liability.

Other large items among the liabilities are those of accounts payable, which shows an increase of over $1,600,000 over the total of 1914; contract rebates, which more than doubled and contract deposits which show an increase of over $500,000 for the year. The reserve for depreciation of fixed assets also shows an increase of more than half a million.

The capital stock of the Ford company is still listed as $2,000,000 although it had been decided to increase it considerably.

Ford Company's Cash in Bank or at Hand Increase

Year	Total	Increase
1912	$6,400,100.66	.....
1913	13,225,710.82	$6,825,610.16
1914	27,441,468.79	14,215,757.97
1915	43,788,151.23	16,346,682.44

Ford Company's Surplus Increase

1912	$14,745,095.57	.....
1913	28,124,173.68	13,379,078.11
1914	48,827,032.07	20,702,858.39
1915	59,135,770.66	10,308,738.59

Ford Motor Co.'s Balance Sheet for 1912, 1913, 1914 and 1915

	1912	1913	1914	1915
ASSETS				
Cash on hand and in banks	$6,400,100.66	$13,225,710.82	$27,441,468.79	$43,788,151.23
Michigan municipal bonds at cost	1,075,051.48	1,283,943.59	1,330,546.84	1,311,924.10
Accounts receivable	230,912.17	448,233.93	3,233,582.73	2,300,456.42
Merchandise inventory at cost	6,629,533.83	9,046,171.68	9,284,449.26	14,335,767.87
Outside investments	7,772.04	7,433.32	9,200.00	9,200.00
Prepaid expenses	44,591.07	215,259.29	437,089.77	385,377.56
Real estate	820,636.97	1,540,483.42	2,227,567.88	3,148,263.01
Buildings and building fixtures	2,596,115.61	4,615,156.82	10,714,928.45	12,931,884.45
Factory equipment	371,110.90	676,589.49	1,661,155.23	2,606,356.06
Furniture and fixtures	58,059.39	77,357.60	105,263.95	328,497.30
Power plant and machinery	1,843,967.02	2,832,907.33	3,821,465.38	5,693,648.50
Tools	566,510.17	824,901.04	1,199,779.11	1,491,824.85
Patterns	66,884.06	92,710.13	105,992.30	142,998.22
Patents	51,793.96	57,224.27	59,767.47	61,472.84
Machinery, tools and equipment at branches	52,746.30	.....	.....	.....
Total	$20,815,785.63	$35,033,919.86	$61,632,257.16	$88,535,840.41
LIABILITIES				
Accounts payable, not due	$2,261,026.63	$3,049,586.86	$3,335,139.01	$4,947,805.81
Accrued pay rolls	149,166.45	191,940.70	537,489.70	428,907.14
Accrued salaries	12,327.45	24,169.30	44,229.95	341,814.16
Accrued expenses	178,766.10	266,119.43	218,140.50	463,111.47
Contract rebates	58,350.00	25,960.00	621,381.12	1,281,661.01
Contract deposits	.....	.....	1,452,622.82	1,968,844.89
Reserve for refunds to take care of reduction in price	75,000.00	.....	.....	.....
Reserve for employees' bonus	242,033.80	134,999.96	.....	.....
Reserve for bad debts	3,655.04	3,510.55	.....	.....
Reserve for depreciation of fixed assets	742,626.89	1,061,805.25	1,935,440.07	2,855,188.94
Reserve for depreciation of patents	51,793.96	57,224.27	59,767.47	61,472.84
Fire insurance reserve	11,900.40	34,059.63	43,934.45	51,263.49
Reserve for profit-sharing	.....	.....	2,557,080.00	15,000,000.00
Unearned profits—branches	284,043.34	60,370.23	.....	.....
Capital stock	2,000,000.00	2,000,000.00	2,000,000.00	2,000,000.00
Surplus	14,745,095.57	28,124,173.68	48,827,032.07	59,135,770.66
Total	$20,815,785.63	$35,033,919.86	$61,632,257.16	$88,535,840.41

*The 1915 statement represents the business for only ten months because last year it was decided to change the end of the fiscal year from Sept. 30 to July 31.

Canadian Ford 50% Dividend

FORD, ONT., Oct. 18—For the third time this year a cash dividend has been declared by the Ford Motor Co. of Canada, Ltd. This time it is of 50 per cent, while on the two previous occasions the dividend was 10 per cent cash. As the capital of the company is $1,000,000 it means $500,000 for the shareholders, this time, or $700,000 all told this year. Most of the stock is said to be held by Henry Ford.

Car for Every 25 Persons in New Jersey

TRENTON, N. J., Oct. 15—One person in every twenty-five in New Jersey owns an automobile or is licensed to drive a car, according to the records of the State Department of Motor Vehicles. Approximately 115,000 persons are licensed to operate. On an average 300 persons are examined every week in Newark.

Car Sales in Norway Good

INDIANAPOLIS, IND., Oct. 19—Alf Neilsen of Christiania, Norway, who has arrived in this country and is interested in the sale of automobiles in Norway as the representative of the Cole Motor Car

Co., states that business conditions in Norway are excellent, and have been so since the beginning of the war. Sweden also is prospering. Both countries have been exporting supplies of various kinds, but in the past few weeks the exportation of foodstuffs have been discontinued, as it is necessary for them to conserve their resources.

In the automobile field prospects are very bright. The country is large and the number of cars is extremely small in proportion to the population. In the entire country there are only 1200 cars in use, and 200 of these are trucks. With the increased prosperity of Norway there is no doubt but that the sale of automobiles is going to reach a high water mark this year.

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Bumper Wheat Crops Presage Good Sales in West

PORTLAND, ORE., Oct. 15—Bumper crops are reported in Eastern Washington and Eastern Oregon. The farmers of the great Inland Empire are inclined to hold their wheat for the high prices which were realized last year. Warehouses and granaries are fairly bursting with grain, but as soon as it begins to roll to market it is predicted there will be a stream of new automobiles rolling up the front yards of hundreds of farmers throughout eastern Oregon and eastern Washington, and in consequence the dealers located at Tacoma, Seattle, North Yakima, Spokane, Walla Walla and Pendleton, Idaho, are going to dispose of their entire allotment of cars.

The banks throughout that section are now much more favorable to the automobile industry than ever before for the reason that the automobile has become to be universally recognized as a necessity instead of merely a luxury, a necessity which is really more valuable to the out-of-town owner than to the city dweller.

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Automobile Sales in Oregon Increase

SALEM, ORE., Oct. 12—Some interesting figures have just been compiled by Secretary of State Olcott, relative to the number of motor vehicles, chauffeur and motor vehicle dealer registrations from Jan. 1 to Sept. 30, inclusive. The total number of motor vehicles was 22,998 for the period, indicating that there was heavy automobile buying, and that it was largely increased over the same period in 1914, when 16,121 motor vehicles were registered. Chauffeurs increased from 1719 to 3804 and dealers increased from 109 to 171.

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8600 Cars in Manitoba

WINNIPEG, MAN., Oct. 15—Manitoba is receiving upward of $100,000 this year from the automobile business. Licenses has already been issued for 8600 cars and probably 500 more applications will be filed.

100,000 Cars for Bay State

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Registrations at Rate of 150 a Day — 19,346 Gain Over 1914—2914 More Trucks

BOSTON, MASS., Oct. 15—Before October is ended there will have been registered in the Bay State more than 100,000 motor vehicles. E. J. O'Hara, who has charge of the registration department, stated to-day that with the numbers being issued at the rate of about 150 a day there was no question about the figures quoted being reached.

In the number of vehicles there were 19,346 more registered this year than for all of last year. For the same period the trucks show a gain of 2914, the makers and dealers 193, the licenses 12,216, the renewals 7452 and the examinations 1308.

Naturally the increase in receipts has been correspondingly large, totalling $234,011.55. Before the year ends the State will have added enough more to make the total at least $250,000 more than last year. One of the most significant items is the fact that there were 1308 more examinations to date than throughout all of 1914, for it shows that the Highway Commission is doing its utmost with the force available to see that operators of cars have some knowledge of handling the machines.

The Commission has just finished taking its triennial highway census throughout the State, but the figures will not be available for some time. The census for October began last Sunday and lasted for a full week. There were 209 people keeping tabs on the traffic of all kinds for the entire week.

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Churchward Leaves Gray & Davis

BOSTON, MASS., Oct. 19—Alexander Churchward, chief engineer of Gray & Davis, resigned Oct. 15. He will take a long vacation. It is stated that no change of policy will follow his resignation from the company.

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Shelley of Packard Returns

DETROIT, MICH., Oct. 17—J. G. Shelley, inspector of trucks for the Packard Motor Car Co., has returned to Detroit after a year spent in Petrograd.

"The motor manufacturer of the United States has won world-wide fame for the sheer honest worth of his product and that will have a tremendous effect after the war ends," Mr. Shelley says. "The developments of the past year abroad have demonstrated more forcibly than anything else could, how greatly the world must depend on gasoline these days and the showing of the vehicles from this country has made them the standard of the earth for heavy duty hauling."

Fred Schaefer, another Packard employee who accompanied Mr. Shelley, will return from Petrograd within two months.

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3139 Overlands Registered in Iowa from April Until August

DES MOINES, IOWA, Oct. 15—From April to August, inclusive, of the current year, 3139 Overland cars were registered in Iowa. In the month of July, 1140 Overlands were registered in the State. From Jan. 1 to September, 1914, the total number of cars registered in Lucas County, Ohio, amounted to 5264. Of this number 786 were Overlands. During the same period this year, 6830 cars have been registered, 1235 of which were Overlands. These figures show that 30 per cent of the total increase in cars registered in the county since Jan. 1, have been Overlands.

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Patagonia Orders Detroiters

DETROIT, MICH., Oct. 16—R. T. Yeats, director of exports of the Detroiter Motor Car Co., Detroit, recently received an order for new Detroiter cars for shipment to Patagonia. This order will be routed via Buenos Aires and is finally destined for Trelew, Patagonia. The new Detroiter is now being represented in forty foreign countries and the sales effected have been remarkable since the re-organization of the company three months ago.

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Overland May Change Fiscal Year

TOLEDO, OHIO, Oct. 14—At the annual meeting of the stockholders of the Willys-Overland Co. which will be held here Oct. 26, it will be proposed to change the end of the company's fiscal year from June 30 to Dec. 31. Other changes to be submitted for approval are that the annual meeting be held on the second Tuesday in May of each year, instead of

Bay State Registration Figures

	Jan. 1 to Oct. 1, 1914	Total, 1914	Jan. 1 to Oct. 1, 1915	Increase Over 1914
Motor vehicles	*73,765	*77,246	*96,592	19,346
Trucks	7,813	8,236	11,150	2,914
Manufacturers and dealers	1,501	1,518	1,711	193
Licenses, operators and chauffeurs	23,492	26,858	39,074	12,216
Renewals, operators and chauffeurs	65,643	72,674	80,126	7,452
Examinations	6,344	7,497	8,805	1,308
Total receipts	$897,994.37	$925,964.75	$1,159,976.30	$234,011.55

*Includes trucks.

the fourth Tuesday in October, as now; that the number of directors be increased from seven to nine; that the officers elected by the directors annually shall hold office during the pleasure of the board of directors instead of for the term of one year; that there be a monthly meeting of the board of directors on the first Tuesday of each month without notice, in addition to the meetings now provided.

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Cars Worth $181,576 Shipped from New York in September

NEW YORK CITY, Oct. 14—South America received from this port during the month of September, 1915, automobiles valued at $181,576. Of this amount $106,295 was for Argentina, with $33,739 for Venezuela and $16,248 for Chile. The rest of the countries ranged from $3,370 to $8,300.

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Chevrolet to Build New Plant in New York

NEW YORK CITY, Oct. 15—The Chevrolet Motor Co. of New York has leased the entire block front on the east side of Eleventh Avenue between Fifty-fifth and Fifty-sixth Streets, fronting 200 ft. on each thoroughfare. The Chevrolet Motor plant now covers the block front directly to the north, between Fifty-sixth and Fifty-seventh Streets. The site will be improved with a modern factory and service building similar to the one it now occupies in this city. With the completion of the new building the facilities of the company will be more than doubled. The concern is also making large additions to its plants at Tarrytown and at Flint, Mich. Within a short time the company expects to be turning out 800 cars a day.

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Goodrich to Insure and Pension

AKRON, OHIO, Oct. 16—Free life and accident insurance and a retirement pension will be given the 15,000 employees of the B. F. Goodrich Co., beginning Nov. 1. The free insurance and pension will be thorough, and applicable to every employee with no cost to him.

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Van Sicklen Opens Detroit Office

DETROIT, MICH., Oct. 14—The Van Sicklen Co. speedometer makers, has opened a branch office and service station at 1255 Woodward Avenue, and C. P. Van Sicklen, son of N. H. Van Sicklen, president, has been placed in charge. The Van Sicklen Co. has also engaged Otto Von Bachelle, consulting engineer, who will be located in the Detroit territory. By opening its branch office here, the company has severed connection with the Cutting, Armstrong and Smith Sales Co.

Stewart-Warner to Add 275,000 Ft.

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New Plant 7 Stories—Will Make Total Floor Area 445,000 Sq. Ft.

CHICAGO, ILL., Oct. 18—The Stewart-Warner Speedometer Corp. has started work on a new factory building, which will have a floor area of 275,000 sq. ft. as compared with the present plant, which has an area of 170,000 sq. ft. of floorspace. Instead of being an addition the new factory is much larger than the old, and will be a seven-story brick and concrete structure measuring 191 by 291 ft. and of U-shape. The new building is being erected alongside the old factory, the corporation having purchased property 125 by 286 ft. The work of razing the residences on the property in the purchase has already begun and it is expected that a city street which separates part of the property from the remainder of the corporation's holdings will be condemned and closed. The company at present employs 1200 men in its factory and hopes with the new building materially to extend its manufacturing facilities as well as its service system. When the new building is completed there will be a total floor area of 445,000 sq. ft.

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Cleveland Employees Demand Eight-Hour Day

CLEVELAND, OHIO, Oct. 15—Three hundred employees of the Bardons & Oliver Machine Co. walked out this week. The men struck for shorter hours and more money. Further demonstrations were held at the Winton Motor Car Co. plant. The situation at the Warner & Swasey machine works remained the same—about 100 of 1200 employees working.

The specific demand is for an 8-hr. day at the 9-hr. rate, with time and a half for overtime.

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Stearns Gives Ten-Hour Pay for Eight-Hour Work

CLEVELAND, OHIO, Oct. 15—Efforts to perfect union organization among 1000 employees of the F. B. Stearns Co.'s plant were stilled last night when it was announced that beginning Oct. 16, they will receive 10 hr. pay for 8 hr. work.

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Chalmers Men Meet in Denver

DENVER, COL., Oct. 10—Twenty-five Chalmers dealers from Colorado and Wyoming towns were given a banquet last night at the Savoy Hotel by E. J. Johnson, Chalmers distributor for this territory. F. B. Willis, the company's sales manager, and J. M. Robbins, factory representative, gave talks on construction features and practical selling points, and several of the dealers reported upon trade conditions in their respective localities. These reports were all favorable for the season's outlook, and the meeting is counted upon to give the business in this district a substantial push forward.

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3000 Detroit Electrics for 1916

DETROIT, MICH., Oct. 18—Between Aug. 1 and Oct. 1, the Anderson Electric Car Co., which makes the Detroit electrics, has sold 92 per cent as many cars as it sold during the entire year 1914. The business is increasing at such a rate that since Thursday, Oct. 14, a large force is working nights. At the present time the company has between 1400 and 1500 men on its payroll, the largest number in its history. The scheduled output for 1916 is 3000 passenger electric vehicles. The daily average production is now ten cars, but this will probably be increased to fifteen or more before long. An addition, 125 by 125 ft., has been made to the body department, and possibly other enlargements will be made necessary.

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Hyatt Roller Bearing to Build

HARRISON, N. J., Oct. 15—The Hyatt Roller Bearing Co. has let contracts for an eight-story building, 75 by 200 ft., at Middlesex and Fifth Streets and Railroad Avenue, Harrison. It will be of the beam and girder concrete type with brick curtain walls and pilasters.

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347 Studebakers a Day

DETROIT, MICH., Oct. 16—At the Studebaker Corp. all former production records were broken to-day when 347 cars were made. How soon this mark will be passed no one at the plant would dare say, but an official said that he hoped that 500 cars a day will be a matter of fact within the next sixty days.

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$300,000 Tire Co. Formed

MARION, OHIO, Oct. 16—The Marion Tire & Rubber Co. has been incorporated with a capital of $300,000 to manufacture automobile tires. The incorporators are A. J. Barry, W. H. Holverstott, S. B. Lippincott, W. T. Jones, J. Leonard Price, W. F. Moyer and R. T. Lewis.

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New Sanford Jitney Body

SYRACUSE, N. Y., Oct. 15—The Sanford Motor Truck Co., this city, has brought out a new body for use in interurban passenger traffic. This body is completely inclosed and is especially adaptable for jitney service.

Southern Enthusiasm for Dixie Highway Found at Every Turn

Trail Blazing Party Nearing Goal—All Kinds of Roads Encountered and Some Delay Caused By Mud and Mountains—Few Mechanical Troubles

NASHVILLE, TENN., Oct. 13—This was hoodoo day for the Dixie highway tourists, the ominous date bringing rain, mud, rough roads and a difficult 13 hr.'s run of 164 miles from Elizabethtown, Ky., to the capital of Tennessee. For the first time since the cars started on the long trek to Florida from Chicago, there was rain.

In addition to two water-soaked stretches, there was some rough going this morning in the southern part of Kentucky. The pike was hard enough but it had too much contour. The cars bounded over the outcropping stones which were laid almost a century ago as a foundation of one of the finest highways in the early days of the republic but a highway which lost most of its surface when the artillery and the munition wagons of the Union and Confederate armies rumbled over it. It was impossible to travel at a greater speed than 10 m.p.h.

However, money already has been voted for reconstruction and the work of repairing and resurfacing has been started.

Cars Stand Up Well

Because of the wet and rough going, the tourists were on the road for 13 hr., the longest day's run of the trip so far, the last 60 miles of the day's tour being covered in the dark. Nashville was not reached until shortly before 9 o'clock.

In the tour to date, three of the six State through which the Western link of the Dixie highway runs have been crossed and 658 miles of the 1800-mile trip have been covered. All nine cars have come through without any mechanical trouble and with few stops for tires, there being but one broken spring.

CHATTANOOGA, TENN., Oct. 15—Hawkins Cove is not in the geographies but the memory of its grades and terrors is indelibly stamped on the minds of the Dixie highway tourists who arrived here at 3.30 o'clock this morning after a tortuous 20-hr. ride from Nashville.

It was about 6 o'clock last evening that the motorists first were introduced to Hawkins Cove at the entrance of the Cumberland mountains. The road that passes through its dense timber and leads to the summit of the mountain is a spiral climb of 3 miles with an average grade of 35 per cent at least.

Only three cars made the top by means of their own power. Two mules rendered first aid to the other machines and pulled them up the steep slopes.

30 Miles in Dark

After the ridge of the Cumberlands had been reached and Hawkins Cove was behind, there was a 30-mile run in the pitch darkness over soft, narrow mountain trails that wound in and out among the dense pines. To make matters worse, the eight-cylinder Cole, carrying Judge M. M. Allison, president of the Dixie Highway Association, and other officials, broke a steering rod and a halt of more than 2 hr. to make temporary repairs was imperative.

Residents of Chattanooga waited all through the night and early hours of the morning to welcome the tourists to this historic city. The Dixie bound cars were met at Jasper's Ford, where the Tennessee River was crossed by means of a ferry, by a delegation from the local motor club.

At 4 o'clock this morning, a dinner-breakfast was served at the Patten hotel. The food had been on the fire since 6 o'clock the evening before when the motorists were scheduled to arrive.

In order to give the drivers an opportunity to overhaul their cars and permit the tourists to recuperate from their trip through the mountains, the officials have decided to lay over to-day in Chattanooga. We will take to the road again in the morning when the 140-mile run to Atlanta will be made.

Postponed One Day

This change in the schedule will make the tourists a day late at all the stops in Georgia and Florida, and Miami, the terminus of the tour, will be reached next Saturday, instead of Friday.

ATLANTA, GA., Oct. 16—Under the fairest of southern skies and over the convict-built roads of the Piedmont range of the Cumberland mountains, the Dixie highway tourists rolled through Georgia in triumph to-day and were feted all the way from Chattanooga to Atlanta.

At Rome, earlier in the afternoon, the tourists received a tremendous ovation and three miles outside of Rome 100 cars met and escorted them to the Berry School, a philanthropic institution where the sons and daughters of poor farmers are given an education, and the Shorter College, one of the most exclusive schools for young women in the South. At both places, there were showers of flowers, songs and speeches.

The demonstration was not sporadic, it extended all along the line from Chattanooga to Atlanta. La Fayette was en fete. The town looked as if it was circus day.

At Cartersville, on the afternoon trip from Rome, the cars were showered with chrysanthemums and a band blared a welcome. A welcome arch of cotton bales spanned the main street at Kington, a small village of about 500 residents. The motorists were bombarded with apples, flowers, cotton and boxes of candy at Acworth.

The roads through the foothills of the Cumberlands were easy to negotiate for most of them are hard and the grades are not steep. They are being worked by convicts at the present time.

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Form Company to Further Trade Relations with Russia

NEW YORK CITY, Oct. 20—A joint sales company to operate in Russia and to further the trade relations between the United States and that country is the object of the International Manufacturers' Sales Co. of America, recently organized with headquarters in Chicago and branch offices in New York City and Moscow. A. S. Postnikoff, for many years connected with the International Harvester Co., and who has had wide experience in Russia, heads the new company. The capital stock of the company will be issued to the amount of $100,000, to be held in parcels of $2,000 each by fifty manufacturers of this country, engaged in non-competing lines. In return for this subscription the company engages to handle the export business of the manufacturers. Not only will they receive the profits from the sales of their own products but will also share in the joint profits of the selling organization.

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Ultimatum on St. Louis Headlights

ST. LOUIS, MO., Oct. 16—The local police department recently issued an ultimatum to every owner of an automobile or motor truck calling upon him to submit the headlights of his machine to the Municipal Bureau for adjustment before Oct. 20. After that date, the Chief of Police has ordered the arrest of every automobile driver the lights of whose machine do not conform to the letter of the recent ordinance against dazzling headlights. This order results from the fact that only 20 per cent of the automobile owners of St. Louis have brought their machines to the Shadow Box at the City Hall, which has been available to them without charge for more than a month.

The police and street department officials are discouraging the use of dimming devices and point out that the new ordinance limits only the direction of the light's rays, not their intensity.

Texas Gasoline Cos. on Grill

State Attorney Claims Consumers' Prices Not Based on Supply and Demand

AUSTIN, TEX., Oct. 19—The State Attorney General's Department which has been conducting an investigation into the gasoline and crude oil situation, with particular reference to the alleged fixing of prices of these products and controlling the output, in different cities and producing field of Texas, claims to have discovered evidence that shows that the actual available supply and demand has little to do with the prices that are charged the consumer. The fact that gasoline prices in Austin and other cities of the State steadily mounted upward during the last four months from 10 cents to 17 cents per gallon and that each advance was made simultaneously by practically all dealers led to the conclusion that a combination was back of the trade. This belief has been fully substantiated, according to the statements of representatives of the Attorney General's Department who conducted the investigation. Already the price of gasoline has dropped from 1 to 3 cents per gallon in San Antonio, Austin and other towns and cities of Texas. These reductions were due, it is said, to the activities of the Attorney General's Department. It is reported on trustworthy authority that preparations are being made by Attorney General B. F. Looney to file suit against all of the Texas refining companies for heavy penalties and for forfeiture of their respective charters for alleged violations of the anti-trust laws in fixing the price of gasoline.

Boost Crude Prices

The reason which the refiners give for raising the price of gasoline is that production of crude oil has materially decreased. It is alleged by the Attorney General's Department that the refiners own the crude oil supply, including the producing wells and that when they want to boost prices of the crude product and gasoline they cap the wells and thus bring about a decrease in the output.

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Portland Gasoline Up Two Cents

PORTLAND, ORE., Oct. 12—Within the past fortnight the price of gasoline in Portland and Multnomah county has advanced 2 cents and the indications are that the end is not in sight. Some of the wisest heads are now declaring that the price will ascend gradually until a retail figure of 18 to 20 cents is reached.

Until two weeks ago gasoline was wholesaling at 9½ cents in Portland. Several of the cut-rate houses were then retailing at 10 cents a gallon, while the filling stations operated by the wholesale companies were commanding a retail price 2 cents in advance of the wholesale figure. Then the wholesale price was advanced a cent and the retail price experienced a similar advance.

Last week orders came for another penny increase, making the wholesale price 11½ cents. The retail prices now vary all the way from 12 cents to 13½ and 14 cents.

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Few Market Changes

NEW YORK CITY, Oct. 19—Markets this week were dull and very few changes occurred. There were three gains and three losses. The heaviest gain took place in the metal markets. The heavy sale of tin which has been going on during the last few weeks has made tin advance to $33 per 100 lb., making a total gain of 25 cents. Antimony is firmer and slightly higher with a better demand. Holders are asking 28 and 28½ cents for spot duty paid. Aluminum, which had all week been holding at a good advance, yesterday was somewhat easier, there being sales of spot at 50 and 55 cents in ton lots. Copper is firm, the asked price being 18 cents for both electrolytic and lake in ton lots only. The steel markets are dormant, there being very few sales made and no changes in prices.

A somewhat better demand was reported for some grades of crude rubber, though there was no snap to the trading. Despite the activity in the rubber markets, manufacturers seemed to want only small lots. Up-River Para fine quoted at 57 cents. The oil and lubricants markets were not very active last week. No changes took place although the trading conditions were a bit more normal. The demand for naphthas continues active and the market retains a firm tone. No changes were reported in crude oil quotations. In the animal oils market trading was more active, inquiries for moderate quantities being received. Prices continued to rule steady. Mineral lubricants market was also active with many buyers on hand. The prices continued the same. Although gasoline has made no further advance it is expected to rise within a short time, making the price per gallon 25 cents.

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Eight per Cent Dividend for Unsecured Detroit Body Creditors

DETROIT, MICH., Oct. 16—Unsecured creditors of the Detroit Body Co., are now receiving a first dividend of 8 per cent, and it is possible that a further payment will be made later. Thus far the trustee has paid claims amounting to $211,691.18. After the appointment of the Security Trust Co. as trustee, May 8, 1915, the Fisher Body Co. made an offer of $170,000 for the bankrupt concern's plant and materials. This offer was 70 per cent over the appraisal value, and, was accepted after a public auction at which no higher bid was made.

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Chalmers Stock Listed

NEW YORK CITY, Oct. 15—Chalmers Motors stock has been admitted to official trading in the outside securities market in this city. The common stock has paid $10 per share for several years. It is expected that the company will earn at least 30 per cent for the $5,000,000 in common stock this year. This stock heretofore has been traded on the Detroit Exchange, and is now listed also on the Philadelphia Exchange.

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Book on South American Finances

WASHINGTON, D. C., Oct. 15—"Financial Developments in South American Countries," is the title of a new publication just issued by the Bureau of Foreign & Domestic Commerce which should be of great value to all those who are seeking to expand their trade in South America.

The booklet contains forty pages and covers the situation as regards currency; the money market; the principal banks

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.50	.55	.55	.55	.55	.50	.....
Antimony	.27½	.28	.28	.28	.28	.28	+.00½
Beams and Channels, 100 lb	1.56	1.56	1.56	1.56	1.56	1.56	...
Bessemer Steel, ton	24.50	24.50	24.50	24.50	24.50	24.50	...
Copper, Elec., lb	.18	.18	.18	.18	.18	.18	...
Copper, Lake, lb	.18¼	.18	.18	.18	.18	.18	—.00¼
Cottonseed Oil, bbl	7.86	7.80	8.00	7.60	7.65	7.80	—.06
Cyanide Potash, lb	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.42	.42	.42	.42	.42	.42	...
Gasoline, Auto, bbl	.17	.17	.17	.17	.17	.17	...
Lard Oil, prime	.85	.85	.85	.85	.85	.85	...
Lead, 100 lbs	4.52½	4.52½	4.50	4.50	4.50	4.50	—.02½
Linseed Oil	.60	.60	.60	.60	.60	.60	...
Open-Hearth Steel, ton	25.00	25.00	25.00	25.00	25.00	25.00	...
Petroleum, bbl., Kans., crude	.80	.80	.80	.80	.80	.80	...
Petroleum, bbl., Pa., crude	1.75	1.75	1.75	1.75	1.75	1.75	...
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	...
Rubber, Fine Up-River, Para	.57	.58	.57½	.57½	.57	.57	...
Silk, raw, Ital	4.05	...	4.05	...	4.05	4.10	+.05
Silk, raw, Japan	3.90	...	3.90	...	3.90	3.87½	—.02½
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb	32.75	32.62½	32.87½	32.75	32.75	33.00	+.25
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	...

and the general condition of business in Argentina; Bolivia; Brazil; Chile; Peru and Uraguay during the last two or three years.

William H. Lough, vice-president of the Alexander Hamilton Institute, who has only recently returned from a trip through the countries treated, is the author of the book. It may be obtained from the superintendent of documents, government printing office, Washington, D. C., for 5 cents per copy.

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Studebaker War Order Profits $20 a Share, Common

DETROIT, MICH., Oct. 16—The Studebaker Corp., by the end of the current fiscal year, Dec. 31 next, will have completed well over $20,000,000 of war orders, on which profits are expected to amount to over $20 per share of common stock outstanding.

Domestic business is running more than double that of a year ago. The 1916 schedule calls for 70,000 cars for domestic use and 6,000 for export. This compares with an output in the past year of about 40,000 cars. Production in 1914 by Studebaker was 36,430 cars, and in 1913, 32,504 cars.

For the calendar year 1915, it is expected that common share earnings will be over $35. The stock is now on a 5 per cent dividend basis. The directors meet next month on the next declaration.

The cash balance of the company is nearly $7,000,000. It is expected that by the end of the year the company will have practically wiped out its note issue amounting to $12,000,000.

Security Prices Higher

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Sturdy Demand in All Stocks —Miller Rubber Makes High Mark

NEW YORK CITY, Oct. 18—A few substantial gains occurred last week in the securities markets, ranging from ½ to 30 points while the losses recorded ranged from 1½ to 15 points. There were many issues which recorded no change at all and these remained firm throughout the week. The trading conditions were somewhat brisker, although the buying was normal. A number of gains took place in the specialties. Chevrolet, which was first rated last week, made a gain of 26 points, the highest to take place in the specialties. Then following closely were Chalmers and Studebaker, both making their total gain 19 points. White made a gain of 16 points while the rest of the issues made either small or no gains at all.

Tire Prices Normal

Tire prices were normal last week, although many issues made but small gains. Miller Rubber made a gain of 30 points, the highest that has been recorded in the rubber markets for several months. Kelly-Springfield common and Firestone were weak in the early dealings and sold down sharply from the recent high level both had made. Swinehart and U. S. Rubber rose 2 points. Sales of stocks were small, as the buyers preferred holding back for further gains.

Detroit Stocks Active

Although the gains that took place in the Detroit market were not heavy the trading conditions were on a somewhat brisker scale. Here many stocks changed hands. Studebaker featured the market with a 16-point rise. Packard rose 5 points and Maxwell 3¼ points. The rest of the gains were small, ranging from ½ to 2¾ points. General Motors declined 25 points, being the only issue in Detroit to make a decline. The inactive stocks were weak, Canadian Ford declining 50 points.

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U-S-L Convention Closes

NIAGARA FALLS, N. Y., Oct. 16—The annual sales convention of the U. S. Light and Heat Corp. was brought to a close to-night, more than 50 branch managers and salesmen from all over the country having been guests of the company for the past three days.

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Form $100,000 Armored Car Co.

PHILADELPHIA, PA., Oct. 16—Joseph F. Curtain, Samuel B. Howard and H. O. Coughlan of New York, are the incorporators of the Armored Motorcar Co., capitalized at Dover at $100,000. The company will manufacture motorcars and aeroplanes.

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Dividend Declared

Willys-Overland Co., quarterly of 1 1-2 per cent common; payable Nov. 1 to stockholders of record Oct. 21.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			102	..	..
J. I. Case pfd			79	81	+1
Chalmers Motor Co. com			170	175	+19
Chalmers Motor Co. pfd			98½	102	..
Chevrolet Motor Co			130	135	+26
Electric Storage Battery Co			71	71½	+1
Firestone Tire & Rubber Co. com			575	..	..
Firestone Tire & Rubber Co. pfd			112	..	..
General Motors Co. com			326	328	—15
General Motors Co. pfd			112	113	+1
B. F. Goodrich Co. com			76	77¼	+2½
B. F. Goodrich Co. pfd			109	111	+ ½
Goodyear Tire & Rubber Co. com			330	337	—8
Goodyear Tire & Rubber Co. pfd			108½	110	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co. com			32½	33½	+5
International Motor Co. pfd			60	65	+5
Kelly-Springfield Tire Co. com			215	220	..
Kelly-Springfield Tire Co. 1st pfd			90	92	..
Kelly-Springfield Tire Co. 2d pfd			225	235	..
Maxwell Motor Co. com			61	61½	+4½
Maxwell Motor Co. 1st pfd			96	97½	+3
Maxwell Motor Co. 2d pfd			50	51	+4
Miller Rubber Co. com			228	..	+30
Miller Rubber Co. pfd			109	110	..
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			140	147	+1
Packard Motor Car Co. pfd			101	105	..
Paige-Detroit Motor Car			435	450	..
Peerless Motor Car Co. com			122	..	..
Peerless Motor Car Co. pfd			92	95	..
Portage Rubber Co. com			54	56	..
Portage Rubber Co. pfd			92	94	..
Regal Motor Co. pfd			..	21	..
*Reo Motor Truck Co			19½	21	..
*Reo Motor Car Co			38½	40	..
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp, com			76	78	+3
Stewart-Warner Speed. Corp. pfd			106	..	..
Studebaker Corp. com			161	163	+19
Studebaker Corp. pfd			110	111½	+1
Swinehart Tire & Rubber Co			90	92	+3
Texas Company			165	167	—2
U. S. Rubber Co. com			53	54	..
U. S. Rubber Co. 1st pfd			105½	106½	—1½
Vacuum Oil Co			215	220	—3
White Co. pfd			110	..	..
Willys-Overland Co. com			247	249	+16
Willys-Overland Co. pfd			108	109½	+ ½

No quotations available at this time on account of war.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com	..	97	162	167	—1
Chalmers Motor Co. pfd	..	94½	99	104	+1½
Continental Motor Co. com	155	180	320	..	—5
Continental Motor Co. pfd	..	75	87	..	+3½
General Motors Co. com	..	66	310	330	—25
General Motors Co. pfd	..	83½	114½	115	+1¾
Maxwell Motor Co. com	..	12¼	60	61½	+3¼
Maxwell Motor Co. 1st pfd	31	..	95½	98½	+1½
Maxwell Motor Co. 2d pfd	..	17	44½	52	+2¾
Packard Motor Car Co. com	..	..	142	150	+5
Packard Motor Car Co. pfd	90	..	100	..	..
Paige-Detroit Motor Car Co	..	..	435	..	..
*Reo Motor Car Co	20	..	38½	39⅜	+ ½
*Reo Motor Truck Co	..	11¼	19¾	20½	+ ½
Studebaker Corp. com	..	..	158	162	+16
Studebaker Corp. pfd	..	..	105½	109½	..

INACTIVE STOCKS

*Atlas Drop Forge Co	21	..	..	29	..
Ford Motor Co. of Canada	..	500	..	1500	—50
Kelsey Wheel Co	..	..	205	..	..
*W. K. Prudden Co	..	20½	21½	24	+ ½
Regal Motor Car Co. pfd	25	..	..	21	..

*Par value $10; all others $100 per share.

100,000 at St. Louis Car Show

25,000 of These Were Prospects and Dealers—Many Sales Reported

ST. LOUIS, MO., Oct. 14—The ninth annual automobile show of the St. Louis Automobile Manufacturers' & Dealers' Association came to an end on Oct. 9, the most successful in the history of the association.

Fully 100,000 persons saw at this show the first display of 1916 models west of the Mississippi River. Probably a fourth of that number were sub-dealers, farmers and other out-of-town prospects brought to the city by the Fall Festivities.

Tuesday, "Automobile Trade Day," was the most productive of sales. One of the biggest deals closed on this day was the sale by the Weber Implement & Auto Co. of a hearse and a squad of five sedans to an undertaker of Springfield, Ill. The new Chevrolet Co. of Missouri announced they had taken 272 orders for their Four-Ninety at the show. Several other distributors claimed they had obtained contracts for carload orders of their lines.

Joseph A. Schlecht, Allen, Jackson and Halladay distributor, treasurer of the Manufacturers' and Dealers' Association and chairman of the Show Committee—in short, commonly acknowledged as the "man who made the 1915 show"—said:

"We had a greater attendance than any year before. Sales were made every day by every dealer. Even the electric vehicle men sold more machines than at previous shows. The prime object of our association is to carry through the annual show. Though we do not aim to make money through admission fees, we no doubt did so at this year's show."

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Fletcher Cup Run Oct. 31

PHILADELPHIA, PA., Oct. 16—The annual fixture of the Automobile Club of Philadelphia, namely the Fletcher Cup Run, will be held on Sunday, Oct. 31. The run, which is a continuation of the Brazier Cup Run, established by the club in 1902, is open only to members of the club, and owners or members of their immediate family must do the driving.

The Fletcher Cup Run is a test of the ability of a driver to keep his car at varying speeds designated on a chart given at the start, showing the route and speed required over each section of the course. Any contestant fined for speed will be counted out. The route, which will not be announced until the start, will cover about 60 miles, with a stop for luncheon. Speedometer dials will be covered and sealed, thus compelling the driver to estimate his speed. For every minute behind or ahead of the proper elapsed time in passing various unannounced controls, the car will be penalized one point, the car with the least penalization being the winner. The Fletcher Cup becomes the property of the driver winning it three times, not necessarily in succession.

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Motor-Plowing Demonstration in Denmark

COPENHAGEN, DENMARK, Oct. 14—At the agricultural fair held at Vehle, Denmark, in July, a demonstration was given of three different motor plows—one manufactured in Denmark, one in Sweden, and one by the International Harvester Co. of America. These plows were of the smaller type, suitable for an average-sized farm. Two of the outfits were equipped with 16-hp. engines and one with a 12-hp. engine; their speeds ranged between 1 1-2 and 2 miles an hr. All were of the one-man type. When the necessary attachments are at hand the same tractors can be used for pulling binders. Two of them can be used for threshing purposes or other belt work without any change, while in order to do this with the Danish tractor an extended shaft with pulley is required.

At present there are in this country quite a few larger plowing outfits at work, and while these smaller outfits seemed to arouse considerable interest among the owners of averaged-sized farms, it is yet to be seen to what extent they can be sold.

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Jackson Trailers in Three Types

JACKSON, MICH., Oct. 12—The Jackson automobile trailer is the latest product of the Miles Mfg. Co. of this city. The trailers are made for use by any kind of automobile. There are three different types, each with several models.

Where delivery body is ordered 1⅛ in. rubber tires are furnished while on trailers with rack style body, models 31 and 33, 1⅜ in. tires are fitted. On model 41, 1¾ in. rubber tires are used. All models have a universal joint coupling. The standard color is Brewster green. The prices range from $22 to $98, f.o.b. Jackson.

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Automatic Traffic Signals for New York

NEW YORK CITY, Oct. 18—Automatic street signals for the control of traffic were in operation to-day at nearly all street corners where traffic policemen are stationed. The signals are a white standard with four arms, two of them red with the command Stop in white letters and two of them green with the order Go.

They are operated by the policeman on the corner who turns a handle which swings the signal and the letters are large enough to be read distinctly at a distance of 200 ft. The signals project over the street at a height to be read by all drivers.

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New Motor Bus Line in New York City

NEW YORK CITY, Oct. 15—The Board of Estimate, after three years of study, has recommended that a franchise be granted to the New York Motorbus Co., to operate double deck, side entrance cars over 31 miles of Manhattan streets, from Union Square on the south to Fort George on the north. The company offers a 10-cent fare for main lines, a 5-cent fare for crosstown and other short lines, and transfers which will keep the cost of a continuous trip within the 10-cent limit.

Howard Conklin, 1 Wall Street, is president of the company. Other directors are S. M. Conklin and H. B. Weaver, the company's consulting engineer. The company agrees to have 100 buses running within eight months.

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Armored Car Train for New York

NEW YORK CITY, Oct. 19—Governor Whitman of New York stated to-day that the State of New York soon will have an armored motor train. "This will be for service with the National Guard of the State," says Governor Whitman. "Certain public spirited citizens have interested themselves in the project by which the equipment is to be made available without cost to the State."

Other Governors, who already have interested themselves in the Automobile Reserve Corps are: P. L. Goldsborough of Maryland; E. L. Philipp of Wisconsin; George W. Hays of Arkansas; John B. Kendrick of Wyoming; Emmet D. Boyle of Nevada, and the Adjutant General writing for the Governor of Georgia.

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Arthur Klein Opens Garage

YOUNGSTOWN, OHIO, Oct. 14—Arthur Klein, the automobile driver, has given up racing and has opened a garage and service station in this city. The new concern is known as the Kleinart Motor Service Co., 637 Elm Street. Frank Lightner, who rode as a mechanician with Klein in a number of races, is associated with him in his new venture.

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Automobile Reserve for Maryland

BALTIMORE, MD., Oct. 16—Plans for the organization of a reserve automobile corps to serve as a branch of the Maryland National Guard are under way. The matter is being handled by Henry L. Rose, president of the Baltimore Automobile Club.

Factory Miscellany

Hess-Bright Adds—The Hess-Bright Manufacturing Co., Philadelphia, Pa., maker of ball bearings, has awarded the contract for the erection of a one-story 40 by 60 ft. addition to the hardening room at Front Street and Erie Avenue, at a cost of $3,980.

To Make Tires—The Hawkeye Tire Co., with a capital stock of $500,000, is being organized to manufacture a full line of standard size tires at a factory in Des Moines. Among the directors are E. G. Raffensperger, manager of the Des Moines Buick Co., and C. B. Hextell, a Des Moines attorney.

To Make Automobiles in Fort Madison—A new automobile company, to manufacture Champion cars, has acquired 7 acres of ground as a site for a factory at Fort Madison, Iowa. Bids for a two-story building, 100 by 200, the first factory unit, have been asked. Officers of the new company are identified also with the Perfection Tire & Rubber Co.

To Make Parts—S. W. Sorensen, formerly president and general manager of the Trio Mfg. Co., and J. B. Allen of the Olds Motor Co., have purchased the Brady-Nagel Mfg. Co. and will operate the same under the name of the S. A. Machine Co. They will manufacture automobile parts and specialties. The plant is equipped and is located at 518-520 Woodbridge Street, East.

Receives Drop Forging Order from Ford—The D. Wilcox Mfg. Co., Carlisle, Pa., has received a large order from the Ford Motor Car Co., for 580,000 pieces of drop forgings. The order amounts to many thousand of dollars and will keep the plant busy for the next 3 months at least. Additional men will be put on and other plans for an expansion are now in progress.

Nearly 31,000 Ford Employees—At the present time between 21,600 and 21,800 men are on the pay roll of the Detroit, Mich., plant of the Ford Motor Co. Of this number about 700 are employed exclusively in the general offices. At the assembling plants and service stations throughout the country there are now 9145 men employed, bringing the total force of Ford workers up to nearly 31,000.

Hartford Tire Pump Busy—The Hartford Tire Pump Co., Hartford, Wis., organized a year ago to manufacture compressors for application to motors, will immediately erect a new shop, which will also contain a complete garage and repair shop. The present quarters are in the Gehl Mfg. Co.'s works. The company is swamped with orders and intends to hasten construction work so that occupancy may be taken before midwinter. A complete welding and cutting apparatus will be installed in addition to considerable new power and manual tool equipment.

New Castle Tire Plant Busy—Much progress has been made by the New Castle Rubber Co. during the past several weeks since starting operations in the company's plant at Mahoningtown, just outside of New Castle, Pa. The plant is now running at nearly its full capacity. Additional men are being put on continually, and the orders booked will keep it running in full for some time. About 400 men are employed in the plant. The average output is between 250 and 300 tires daily.

Breeze Carbureter Adds—Work has been started on a two-story addition to the Breeze Carbureter Co. plant at 250-252 South Street, Newark, N. J. At present the manufacture of tubing by this concern is done in a one-story brick building having a frontage of 33 ft. on South Street, a depth of 120 ft. and a breadth which widens at the rear to 86 ft. In the rear of the present structure the reinforced concrete addition is being erected. The new quarters will give the plant 13,000 more sq. ft., making a total working space of 25,000 sq. ft. The addition will measure 80 by 80 ft.

Waukesha Motor Increasing Speed—The Waukesha Motor Co., Waukesha, Wis., manufacturing motors for passenger cars and trucks, is carrying out a new construction program which will afford much increased space for machine shop work in the present buildings and a new testing room and heat-treating department. Additions now under way include a new power and heating plant, 44 by 66 ft., and a new shop, 88 by 220 ft., for assembling and finished stock.

The Automobile Calendar

Oct. 16-23.....Pittsburgh, Pa., Show, Motor Square Garden, Automobile Dealers' Assn.
Oct. 18-24.....Troy, N. Y., Show, State Armory, Troy Automobile Dealers' Assn.
Oct. 18-25.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 20-22.....Excelsior Springs, Mo., National Assn. of Automobile Accessory Jobbers' Meeting.
Oct. 21.....New York City, Met. Sec. S. A. E. Meeting of Automobile Club of America.
Oct. 24.....Fort Worth, Texas, Race Meet.
Oct. 25-27.....Columbus, O., Garage Owners' Convention.
Oct. 29.....Indianapolis, Ind., Claypool Hotel, S. A. E. Meeting of Ind. Section.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 2.....New York City, Sheepshead Bay Speedway, 100-Mile Race.
Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 18.....New York City, S. A. E. Met. Sec. Meeting.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.
Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.

1916

Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 29-Mar. 4....Fort Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19.....Newark, N. J., Show.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Sheldon Hood Tire Mgr.—B. K. Sheldon has assumed the active management of the Quality Tire Co., 825 Main Street, Buffalo distributer for the Hood tire.

Logie Heads Toronto Chalmers—The Chalmers Motor Co. has opened a Canadian office at 18 Bloor Street, East, Toronto, with L. Logie as Canadian manager.

Manley Resigns—L. E. Manley has resigned as sales manager of the Adams-Oakland Co., Pittsburgh, Pa., and has assumed the duties of sales manager of the Wood-Oakland Sales Co., Cincinnati.

Marshall Buffalo McGraw Mgr.—G. J. Marshall has been appointed manager of the Buffalo, N. Y., office of the McGraw Tire & Rubber Co., East Palestine, Ohio. C. H. Connolly, former manager, goes to the Kansas City office.

Lindeman Firestone Western Ad Mgr.—C. B. Lindeman of the sales staff of the Seattle branch of the Firestone Tire & Rubber Co., has been elevated to the position of Western advertising manager. His headquarters will be in San Francisco.

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Dealer

New Boston Company—W. J. Stusick and E. L. Warner have formed the Winchester Motor Co. at Springfield, Mass., and they have taken the agencies for the Moline Knight and the Vixen with salesrooms and service station at 776½ State Street.

New Toledo Tire Co.—The Ohio Tire Service Co. is the name of a new concern which has been incorporated, and is located at 310 Ontario Street, Toledo. Joseph Love is president and Samuel Love is general manager. The concern is distributor for Ohio tires.

Spokane Buick to Move—The Northwest Buick Co. of Seattle and Spokane, has contracted for a new building in the heart of the automobile district in Spokane. The building will give a total of 11,600 sq. ft. of floorspace. The building will be in First Avenue, near Adams Street.

Five New Studebaker Branches—Five new Studebaker branch houses are now either being built or are about to be. Under construction at present are three new Studebaker branches, at Brooklyn, Long Island City and Kansas City. Building operations on two more are about to begin, at Dallas, Tex., and Portland, Ore.

Motor Men in New Roles

Merritt Now Sales Mgr.—S. W. Merritt, formerly with the Moreland Motor Truck Co., Los Angeles, in the capacity of factory superintendent of production, is now with Hughson & Merton as sales manager for the farm tractor department.

Krimmel G. & J. Tire Sales Mgr.—Andrew Krimmel, formerly assistant manager of the Republic Rubber Co.'s Philadelphia, Pa., branch, has been appointed sales manager of the Berrodin Rubber Co., 715 North Broad Street, distributor of G. & J. tires.

Blackley Promoted—B. C. Blackley, for some time manager of the truck department of the J. C. Tucker Co. that handled the Chase and Vim trucks in Rhode Island, has been made New England division manager for the Chase Motor Truck Co. of Syracuse, N. Y.

Barber Eastern Branch Mgr.—Z. C. Barber, who was wholesale manager of the Saxon Motor Co. in New York City, has been appointed eastern branch manager of the Detroit Weatherproof Body Co., and will open a salesroom in New York City. His present offices are 2202 Broadway.

Minto Gibney Pacific Coast Mgr.—The Gibney Tire and Rubber Co., Conshohocken, Pa., has appointed C. H. Minto as Pacific Coast manager for Gibney Tires, with headquarters at San Francisco. He will have complete charge of the far Western business. His headquarters will be a factory branch.

West Returns to Portland—Fred West, who for two years, 1913-14, was at the head of the J. W. Leavvitt Co., Portland, Ore., has returned to that field in charge of the Chevrolet line. Mr. West will have charge of all of the territory of Oregon, Washington and Idaho with the exception of the city of Seattle.

Day Heads Buffalo Packard—Promotions in the organization of the Packard Motor Car Co. of New York are announced by the company as follows: B. C. Day of the New York city headquarters has been appointed branch manager at Buffalo; T. P. Myers, also of the local headquarters, has been chosen manager of the truck sales department.

Pittsburgh Franklin Reorganized—Reorganization of the distributing agency of the Franklin company has been effected and the company known as the Franklin Motor Car Co. of Pittsburgh becomes the Franklin-Pittsburgh Automobile Co. The officers chosen for the new company are W. M. Carr, president; R. S. Suydam, treasurer, and A. R. Gribben, secretary and assistant treasurer.

Hyde Opens Indianapolis Office—Harlow Hyde, formerly advertising manager of the Empire Automobile Co., has opened an office in the Telephone Building, Indianapolis, Ind., and established an advertising and publicity bureau. Mr. Hyde has been identified with the advertising and selling end of the automobile trade for many years, at one time having been advertising manager of the Bosch Magneto Co.

Mitchell Now Enger Dealer—R. D. Mitchell, formerly selling representative for Gray & Davis products and later for Kelly-Springfield and Pennsylvania tires, has organized the Enger Motor Sales Co., of Wisconsin, to handle the State territory for the Enger Motor Car Co., Cincinnati, Ohio. E. A. Glab, also well known in the industry, is associated with Mr. Mitchell. Headquarters are being established in Milwaukee.

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Dealer

Newark Chalmers Moves—The service station and parts department of the Paddock-Zusi Motor Car Co., Newark, N. J., Chalmers dealer, has been moved to the company's new building at 894-896 Broad Street.

Hartford Co. Gives Free Service—The Auto Tire Co., 129 Allyn Street, Hartford, Conn., which does business also under the name of Jack The Tire Man, is exploiting its free service to tire customers. In order that the service may be broadened in scope a special service car has been commissioned. The plan now is to assist customers of the firm in tire trouble any distance from the store. The car will be on duty all the time.

Mason-Newark Velie Agent to Move—J. W. Mason, Velie and Briscoe agent in Newark, N. J., and at present located at 350 Halsey Street, will occupy a new building at 1005 Broad Street. The new building will be of the modern type of automobile sales and service station and will have a Broad Street frontage of 33 ft. and a depth on Kinney Street of 189 ft. The showroom, opening on Broad Street, will be 55 by 33 ft., finished in white tile with a mezzanine balcony. The second floor will be devoted to service.

Baltimore Trade Happenings—The Motor Car Accessory Co. has opened at 1201 North Charles Street, Baltimore. H. C. Clark and Frank Hoddinott are at the head of the firm. A general line of accessories, lubricating oils, etc., are being handled. The company also is distributor of the Newcastle tire.

A direct factory branch of the Firestone Tire & Rubber Co., Akron, will be opened in Baltimore next week. Temporary quarters will be established at 17 and 19 East Mount Royal Avenue, in a new addition which has been constructed to the quarters of the Zell Motor Car Co. building.

B. R. Leisure, who has been the manager of the Firestone branch at Salt Lake City is in Baltimore and will have charge of the local branch. His territory will include all of Maryland and large parts of Virginia and North Carolina.

Branches of the American Oil Co. of Baltimore are to be established in many Maryland towns. The American company, which refines and distributes Eze-Lube lubricating oil and which is one of the largest gasoline distributors in this section of the country, has established a branch at Cumberland, Md.

Recent Philadelphia Changes—About Jan. 1, 1916, the Republic Tire Co. will occupy a new four-story building now in course of construction at 806 North Broad Street, Philadelphia.

The Swinehart Tire and Rubber Co., at 320 North Broad Street, Philadelphia, will on Nov. 1 open its new and larger quarters at Broad Street and Fairmount Avenue.

Columbus Buick Adds—Oscar Lear, central Ohio agent for the Buick is making a number of changes at his salesrooms and garage at 286 East Long Street, Columbus. A 4800 sq. ft. service station has been built in the rear and a show-room has been added to the front.

Old Stutz Agency Bankrupt—The Stutz Motor Car Co. of Boston, Mass., that handled the Stutz until a month ago, has gone into bankruptcy with liabilities of $27,342.19 and $2,248.20 assets. The chief creditors are Edward M. Becker, $6,500, A. E. Chase, $6,500, and J. S. Bradstreet, $8,000, all of whom were identified with the company. There are about fifty unsecured creditors.

No More Gasoline Stands—Mayor James M. Curley of Boston, Mass., has just sent an order to the Street and the Park and Recreation Commissions of his city not to grant any more permits for sidewalk gasoline stands. He says in his letter that no such stands should be granted without a fee, and that as they are an obstruction to traffic care should be taken not to allow any more to be put up. Furthermore fees should be charged for those now in use as a rental at so much per year.

New Sparton Horn House Organ—Everybody's Business is the title of the new house organ of the Sparks-Withington Co., Jackson, Mich., manufacturer of the Sparton safety signals. The magazine is a monthly publication devoted to the better acquaintanceship between employees and employer. It will contain articles of every kind which will be both educational and humorous. William Sparks is the managing editor and G. C. Core the news editor.

Late Missouri Trade Items—The Fisk Rubber Co., St. Louis, Mo., has leased the southeast corner of Grand Avenue and University Street where it will improve the present building preparatory to increasing its stock of tires.

The Pierce Oil Corp. has virtually closed a deal for a large lot at the corner of Fourth and Monroe Streets, Hannibal, where it will erect a warehouse, tanks and filling station. This depot will act as distributing point for northeastern Missouri and probably the west central part of Illinois.

Bert A. Stephens, F. B. Stephens and A. B. Gauge have opened an automobile supply house at 432 St. Louis Street, Springfield. They will deal chiefly in tires.

The Kansas City Motor Sales Co., Kansas City, has been incorporated and has established office and salesrooms at 1711 Grand Avenue. The chief business of this company will be to sell Ford cars on deferred payments, and to make exchange of Ford cars in Kansas City and territory.

The Ford Automobile Co., Kansas City, which is doubling the size of its branch plant at Eleventh Street and Manchester Avenue in this city, will have the extension completed and ready for occupancy by Dec. 1.

Boston Co.'s in New Quarters—The Reo Motor Car Co., The Hupmobile Co. of New England and the Joseph S. Porter Co., agents for the Pathfinder and Regal cars, have all moved into the new building near the junction of Commonwealth Avenue and Beacon Street, adjoining the Marmon at Boston, Mass. The structure is divided into three sections, the Reo on the east, Pathfinder and Regal in the centre and Hupmobile on the west. Both the wholesale branch of the Hupmobile and the new retail agency will occupy the western section.

Willard's New Coast Quarters—The Willard Storage Battery Co. has opened quarters at 1433 Bush Street, San Francisco. Fourteen new service stations have been added by the company. This brings the total of Willard stations to 535. The most recent additions are: Conklin & Spindler, Chicago Heights, Ill.; Wells Garage, Wells, Minn.; Weber Battery Co., 1312 W. Jackson Blvd., Chicago, Ill.; Handy-Lewis Motor Car Co., Willmar, Minn.; Hackler Battery Co., Kaufman and Twenty-second Streets, Paris, Tex.; G. G. Gardner, Estherville, Neb.; Thorne Electric Co., 515-16 Center Avenue, Bay City, Mich.; C. E. Coogins, El Centro, Cal.; Woodward Tire & Repair Co., 1325-27 Woodward Avenue, Detroit, Mich.; C. P. Seeberg, 1918 Tuoulumne Street, Fresno, Cal.; Geo. H. Gant Electric Co., 320 S. Boots Street, Marion, Ind.; Herbert Hedges, Oxnard, Cal.; Slayton Power Co., Slayton, Minn., and Electric Garage Co., Third and Main Streets, Woodland, Cal.

Gemmer Co. to Build—Plans have been prepared for the construction of a two-story 40 by 60-ft. plant at Detroit, Mich., for the Gemmer Mfg. Co., manufacturer of automobile parts.

Rotary Motor Co. to Build—The Rotary Valveless Motor Co., Auburn, Wash., recently incorporated with $100,000 capital, by J. O. Menard and others, will build a factory for the manufacture of its specialty.

Recent Incorporations in the Automobile Field

Delaware

WILMINGTON—Standard Accessories Co.; $100,000; maker. Cloyd Marshall, 81 New Street, New York City.

District of Columbia

WASHINGTON—Livingston & Co.; $5,000. Leroy Livingston, J. L. Smith, W. N. Wood.

Illinois

CHICAGO—Good Care Garage Co.; $5,000. J. J. Purcell, J. Gumburger, E. S. Purcell.

CHICAGO—Sporub Tire Co.; $2,500. Jacob Levin, Davis Blumrosch, Lazarus Krinsky.

VANDALIA—Midland Accessories Manufacturing Co.; $150,000.

Indiana

AUBURN—Union Automobile Co.; $100,000. C. M. Brown, John Zimmerman, W. H. Schaab.

FRANKLIN—Continental Auto Parts Co.; $15,000; maker. J. H., S. C. and M. N. Staley.

LAPORTE—Indiana Mutual Automobile Insurance Co.; to do a mutual insurance business. F. C. Brewer, F. H. Henderson, F. J. Cook.

Kentucky

LEXINGTON—Taxicab Co.; $7,500. B. J. Mathews, Frest Hall, Annie Kendall, B. D. Berry.

Maryland

EMMITTSBURG—Emmittsburg Motor Car Co.; $10,000. E. E. Zimmerman, J. W. Wagerman, E. F. Ohler, D. F. Roddy.

Michigan

DETROIT—General Manufacturing Co.; $5,000; to manufacture and deal in automobile accessories, machinery, etc. C. W. Olson, C. R. Robertson, Henry Wild.

DETROIT—National Bronze & Aluminum Castings Co.; $10,000. P. J. Donnelly, V. R. Donnelly, R. L. Pratt.

FLINT—Monroe Motor Co.; $250,000 to $735,000.

MOUNT PLEASANT—Mount Pleasant Motor Co.; $5,000 to $15,000.

North Carolina

AYDEN—East-Over Corp.; $10,000; automobile dealer. J. R. Turnage, B. S. Sumerel.

North Dakota

HARVEY—Blanding Motor Co.; $10,000. C. H. Blanding, Adelaide A. Blanding, Millie L. Blanding.

New Jersey

MONTCLAIR—Brooks-Ostruk Co.; $5,000. Paul Ostruk, William H. Booth, Emerson Brooks.

New York

BUFFALO—Knoll Automobile Electric Service Co.; $5,000; electric equipment, automobiles. C. A. Hamlin, F. J. Rogan, J. G. W. Knoll.

New York City

Metropolitan Motor-Vim Agency; $50,000. W. C. Freeman, B. B. Stowe, C. Plock.
Utility Motor Trucking Co.; $200,000. J. M. Greene, E. M. Klein, Jennie Alex.

Ohio

CANAL DOVER—Dover Buick Co.; $5,000. H. C. Campbell, H. E. Haas, O. H. Weaver, E. G. Weaver, R. J. Weaver.
CLEVELAND—Auto Casting Co.; $10,000. W. R. Wildman.
CLEVELAND—Electric & Auto Parts Co.; $50,000. J. H. Ladwig, R. R. Bachelier, F. E. Lazare, G. W. Cowley, E. W. Slater.
CLEVELAND—Fred P. Brand Motor Co.; $30,000. F. P. Brand.
CLEVELAND—Cole-Cleveland Co.; $10,000. C. D. Simmons.
CLEVELAND—K-K Co.; $15,000; automobile dealer. F. W. Emslie.
CLEVELAND—The Keystone Oil & Supply Co.; $10,000. R. H. Lee, W. J. Patterson, G. M. Gallagher, E. M. Holmgren, S. D. Corbett.
CLEVELAND—The Motor Equipment Co.; $10,000; accessories. O. D. Summers, H. K. Summers, W. H. Everhart, M. Manshower, J. B. Moore.
CLEVELAND—The Ohio Electric Sales Co.; $10,000. O. K. Herron, W. A. Albaugh, Luther Day, R. E. Bixby, J. B. Kanner.
COLUMBUS—Shilling Safety Auto Bumper Co.; $100,000. F. W. Schriner, E. C. Shilling, Jacob Dagger, R. N. Ulrey, J. C. Erwin.
COLUMBUS—The Peters Sales Co.; $10,000; selling the Brinnon Ford starter. C. M. Peters, Albert Peake, G. A. Peters, J. B. McGaughy.
LLANO—Llano Motor Co.; $50,000; engine maker. M. D. Slator, M. M. Moss, E. G. Bogusch.

Pennsylvania

ERIE—Erie Trailer Mfg. Co.; $100,000; to make trailers for automobiles and trucks. H. A. Wilburn, C. C. Leon, F. J. Behrens.
UNIONTOWN—Gallatin Automobile Supply & Repair Co.; $5,000. W. H. Helmey, J. T. Hoover, C. H. Helmey, George Patterson.

South Carolina

COLUMBIA—New Zion Motor Co.; $3,000. W. C. Plowden, D. C. Shaw.
SUMMERTON—Summerton Motor Co.; $3,000. D. C. Shawk, H. A. Richbough.

Texas

CROSBYTON—Texas Auto Co.; $1,000. A. J. McKinnon, G. M. McGee, C. W. Murray.
WACO—Court House Garage and Supply Co.; $5,000. J. J. Richards, John McGlasson, J. E. Watson.

Virginia

ASHLAND—Hanover Garage and Repair Co.; $10,000. Boxley Vaughan, F. W. Tucker.
CLIFTON FORGE—Virginia Garage Co.; $30,000. B. H. Tatum, E. A. Snead, B. C. Goodman.

Washington

SPOKANE—Chalmers Auto Co.; $10,000. M. McInnis, O. E. Logan.
WALLA WALLA—Franklin Motor Co.; $75,000. B. H. Tuttle, Alex McKenzie, Inez Tuttle, Vivien Cookerly.

West Virginia

MORGANTOWN—Morgantown Jitney Co.; $3,000. F. M. Lucas, R. M. Davis, Fannie Davis, Hazel Lucas, Mabel Wilson.
WHEELING—Auto Accessories Co.; $5,000. P. F. Haberstick.

Wisconsin

LA CROSSE—Zimmer Motor Car Co.; $5,000. J. E. Zimmer, O. H. Matzke, Susan Zimmer.

Virginia

ROANOKE—Meadow-Price Co.; $1,000 to $50,000. D. S. Meadows, R. E. Price.

Automobile Agencies Recently Established

Alabama

Birmingham	King	Birmingham Motor Co.

Arkansas

Hope	King	C. C. Spragins
Paragould	Halladay	W. S. Coleman & Sons

California

Los Angeles	Enger	Irving Motor Car Co.
Los Angeles	Grant	Bekins-Speers Motor Co.
Los Angeles	Hollier	Stone-Dancy Motor Sales Co.
Los Angeles	Kelly-Springfield	Stone-Dancy Motor Sales Co.
Monrovia	Chevrolet	Foulke & Deatherage
Redlands	Chandler	Park Garage
Redland	Chevrolet	C. H. Clem
Redlands	Oakland	Park Garage

Colorado

Boulder	Metz	J. A. Outhier
Boulder	Stearns	F. Deckelman
Buena Vista	Haynes	W. C. Fletcher
Burlington	Metz	G. Danforth
Cheyenne Wells	Metz	D. R. Purdy
Colorado Springs	Haynes	E. D. Marr
Colorado Springs	Stearns	Ferguson & Ingersoll
Denver	Denby	A. C. Wagner
Denver	Paige	Platt-Fawcett Motor Co.
Fair Play	Apperson	H. Bergstrand
Flagler	Metz	Lewis Clark
Fort Collins	Inter-State	C. B. Mossman
Fort Collins	Metz	L. W. Van Dyke
Fort Morgan	Metz	J. M. Scofield
Greeley	Inter-State	C. C. Kersey
Greeley	Metz	F. P. Meeker
Haxtum	Metz	M. Anderson
Iliff	Metz	W. F. Alexander
Leadville	Haynes	Cloud City Garage
Longmont	Inter-State	Watts & Hylton
Longmont	Metz	F. Hildreth
Loveland	Inter-State	A. Straight
Mattison	Metz	K. Koontz
Ouray	Dodge	Silva Auto Co.
Pueblo	Metz	F. Hamilton
San Luis	Apperson	W. S. Parrish
Steamboat Springs	Dodge	J. A. Brobeck
Sterling	Inter-State	Ideal Auto & Mch. Co.
Trinidad	Metz	J. I. Glendenning
Vilas	Metz	C. F. Wheeler
Wray	Metz	McGinnis Bros.
Walsenberg	Metz	C. B. Blanton

Connecticut

Norwalk	Kissel	F. E. Lockwood & Co.

Georgia

Columbus	Apperson	B. Y. Hill Garage

Illinois

Abingdon	Maxwell	Reynolds & Fields
Alton	Haynes	C. G. Luft
Bloomington	Stearns-Knight	C. W. Frey
Champaign	Milburn Elec	R. C. Nelson
Chicago	Enger	Central Sales Co.
Chicago	Oldsmobile	P. Lorenzen
Colfax	Ford	F. M. Hager
Decatur	Mitchell	L. W. Cook
Freeport	Mitchell	M. L. Miller
Freeport	Vim	T. B. Rigney
Jacksonville	Haynes	W. C. Hamm
Jacksonville	Jeffery	Jacobs & Meyer
Manito	Oakland	Frank Wilson
Murphysboro	Oldsmobile	P. B. Outhouse & Co.
Pekin	Davis	H. A. Reuling & Son
Rockford	Paige	F. Carlson
Shirley	Reo	Charles Hutchinson
Springfield	Chevrolet	C. E. Knecht
Springfield	Oldsmobile	White Garage
Strawn	Dodge Bros.	Stottler Brothers
Weldon	Reo	M. H. Shinneman

Iowa

Anamosa	Kissel	Anamosa Auto Co.
Cedar Rapids	Vim	P. Perley
Des Moines	Kissel	Guarantee Motor Co.
Des Moines	Stearns	Hal Wells
Fonda	Kissel	Kenning Auto Co.
Waukon	Oldsmobile	J. G. Minert Auto Co
Waterloo	Abbott-Detroit	G. W. Campbell Co.

Kentucky

Carrollton	King	Thomas Garage
Louisville	Scripps-Booth	Callahan Motors Co.

Maine

Greenville	Chandler	W. R. Dailey
Portland	Allen	Paterson Garage Co.

Maryland

Baltimore	Standard	Little Giant Sales Co.
New London	Apperson	J. R. Brandenberg

Massachusetts

Boston	Pullman	W. J. Hurley
Brockton	Flint	Loring Motor Car Co.
Brockton	Kissel	KisselKar Brockton Branch
North Adams	Oldsmobile	M. O. Haggerty
S. Deerfie d	Oldsmobile	T. J. Ahearn
Springfield	Haynes	Springfield-Haynes Co.
Worcester	Stearns-Knight	H. E. Plimpton
Worcester	Jackson	Greene Hale Co.
Worcester	King	H. B. Pulsifer

Michigan

Addison	Maxwell	Frank Barnaby
Adrian	Dodge	Wilcox Hardware Co.
Dowagiac	Ford	Scammon & Adams
Hartford	Regal	C. G. Warren & Son
Ionia	Dort	Benedict Buick Co.
Ionia	Oldsmobile	C. H. Welker
St. Johns	Jeffery	Steel & Valentine

Minnesota

Minneapolis	Herff-Brooks	Eagle Motor Works

Missouri

Centralia	Reo	L. & H. L. Roemer
Kansas City	Engel	Packard-Missouri Co.
St. Louis	Elco	Motor Car Repair & Supply Co.
St. Louis	King	Brinkman Motor Car Co.

Montana

Lewiston	Oldsmobile	J. W. Drake

Nebraska

Cozad	Oldsmobile	W. Robertson
Fremont	Apperson	Hall & Steele
Lincoln	Kissel	A. H. Meyers
Omaha	Enger	Foshier-Enger Co.
Omaha	Moline-Knight	R. G. Davis

New Mexico

Albuquerque	Metz	F. E. Dearth

New Jersey

Bradley Beach	King	E. S. Thomas
Matawan	King	J. C. Bushnell

New York

Buffalo	Inter-State	Blackburn Sales Co.
New York	King	Mineola Garage
Rochester	Enger	Heiber Motor Car Co.
Schenectady	Kissel	Wm. D. Havens
Shelter Island	King	G. B. Wells
Silver Creek	Oldsmobile	Wm. J. Dickerson
White Plains	Kissel	Kissel Kar Garage Co.

Oklahoma

Oklahoma City	Marion	Sutter-Johnson Motor Co.

Ohio

Alliance	King	J. F. Brannon
Bucyrus	Enger	F. J. Norton Sons
Portsmouth	Vim	R. S. Prichard
Rayland	Oldsmobile	W. D. Hoge
S. Charleston	Oldsmobile	Sullivan Auto Co.
Xenia	King	Page-Maxwell Sales Co.

Philadelphia

Addison	Enger	Straw & Dean
Germantown	King	Delmar Garage
Harrisburg	Studebaker	Ford Sales Co.
Hawley	Dodge Bros.	Gottlieb Matter & Sons
Hazletown	Enger	G. W. Wilmot
Lancaster	Enger	O. H. Shank
Monessen	Oldsmobile	H. N. Odbert
Parkers Landing	Apperson	Gibson & Sorgen
Philadelphia	Kissel	Baker-Price Co.
Reading	Vim	Reading Auto Co.

South Dakota

Sinai	King	F. H. Fo lberg

Tennessee

Memphis	Vim	G. W. Richardson

Texas

Fort Worth	Franklin	G. L. Omohundro
Houston	Apperson	Young & Dwire Co.
Marble Falls	Oldsmobile	Marble Falls Garage
Mesquite	Kissel	Humphreys & Vauston

Vermont

Burlington	Kissel	Todd & Tupper

Virginia

Big Stone Gap	Enger	Dominion Motor Car Co.

Washington

Spokane	Velie	Franklin Auto Sales Co.
Taconia	Enger	W. E. Newton
Walla Walla	Hupmobile	Alvin Coyle

Wisconsin

Eagle	Oldsmobile	Smart Bros.
Hartford	Kissel	Schauer Brothers
Marion	Kissel	F. J. Hauge
Watertown	Oldsmobile	The Service Co.

Wyoming

Basin	Metz	G. R. Hoover & Co.
Dayton	Metz	R. W. Ratcliff

VOL. XXXIII. NEW YORK—THURSDAY, OCTOBER 28, 1915—CHICAGO No. 18

The AUTOMOBILE

The History of the American Automobile Industry

Opening Chapter of History of America's Great Industry—First Time the Complete Story of Early Endeavors Has Been Told—To Be Published Serially and Later in Book Form

This Issue—The Scope and Early Efforts

By David Beecroft

THE practical and continuous development of the gasoline-engined automobile in America dates back to 1891; the first application of an electric motor coupled with a battery to propel a vehicle dates to approximately 1884, marking the advent of the pioneer, but the practical start of the electric vehicle industry dates from 1893 or 1894; and the pioneer in building steam road automobiles or locomotives as they were then called goes back to 1769, when the movement had its inception, although steam automobiles, as we now know them, date back little further than 1887, when our pioneers brought out their initial machines for passenger use.

Idea Is Centuries Old

The concept of building a vehicle that would run without horses is centuries old: Visions of the motor vehicle are recorded in Holy Writ, our ancient historians record prophecies by the great scientists; and poets wrote centuries ago of the possibilities of the fleet motor vehicle that would navigate the seas, traverse the land and cleave the air. While the practical development of the automobile in America covers a span of thirty-five brief years, yet the brains of earlier days handed to our inventors and pioneers of the present generation the essentials of the automobile as we know it to-day. Hence to get the broad perspective of the history of the automobile in America it is necessary to review the recorded efforts of the last 50 years both in America and Europe, for in them we find the roots of the many constructions constituting the warp and woof of the present-day car.

First Internal Combustion Engine

In 1791 Barber's internal combustion engine marked the first recorded effort from which the gasoline engine of to-day is the offspring. The thread of progress was slow and it was not until 1876, when for the first time the charge of gasoline vapor was compressed that the possibility of the high-compression engine of to-day was a reality. It was 10 years later before Daimler and Benz in Germany gave us their engines, and in 1892 before Charles E. Duryea and his brother Frank gave us our first practical American gasoline automobile.

Pneumatic tires were made and used in 1845; the differential gear as used in the rear axle dates to 1828, when a Frenchman, Pecqueur, used it; the pivoted axle ends carrying the front road wheels were used in 1818, nearly a century ago; we have had the irreversible steering gear since patented by Jentaud, a Frenchman, in 1878; the use of the hot tube for igniting an explosive mixture takes us back to 1791; the use of the electric spark in ignition was recorded in 1853; and the use of springs, wheels, frames and other essentials carries the

reader far back into other centuries of the past.

To trace the growth of the automobile, as suggested by these conspicuous landmarks, it is imperative to turn back the pages of a century or more and analyze the outside influences that were factors in stimulating the industry or retarding it. War, always a retarder, exerted its influence a century ago, hostile road laws held the movement back in certain countries and the lack of improved roads exerted a strong retarding influence.

A Tremendous Subject

Yet, no apology is needed for a history of the great and still rapidly growing American automobile industry, but having delved into the earlier facts connected with the industry further than has heretofore been attempted in America, we recognize better than our readers possibly can how much limited space and time have compelled us to leave undone and although giving a great amount of information that is new to them and to the world at large, we regret that the limitations mentioned do not permit us to make it larger.

While it is well known that histories in general recite only the main parts and leave unmentioned the less important ones, it is not so well recognized in a history of this kind, that it is the exceptional which received mention, while the more common or commonplace, even though equally good, is neglected. The thought that, "Full many a flower is born to blush unseen and waste its sweetness on the desert air," has been constantly exemplified in connection with the automobile industry.

Foreign Influence

While it has been our intent to confine ourselves to the history of the industry in America we have been forced to constantly refer to work done by foreigners for several reasons. The ancient history is as much our inheritance as that of any other people and we give in these pages the more important points therein that our readers may understand the age and growth of this history-long problem and its bearing on our modern productions. The publications of foreign countries reach America much more freely than American publications go abroad because of the fact that many of our people or their immediate ancestors were foreign born and therefore take interest in things happening abroad. Our most liberal patent system is taken advantage of by foreign inventors quite freely and on these accounts foreign influence and foreign work have very materially affected American development and cannot therefore be ignored in an unbiased American history.

Several other factors have influenced the industry in America that were not felt or were felt to a much different degree in Europe. Probably the most important of these is the road problem. In this new land there are almost no roads whatever in the sense that the improved highways of Europe exist. At the beginning of the modern automobile movement there were practically no improved roads in this country. The rise of the automobile and modern road building in America have been exactly contemporaneous. In 1891 New Jersey passed the first road improvement bill and the first American automobile was begun by C. E. Duryea. Straggling road improvement and likewise straggling growth in the automobile industry during the next seven or eight years, but a considerably increased activity both in roads and automobiles thereafter. The difficulties imposed upon our automobile inventors by our money wasting excuses for roads, has been a matter of comment by foreigners visiting us ever since we arose to the dignity of a nation.

A second very important factor has been the cost of horses and horse feed. In this land of broad area and fertile acres feed has been so cheap and horses so plentiful that the incentive to secure transportation other than by animal power and thus save hay and oats has not appealed to our inventive minds or our buying public as it has in the more thickly populated European lands where horses have been much more of a luxury. The very commonness of the horse made him the companion of all our people to such an extent that few believed he could be displaced in their hearts by a mere machine, no matter how swift or how economical it might prove to be. So certain were several of our automobile pioneers that no one able to afford a stable and hold the lines over a lively, intelligent and beautiful animal would ever purchase or drive for pleasure a machine vehicle that their earliest efforts were directed toward supplying transportation for those city brothers, who could not afford or whose surroundings would not permit maintaining a horse and stable. Such a view naturally did not encourage work toward a solution of the automobile problem. The limited market and the certainty that the price must be low and perhaps taken in installments made it necessary that the vehicle should be of the cheapest possible design and construction, and it was not until experience gained by riding on his brains showed that the motor vehicle opened a new world that Duryea and his brother Frank began in 1893 to develop the automobile for the high-priced market. It takes time to establish a manufacturing industry or create a manufacturing people, and naturally the newer country remained an agricultural one and looked to Europe for its mechanical supplies.

American Inventions

In spite of these and other reasons American inventors made a record to be proud of, and although not so numerous because our population was not so large and perhaps not so successful, for reasons above given, yet the records show that they were not laggards, but were closely in touch with the world's progress and often leading it; in fact, the record frequently shines with such brilliance that every patriotic American must glow with pride and should wonder if our national recognition and treatment of the American inventor is as liberal as his efforts and devotion to his work merit. The steamboat, the ironclad, the telegraph, telephone and electric light, the grain harvester, the submarine and aeroplane are familiar examples of

American ingenuity leading the world, and our pages will show a goodly number of such examples in the automobile business.

Solving the Problem

No mechanical problem, except possibly flying, remained unsolved so long as this one of self-propelled vehicles, and no problem has ever had expended upon it so large an amount of thought, effort and money in so many parts of the world or by so many people or under such widely divergent conditions. While it is true that many hinderances, particularly bad roads, and in some cases restrictive laws, hindered or stopped the work, it is safe to assert that no mechanical problem has proved so difficult of solution as this one and it has required not only a very high order of mechanical ability, but the growth of mechanical progress and the combination of ideas from many sources in order to accomplish it.

In writing the history of the automobile in America it is almost paradoxical that there is no first. Each man had been preceded by work which led up to his efforts and, which if he knew of them, undoubtedly assisted him materially. In passing judgment upon the work of the various people care must be exercised to note whether he was an originator or whether he was simply a sporadic worker, who did very little outside of his single effort and who added very little to the final result; or, whether he was persistent and kept his work going ahead until it did finally affect the entire industry.

Judged by these standards, we find that, although the automobile industry could have been developed many years earlier, using the material at hand and using no new devices whatever, it was not until certain persistent individuals came along who, having taken up the work and put their hands to the plow, continued until the industry became influenced by their work. Judged by this standard Charles E. Duryea, Ellwood Haynes and Alexander Winton were the pioneers in the gasoline vehicle work; Morrison & Salon were pioneers in the electric, and S. H. Roper, followed by George E. Whitney were the steam pioneers. R. E. Olds, Henry Ford, King and others followed close after as did Woods and the Stanley brothers.

Ancient Vehicles

The self-propelled carriage concept is undoubtedly almost as old as carriages of any form. The drag or sled which slid down a hill without assistance was not only the first self-propeller, but with no less doubt awoke within the mind of its possessor a desire to enjoy similar self-propulsion on the level and up hill just as every child coasting with his sled desires this thing. That our records of the automobile do not go back so far is not because the idea did not exist, but because it was not successfully carried out.

The oldest recorded vehicles are Egyptian war chariots whose pictures are sculptured on the enduring monuments dating back probably 2000 years B. C. The wheels of these chariots varied from 30 to 39 in. and thus corresponded very closely with modern automobile sizes.

The first written mention of vehicles is in the Bible, where Joseph sent wagons to assist in moving his relatives. By the time of Solomon, some 500 years later, chariots were so plentiful as to be mentioned in thousands, and it is at about this time that the first written mention of the automobile idea is found in Homer's Iliad, 18th Book. That it is not found sooner is more probably due to the fact that writing itself was new at the time of Moses and the alphabet very imperfect (16 consonants only) until about the age of Solomon and Homer.

The Art in Homer's Time

That the arts of carriage making were considerably advanced in Homer's time (1000 B. C.) or before, is conclusively shown by mention in the fifth book of the Iliad, where the advantage of using a different metal for the bearing than that used for the axle is clearly indicated in the assembling of Juno's chariot:

"by Hebe, ever young,
The whirling wheels are to the chariot hung.
On the bright axle turns the bidden wheel
Of sounding brass; the polished axle steel.
Eight brazen spokes in radiant order flame."

These wheels undoubtedly were cast in a single piece just as the one-piece steel wheels used on many heavy trucks to-day, and there is some indication in the text that they were even turned, or in some manner machined on their circumferences.

The following quotation shows plainly the existence of the conception of self-propelled vehicles in Homer's time. He describes Juno as seeking aid from Vulcan the lame blacksmith and—

"There the lame architect the goddess found,
Obscure in smoke, his forges flaming round,
While bathed in sweat from fire to fire he flew;
And puffing loud, the roaring bellows blew.
That day no common task his labor claimed;
Full twenty tripods for his hall he framed,
That placed on living wheels of massy gold,
(Wondrous to tell) instinct with spirit roll'd
From place to place, around the bless'd abodes
Self-moved, obedient to the beck of gods."

Iliad 18th Book.

From other sources also we learn of self-moving apparatus in use in the temples before the Christian era; the priests being leaders in mathematics and mechanics in those times. How these devices were moved is not known, although some very ingenious arrangements for other purposes have come down to us. It is practically certain that the first forms of vehicles that were not drawn were propelled by man-power often concealed for the mystification of the public or for protection from the enemy. The Ethiopics of Heliodorus mention a triumphal wagon as having been used at Athens, which was moved by men carried therein and similar references are found in other authors. The moving forts or shields used by armies were carried or pushed rather than propelled and can hardly be considered mechanical devices. Friar Bacon

wrote in the thirteenth century of mechanical possibilities and said, "it will be possible to construct chariots so that without animals they may be moved with incredible speed." Certainly the racing creations of to-day would amply satisfy this speed prediction.

Chinese Wind Wagons

Vehicles propelled by a rowing or pushing action and also by sails were seen in China by western travelers in the fifteenth and sixteenth centuries with no record as to their first use, which may have been centuries before. Sails are still used in China to assist in propelling their crude wheelbarrows or carts, but they are hardly independent of man power and therefore not proper examples of this art.

Beginning with about 1600 sailing carriages were made in Europe by the celebrated mathematician, Simon Stevin of Holland. One in particular carried five passengers and another had a capacity of twenty-eight passengers. This latter was simply a box on wheels with two masts and sails and with the rear axle arranged so that it might be steered. In short, a boat running on wheels instead of on water. A description of a trip made in the larger car recites a run of 42 miles along the Dutch coast in two hours with full passenger load. The smaller carriage was kept at Scheveningen as late as 1802, but had not been used since 1748.

The rope or chain steering cable wound around the steering column and much used on traction engines and more recently on cycle cars, dates back to a Holland wind wagon of 1740.

The Use of Kites

Many other accounts of wind-driven vehicles are to be found which carry this art down to the present day and include sail-driven vehicles on the prairies of the central United States as well as sail-driven bicycles and skate sailing, both popular sports in some localities.

One of the most interesting accounts of wind-driven vehicles is found in Pocock's "Navigation in the Air by the Use of Kites or Buoyant Sails, 1827," in which he describes many trips made about England and also fishing vessels driven by means of his controllable kites. By the use of three or four cords he was enabled to make his kites pull strongly or float lightly on the air at will and also to tack one side or the other just as sails are set at an angle to the wind which, coupled with a proper steering device, enabled his vehicle to be run almost into the teeth of the wind. Speeds of a mile in 3 min. were frequently attained and fishing smacks drawn by kites traveled much faster and were not becalmed so often as those dependent on sails.

The use of springs for carriage propulsion was suggested early and has persisted until the very end of the last century. The first known attempt was made in Paris by an Englishman in 1644. Patin tells us "this carriage was intended to run from Paris to Fontainebleau and back in a single day," and that it was thought there would be "a great economy in hay and oats." The device apparently worked well on a floor, but anyone knowing the amount of power required by a successful motor vehicle can readily understand that winding these springs by men would not be a practical method. Another attempt with a spring motor was made by Vegelius, a Jena professor, who in 1679 made a spring-propelled horse covered with the skin of a real horse, which on level ground was able to cover 4 miles in a day. How often it required winding or how long to wind is not stated.

Propulsion by Spring Power

The spring carriage problem again and again received attention with each wave of development of locomotives or railways and in the latter part of the last century several very serious attempts were made to propel street cars by the spring method. The almost level and practically perfect track permitted carrying a heavy load of springs while the possession of mechanical power for winding them removed one of their most objectionable features. Steel making had progressed by this time so that much better and much larger springs were quite possible to secure. Among these attempts may be mentioned a spring-driven omnibus tried in New Orleans in 1870, a street car tested in Philadelphia later, and another one tested between Richmond, Va., and Manchester in 1891. This car weighed about 1000 lb., carried ten people on a successful trial trip and employed eight springs, each formed of a strip of steel 8 ft. long by 18 in. wide by 3/32 in. thick, estimated each at 2 hp. or a total of 16 hp. Suitable mechanism permitted applying one or more springs at a time as the amount of power was needed.

Many Patents Sought

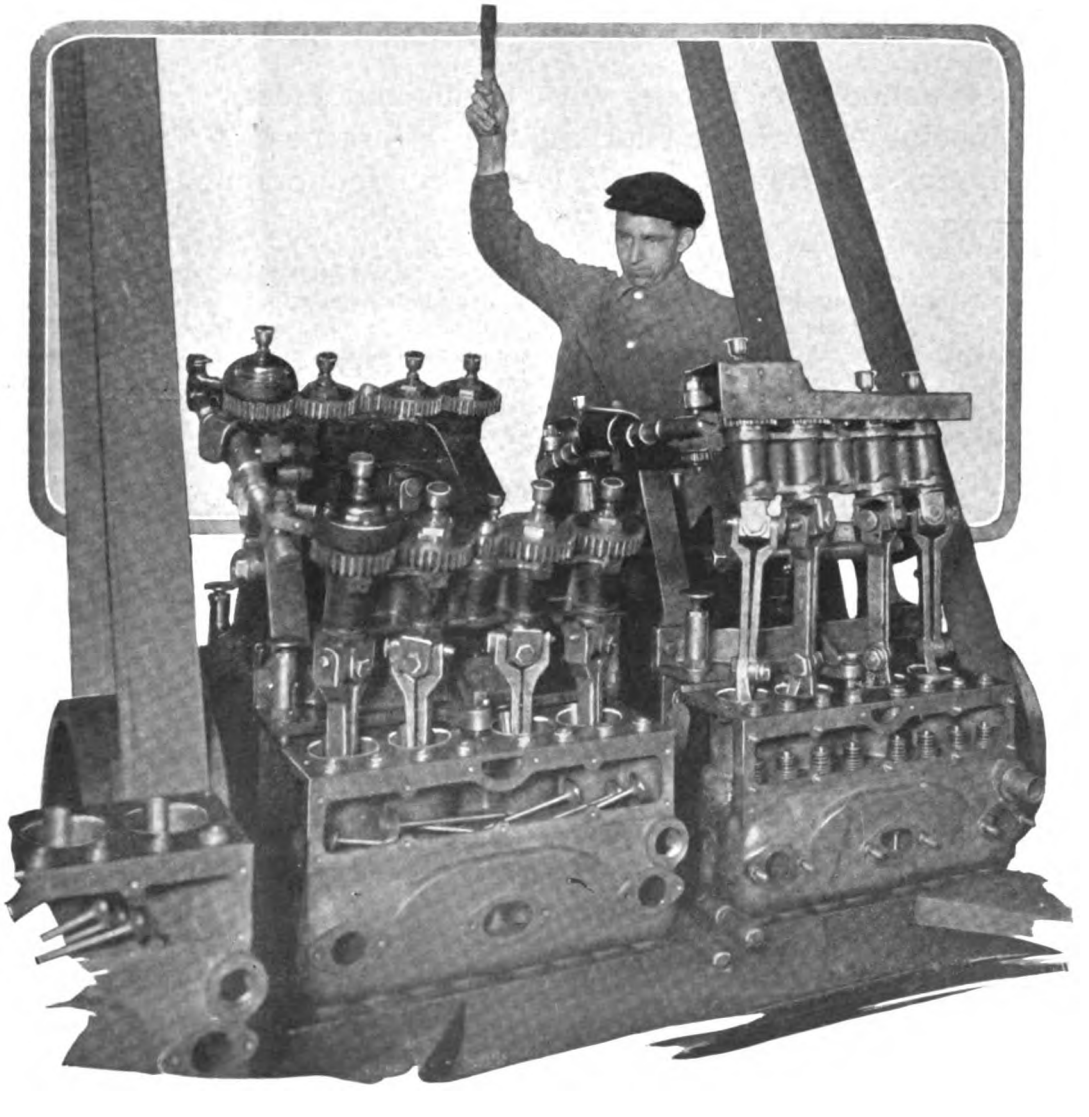
The latter part of the century embracing about thirty years, from 1866 to 1897, shows a very considerable activity in spring-propelled vehicle designs. This activity is coincident with great activity in other lines and a part of that larger movement of the national life toward a much wider manufacturing and distributing activity which began to develop after the Civil War. United States patent records show fully fifty different attempts before 1900, but they are of very little interest to the motor vehicle art because they were in no sense permanently successful nor did they add anything to the stock of knowledge or the mechanical devices needed to make the industry a success. On the contrary, they show evidence of being rather the efforts of those who were not well posted either as to the requirements or the history of the art and who, therefore, could hardly be expected to add anything to it.

While in general the self-propelled vehicle is designed to displace the horse, a part of the progress to this end has been the construction of vehicles propelled by horses employing treadmill or turntable mechanism. It was quite early recognized that, given good roads or a good track, animal muscle can be expended to better advantage than in the natural process of walking or running and that a horse may propel the vehicle and himself

farther and faster than he can pull it just as a cyclist can cover two or three times as many miles in a day in spite of the added weight of his machine than he could possibly do afoot. In 1824 Snowden, a British mechanic, proposed a two-story turntable or merry-go-round, on the lower floor of which the horses walked in a circle to propel the structure. He seems to have had the then very common notion that to get traction cogs were necessary, and his vertical driving shaft seems to have extended down into a slot in the road with a pinion on the lower end meshing into a rack in this slot. Stevenson, known for his locomotive, claims to have had designs for a treadmill device and one of these, Brandreth's cyclopede, was tried on the Liverpool and Manchester Railway in a competition held in 1829. It failed to attain speeds higher than 5 or 6 miles per hour.

Other experimenters frequently had this idea in mind, which is not to be wondered at when we remember that in the early part of the last century the treadmill operated by horses, oxen, dogs, convicts and slaves was not an uncommon method of securing needed power.

While the expansive force of gunpowder was early recognized as a possible source of power and was probably tried before any modern application of steam and has been tried many times since even as late as 1891, it is is to steam that we are obliged to look for the first really successful self-propelled carriage. The difficulties connected with building and operating gas and hot-air engines, or their predecessor, the gunpowder engine, were not sufficiently well understood when the early attempts were made to permit their being overcome, while the inability to get suitable machine work for such engines and suitable lubrication made them practically out of the question. It was not that the thinkers of those days were unaware of the principles involved or of the possibilities, but that they were ahead of the age and therefore ahead of the market as well as ahead of the practical equipment needed to do the work. Some idea of the imperfection of machine tools may be gathered from the fact that Watt wrote a friend about his steam engine and explained that he had succeeded in getting the piston fitted to the cylinder so accurately he could not insert anything thicker than a half crown between them. Only a mechanic who has worked under such discouraging conditions can appreciate the joy that the pioneer of steam would have felt had he been able to secure work down to fractions of a thousandth of an inch in accuracy, as is quite practical to-day.

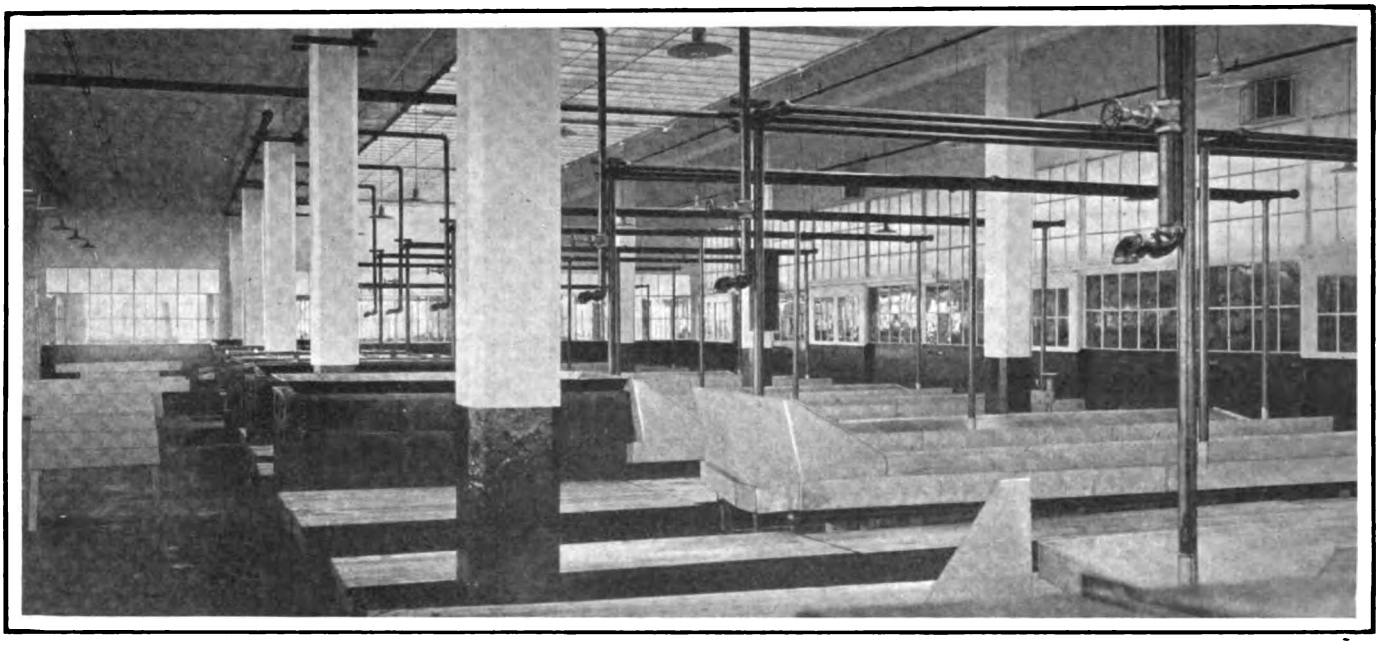


Piston Lapping Machine a Labor Saver for Hupmobile

The illustration shows a novel machine in the factory of the Hupp Motor Car Co., Detroit, Mich. It is called a piston lapper, and was designed by the concern. Four blocks of cylinders are placed on the machine at one time, two on either side. By a "walking beam" movement, the pistons attached to the machine are forced up and down in the newly machined cylinder blocks until a good lap fit is obtained.

At the same time as the up-and-down movement is being carried on, the pistons are made to revolve by gears at the top of the piston linkages. This is to insure a perfect lap fit.

By the use of this intricate-looking device, one man now does the work formerly done by eighteen men—an enormous saving of labor cost.



One of the two dipping rooms at the Buick plant where aprons, fenders, radiator shells, etc., are immersed in enamel by men in dust-absorbent clothes. The parts are then hung on racks to allow excess enamel to drip off. Hoods are dipped in a separate room at one end. Each of these rooms has a separate supply of washed air

Eliminating Dust in Body Enamelling

Buick Uses Washed Air, Rooms with Walls and Floors Oiled and Special Absorbent Clothing for Workmen—Spraying, Dipping and Baking Avoid Delay in Production

By L. V. Spencer

THE body painting and metal parts enamelling departments are the bugbear of many an automobile manufacturer. Fine finish is one of the things that helps to sell cars these days, yet it is a costly feature to obtain, and it takes time to produce it. Dust is its deadly enemy; it frowns seriously upon rapid production insofar as this branch of the work is concerned.

For there are probably no parts of the average plant that take up more room, are conducive of more waste and hold onto the car longer in its journey to completion than those divisions which have to do with these color processes. Though rapid production kinks are constantly being installed in other departments of the average plant, little thought is given to methods of speeding up the painting operations without in any way sacrificing the desirable fine finish. Methods which have been in vogue since the carriage days are still adhered to in most painting rooms, with the result that while production is speeded up at a great rate in all other departments, there is a marked slowing down again when the car reaches the "paint." Hand work is usually employed, with the time-honored paint brush monarch of all it surveys.

Paint Usually Slows Production

Several of the big makers, however, have been studying this matter of painting, and have realized that they could get the cars out faster with some modern methods of quickening the processes. The main operations in painting and enamelling are to apply the paints or varnishes and then to dry them. So the production men have studied the problem, and now in many plants where the output runs into thousands of cars a year, both of these operations have been hurried. Application of the colors is done in many cases by either dipping the parts into them or by spraying them, and drying is hastened by huge ovens.

New Methods for Parts

While this development in painting and enamelling does not apply to the bodies of cars to any great extent, many large producers employ the new methods in enamelling the metal parts. No doubt the spraying and baking scheme will be extensively extended to body finishing as time goes on, and facilities for uniformly and smoothly applying the coats in this way to such large and unwieldy surfaces are perfected.

Typical of the very latest in the new era of enamelling and painting plants is the building belonging to the Buick Motor Co., Flint, Mich., especially for the enamelling of metal parts and the spraying of varnish onto wheels. The utmost rapidity of applying the coats to the parts is made possible, and huge baking ovens do the work of quickly drying these coats. No loss of time is occasioned by the new department, the capacity of which is every bit as great as any other part of the big factory.

All chassis metal parts, such as fender irons, hoods, fenders, radiator shells, and the like receive lasting coats of enamel here, and the pains taken to assure a smooth and lustrous finish are almost unbelievable. Dust is recognized as the enemy of the whole process, and the means employed for

eliminating that microbe from the varnish and enamel surfaces is most elaborate.

Color Sprayed on Wheels

There are also some new ideas worked out in the coloring of the wheels by spraying, then baking them in ovens similar to the enamelling ovens. A surprising saving of time is the result of this wheel painting method, for it takes considerable time to properly coat each spoke with a hand brush.

The new Buick enamelling building is three stories high and measures 110 ft. wide by 260 ft. long, giving a total floor-space of 85,000 sq. ft. The arrangement of the floors is given in the floor plans herewith. Throughout, the new building has been laid out for a production of 350 cars a day. This does not mean that only 350 wheels can be colored in a day, but that enough for that many machines can be put through —1400 wheels. This applies to fenders and other parts as well. Each car has four fenders, so the fender capacity is 1400 per day, and so on.

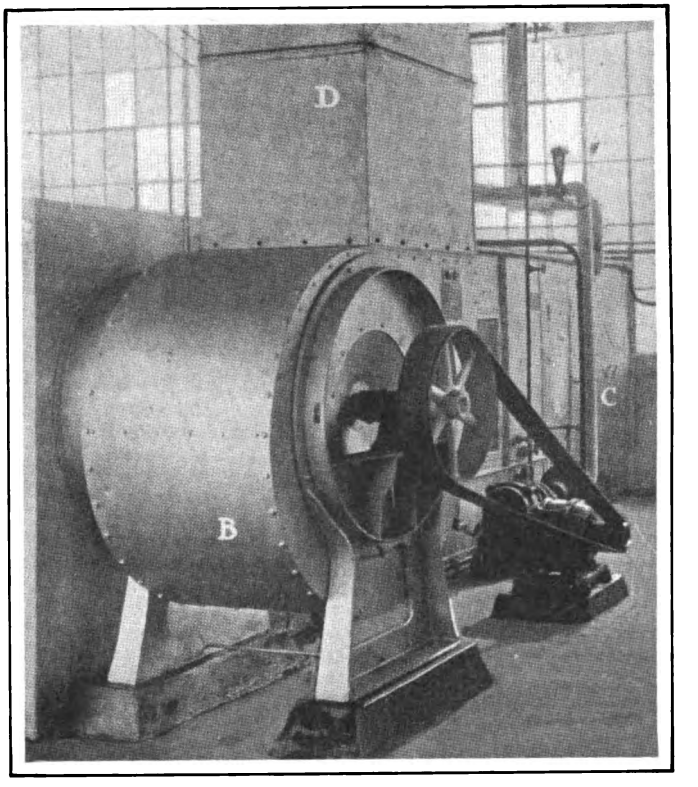
The Pickling Room

Coming from the manufacturing departments, some of the parts to be enamelled are first taken to the second floor. Here there is a pickling room measuring 35 by 70 ft., where the metal parts that have smooth flat surfaces, such as fenders, aprons and hoods must have an acid bath before they can go upstairs to the beauty parlors to be enamelled. Rust, finger marks and other foreign substances must be entirely eliminated from the surfaces of these parts before the enamel can be put on. Should a finger mark be left on the surface of a fender, for instance, the enamel would come off at that spot in less than three months. The same with rust and other substances. For the enamel to stay on, it must be applied to an absolutely dry and clean metal surface.

However, this pickling room visit is not required of the rougher metal parts such as step hangers, tire irons, bolts, and the like. The enamel has plenty of opportunity to stick to them providing they are wiped clean. These go directly to the enamelling department.

In the pickling room there are six vats each large enough to receive a fender or an apron, and above them, as protection to the workmen, are hoods which carry away the fumes. The first two vats contain a strong acid solution, the second pair have a weaker acid, and the others contain hot water only.

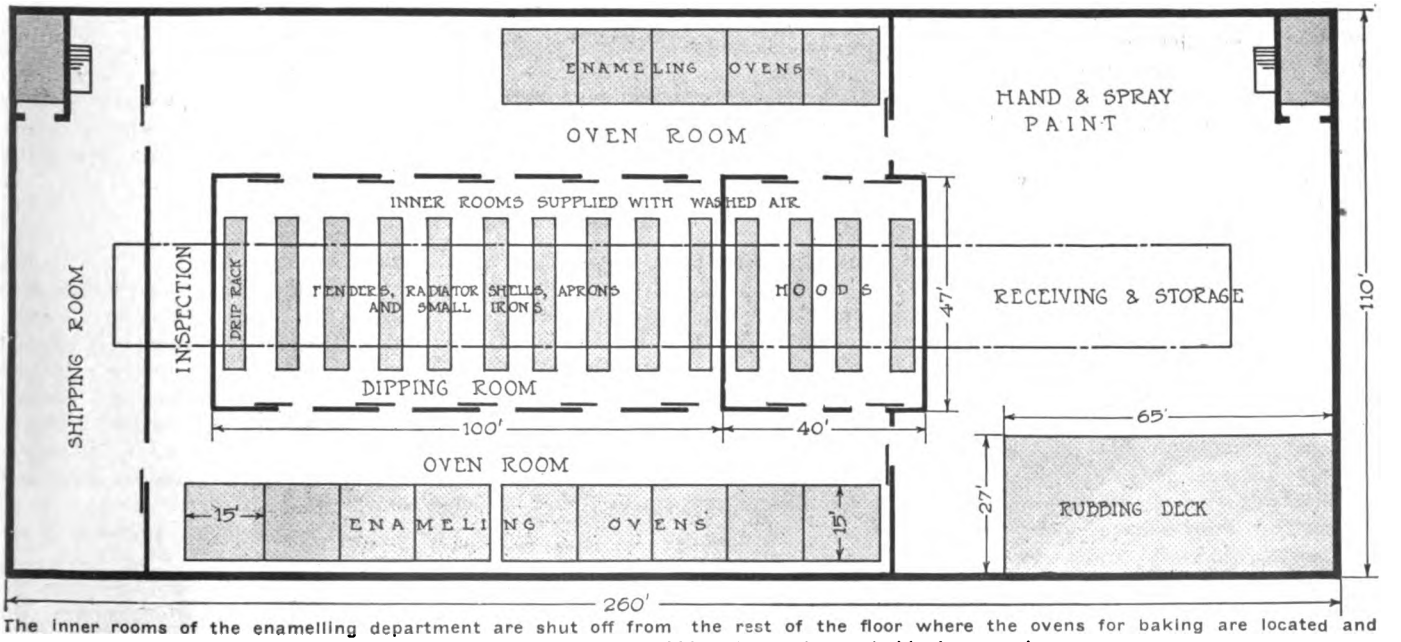
The procedure is to first dip the part in the strong bath,



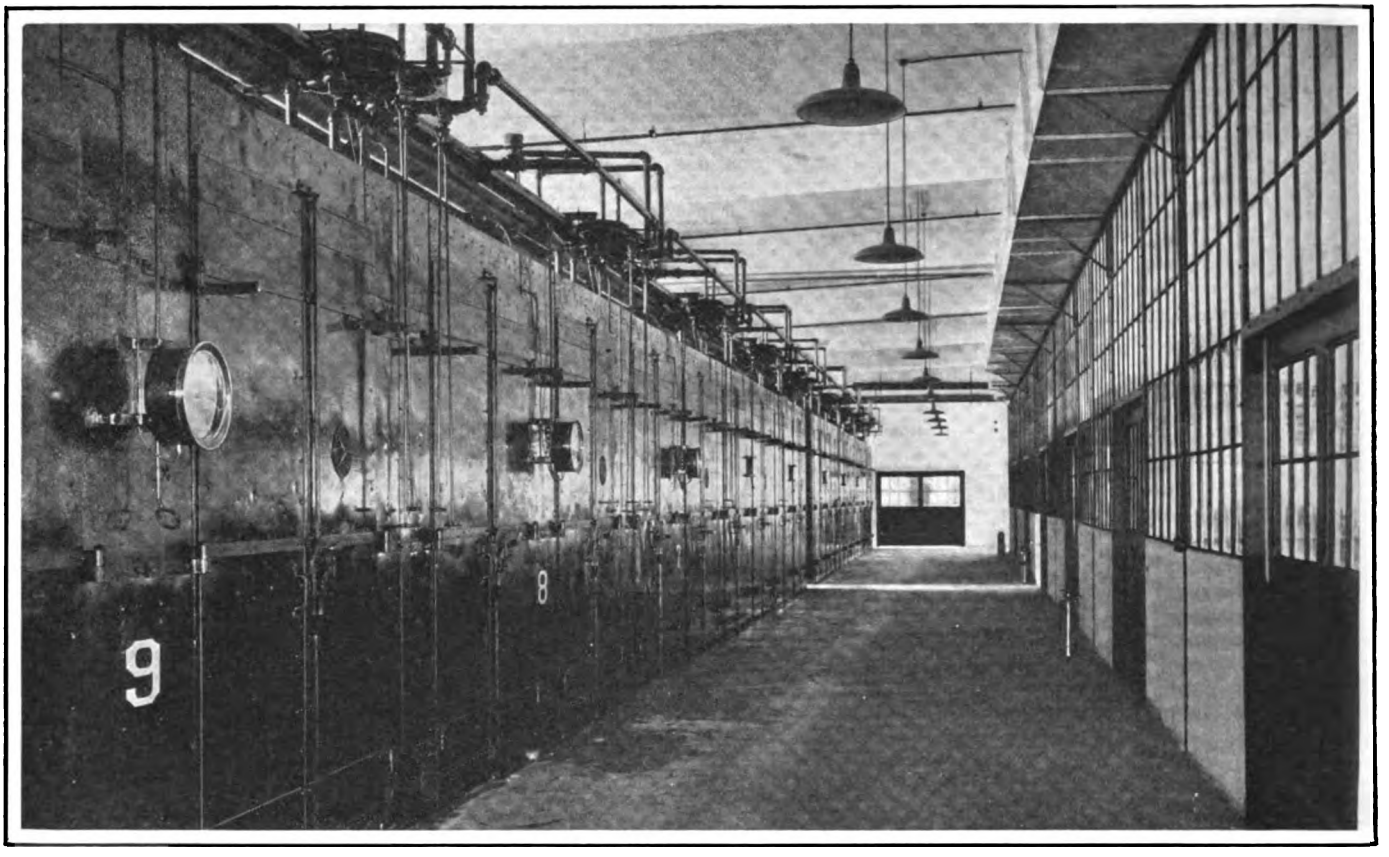
The large blower-type fan B which draws the air over a series of baffles, thus washing it. D is the air shaft and C is one of the pipes which carry the purified air to the inner rooms

then to transfer it to the weaker bath, after which the acid is rinsed off in the hot water. The piece is left in these acids only from 15 to 30 sec., and it is a solution which quickly eats off any rust. Following the baths, the piece is dried by directing a jet of compressed air onto it to get any acid out of the cracks, in addition to which a man rubs it with special cloths, always being careful not to put his fingers on the clean surface. The piece is now thoroughly cleaned and is ready to go to the next floor for the enamelling processes.

Here the campaign against the dust microbe begins in earnest. The actual dipping of the parts is done in two special rooms, which are virtually rooms within the main rooms. That is, they have four walls and ceilings, and are thus com-



The inner rooms of the enamelling department are shut off from the rest of the floor where the ovens for baking are located and where the hand and spray painting, rubbing, inspection and shipping are done



One of the banks of huge ovens used for baking the enamel on the sheet metal parts after they have had been dipped and drained. There are fourteen of these ovens

pletely inclosed within the main boundaries of the floor. Air which has been washed by a special process is circulated through these inner rooms, so that the purest of atmosphere is obtained.

Oiled Walls and Floors Kill Dust

But this is not all. It would be an easy matter for dust to reach the enamelled surfaces if the floors were not specially cared for. So, to further prevent dust, the walls and floors of these inside rooms are oiled. Once a week they are mopped in paraffin oil. Any slight amount of dust that might get in is thus caught by these surfaces and kept out of the air. But, you say, the men themselves might bring in some dust on their clothes. Buick has taken care of even this slight possible dust agency by requiring the enamellers to wear specially-prepared clothing, which absorbs any dust against its recirculation in the air. These clothes are furnished by the company at cost to the men.

Only black enamelling is done, and before it can be put into the dipping tanks, the enamel is first clarified and then mixed with oil to give it the right specific gravity, or thickness. The apparatus for clarifying somewhat resembles a cream separator. The centrifugal action of the apparatus throws off any impurities in the liquid. The clarifying is done to insure that only the clearest possible enamel is used. Having been properly mixed, the liquid is pumped to an overhead tank through the clarifier, and it then is strained back into a storage tank through a series of special gauze sheets ready to be drawn off into the dipping vats.

Arriving through pipes at these vats, the enamel is again strained through gauze before actually running into them, doing away with any foreign matter, however slight, that might have been collected in the pipes or connections.

Washed Air for Inside Room

The method of obtaining the washed air for these inside rooms is the same as that employed in theaters and other public places where they make a great feature of the washed air which their patrons breathe. For the dust pest is just as detrimental to an enamelled surface as it is to the lungs of the human being. The air is drawn by the suction of a large blower-type fan from outside through a series of baffles over which water is constantly playing. This literally washes the air, and the dust is trapped at the bottom of the air box. Reaching the blower after coming from its bath, the air is then sent through galvanized piping to the inner rooms. Ventilators are located near the floor, so that the air is kept circulating, since it is introduced to these rooms at the ceiling.

Separate Air Supplies

The two dipping rooms, which are thus proof against dust, are separated from one another by a partition, and each has its own supply of air. One room, in which hoods are dipped exclusively, has five dipping tanks, while the other adjoining room is provided with ten tanks and is used for aprons, fenders and radiator shells, principally.

Fourteen Baking Ovens

Along the length of the floor and outside of the dipping rooms are arranged the series of baking ovens, fourteen in number. Nine are placed on one side and five on the other for convenience. The floor plans show this arrangement clearly. Sliding doors in the sides of the dipping rooms allow the placing of the enamelled pieces in the ovens conveniently. These doors are of necessity kept closed at all times except when an actual transfer from dipping tank to oven is being made, for otherwise, the very purpose of the inner room would be defeated. It would never do for the air of the outside main room to get too well acquainted with the pure air of the inner room.

The dipping process is simple. We have seen how the parts are washed in acid and dried. Just before entering the inner room they go through one more procedure. They are

wiped with special dust-collecting rags, known as "tacky" rags. After all of this initiation, they are given the password to the inner shrine.

Dipping Hoods and Fenders

Two men do the dipping, one standing on either side of the tank. They use long hooks to catch hold of the hood or fender, drop it slowly into the tank of enamel, and then hang it over a drip pan at the end of the tank. It remains here for about 10 min., after which it is placed in the oven for 1½ hr., and baked at a temperature varying from 400 to 450 deg. Fahr.

Special racks are provided over the drip pans to accommodate the dripping pieces coming from the tanks, and the excess of enamel thus dripping off is drained back into the tanks. As many as forty fenders can be accommodated on one rack.

This first coat is known as the No. 1 "rubber coat," and following its baking on, the part comes back into the dipping room for the No. 2 rubber coat. The same dipping procedure is followed, after which another 1½ hr. baking is given it. Then a third or finishing coat is applied in the same way, and the piece goes into the oven for the last time, consuming another 1½ hr. Allowing 10 min. for each dripping, the actual time required to enamel a piece is 5 hr., figuring from the time the first dipping takes place to its final removal from the oven.

Special portable racks are used to hold the pieces while being baked and to convey them to the outgoing end of the floor after their final baking. These are specially shaped to receive either fenders, hoods or whatever other part is enamelled.

The ovens are a standard type made by Young Bros., Detroit, and designed to be heated by gas. They are constructed of sheet iron, and have provision for taking off fumes incident to the drying. They are about 15 ft. square and arranged to maintain the temperature desired.

Occasionally a fender or apron is marred or scratched in the assembly or in the course of painting, and to take care of any such, a rubbing deck is provided on the enamelling floor. This deck is about 20 by 60 ft. in size and provides for the preparing of the damaged piece for re-enamelling. The men smooth off the scratched places, and follow the usual procedure of making a piece ready for painting.

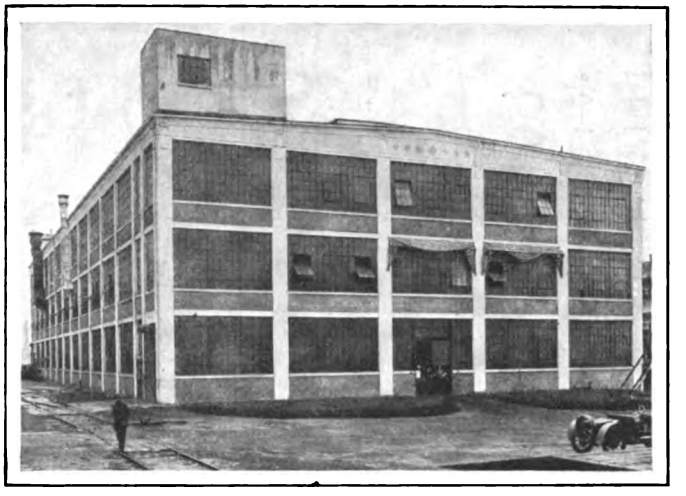
Baking the Wheels

No less interesting is the method of coloring the wheels on the floor below. Arranged around three sides of the wheel painting room are fifteen specially constructed ovens for the baking of the wheels. The room is approximately 80 by 100 ft. in size, and the ovens measure 10 by 10 ft. In the center of the room are the eight spray stands, each within a hood which carries away the fumes and gases, and confines the spray to the hood space. Each hood is about 3 ft. wide by about 4 ft. in height, giving plenty of room for the wheel, there being a dummy spindle on a stand to receive the wheel to be sprayed.

At the bottom of the hood there is a trap which catches the excess of the enamel, saving it for use again. The hoods connect through piping with a suction blower which carries away the odors, and also draws along some of the sprayed enamel suspended in the air. This is caught at the blower on a series of baffles and reclaimed.

Ovens for Wood Parts

The ovens are not like those used for metal enamelling, since they are not subjected to such high temperatures—130 to 140 deg. is about the average limit, due to the glue and sap in the wood wheels. Made of wood, the ovens are lined inside with galvanized iron, with a coating of asbestos between this and the wood. They are heated by steam, and the permissible temperature is 250 deg., although this is but rarely reached.



The new Buick enamelling building is three stories in height and 110 by 260 ft., giving a total floor space of 85,000 sq. ft.

Another series of hoods are also a part of the wheel painting equipment. These have to do with the sanding of the wheels and are twenty in number. The natural wood is first given a lead coat by hand, and before any of the color varnish is sprayed on, this lead coat must be rubbed down to a very smooth surface. This is done by hand with sandpaper, and has always been regarded as a dangerous occupation, for the sander is apt to breathe the tiny particles of poisonous lead as he rubs the spokes, getting them into his lungs.

The New, Safe Way

The hoods now used by Buick do away with this danger, for the suction draws away the dust, the sanding being done within the hoods specially provided for that purpose. Then follow the oil and primer coats, after which the color varnish is sprayed on.

The wheels come to the sprayer on double deck racks. Behind his hood he has two of these racks, one loaded with wheels ready for spraying and the other empty. He places the finished wheels on the empty rack, which, when loaded, is pushed into the oven. This spraying method is a remarkable time saver, for it requires but 40 sec. to finish a wheel. At the same time, the spray gets the paint into the pores of the wood and the isolated cracks in much better fashion than could be done by the slower hand process.

The wheels are baked for 1 hr. and 10 min. at the 140 deg. temperature, and they are then given their final varnish coat in the same way, another baking completing the job.

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One Man Replaces Ten in Oldsmobile Wheel Department

New methods have been introduced into the Oldsmobile plant in the wheel finishing department and it is estimated by officials of the company that one man now does the work of ten in this phase of Oldsmobile manufacture. In former times, the finishing fluids were put on the wheels with a brush and a large body of workmen were required to carry out this work. Methods in this branch of automobile production have now become simplified and instead of the old brush painting method, the wheels in the Oldsmobile plant are finished by dipping them and then spinning them on a spindle revolving at high speed. By this method, the centrifugal force applies the finishing fluid much more evenly than would be possible with a brush and furthermore, one man can accomplish the work done by from ten to a dozen with the slower methods. The whole process of dipping and spinning a wheel requires not more than a few seconds.

High Spots in Design

1916 Models Show All-Round Progress—Multi-cylinder Motors, Reduced Weights, Simplified Chassis and Higher Efficiency

By A. Ludlow Clayden

IN succeeding issues of THE AUTOMOBILE, progress in the design and manufacture of different component parts of 1916 cars will be described in detail. In the following it is desired to touch merely upon the high spots; to review the situation in a very broad and general way. The broad view, if it is less instructive, serves to give a better perspective than is obtainable from a more detailed study; it is an almost essential preliminary to the latter.

Hardly ever before in the history of the automobile industry has there been a year so full of mechanical progress. Often in reviewing a year from the mechanical aspect it has been difficult to pick out the most important trend; has been a matter for debate whether the changes had been greatly for the better or not. During 1915, however, there is nothing to create doubt, though, of course, there may be discussion as to which of the different developments is destined to rank highest in ultimate importance.

V Engines Most Spectacular Novelty

Of course, the twelve-cylinder engine stands out as the most striking development with the coming into general popularity of eights as the second surprise. The eight has consolidated itself in a way that its most sanguine supporters would hardly have dared to predict a year ago, and the twelve has been accepted very quietly, as a natural development of the V-engine principle. It was just as bound to follow the eight as the six was bound to follow the four. Taking a long view over the engineering argument of the year on this subject of multi-cylinder engines, the conclusion has been reached that both varieties of V motor are good engines. The point remaining in doubt is the exact, best application of eights and twelves to automobile use.

The subject is intimately bound up with the question of weight. Till lately it has been assumed tacitly that the luxurious, seven-passenger car must necessarily be of a weight in excess of 4000 lb. With this as a basis the purpose of the twelve is easy to explain, but when it is shown that 1000 lb. or more can be cut from this weight, without affecting any quality of service, the position of the six is improved. Weight reduction is but just beginning and it is not yet possible to predict how little the ultimate automobile will scale. Till this knowledge is obtained it would be folly to attempt to place the future of different types of motor.

Small Twelves Coming

Next year we may expect to see twelves and eights with small total piston displacement and to thus have evidence for estimating where the advantages begin and end. One school of engineering holds that there is no need for any motor with more than six cylinders unless of a total capacity exceeding 400 cu. in., while another predicts a general use of twelves down to half this size.

American engineering in the automobile field can congratulate itself most heartily on the wonderful success of V motors. To create a type that is really new, and to make it in all qualities and for all prices, and to satisfy the public with each and every variety is no small accomplishment for a single, short year.

Perhaps the success of the V motor is all the more remarkable because in making new designs the engineers have, at one sweep, modernized everything. Crankshaft speeds have been raised, valve proportions increased, compressions altered and new lubrication systems adopted. In a broad way all these things have gone through without trouble above the trouble inseparable from new model production; the great changes have been no more difficult than the smaller ones of previous years.

The increase in motor efficiency is also partly due to the fact that much experiment has been made since 1912 with a variety of things that have all been brought to perfection simultaneously. The aluminum piston has been tried out here and there for many years and in 1915 it has come into its own. The various improved lubrication systems have similarly developed in experimental shops and all come into regular use suddenly. Engineers who had been studying cam design and rapid valve action for long, found the opportunity for the compete redesign they had been wanting. And so with many petty details, everything has been done at once, in a manner of speaking.

Carbureters a Large Factor

To the credit of the V motor must go a great change in the average excellence of carburetion, for the even torque of the eight and twelve have made possible, and desirable, crankshaft speeds far below anything attempted previously except on a few very costly sixes. This demand for good gas at ultra low revolutions, combined with good gas at crankshaft speeds far above previous practice, has led to many changes of detail in carbureters which all tend to make an already accurate instrument still more precise.

With the earlier eights it was found that the only way to get the desired "ability" was to use a mixture wastefully rich, and this dirtied the cylinders as well as costing much in gasoline. Now by perfecting the air and fluid mixing devices, by making valves move more positively, or by reconstructing nozzles, we are getting better ability with greater economy. Development along this line is certainly not yet at an end, but the advances made are much greater than appear on the surface.

What of Aluminum?

It is interesting, if idle, to speculate on what might have been the state of design had aluminum fallen in price instead of rising. The now almost "precious" metal ought to sell for a price not exceeding double that of casting iron, weight for weight, and it will do so one day when there is a sufficiency of plants for its production. Meanwhile its use in large quantities is confined to cars of moderate and high price. It may be that the aluminum cylinder motor will in the future come to be seen as the most important development of 1915. It may outshadow the multi-cylinder engines and everything else.

At present all that can be said is that there are many motors with aluminum cylinders that are giving the greatest satisfaction in use. That these motors are much lighter than the ordinary, cost no more to machine and assemble and are easier to cool efficiently.

Conversely, we desire experience to show whether the

metal will withstand long use, year after year, and whether the price will fall sufficiently to make wider use of aluminum commercially possible. Also there is the possibility that the lightness obtainable with aluminum may provoke other experimenters to devise ways for using sheet steel which will give equal strength and satisfaction with equal lightness. At present, light metal seems the easiest and best way of obtaining light chassis.

Light Weight Spells Low Cost

The ratio of the cost of the metal in an automobile to the labor has changed and the cost of producing a car complete can be gaged in a rough way by its weight, if the standard of engineering is about the same. Thus refined design which enables weight to be cut, assists the manufacturer just as much as it helps the man who has to pay the gasoline and tire bills.

The present year has seen the beginning of light weight work on the part of engineers generally. There have been some who have realized its advantages for years, and built light weight cars, but it is only lately that the attention of the majority has been attracted to this most vital problem.

Spiral Bevel Generalized

Hand in hand with higher efficiency motors, running at higher speeds we see the spiral bevel gear for rear axle transmission has come into general use. Last year it was employed on many chassis, but it was confined mainly to machines of high price. Lower gear ratios to give greater high gear ability are now the rule, and it is difficult to find room in an axle case of reasonable size for straight tooth bevel gears with a ratio much below 4 to 1. With the spiral bevel, however, the task is easy.

Another reason for the popularity of the spiral form of gear is that it is naturally quiet in operation. This was known years ago, but that the new gear was as durable as the straight tooth form had to be proved and was proved by the 1915 model cars. Thus on the 1916 machines the spiral bevel is used almost always, except where cost is an extremely important consideration.

Even then the position is rendered difficult of judgment, because the number of spiral bevel gears asked for by automobile manufacturers has exceeded the possible output. The machine which made the spiral bevel a commercial possibility is new and its makers have only been able to supply a proportion of those they have on order. This being the case the spiral bevel ought to be cheaper next year and to come into wider use than ever.

Gearing Changes Little

In gearset and rear axle design but few innovations have been made. Probably the most striking development is the discontinuance of the rear axle location for the gearset by the Packard Company, who have been the leading exponents of this design for so many years. Generally, the use of the unit transmission is declining, mainly because the unit power plant is a better proposition from a manufacturing viewpoint. It is possible to see a slight trend toward the use of double internal brakes on the rear axle, but the point is debatable, because axle manufacture is confined mainly to a very small number of firms, and these have been far too pressed by unprecedented business to consider changes of design even of the slightest.

One development which was expected by some people and has not transpired, is the electrically operated gearshift, another is complete electric transmission. With respect to the latter, however, it must not be forgotten that the Owen Magnetic car has been far more successful commercially and practically than most of the trade anticipated, and it is to be supposed that this will not be without effect upon engineering thought in general. The placing on the market, and selling in regular, if small, production of a passenger car with an all-electric transmission deserves a prominent place, however, in any list of mechanical achievements of the year.

Better and Cheaper Materials

Thanks largely to the accumulated labors of the S. A. E. Steel Standards Division, the average of quality of fairly good steel has been raised quite perceptibly, because the creation of standard specifications has assisted steel makers to discover better methods. It has been possible to tighten the limits of accuracy for chemical constitution of many steels, and users find that a more regular quality is coming to them, without an increase in price. This has had a levelling effect because it has helped to offset the slight general rise in the price of cheap steel due to the huge demand for purposes other than automobile making.

Chassis Layout Simplified

As was pointed out in a recent article, the reduction in the price of automobiles has largely been due to a simplification of detail and the elimination of parts which have proved needlessly cumbersome or altogether valueless. For instance, brake rod layouts have often been redesigned so as to eliminate a number of brackets and links. Likewise the pedals and steering gear now commonly make up with the power plant instead of being separate frame attachments.

More important still, in the detail *of* the detail simplification has been the rule. Stampings and pressings have replaced castings to a much larger degree than formerly. Die casting is becoming more popular for all sorts of small parts. Block motors eliminate the necessity for pipes and couplings. Perhaps this tendency is most conspicuous among accessories and fittings. Lamps, switches, control details and such like, are now more often die castings or stampings than anything else, yet a short time ago heavy, expensive brass castings found a large use in their makeup.

Battery Ignition Gaining

It would be a nice point to decide how much price has influenced the ignition situation, and equally delicate to forecast the future of ignition mechanically. Whatever opinions may be held, however, the fact remains that battery ignition has gained in favor enormously. It has improved too, being vastly better in detail than a few years ago. Makers of distributers and contact breakers have taken a leaf from the magneto manufacturers' book and utilized similar materials with similar care and accuracy, so the reliability of battery ignition now rests mainly upon the battery and the generator which keeps it charged.

Batteries themselves are improved a little in mechanical detail and generators in both electrical and mechanical efficiency, so the battery ignition that has come through this season without mishap stands an even better chance next year. None the less the magneto has not stood still and remains the standard ignition where performance is considered above everything else, with one or two exceptions.

Bodies Are Larger

Bodies generally are larger, of better appearance and more comfortable. On the matter of size it is possible that manufacturers have gone a trifle too far, because many of the seven-passenger cars of 1916 type are not good to ride in with less than five passengers aboard. Four people are usually much better suited by a close coupled design and not too great a width of seat, and the rapidly growing popularity of clover leaf three seaters, small four-passenger jobs and roadsters with a single seat wide enough for three, shows clearly that whatever the *majority* demand may be for, there is a large class that prefers a less spacious body.

Parlor car front and sometimes rear, seats are another development of the year and at present look as though their popularity would lead to a wider use of the design next season.

German Army Transport

Heavy Consumption of Automobiles and Trucks Points to Shortage After War—Large Field for American Products

By E. A. Langdon

HANOVER, GERMANY, Aug. 30—There were some 70,000 motor vehicles, including passenger cars and trucks, in Germany when the war broke out; to-day there are fewer than 15,000. In the Dual Monarchy, Germany's ally State, there were more than 30,000; to-day there are considerably fewer than 10,000; in other words, the civilian population has lost the services of some 75,000 motor vehicles in Germany and Austria-Hungary. These vehicles are now rendering yeoman service in the campaigns in the east and west and were largely responsible, it is said, for the rapid advance of the Germans in France during the first three weeks of the war in 1914, as well as for the manner in which the German army in Poland stemmed the Russian tide and severely defeated the Czar's hosts a number of times.

It would be going too far into details to consider here the thousand and one ways in which the transportation system has rendered the Kaiser's army as efficient as it has. But from the descriptions of the several special newspaper correspondents, who have been permitted to visit the front, and from the tales of wounded soldiers who have been sent to the interior of Germany, it is obvious that the importance of the motor car to Germany to-day is on a par with that of the other two classes of military equipment, which have revolutionized modern warfare; namely, heavy rapid-firing artillery and aerial scouting service.

In addition to facilitating the transports of troops and materials of all kinds, the motor car has done invaluable work for the "Sanitaetswesen," hospital division, and has taken over a great deal of the work formerly exclusively handled by the cavalry; namely, reconnoitering and carrying of rapid dispatches.

Car Supply Maintained

In addition to the approximately 75,000 motor cars taken into German and Austrian army service at the beginning of the war, many thousands of vehicles have been turned out by the car factories of both countries. Many plants are working seven days a week and twenty-four hours a day, and in not a few cases have the vehicle designs and the production machinery been adapted to the specific requirements of the strenuous army service. It will probably take a long time ere the details of this wonderful adapting process, planned and carried out even while the armies were battling on the borders of the Empire, will become generally known. The effect of this system, however, is that the number of motor vehicles now in service is even greater than that available at the outbreak of the war; for not only have the factories worked at maximum capacity, but thousands and thousands of owners whose cars were not requisitioned by the government have put and are still putting their vehicles at the disposal of the fatherland; in many cases they also serve as volunteer drivers if they were not called into the army already.

Of course, a great many vehicles are destroyed or damaged, due to the terribly hard work. The remainders of the former are taken to the interior of the country, to be refashioned and reused as best they may, while the injured cars and trucks are taken to the nearest "Automobillazarett," automobile hospital, to undergo quick but thorough repairs. It is almost impossible to learn the details of these elaborate repair works, five of which are said to exist along the western front and four along the eastern; the Austrians also have one automobile hospital in the east of Galicia, near Cracow. In these places the work is also carried on incessantly.

Like everything else in war, the motor car equipment is being worked at maximum capacity. If the cars are used for troop transports, a touring car designed for five or seven passengers is frequently made to accommodate twenty soldiers. The effect on motor, running gear, etc., especially the spring suspension, is obvious enough. But if there is any way at all in which 25,000 cars can be made to quickly carry 500,000 fighters from one point of the front to another—often 100 or 200 miles away—the expense of the process must necessarily be ignored. Thanks to the fact that

"—beyond a doubt,
A chaise breaks down, but doesn't wear out—"

one part of the car after the other may be injured and repaired and the whole vehicle still remain useable.

New Factories Created

Another fact which is positive enough, although it is very difficult to obtain detailed information about it, is that many machinery factories, the products of which are not needed or not badly needed while the war goes on, have been transformed into automobile or parts factories. This still enhances the supply of available motor vehicles.

Thus, there seems a foundation for the assumption of the German military motor experts that the Kaiser will have all the cars and trucks he needs, even if the war should go on for years.

It should be remembered, however, that what is fair in war is not always considered so in times of peace. After the conclusion of the peace the owners who have willingly sacrificed their machines on the altar of the fatherland will undoubtedly make wry faces when their cars are returned to them. Every machine will be badly battered and shaken through and practically unfit for pleasure use. The trucks, too, will have suffered to such an extent that their operation will be much more expensive than before, due to ever recurring high repair bills and high fuel consumption. A few weeks after the war it will dawn on nine out of every ten owners that the best course for them to take is to buy new vehicles.

From where are these vehicles to come?

Shortage with Peace

The German factories' capacity will be far short of being able to supply the demand. There will be a call for from 50,000 to 80,000 new motor cars and trucks in Germany, and perhaps 25,000 in Austria-Hungary; as not only will the cars destroyed and spoiled by the war have to be replaced, but tens of thousands, perhaps hundreds of thousands of horses killed during the war will have to be supplanted by motor vehicles. The prediction made by many experts during the early days of the war that the war will serve to motorize Europe will come true.

German factories will of course attempt to supply the de-

mand as far as possible, but will be hampered both by a shortage of labor and by a lack of capital. The shrewd German manufacturers will undoubtedly reason that it is not good business policy to increase their factory equipments to a very great extent for the immediate supply of the great demand, only to be a year later with superfluous equipment or superfluous stock which could not be sold profitably on the world's market. Furthermore, the scarcity of money will in itself be a hindrance to a general increase of capitalization.

Hence, Germany will look to other countries to supply at least part of her great motor car demand.

It is safe to say that Germans will buy as little as possible in the way of English and French-made goods. Probably Switzerland will therefore supply many high-priced cars to Germany. In addition, the Belgian industry may find a German market depending on the friendliness of the relations of these two countries after the war.

For, there will enter more sentiment into business matters after this war than ever before. The commercial relations between the now belligerent countries will be mended much later than the political ones, and in this fact lies the great advantage of the nations which remain neutral through the full time of the conflict.

For this reason, and also because of its ability to produce standard, efficient, moderately-priced passenger and commercial cars, the United States should be in a position to sell myriads of cars to German buyers. This, however, will not be as simple and as easy as might appear at first glance, for reasons which will be given a little later on.

America's Opportunity

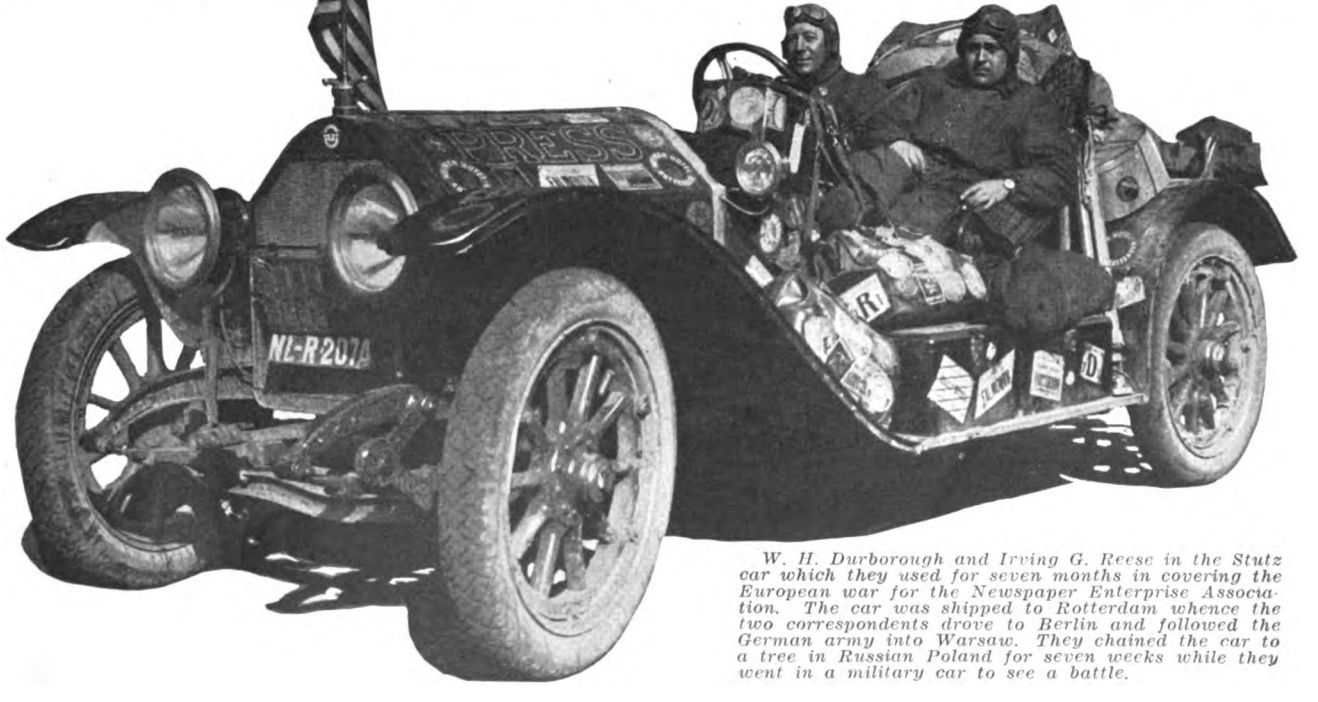
Standard American products, sold intelligently by American methods and at American prices, have long since found a good market in Germany as well as in Austria-Hungary. All kinds of machinery, including machine tools, typewriters, phonographs, motor cars and motorcycles have been welcomed by the Germans if introduced in the proper manner. Especially is this true of motor vehicles, for the number of motor cars per head of the German population is from one-tenth to one-eighth of that in the United States, although the economic power of the average German is certainly not less than half of the average American. The difficulties consist in the slow and careful thinking of the Germans, who give much thought to such a matter as the purchase of a car or truck before they spend the money. A car must be so designed, internally and externally, as to be suitable for four to five years' use. Simplicity of design and color, strength of construction and relatively low fuel consumption are wanted by German buyers. Service is another important point. Not one German buyer in ten will purchase a car unless it is backed by years of satisfactory performance and unless the company keeps a stock of spare parts within a few hundred miles of his place of abode.

Despite these difficulties, a number of well-known, standard, well-equipped, medium-priced American makes have been successfully introduced into Germany and Austria-Hungary. As the foregoing explanations indicate, selling in these countries is not as easy as in America; but, nevertheless, splendid business has been done by the efficient selling organizations of these concerns.

There is another difficulty about this situation, which has been brought out, in fact, created by the war, and which will continue to be effective for a considerable length of time after the cessation of hostilities. It might as well be admitted that there is a widely felt lack of sympathy for America in the realm of the Kaiser. The reason is simple. Germans do not realize the geographic, commercial and political position of America very well, and there is a widely prevalent idea that Germany had deserved a more friendly treatment from America than it got since the beginning of the war. This feeling may be poorly founded, but its existence is an indisputable fact. Hence, the American is not looked upon with the same amity to-day as he was a year ago. The fact that English is the only language spoken by a great many Americans hardly helps to alleviate the situation; it rather has the opposite effect.

Salesmen Must Speak German

This fact has the following bearing on the commercial situation. The average German, after the war, will be loath to deal with a salesman who does not know the native language. It is to be presumed, in fact, that a salesman not in command of German will be at a very great disadvantage. Even a foreign accent will be looked upon in the nature of something unfriendly to Germany—of course, only by the little business man; but these people, after all, constitute the largest class of prospectives in Germany. Therefore, companies starting an export campaign in Germany after this war should be careful to equip their salesmen with a knowledge of German; in Hungary and Bohemia, the languages of these countries should be known by the salesmen.



W. H. Durborough and Irving G. Reese in the Stutz car which they used for seven months in covering the European war for the Newspaper Enterprise Association. The car was shipped to Rotterdam whence the two correspondents drove to Berlin and followed the German army into Warsaw. They chained the car to a tree in Russian Poland for seven weeks while they went in a military car to see a battle.

It hardly needs to be mentioned that, selling being less simple than at home, the salesmen will require some diplomatic ability to do business.

Among the many developments brought about by the war is also the following one, in the fuel situation. It is an admitted fact that Germany, on account of a shortage of gasoline, has taken resort to benzol and alcohol. Most probably, the fields of these fuels will increase after the war, and many thousands of German car owners will insist on using benzol, for economical and patriotic reasons. Alcohol, too, can be very easily and cheaply produced in Germany, as this country is the leading potato grower of the world. Hence, it would pay for American manufacturers to experiment with adaptations of their motors to these two fuels. The very argument that benzol or alcohol can be used in a car will enable its salesman to get a better price for it than he could if the machine needed gasoline for its operation.

Government initiative in Germany and Austria has grown very strongly during the war, and very probably will continue to do so after. It is safe to assume that the governments will do their best to further the home industries producing these two fuels and that the population will follow their lead with enthusiasm. This renders the point of a motor applicable to non-gasoline fuels of eminent importance.

Tire Market Temporary

Tires will probably find a very ready but short-lived market after the war. If American makers will be able to supply large quantities at most reasonable prices, they will be able to do a great volume of business in a very short time. It is reasonable, however, to assume that the artificial rubber question is also being solved, as so many other problems, under the pressure of the war. If this is the case—and indications seem to point in this direction—then Germany will very soon produce enough cheap synthetic rubber to supply its entire demand for tires.

Several classes of accessories, such as starters, lighting equipments, automatic tire pumps, etc., should also find a good market, provided the products are reliable, simple and reasonably priced.

American motor car manufacturers who are not represented in Central Europe at this time and intend to break into the German and Austrian markets after the war, would do well to send one or two intelligent representatives to these territories without delay. These men could gather valuable information about conditions in general, about the experiences with the different types of vehicles in the war zones, about the sentiment of the people; they could outline a sales campaign to be carried out after the war; they could form valuable business connections, etc. As already stated, it is highly important that these men be possessed of practical intelligence and a strong instinct of how to act and what to do.

One thing is certain. American car manufacturers will have an unprecedented opportunity in Germany and Austria-Hungary after the war. The advantages of the opportunity will go to those who are able to see its magnitude now and who prepare for its utilization, so that when the right moment comes, the business may be carried through efficiently.

Three Models in Partin-Palmer Line

FOR 1916 the Partin-Palmer line, built by the Commonwealth Motors Co., Chicago, Ill., will consist of a light five-passenger touring car known as the model 32 and listing at $675, fully equipped, a six-passenger at $975 and a roadster for $495. The power plant consists of a four-cylinder motor 3½ in. by 5 in. and has a three-point suspension. The cylinders are block cast with spacious water-jackets the water inlet being located in the center of the cylinder block opposite the valves and at the bottom of the jacket, permitting a complete drainage through the radiator. The cylinder head is cast separately, allowing ample space for valves and enabling proper setting of cores and even thickness of walls, designed to give greater efficiency to the cooling system.

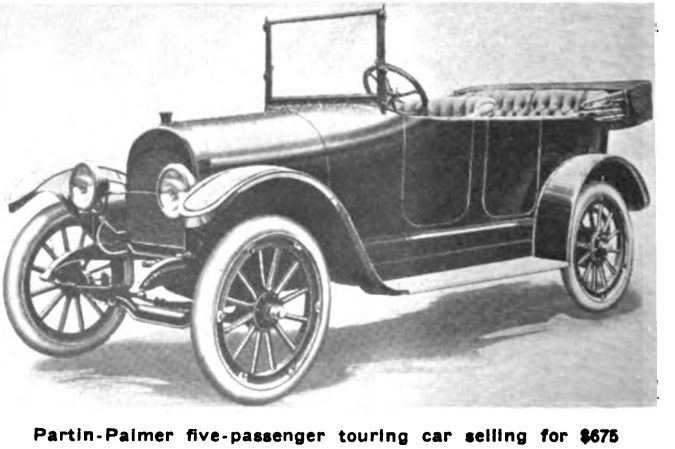
The crankcase is of reinforced aluminum cast in two sections and completely incloses the flywheel and multiple disk clutch. Heavy webs are provided for supporting the crankshaft bearings with provision made for removing the bearing caps easily. An oil pan having a capacity of 5 qt. is bolted to the bottom of the crankcase. Any of the connecting-rods and pistons may be removed without disturbing the adjustment of the main bearings. Lubrication is by constant level splash, the level being maintained by a plunger pump driven by an eccentric on the camshaft. Cooling is by thermo-syphon.

Crankshaft bearings measure 3¼ by 1¾ in. front, and 3 15-16 by 1¾ in. rear; the flange to which the flywheel is bolted is integral with the crankshaft and the connecting-rod bearings are of the split type measuring 2⅜ in. by 1¾ in. The camshaft is 1 in. diameter with cams integral, and is supported by three bearings. The valves are 1⅜ in. in diameter fitted with gray iron heads and steel stems.

The three-speed gearset is placed in a unit with the motor, the gears and shafts being of liberal size, while annular ball bearings are used throughout. Drive is taken through a 1¼ in. shaft completely inclosed in a torque tube supported at the forward end by a yoke which is attached to the transmission housing instead of to a cross member of the frame. A double universal is placed between the forward end of the propeller shaft and the transmission, while adjustable radius rods extend from the yoke to the rear axle.

The rear axle is floating with a gear ratio 4 to 1 and provision is made for adjustment of the differential without removing the rear plate from the housing. The driveshaft is fitted with New Departure ball bearings. Brakes are expanding, both emergency and service being fitted with equalizers. The rear springs are three-quarter elliptic underslung and the front semi-elliptic.

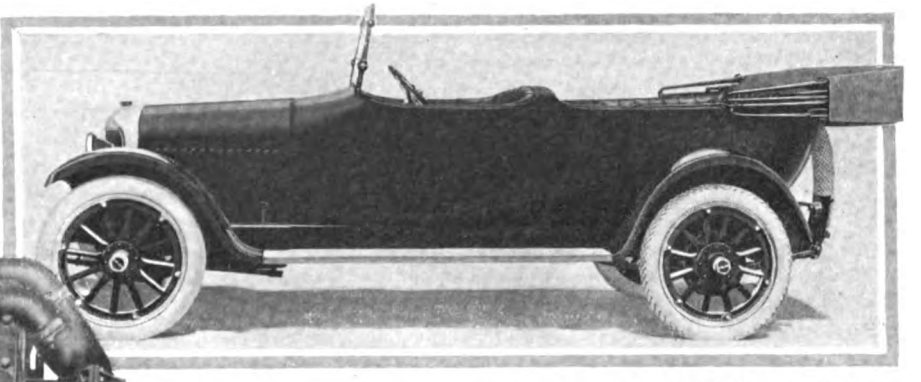
Body design follows yacht lines and the wheelbase of 110 in. affords ample seating capacity for three passengers in the rear seat, which is 50 in. wide. The gasoline tank, which is placed in the cowl, has a capacity of 10 gal. The body is finished in dark olive green and the fenders and hood in black enamel, while the wheels are red. Tires are 32 by 3½ and the car is fitted with non-skids on the rear wheels. Equipment includes electric starting and lighting. Connecticut ignition, electric horn, Stewart-Warner speedometer, one extra rim with carrier, windshield and one-man top.

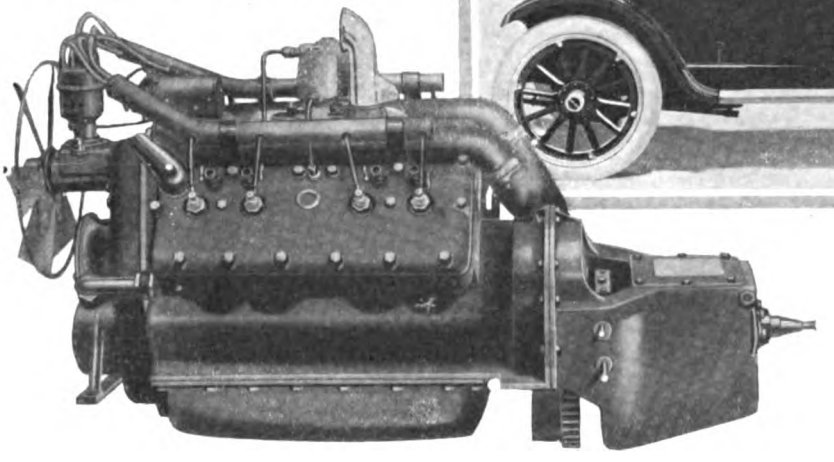


Partin-Palmer five-passenger touring car selling for $675

Oakland Adds Eight-Cylinder Model

3½ by 4½ Cylinders Give 346.4 Cu. In. Displacement —71 Hp. at 2600 R. P. M.





Above—The new Oakland eight-cylinder touring car which is built only as a seven-passenger type, the chassis having a wheelbase of 127 in. With complete equipment this car sells for $1,585

Left—Eight-cylinder 3½ by 4½ in. motor used in the Oakland. This motor has a counterbalanced crankshaft made by forging crescent-shaped counterweights integral with the crank arms. Another feature is the use of aluminum pistons

ANOTHER of the prominent automobile manufacturers—the Oakland company—has fallen in line with an eight-cylinder machine, which is considered the best appearing car yet built by the Oakland Co. The characteristic V-shape radiator with German silver finish has been used, and the slope is from this point backwards in a practically unbroken line.

Although designed for exceptional roominess, the car has not the appearance of weight, and there is a surprising amount of room in the tonneau. The auxiliary tonneau seats are of the disappearing form, folding into the back of the front seat, out of the way when not in use. The new Oakland is built only in seven-passenger type, at present, and has a wheelbase of 127 in. It is to sell at $1,585 with complete fittings.

Low Without Sacrificing Clearance

This eight, like other cars of the Oakland make, is carried low to the ground without sacrificing road clearance. The springs have much to do with this feature, the rear set being underslung. Cylinder dimensions of the motor are 3½ in. by 4½ in., giving a displacement of 346.4 cu. in. with a formula horsepower rating of 39.22. It has developed 71 hp. on the block at 2600 r.p.m., however. Other specifications include the complete Delco ignition, starting and lighting installation, cone clutch, three-speed gearset in the motor unit, open driveshaft with two universals with the Hotchkiss principle employed, one-bearing floating rear axle, three-quarter elliptic rear springs, 34 by 4½ tires, and left drive with central control. The carbureter is a Stromberg, and is fed by the Stewart vacuum system.

Ample power is invested in the engine to secure excellent performance at all speeds. It has a wide range of flexibility, will throttle down to a walking pace, and possesses quick pick-up to high speed. It is to be expected that an engine of this power would handle such a vehicle with great satisfaction to the owner, especially that type of driver who is adverse to manipulating the speed-change lever.

This eight is of the type in which the crankcase is split vertically, each half being cast in unit with one block of cylinders, and the two bolt together to form the complete engine. A stamped oil pan attaches to the bottom; the gearset bolts to the rear of the built-up crankcase; and there is another stamping to house the front driving gears and chain. Removal of the steel oil pan exposes all of the bearings and the camshaft with its contacting tappets. The left half of the crankcase carries the camshaft and crankshaft, the caps for the bearings facing the other half of the crankcase.

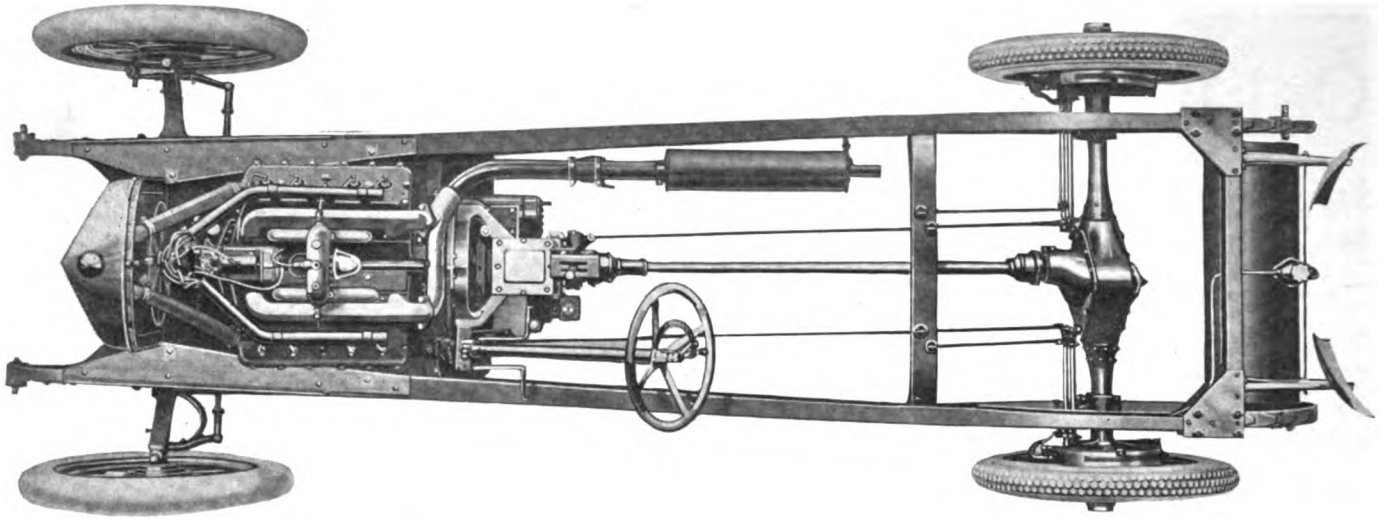
In the general layout of the powerplant, the various units are all very nicely taken care of, and there is nothing which can be criticised from a practical engineering standpoint. The cylinder heads are detachable, providing for access to the pistons and valves through the top, as in most motors now made with the crankcase and cylinder block in unit. Thus the desirable feature of being able to get at the pistons quickly has not been sacrificed, and rigidity is still maintained.

A single camshaft is used, there being a separate cam for each valve. In order to make the valve pockets as short as possible, and at the same time to use one camshaft, the valves have been inclined to the cylinders sufficiently to bring them out at the bottom and close to the combustion chambers at the top. From an external glance at the engine it would seem impossible for each valve to have its own cam, since the cylinder blocks are directly opposite one another. They are in reality staggered sufficiently to allow sufficient room for the tappets and cams side by side, the offsetting of the cylinders with respect to those on the opposite side being done within the castings.

Standard practice obtains for the valve mechanism with the exception of the seating of the valves on an angle as already mentioned. The tappets are provided with rollers and drive of the camshaft is by gear connection with the crankshaft directly below.

All Shafting Inclosed

On the outside of the camshaft gear is a sprocket over which runs a silent chain to drive the fan and generator shaft, which is also vertically above the crankshaft and camshaft. The front end of this upper shaft drives the fan; at its center it drives the ignition distributer; and at the rear the generator couples on. So a very compact assembly is attained, the end of the generator protruding only a short distance into the front of the V. The steel cover very neatly



Plan view of Oakland eight-cylinder chassis showing layout of unit power plant, Hotchkiss drive, etc.

encloses the whole driving apparatus, and another housing extends out from the top of it to enclose the small shaft at the top, forming a mounting for the distributer at the same time. There is, therefore, no exposed shafting whatever, a feature which should work to the advantage of the mechanism, since any enclosed apparatus should necessarily be proof against dust and dirt, should be better lubricated and less noisy.

A feature of the engine is the counterbalanced crankshaft. This is made by forging crescent-shaped counterweights integral with the crank arms, one to counterbalance the weight of each set of rods. There is a weight protruding from the main bearing end of each arm, making for correct balance of the rotating parts, and taking care of the oscillatory effect of the connecting-rods. The counterbalancing is done to reduce vibration from this source to the minimum, with the result that a very smooth running engine is secured. In fact, there seems to be no periodic vibration at any speed within the possible driving range.

Aluminum Pistons Used

Oakland is using aluminum pistons successfully in this engine, they also playing a part in the promotion of sweet running at high speeds. Connecting-rods are of the forked type mating with small-end rods on the opposite side. The camshaft is a carbon steel forging, and like the crankshaft, has three bearings of phosphor-bronze.

For the sake of balance, there are two yoke-end rods on one side and two on the other. The yoked rods have bronze-backed, babbitt-lined bushings, which, besides being clamped in the rod ends, are pinned to prevent rotation. The inner rods oscillate on the outside of these bushings and, while the ends of the forked-rods are not adjustable, the inner rods can be adjusted by the use of shims. However, in an eight, where the oil pressure is high, and where special bushings such as these are employed, adjustment is not required, and with proper care they should run satisfactorily for a long period—probably two seasons at least.

The crankshaft bearings have these dimensions: Front, 3⅛ by 2 in.; center, 3 by 2 1/16 in.; rear, 3 15/16 by 2⅛ in.; connecting-rod bearings (on crankshaft), 2⅛ by 2⅛ in.

Pressure running from 30 to 40 lb. per sq. in. is used in the oiling system when the engine is running at high speed, after being warmed up. At normal speed it probably rises to about 20 or 25 lb. per sq. in. The pressure is produced by a gear pump on the front end of the crankshaft, housed in the lower part of the timing gear case. The oil is drawn from the base, and then sent through a pressure regulating valve, after which it goes directly to the main bearings. From there it runs to the rod bearings through holes drilled in the webs of the crankshaft. The pressure regulating valve is fitted with a by-pass, and when the pressure for which it is set is reached, this by-pass is opened and the overflow runs to the camshaft bearings and to the timing gears and chain. The spray from the connecting-rod bearings is thrown up into the cylinders to lubricate the walls and pistons.

A filler and breather pipe is placed on the right side of the front gear cover. This makes a most convenient location for a filler, as it is an easy place to reach with the oil supply.

Delco Electric System

The electric system is entirely Delco. Positions and method of drive of generator and distributer have already been touched upon. The starting motor, which is entirely separate, is hung from a supporting bracket on the right rear of the power plant alongside of the gearset. The starter drives through the flywheel, with the teeth of which the pinion on the end of the starter motor shaft meshes. The Bendix type of connection is used, in which the meshing and demeshing is entirely automatic when the current is sent to the electric motor.

Adequate cooling facilities are provided by a double centrifugal water pump, cleverly mounted on the front end of the camshaft extension and outside the timing gear housing. In this position the pump drive could not be much simpler, and at the same time, there is the advantage of having the pump equi-distant from each cylinder block so as to assure uniform circulation. The intake pipes run from top and bottom of the pump to the front of the cylinder castings.

Fan Drive by Friction Clutch

The fan drive is through a friction clutch on the end of the generator shaft, and the fan can be turned by hand, but the clutch has sufficient tension to prevent slippage when the engine is driving it. The center of the fan encloses a coil spring which bears at one end against a plate on the end of the shaft and at the other against the fan, thus making a friction connection. Such a friction arrangement is used to safeguard the drive.

On the left side of the gearcase is mounted a Stewart single-cylinder tire pump which is driven from the reverse idler gear. It is operated at 2.6 times engine speed and is readily thrown into mesh.

Six springs equally spaced around the clutch cone hold it in engagement, and there is also a clutch brake to prevent spinning and make for easy gear shifting. The gearset uses ball bearings, and the gears are of high carbon chrome-nickel steel. A form of yoke surrounds the flywheel to carry the gearbox, leaving the top and bottom of the flywheel exposed for timing purposes.

Final drive is made very simple through adherence to the

Hotchkiss drive system which has featured Oakland cars for several seasons. The propeller shaft is tubular and of open construction with a universal at gearbox and axle ends. No torque arms or radius rods are used, but drive and torque are taken through the springs, the master leaf of each rear spring being designed for the service.

To how great an extent simplicity has been attained is shown very clearly indeed by the chassis plan view on the opposite page; the chassis is as handsome as the car.

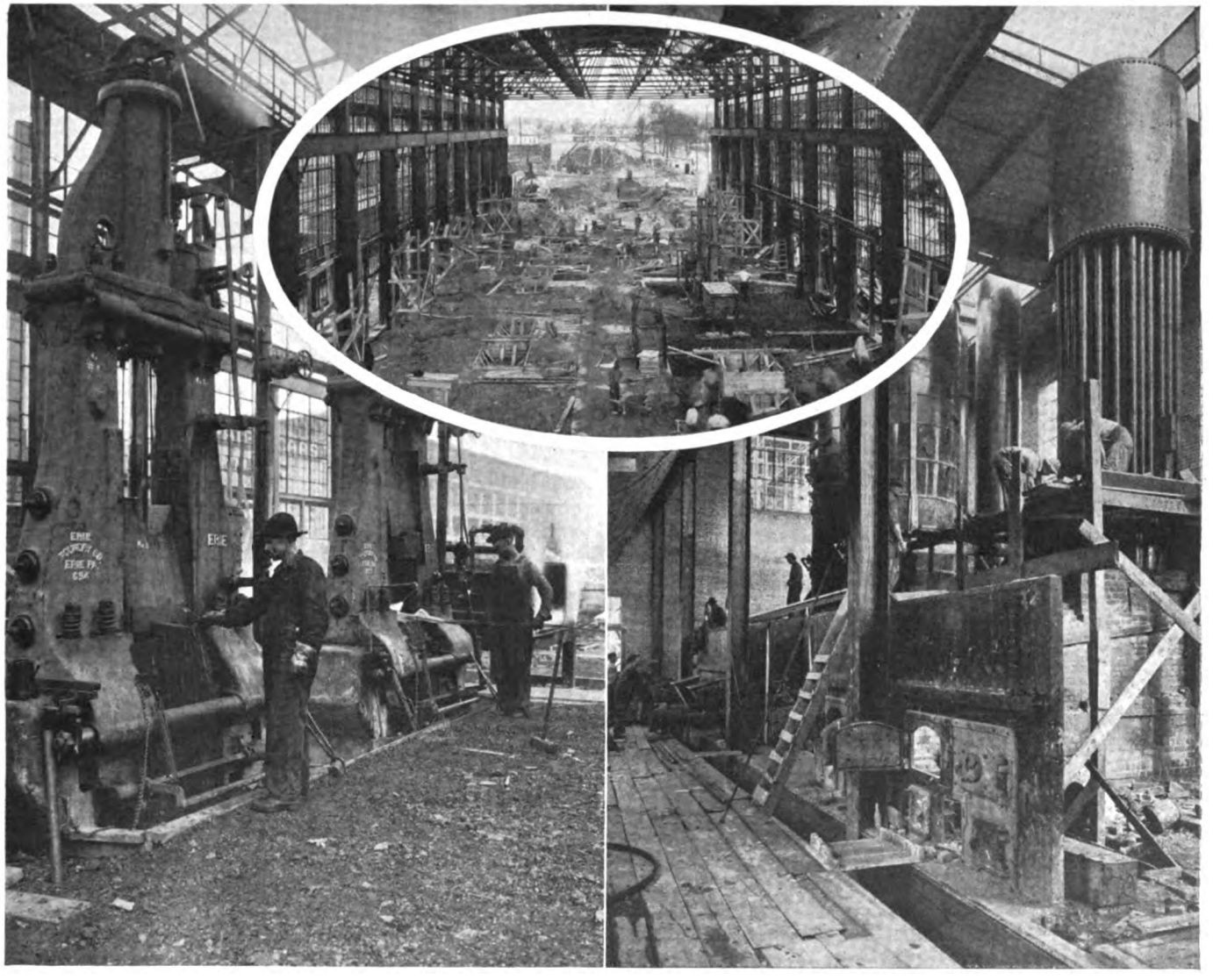
Spiral bevel driving gears are fitted to the rear axle which is of the one-bearing floating construction. There is a Hyatt roller bearing at each wheel, and the differential unit is carried on Hyatts, with New Departure ball thrust bearings at either side and ahead of the driving pinion. The axle housing is a strongly proportioned steel pressing, having a large plate at the rear for access to the differential.

As in other Oaklands, this car has the form of frame in which the channel is made quite deep to meet the running board brackets. No apron is used between frame and running boards, the sides of the frame acting in that capacity. This does away with one extra part and makes a simple construction. The frame tapers practically its entire length, being quite narrow at the front to give a good turning radius. The characteristic Oakland rocker bearings for the mounting of the brake equalizer and the control levers and brake pedal connection are used.

Body construction is light by the use of a wood framework and steel sheets. Fenders are crowned, and the standard body color is a coach green.

It goes without saying that the equipment of this latest addition to the Oakland range of models is entirely in keeping with the character of the car as a whole.

Building the Timken-Detroit Axle Co.'s New Drop Forge Plant



Detroit, Mich., Oct. 23—The new drop forge plant which is now being built across Clark Avenue from the main plant of the Timken-Detroit Axle Co. will be about 558 ft. long, 70 ft. wide, and 50 ft. high. It is of steel construction, the sides from the ground up on both sides being of glass set in steel frames.

In the new drop forge will be thirty-three hammers ranging in size from 1500 lb. to 8 tons. They are all set on a concrete base and a bed of wooden spiles to eliminate as much of the jar as possible.

Three self-stoking Wicks boilers generating 1200 hp. will supply the power for these hammers. The exhaust steam will be used in a turbine motor to generate electricity for use in the drop forge. Running the full length of the drop forge on the inside will be a 40-ton traveling crane to carry the dies from the die room to the hammers, and to carry raw forgings to and from the hammers throughout the shop. Out in the stock yard, which runs the entire length of the building, is another 5-ton magnetic traveling crane which will unload the freight cars and move stock around in the yard up to the door of the drop forge where the 40-ton crane will pick it up.

In the die room will be another smaller crane to move the dies to and from the forge shop.

All of the steam pipes and power pipes going from the boilers to the steam hammers will be contained in a tunnel running through the center of the shop, thereby eliminating all piping over the hammers. The exhaust steam from the hammers will be carried back to the engine room by the way of this same tunnel. There is also a tunnel running from the drop forge under Clark Avenue to the main plant so that the truckers carrying stock back and forth will not have to go out of the buildings.

The FORVM

ARGUING BALANCE. THE SIX AND THE TWIN SIX DISCUSSED FROM DIFFERENT VIEWPOINTS OF THEORY

Fallacy in Twelve Argument — Six Balance Better Than Allowed

By David Fergusson
Mechanical Engineer Pierce-Arrow Motor Car Co.

EDITOR THE AUTOMOBILE:—There have been many articles published during the past few months on the twelve-cylinder engine; in all these there is generally found the statement that in the twelve V-type engine with six cylinders on each side, 60 deg. apart, the force due to the inertia of the reciprocating parts, which is recognized as being of tremendous moment, is only half that of a six-cylinder engine of the same total cylinder volume.

In some of these articles, a direct comparison has been made between a six-cylinder 4 by 5½-in. engine and a twelve-cylinder 3 by 5-in. engine, the total cylinder volume of each being practically alike. In this case the smaller piston, together with the reciprocating part of the connecting-rod, weighs about one-half of the corresponding parts of the larger piston. It is then assumed that the twelve-cylinder engine is merely two sixes and that the inertia loads present in the twelve-cylinder type of engine are those due to one piston complete, with the small end of one connecting-rod. I have been waiting for someone to point out the fallacy of these assumptions, and as no one has done so, I feel impelled to myself bring the following to your readers' attention.

There is, in my opinion, considerable misunderstanding in regard to the stresses in the conventional twelve-cylinder, V-type engine. This should be considered not as two six-cylinder engines, but as a twelve with all cylinders vertically in line. This alters the case entirely, and gives a much more correct impression of the loads that must be provided for. We then find that the inertia of the reciprocating parts to be considered is not that of one piston and the part weight of one connecting-rod, but it is double this, as two connecting-rods and two pistons are attached to one crankpin. Two pistons 3 in. diameter complete, with the reciprocating parts of two connecting-rods, weigh at least as much as one 4-in. diameter piston complete with the reciprocating part of its connecting-rod. Therefore, the inertia load in the case of the twelve is as great as in the large diameter six and, therefore, necessitates as large a diameter crankshaft, and this shaft must, in addition, be very much larger in diameter in the case of a three-bearing crankshaft than is necessary in a seven-bearing shaft.

It will be contended that the assumption of all the twelve cylinders being in line is not a fact, as the six cylinders a side are placed at an angle of 60 deg., this certainly reduces the resultant inertia loads, but only about 18 per cent. It is, therefore, much safer to consider this in the manner indicated, especially as twelve cylinder engines are being run at a higher speed. The combined inertia force at high speeds being greater than the explosive force, it is quite possible that the twist of the crankshaft, due to the force created by the inertia of the reciprocating parts, may be almost as great in the twelve cylinder engine as in the six, in which case the vibration coming from a torsional twist of the crankshaft should be almost as great in the twelve-cylinder crankshaft, as in the six, if the same diameter shaft is used in both cases.

Twin Six Balance Superior

By J. G. Vincent
Vice-President of Engineering, Packard Motor Car Co.

EDITOR THE AUTOMOBILE:—I have read with interest the proof sheet of Mr. Fergusson's remarks regarding articles recently published on the twin six or twelve-cylinder engine. I would like to comment on the points that he has raised, as follows:

Mr. Fergusson refers to a direct comparison that has been made between a six-cylinder engine, 4 by 5½ and a twin six engine, 3 by 5, and as these are the sizes of engines referred to in my paper before the Detroit Section of the Society of Automobile Engineers on Sept. 16, and before the Indiana Section of the Society of Automobile Engineers on Sept. 24, my comparisons are, perhaps, the ones referred to.

In the first place I must disagree with Mr. Fergusson regarding the relative weight of 3-in. and 4-in. pistons, as, from my personal experience, I am convinced that it is not possible to make a 4-in. piston assembly complete with piston rings, piston pin, piston pin set screw and cotter pin that will not weigh more than twice as much as a 3-in. piston assembly of corresponding design. In my paper before the Society of Automobile Engineers, I included the following figures regarding reciprocating and rotating weights and their inertia effect, which were taken from three actual motors:

	338 Six, Lb.	Special 338 Six, Lb.	Twin Six, Lb.
Piston assembly, complete with rings, piston pin and set screw	4.125	2.11	0.814
Connecting-rod upper end	1.38	0.828	0.625
Connecting-rod lower end	3.31	2.421	1.52

The following table gives a comparison of forces due to gas pressure and inertia at 2000 r.p.m. of the same motors:

Inertia of one piston assembly complete	2,130	1,140	492
Centrifugal forces of one connecting-rod lower end	1,030	754	430
Centrifugal forces of one pair of connecting-rod lower ends	....	....	860
Crankpin bearing pressure per square inch due to inertia	768	433	379
Crankpin bearing pressure per square inch due to gas pressure	916	916	871

The column of figures under 338 Six was taken from one of our last year's standard six-cylinder motors. The column of figures under Special 38 Six was taken from a motor of substantially the same design as last year's 38, but with reproportioned length of crankshaft bearings, the lightest possible connecting-rods, machined all over, and equipped with special alloy pistons. The column of figures under Twin Six was, of course, taken from one of our standard engines.

As suggested by Mr. Fergusson it is, of course, correct to

add the upper end of the connecting-rod to the piston assembly to get the total reciprocating weight for each cylinder. By this process we get the following information from the figures on the previous page:

Total reciprocating weight of 338 6-cylinder motor.....5.505 lb.
Total reciprocating weight of special 38 6-cylinder motor...2.938 lb.
Total reciprocating weight of twin six motor.....1.439 lb.

Now in regard to Mr. Fergusson's suggestion to consider the twin six as having twelve vertical cylinders, I certainly must take exception to this method of treating the subject, as all my arguments have been based on the V-type or twin six motors and not twelve-cylinder vertical motors. It is true that the inertia forces of a twelve-cylinder motor overlap, as suggested by Mr. Fergusson, and his statement that the net inertia effect is only approximately 18 per cent less than it would be in a single six-cylinder vertical engine, whose reciprocating parts weighed twice as much as the twin six, is approximately correct. Figures from actual parts, however, throw considerable light on this subject.

Let us see how this works out in actual practice, taking Mr. Fergusson's method of figuring:

As outlined above, the reciprocating parts in a single cylinder of a Packard twin six motor, 3 by 5, weigh 1.439 lb. and two complete sets of reciprocating parts, therefore, weigh 2.878 lb. Deducting 18 per cent from this weight, leaves a net weight of 2.36 lb. as the figure to be used in computing the combined inertia effect of the two sets of pistons and rod upper ends in the twin six motor.

As outlined above, one piston assembly and rod upper end of the 3-38 motor weighed 5.505 lb. or considerably more than twice the equivalent weight of 2.36 lb. for two sets of reciprocating parts of the twin six.

As mentioned in my paper before the Society, it might be argued that this is not a fair comparison. My reason for giving these weights is to show what has been considered good practice in six-cylinder motors of approximately 4 in. bore by 5½-in. stroke. It was for the purpose of putting this argument on a strictly engineering basis that I included the figures for the special 38 motor which I believe to have been equipped with reciprocating parts as light as it is possible to make them, and probably slightly lighter than can be produced in actual manufacture. By using reciprocating parts of this special motor for comparison, we obtain a figure of 2.938 lb. to be used in direct comparison with the net figure of 2.36 lb. of the twin six, or a difference of 0.578 lb. in favor of the twin six construction.

By calculating the inertia effect at 2000 r.p.m. for the twin six motor, and for this special 3-in. by 5½-in. six-cylinder motor, we obtain a figure of 670 lb. for the twin six, and 918 lb. for the special six, or 248 lb. in favor of the twin six construction.

The corresponding inertia effect of the 3-38 motor, which I maintain has been considered good six-cylinder practice, amounts to 1712 lb. or 1042 lb. in excess of the twin six construction.

Effect of Speed

Now, as to Mr. Fergusson's suggestion that something ought to be figured in on account of the twin six motor being run at higher speed, I wish to state that I do not consider this proper engineering, because the two motors should be compared at the same motor speeds. My reason for making this statement is that the twin six type of motor will develop more power than the single six-cylinder motor of the same piston displacement, at the same motor speed, and this being the case, it would actually be necessary to run the twin six motor at a lower speed than the single six, in order to have it only develop the same amount of power.

The fact, however, that the inertia forces are less in the twin six motor, makes it possible to run it at higher speeds and thus obtain larger range of ability without undue bearing pressure due to or arising from the forces of inertia.

I have carefully noted what Mr. Fergusson has to say about crankshaft design. A great many things must be taken into consideration when designing a crankshaft, particularly its length, and the magnitude of the power impulses as well as the forces due to inertia. I have proved by exhaustive experiments that there is considerable advantage in the three-bearing shaft over the seven-bearing type, providing the motor is short enough overall to permit of proper strength in the design to resist the bending forces. I would like to outline what I consider to be the main advantages of the three-bearing shaft, as follows:

First: The main bearing portions of a crankshaft are, of course, its weakest points, so far as resisting torsional displacement is concerned, and the more main bearings it is found necessary to use, the longer this section of the shaft will be, and its ability to resist torsional displacement will be correspondingly reduced.

Second: I have found from actual experience, that a single long bearing is much better than two short bearings of the same total length, partly on account of the extra loss of fillets in the two short bearings, but primarily on account of the fact that there is not the same tendency for the oil to work out of the long bearing, as it has to travel twice as far before actually getting out of the bearing.

Third: A proper balance between the forces due to inertia, and the forces due to the power impulses is much easier to obtain in a three-bearing shaft for the following reasons: The center bearing of either a single or twin six motor is the one that is apt to have the highest bearing pressures, unless the designing work is very carefully done. In a seven-bearing shaft it is, I believe, correct to assume that the pressure due to each working stroke is equally distributed over two main bearings; that is, the pressure, due to the working stroke of piston No. 3 will be distributed over main bearings, Nos. 3 and 4, and assuming that with this design these bearings are properly designed to carry this load, we will obtain comparatively short bearings, or, in other words, approximately the length of main bearings that has been common practice in seven-bearing shafts.

If we take these bearings as a basis, and then consider the bearing pressures due to inertia, we will discover that the center bearing pressure will run excessively high, as in this design one-half of the inertia effect of rods and pistons in both cylinders 3 and 4, must be considered as concentrated on the center bearing.

If a seven-bearing shaft is to be designed to have its bearing pressures properly equalized, it will be found necessary to make the center main bearing something like twice as long as the other intermediate main bearings, and this is usually found impossible, on account of the excessive length that will result.

In a three-bearing shaft there are but eight cheeks, while in a seven-bearing shaft there are twelve cheeks, and all other things being equal, it is, of course, true that the total main bearing length of a seven-bearing shaft is cut down by the total width of the four additional cheeks, or else the motor will have to be made correspondingly longer, and this loss in bearing length, coupled with the loss of bearing efficiency, due to the difficulty of keeping oil in the several short bearings, certainly works to the disadvantage of the seven-bearing shaft.

So far as the inertia forces are concerned, the three-bearing shaft is, therefore, the best, and it is only necessary to use more bearings when the crankshaft has to be so long that it would bend under the influence of the power strokes.

One of the most attractive features of the twin six construction is the fact that, due to the small magnitude of the separate impulses and the short compact form of motor on account of its small bore, it is possible to use an ideal design of the six-cylinder, three-bearing crankshaft.

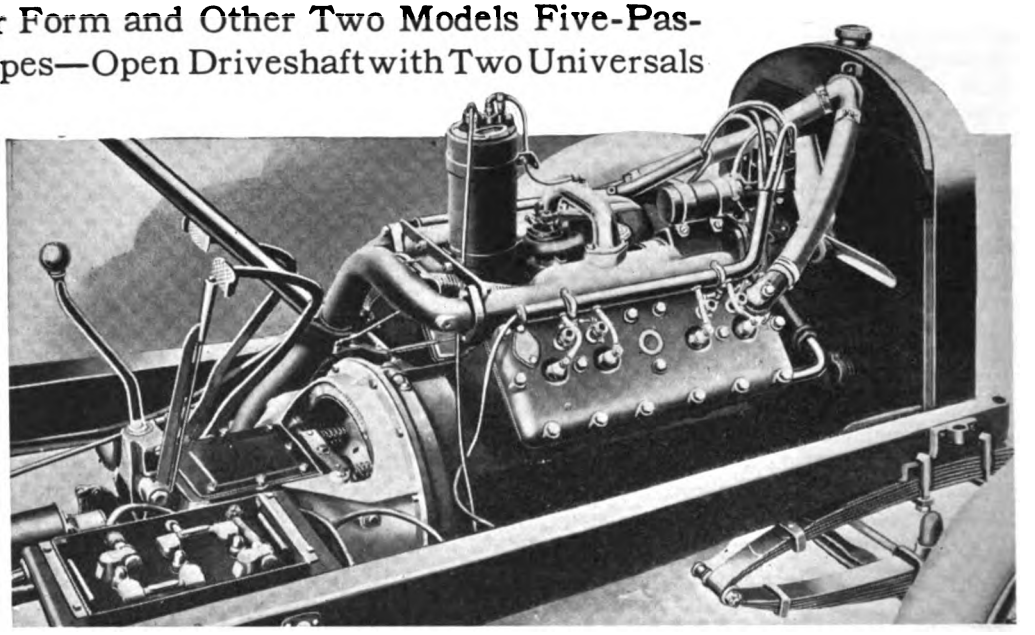
Two Jackson Eights and a Four

Elliptic Springs All Around—Large Eight in Seven-Passenger Form and Other Two Models Five-Passenger Types—Open Driveshaft with Two Universals

THE Jackson Automobile Co., Jackson, Mich., has an ambitious program for the coming year and is the first manufacturer to announce two eights of different capacity. Both will have Northway motors, the larger the engine which was introduced last winter and the smaller a new motor modeled upon the same general design. In addition there will be a light four with a high-speed type of engine and it is expected that this will be a very popular car.

The light four is a Northway motor like the eights, having dimensions 3½ by 5 in. —192 cu. in.—and, being carefully balanced, its ability for high-speed running can be made use of freely. It is the idea of the Jackson company that there will be a large demand for a thoroughly good and well finished four-cylinder car despite the low prices of some sixes and eights, so it is making an excellent job of its four which is listed at $985.

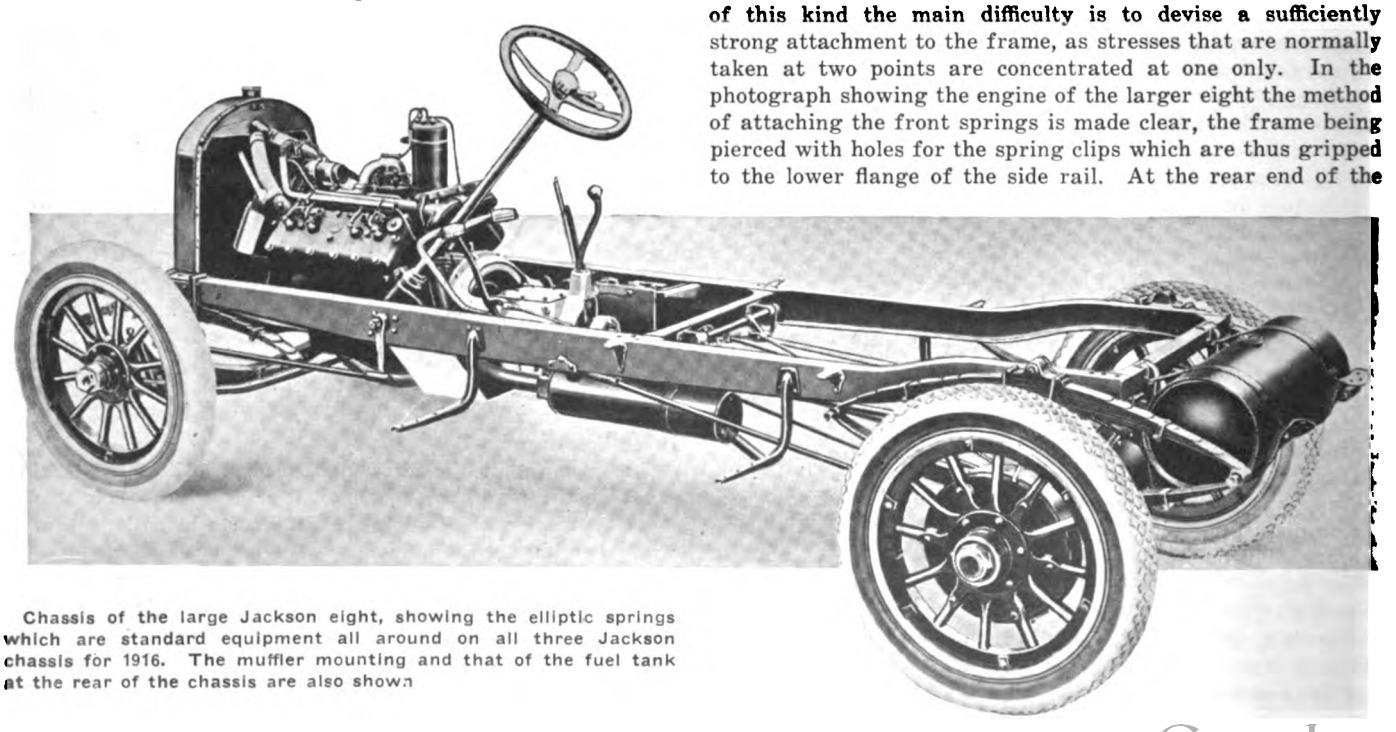
The smaller of the eights has 2⅞ by 4¾ bore and stroke, or 246.7 cu. in. and the larger 3½ by 4½ in., giving a piston displacement of 346.3 cu. in., the prices being $1,195 for the smaller and $1,685 for the larger car. Only the large eight has a seven-passenger capacity, the other two being supplied with five-passenger touring bodies. A feature common to all three cars is high finish for the bodies and the use of really good leather upholstery. Also the Jackson company is to be congratulated on having broken away from the conventional black paintwork, as the four is finished in a rich maroon tint, the small eight in dark green with natural wood wheels, and the large eight in dark blue.



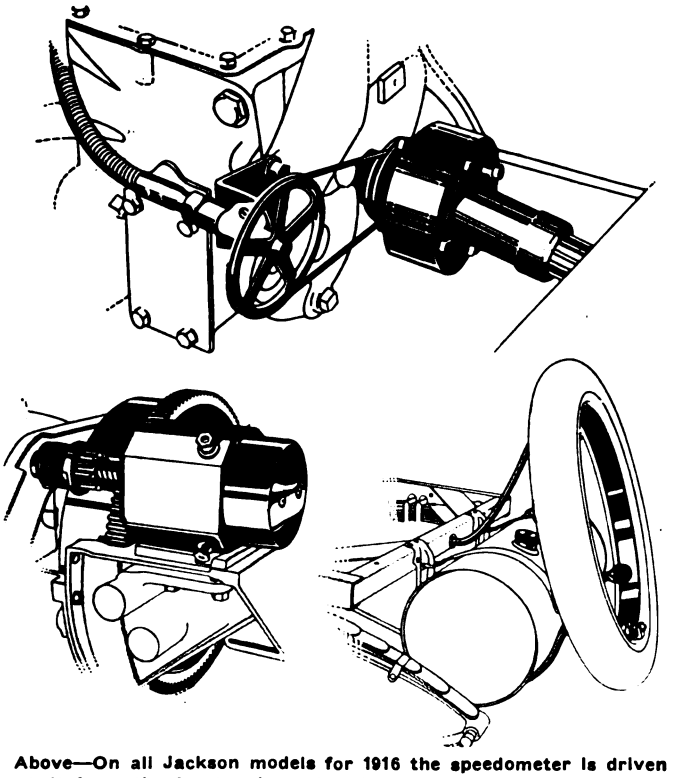
Northway eight power plant used in the large Jackson eight-cylinder model for 1916. Note the vacuum fuel feed tank and the single exhaust manifold

Elliptic Springs Employed

On all Jackson chassis both front and rear springs are full elliptic, giving an unusual amplitude of motion and ability to take really bad roads in comfort. In using springs of this kind the main difficulty is to devise a sufficiently strong attachment to the frame, as stresses that are normally taken at two points are concentrated at one only. In the photograph showing the engine of the larger eight the method of attaching the front springs is made clear, the frame being pierced with holes for the spring clips which are thus gripped to the lower flange of the side rail. At the rear end of the



Chassis of the large Jackson eight, showing the elliptic springs which are standard equipment all around on all three Jackson chassis for 1916. The muffler mounting and that of the fuel tank at the rear of the chassis are also shown



Above—On all Jackson models for 1916 the speedometer is driven by belt from the front universal. Note the splined telescope slide mounting for the universal

Below at left—How the starting motor is mounted at the flywheel

Below at right—Rear spring attachment and mounting of spare tire carrier. Note the round gasoline tank for maximum strength with minimum liability to leak

frame the other springs are attached in the same manner except on the large eight where a swivel mounting is used.

The largest car has both torque and radius rods, so as to relieve the springs of all stresses save those imposed by the load, but the two smaller chassis have only torque stays, driving effort passing through the springs. In practice it seems that this gives a very easy and elastic drive, the flexibility of the spring acting as a cushion.

Not long ago the Jackson company was using a single universal with the propeller shaft inclosed, on some of their models, but this design has now been abandoned in favor of the open type shaft with a universal at each end. The rear axles are all floating and the gear ratios on high are 4.4 to 1 on the four and small eight, and 4.25 to 1 for the large eight. It should be mentioned that telescopic motion of the drive shaft is cared for by mounting the front universal upon a large splined shaft, which eliminates a universal combining sliding with the other motion. This makes for easy inclosure and better lubrication of the joints.

Autolite Electric Equipment

On all models the two unit Autolite system is used, the distributer being combined with the generator. The starting motor is carried low on the crankcase side, and the generator is between the cylinders on the eights, being mounted in the usual place on the four. Fuel is supplied by a Stewart vacuum tank sucking from a rear tank which is made of round section so as to give the greatest possible strength and minimum of liability to leakage.

The Power Plants

Returning to the power plants, each of these includes a cone clutch with external springs and a three-speed gearset, and both the eights are of the same sort of design having the crankcase divided vertically, the cylinder blocks being cast integral with half the case. The large motor is practically unchanged since the Northway company first introduced it early in the present year and the small one is different only by the fact that it has a two-bearing crankshaft instead of the three bearings used for the larger engine. Both have pressure lubrication of a most complete kind and a single camshaft with sixteen cams. The same style of forked connecting-rod is used for both motors, this having proved extremely satisfactory in the large number of Northway eights that have been put in the hands of private users during the last six months. The cylinder heads are detachable, which makes a light task of the occasional necessity for cleaning out carbon, and the spark plugs are located centrally which is usually assumed to be the most efficient position.

Wide Steering Lock

The Jackson company makes a feature of its wide steering lock which makes the car convenient to handle in cities or in exceptionally rough country. To enable the fullest value of this to be obtained the wheelbases have been kept fairly short, that of the four and small eight being 112 in. and that of the large eight 124 in. Tires are 32 by 4 all round on the smaller chassis and 34 by 4½ on the big eight.

Runabout bodies are supplied instead of the five-passenger equipment, on the four and the small eight, but the large eight will be made with a seven-passenger touring body only. The runabout type is very good in both appearance and comfort and has a most capacious boot, or rear storage space, which is always extremely useful for touring. It should be remembered that the Jackson company also can provide its special Transcontinental body, in which the seat back of the front compartment can be let down and a comfortable bed made with the upholstery and cushions. This body has met with a considerable success since its introduction a few months ago and it is surprising that the type is not more common, considering the popularity of camping on tours.

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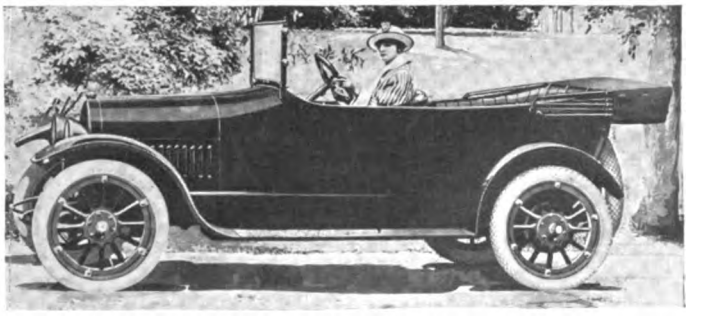
A Good Book for Draftsmen

To books intended to assist the young draftsman there are no end, but one of the best and clearest is the latest addition, published by G. P. Putnam's Sons, New York, and The Cambridge University Press, England. The author is John Handsley Dales, former head of the engineering department of Bradford (England) Technical College. Commencing with instructions on such simple yet elusive things as the proper method for sharpening a pencil, the book continues with a series of drawing exercises designed to train hand and eye in the manipulation of all the tools of the draftsman's trade.

No questions of machine design are considered, the book's sole purpose being to teach drawing and it should be of very real assistance in developing combined speed and accuracy. Perhaps it is rather a college primer than a factory library volume, but there are few juniors in automobile drafting rooms who would not be benefited by a careful perusal of the volume and by some practice with the exercises. The title, Mechanical Drawing (Dales), does not give much idea of the usefulness of the book.



The small eight-cylinder Jackson with the new body

The Rostrum

Flying Paper Dangerous on Speedways

EDITOR THE AUTOMOBILE:—In the interest of fair play and best results in speedway contests, it would seem only fair to recommend that some action be taken in future contests to have men stationed around the track to remove scrap papers which—through one cause or another, may get onto the track.

The writer noticed two laps before entry No. 2, Peugeot, driven by John Atkin withdrew from the race with a cracked cylinder, that his radiator was almost entirely blanketed by a sheet of paper picked up on the track, and without any doubt this had a very considerable bearing on the withdrawal of this car. The writer also noticed that there was a great amount of loose paper, particularly on the bank track at the right of the grandstand, which paper was in a state of constant motion as the cars passed through it.

In view of the results of the race, it is very improbable that had the paper not been on the track the results achieved by the winners would have been any different, but it leaves in the mind of the spectator a possible doubt as it allows an element of luck, which should not be present, to enter into the final result of the race.

We thoroughly believe that American built cars can repeat or even better the records made, and we wish to accomplish this result without a shadow of doubt as to the conditions. H. R. S.

Schenectady, N. Y.

Probable Effect of Lighter Flywheel

Editor THE AUTOMOBILE:—What would be the result of putting a smaller flywheel on an automobile engine? Would it make a faster easier-pulling engine where used in a stripped car weighing say about half as much as the touring car in which the engine is used? My idea is to use the flywheel of a 4 by 4 motor on a 4½ in. by 5 motor. Both motors are identical except as to size and also size of the cars they were used in. Both are the same make and same year model.

Would you advise using the lighter flywheel for the cut-down car?

Columbia, S. C. C. M. L.

—It is not advisable to put a lighter flywheel on a motor unless it is to be used for high speed work only. The lighter the flywheel the more unevenly a motor runs at low speed and this is quite noticeable in a car used for ordinary work. On racing cars, however, where most of the traveling is at very high speed a much lighter flywheel can be used than in the case of touring cars. Therefore, unless you intend using the car for only high-speed work it would be advisable to keep the standard size flywheel.

Applying Stewart Vacuum to Cadillac

Editor THE AUTOMOBILE:—Can you please tell me if a Stewart vacuum gasoline system can be successfully installed on a 1915 Cadillac eight touring car, and if it can be installed, will you kindly publish instructions how to do it?

Bangor, Me. F. H. C.

—The Stewart vacuum system can be installed on a Cadillac eight, the model 113-K being the best for the installation. The instructions for installing are as follows:

Place the tank on engine side of dash, right hand side of car, as high as possible.

Use 4⅝ in. wheel gear spacers under the bracket. This will permit setting the bracket out from dash far enough to clear a pipe that will otherwise obstruct.

Move both brackets on the tank as close together as possible.

Tap the neck of the carbureter above the butterfly valve instead of tapping the manifold, which is water-jacketed.

Five Cylinders Hard to Balance

Editor THE AUTOMOBILE:—Why is it that automobile manufacturers never build a five-cylinder motor? In a five-cylinder, four-cycle motor, there would be a continuous turning effort of the crankshaft, due to the overlapping strokes, the one added cylinder being sufficient to cover the interval of "no power" which is present in the four-cylinder type of automobile engine.

A five-cylinder motor has the least number of cylinders to have continuous power and therefore seems to me should have been the next step after the four.

Since the greater number of cylinders creates the greatest smoothness, it is evident that absolute smoothness can never be attained, no matter how many cylinders are used. For this reason, the most practical motor in my judgment would be a five, as it has the least number of cylinders to give continuous power. K. B. W.

E. Orange, N. J.

—A five-cylinder engine is only in proper balance when the cylinders are arranged star fashion as in some aeroplane motors. This means that a vertical cylinder motor with five cylinders would vibrate a good deal. It would not run smoothly like a six. Vibration has nothing to do with the overlap of power impulses and it is freedom from vibration more than the even torque which accounts for the great popularity of the six.

Ford Direct Ratio 3.63 to 1

Editor THE AUTOMOBILE:—Am asking the following questions with the idea of using Ford axles in the construction of a light car, roadster model for three passengers, using the conventional type of frame and cantilever rear springs and semi-elliptic front springs.

1—Please advise if a Ford rear axle will support a three-, or four-passenger car of about 1900 lb., using spring seats on the axle housing about 32 in. between centers.

2—Give the ratio of driving gears.

3—Will the rear axle stand a four-cylinder, high-speed motor 3¼ by 5, developing about 18 hp. at 1000 r.p.m.?

4—Suggest a method and give a sketch of attaching semi-elliptic springs to the Ford front axle about 27 in. center.

5—Give dimensions of shaft required to fit transmission end of universal joint, also dimensions of propeller shaft end.

Owensboro, Ky. F. S. B.

—The Ford rear axle should be able to support the load you mention.

2—The ratio of the rear axle driving gear is 3.63 to 1.

3—The rear axle is capable of transmitting 18 hp.

4—This is a straight job and merely consists in having the necessary fittings made to fit the frame and axle.

5—A sketch is given in Fig. 1, which will give the dimensions of the part which you need.

Testing Spark Plugs and Cylinders

Editor THE AUTOMOBILE:—Kindly give me the different methods for testing the effectual working of the spark plugs in giving equal and uniform explosions, if there is any variation owing to the strength or power of the spark.

2—Likewise kindly give the different methods for testing out the efficiency of each cylinder for suction of the carbureted gasoline into it and for non-leakage of the gas from the explosion therein.

3—When the engine refuses to respond or chokes down on too sudden and too wide opening of the throttle, kindly explain the causes therefor, i.e., whether from too lean a mixture, or an over-rich mixture, or defective suction of part or all of the cylinders, or whatever they may be.

Connersville, Ind. H. L. F.

—The operation of the spark plug can be readily determined by eye. All that it is necessary to do is to place the spark plug points at the proper distance apart which is between 1/64 and 1/32 in. for magneto use and then after this approximate adjustment is made, remove the plug from the cylinder and start the engine on the other three. The color and intensity of the spark which jumps across the gap of the plug removed from the cylinder gives a ready clue to its performance when firing a charge. The spark may vary all the way from a thin, fine line to a thick dot of flame. Something between the two, or a hot, blue spark, is most desired.

2—The best method for testing the suction of each of the cylinders is by compression. Cylinders, roughly speaking, having the same compression will have the same suction.

3—The choking action you speak of is generally due to too rich a mixture. Properly designed motors, unless improperly timed, do not suffer from defective suction.

Oxygen for Removing Carbon

Editor THE AUTOMOBILE:—I have a 1915 eight-cylinder Cadillac. How far should this car be run before the carbon is cleaned out?

2—I expect to have an expert do this. What is the best method?

3—The gear ratio is 4 7/16 to 1. I get about 10 and 11 miles to the gallon. If this were changed to 5 to 1, can you tell me what I would get to the gallon of gasoline then?

4—What is the best speed that this car will develop as it is with full equipment?

5—Does it harm the engine to run it at 60 m.p.h.?

New York City. J. C. W.

—The frequency with which carbon should be removed from a motor depends upon its steady rate of accumulation. For instance, a motor considerably carbonized one day might have this carbon almost entirely burned out by driving the car at an extremely high rate of speed for a certain time. On the contrary, if the car was not subjected to this extremely high rate of speed, the accumulation of carbon would be constant. The rate of this constant accumulation depends upon the nature of the oil used, the amount of oil used, as well as the carbureter adjustment. If the oiling system is in improper adjustment so that an excessive amount of lubricant is being used, and if after such a time the mixture happens to be too rich, the condensation of this lubricant would form a sticky film to which lamp black from the very rich mixture would readily adhere. Again, certain grades of lubricants have a larger carbon residue than other lubricants, and as any lubricant which finds its way to the combustion chamber will burn under the high temperatures reached, the greater this carbon residue in the oil, the greater will be the amount of carbon deposit. Frequency with which carbon should be removed from a motor depends upon the rate of its accumulation which may, to a certain degree, be controlled by the operator. The instruction book which is shipped with every car from this factory takes up the matter of carbureter adjustment and the nature of lubricants which should be used on Cadillac cars very carefully.

2—When necessary, carbon may be very successfully removed by the oxygen process. When using this process, however, the piston should be on its high dead center, in order to permit the head of the piston to be thoroughly burned over, and at this time both valves in the cylinder should be closed to prevent the possibility of the flame passing through the inlet valve to the carbureter, and as a further precaution the carbureter should be drained.

3—The gear ratio on this particular car is 4 7/16 to 1 and the mileage is from 10 to 11 miles to the gallon of gasoline. As to the effect on the fuel consumption should the ratio be changed to a 5 to 1, this would depend somewhat upon the nature of the country. Ordinarily, of course, changing from a 4 7/16 to 1 to a 5 to 1 means that for any particular road the engine would be operating at a higher revolution per minute, and a higher rate of fuel consumption might be expected. However, if this car happened to be operated in a hilly country, it is possible that by changing from a 4 7/16 to 1 to a 5 to 1 the fuel consumption might be actually decreased, for the reason that with a high gear, hills would have to be negotiated with a wide-open throttle, whereas with a low gear the same grades might be negotiated readily with the throttle partially closed.

4—The maximum speed would depend upon the type of the body, whether a two-passenger, a seven-passenger or a closed type. The gear ratio, size of the tires and whether the windshield were both up or down, would also enter into this question. A complaint was received recently from an owner because his standard type 51 car would not do better than 70 m.p.h. but you probably won't want that speed.

5—The engine speed at a road speed of 60 m.p.h. depends of course upon the gear ratio. If an engine is being run under load, its tendency toward self injury will be less during this period than with the motor run idle for the same length of time at the same high rate of speed. The motor should never be run idle at high engine speeds. If, however, all parts of the car are in proper adjustment; the cooling and oiling systems in proper working condition; the bearings properly adjusted, etc., there is no reason why the usual operation of this car from its lowest to its highest speed, under the proper conditions, should be in any way detrimental or result in any other than the ordinary wear.

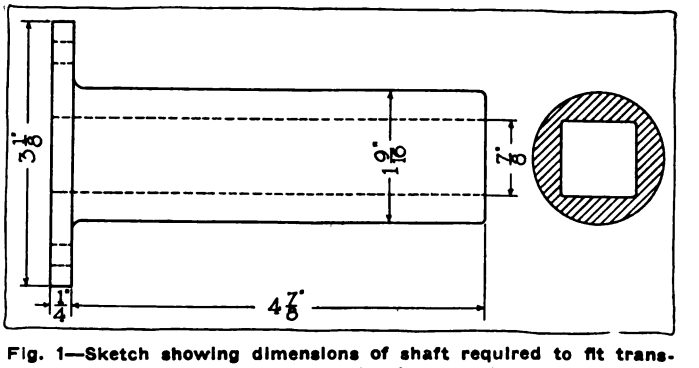


Fig. 1—Sketch showing dimensions of shaft required to fit transmission end of Ford universal joint

Bijur Electrical Units Standardized

Simpler and Lighter Construction— Magnet Shells Cut from Steel Tube

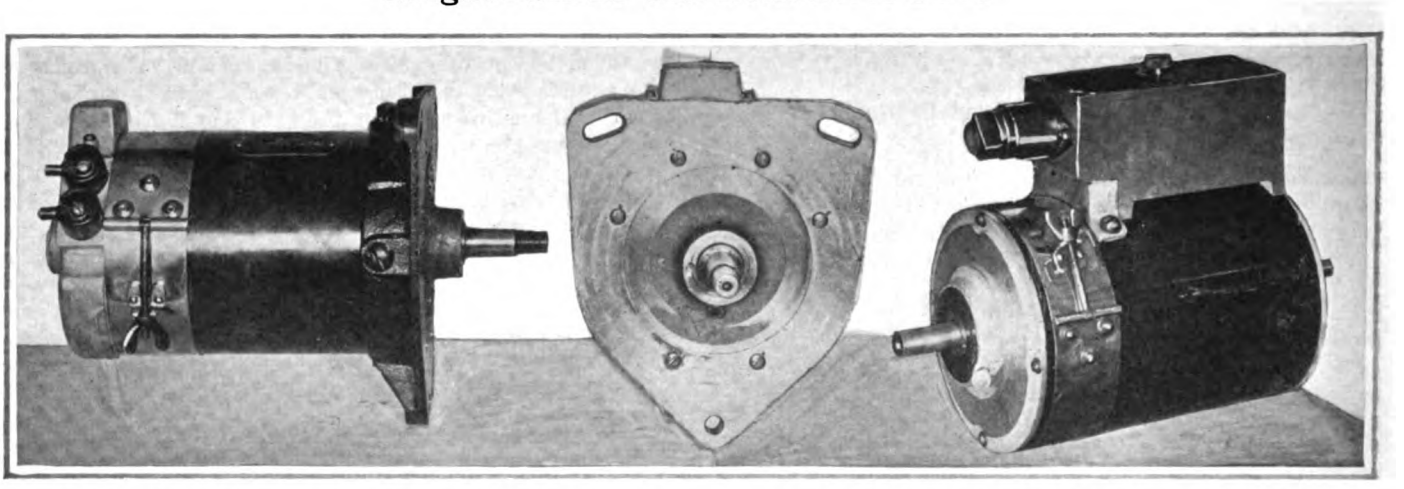


Fig. 1—Left—Constant current generator controlled by third brush principle. Center—Generator base, showing slotted bolt holes for chain adjustment. Right—Voltage-regulated type of generator with detachable regulator on top

INCREASED efficiency in conjunction with a marked reduction in the size and weight of the principal units marks the development of electrical equipments for automobiles during the past two years. Compactness is a fundamental requirement and this has led to the cutting down of much metal in generator and motor construction, especially in regard to the magnet, though there has also been much weight saving in the more efficient and compact methods of arranging the windings. With this desire for compactness has come the necessity for ease of manufacture in order to keep the production cost inside the competitive field.

After more than three years' experience the Bijur Motor Lighting Co., Hoboken, N. J., has decided that the above requirements are best obtained by the adoption of a simple cylindrical form for the field magnet casing with four inserted poles. For 1916, therefore, the Bijur output will consist of motors and generators constructionally identical, with the exception of the windings and size. All magnets are cut from seamless steel tube. All are four-polar with drop-forged poles screwed in after inserting the windings. The motors are designed for flywheel connection only either by direct sliding pinion or through reduction gear and sliding pinion. The Bijur company, however, does not supply gearing.

The generators are divided into two classes, irrespective of size, namely, the constant-current type in which the output is governed inside the generator by means of the third brush principle, and the voltage-regulated type in which a special vibrating regulator of Bijur design is mounted on top of the generator casing holding the voltage by the use of a resistance inserted in the shunt field.

Besides the separate motor and generator there is a motor-generator set for connection by chain to the engine. This design is remarkably simple and is suited to the needs of the smaller sizes of power plant.

The constant current type of generator has the great advantage of simplicity, all the control being located inside the generator casing. The third brush principle is used, in which the speed of the armature controls the amount of current passing through the shunt coils by field distortion. The outfits can be classified as follows:

A Constant current generator Geared motor
B Constant current generator Direct acting motor
C Voltage regulated generator Geared motor
D Voltage regulated generator Direct acting motor
E Motor generator

Vibrating Reed Regulator

The voltage-regulated generator is governed by a vibrating regulator, which is made only in one size for mounting on the magnet casing. This regulator differs from others of similar type in the arrangement of the contact points, Fig. 2, which are fitted to the ends of brass reeds so as to preserve a clean contact surface at all time by varying the actual point at which the spark occurs. The coil is arranged vertically with the hinged iron armature above. Behind the hinge on an extension of the armature one of the two reeds R1 is fitted, while the other reed R2, representing the fixed point is arranged horizontally so that the weights at the ends, in which the platinum points are inserted, face one another. An adjustable spring which holds the armature away from the core is provided. When attraction of the armature takes place as the speed of the generator rises, the contact points are separated. This inserts a resistance connected across the contacts, Fig. 3, in the shunt field, thereby cutting down the power of the field magnet. The spring then returns the armature and again closes the points, allowing the shunt field full current on which the action is repeated. On high speeds this armature vibrates at a fast rate and the claim is made for the special reed arrangement that the contact points cannot become pitted owing to the sideways vibration of the surfaces.

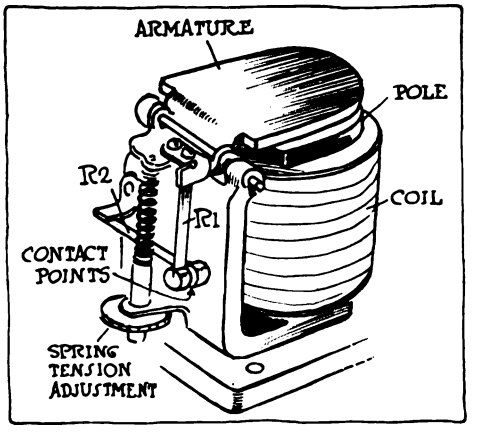


Fig. 2—Bijur voltage regulator in which the contact points are fitted to two vibrating reeds to preserve a good surface

In the same rectangular aluminum casing, Fig. 4, the cut-out *C* is fitted and all the connections to the generator are made by plugs *P*, which are inserted into sockets in the generator casing. No electrical knowledge is required in changing the regulator. The act of putting it in place on the generator and fastening it by the single thumb nut automatically makes all necessary connections through the plugs.

This feature is of great value in the case of a breakdown or failure on the part of the regulator. All the owner does is to remove it, forward it to the maker and replace with a new one. By this arrangement the maker can seal up the regulator, and repair according to guarantee only when the seals are unbroken. The connection to the outer circuit is made through a two-point plug *T*, which is inserted into a socket *S*, in the end of the regulator casing.

Chain Adjustment Provided

There are two alternative methods of fitting the generator to the engine. It may be strapped in a cradle or mounted by the end cover on the crankcase arm. In the latter method provision is made for chain adjustment through slotted holes for two of the three bolts, Fig. 1, center.

The starting motors are series wound and in the direct-acting type have either a squared shaft to take the sliding pinion or a screwed shaft for the self-acting momentum type of pinion.

The starting switches, Fig. 4, are plunger operated and can be located under the floor with the plunger projecting for foot actuation or interconnected with the pedal that brings the driving pinion into mesh with the flywheel. A flat resistance is incorporated in the switch which is included in the circuit on the first movement of the plunger and cut out when the plunger is pushed home. This insures easy meshing and a gradual start.

By using the third brush principle of regulation on the motor generator the moving parts are brought down to the minimum. The field coil for generator purposes is a shunt across the third brush and one of the main brushes, Fig. 3. When the car slows down below the minimum charging speed the unit automatically takes up its duties as a motor helping the engine. By this means the engine is prevented from stalling.

How Magnets Are Made

The method of manufacture of the magnets and the assembly of the windings are of particular interest. Raw stock in the form of seamless steel tube is fed into automatics

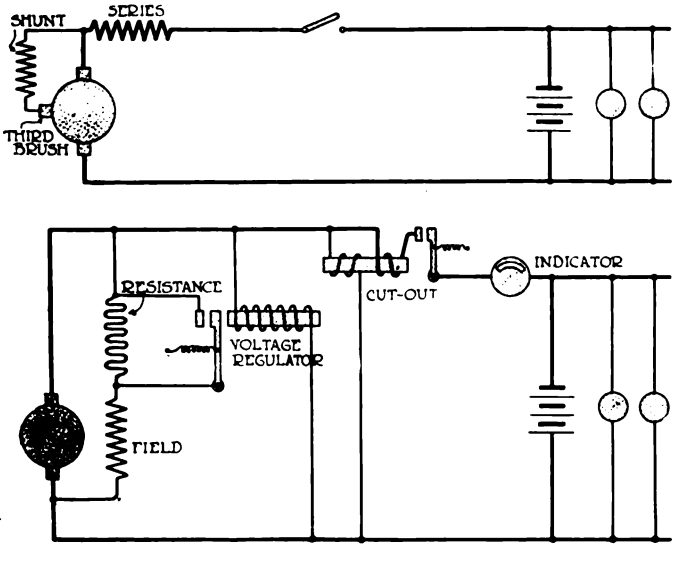


Fig. 3—Top—Diagram of connections on the motor-generator, showing the third brush control method. Below—Connections of the voltage-regulated generator and external circuit

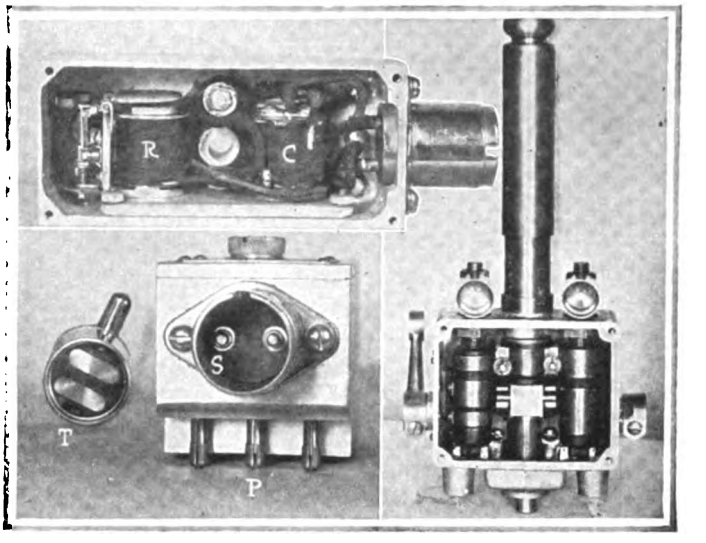


Fig. 4—Left—Interior and end views of the Bijur regulator which is connected to the outer circuits by a change over plug T. Right—Plunger type of starting switch with barrel contacts

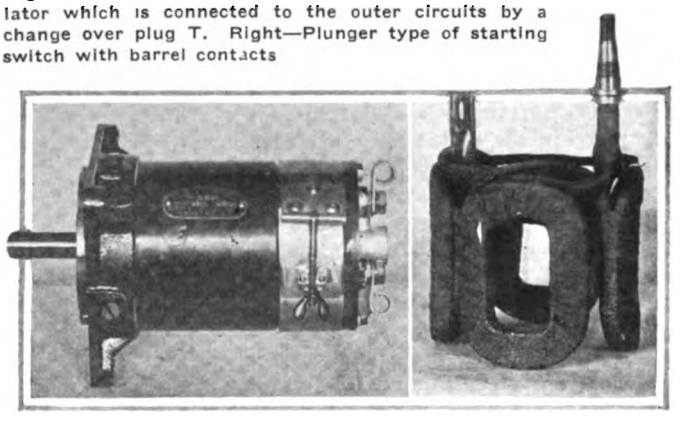


Fig. 5—Left—Bijur starting motor with squared shaft for sliding pinion. Right—Assembly of starting motor field coils

which machine inside and out and cut off to the required length, facing both ends accurately. The shells are then taken to a large press which punches out the holes which give access to the brushes. Until this year this particular operation was performed in the milling machine, which was naturally several times slower than the cold punch. The poles are drop forgings which require only slight grinding to true up. This is done by clamping twenty-four at a time on a mandril, which is inserted in an automatic grinder. The field coils are former wound and are assembled in complete sets, Fig. 5. After all holes have been drilled in the shell a set of windings is taken, four poles inserted and the whole then slid inside the shell. The assembly is then placed over an expanding mandril which forces the poles tightly against the inner machined surfaces of the shell, forming a good magnetic contact. While in this position the screws are inserted through the shell and tightened up with a machine screwdriver. The accuracy of the grinding and this method of assembling are such that a truly circular tunnel is obtained without further machining. Plug gages are used after this operation before passing on to the armature department.

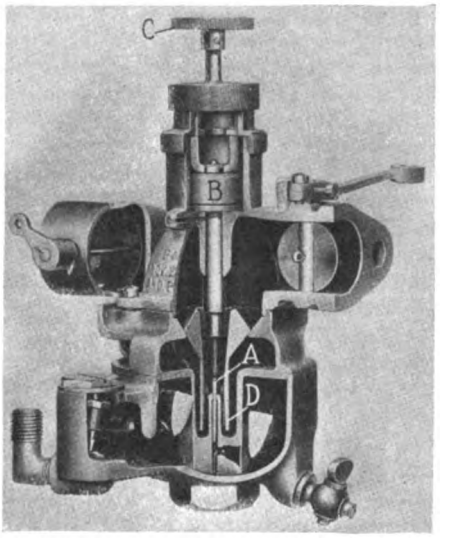
When complete all units are tested for grounds and shorts in the fields, commutator and armature windings. Motors are then given a long free run at a very high speed, after which comes a second test for possible shorts. Finally, motors are taken at random from the output and given brake tests. Generators are first given a test run of half an hour in which all regulator and brush adjustments are made. This is followed by a long run, each generator with individual battery and lights exactly as on the car, the speed being frequently changed over a wide range.

ACCESSORIES

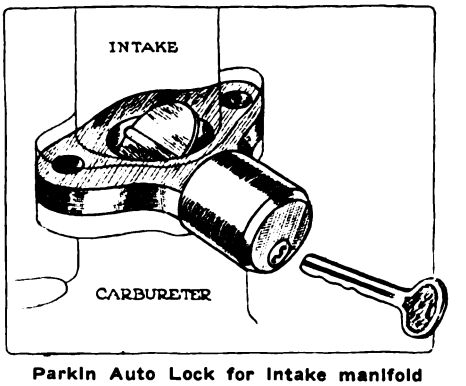
Diamond Drip-Proof Carbureter

TWO new, and extremely ingenious features, are to be found in the Diamond carbureter. The main design is on a simple, approved principle with a lifting valve to control the mixture. As is seen in the illustration, this valve controls both air and fuel passages as it has a metering pin *A* attached which varies the nozzle orifice as the valve rises or falls. At starting the whole of the air passes downward in the central well and then up through the hole pierced through the middle of the valve. When the engine picks up speed the valve lifts and the air stream then divides, so that the velocity of air actually passing the nozzle does not vary much. The metering pin lifts with the valve and thereby increases the size of the jet, calculation so proportioning the size of the pin as to secure a constant ratio between the air and gasoline admitted.

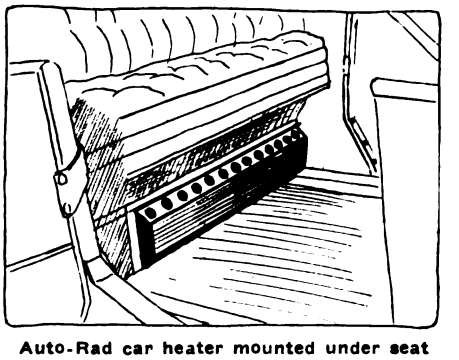
When idling, or when starting with the strangler closed, gasoline collects in the bottom of well *D* around the foot of the nozzle and the air bubbles through and provides a whiff of very rich gas to give acceleration as the throttle is opened up. This feature is well shown by demonstration which the makers are giving on an old Ford, exhibiting a great ability on high gear in heavy traffic.

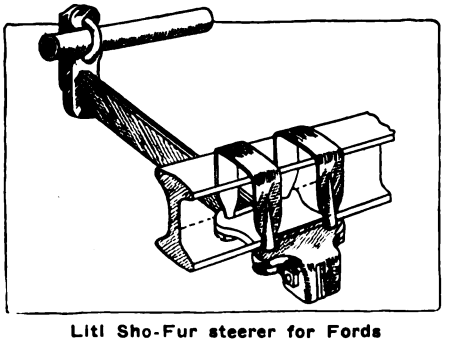


Diamond drip-proof carbureter



Parkin Auto Lock for intake manifold


Auto-Rad car heater mounted under seat


Litl Sho-Fur steerer for Fords

Graphite Dashpot

To steady the action of the valve a dashpot is needed, and a common fault of such dashpots is their tendency to stick. The inventor of this carbureter has hit upon the happy idea of using a solid block of graphite for the plunger *B* which is therefore everlastingly self-lubricating. Another clever feature is that the carbureter cannot leak or drip, as there is no outlet or intake below the level of the throttle. With an air pipe securely attached the carbureter will even operate under water. There is only one adjustment, this being on the metering pin and a control goes from the screw cap *C* to the dashboard.

Being a simple manufacturing proposition the carbureter is sold for the low price of $12.50, and it is made in sizes to suit cars of different make.—Diamond Carbureter Co., Jersey City, N. J.

Parkin Auto Lock

A new type of lock which places a shutter in the intake manifold when it is desired to prevent the car from being used is put out under the name of Parkin. The lock takes the position of a gasket between the carbureter and manifold flanges. In it is a butterfly valve which can be locked across the passage, thereby preventing the flow of gas into the motor. Each of the locks is different mechanically and there is no master key. The carbureter can be removed at any time without interfering with the lock. There is also a combined unit of lock and manifold on the market which can be purchased if desired in this form.—Parkin & Son, Philadelphia, Pa.

Auto-Rad Car Heater

A radiator for heating the automobile has been brought out under the name of Auto-Rad. The makers claim that the exhaust of an ordinary 40-hp. motor would heat an eight-room house, and there is no reason why a portion of this should not be taken for making the car comfortable in winter. The radiator consists of an enameled steel casing inclosing the radiating surface, thus permitting a circulation of warm air around the feet and under the body. The weight is given by the manufacturers as 4 lb. The upkeep cost for fuel is nothing since the exhausted gas which would otherwise pass out into the atmosphere is simply led through the radiator. Since the radiator is gas-tight the device is clean and odorless. The price of the device is $6. —Brevando Mfg. Co., Rochester, N. Y.

Litl Sho-Fur Ford Steerer

To bring the wheels of a car with reversible steering gear back in line the Litl Sho-Fur has been designed particularly for use on the Ford car. As shown by the illustration, it can be attached to any model T without machine work or without boring a hole and can be put on the car in 10 min. It is attached to the front axle of the car by two strap bolts. The means used for bringing the wheels back into line is a two-leaf spring of tempered steel. This passes through an eye clamped on to the tie rod and when this is moved to either side the spring tends to return to its center and bring the tie rod back to its normal position. The price of the device is $3.—White Mfg. Co., Cincinnati, Ohio.

Stewart Duplex Carbureter

To meet the demands for eight- and twelve-cylinder motors the Stewart Duplex carbureter, which is in reality two carbureters in one, has been designed. The principle of the single Stewart carbureter is followed, but all the essential elements such as the metering pins, metering valves, mixing chambers, throttles, and adjustment are all separate. In order to obtain uniform results in both sides of the V, this duplex model is so arranged that the throttle and adjustment can be perfectly synchronized thereby equalizing the two motor sets.

The only function which is the same for both sides of the carbureter is the float bowl and the mechanism which keeps the gasoline at a constant level. There is also a single air intake port which works from a single hot air tube and stove on the exhaust manifold.

The Duplex carbureter is illustrated in the sectional view. The carbureter operates on a metering principle which can readily be understood from the illustration. With the motor at rest the main air passages are closed because the air valves *A* rest on their seats. As soon as the engine starts to rotate a vacuum is formed lifting these valves from their seats admitting air and drawing gasoline through the aspirating tubes *B*, a small amount of air is drawn through the primary air passages and up around the flared top of the aspirating tube. This flare on the end of the tube is for the purpose of spreading the gasoline in a film in which condition it is picked off the rim by the air which passes this point at a high rate of speed.

Only One Adjustment

The more the throttle is opened the more the air valves will lift and the more gasoline will be allowed to pass by the tapered metering pins. The higher the valves are lifted the greater will be the opening around the metering pins, thus increasing the gasoline supply. The only adjustment possible in this carbureter is that of the relative position of the metering pin to the opening in the bottom of the aspirating tubes and when this is once made, it should be permanent.—Detroit Lubricator Co., Detroit, Mich.

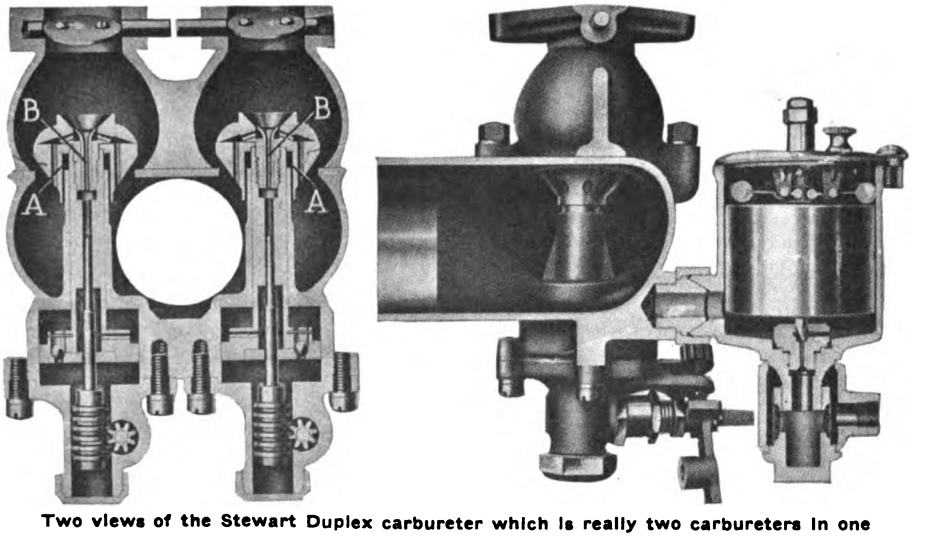
Magnalite Alloy Pistons

Aluminum alloy pistons have been much in the public mind of late especially in the automobile engineering world. Among other advantages planned for Magnalite pistons are less vibration and a cooler motor, the aluminum alloy used in their construction being lighter than aluminum and stronger than cast iron. The light weight minimizes vibration and the higher conductivity effects a quicker transference of the heat to the waterjacket. These pistons are manufactured to fit all cars. The rings used may be of either Magnalite or the ordinary cast iron type.—Walker M. Levett Co., New York City.

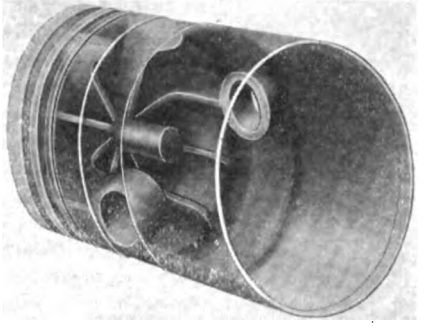
Guardian Robe Lock

For locking the robes on a car which is abandoned by the driver temporarily, a combination device has been brought out whereby these can be clamped to the robe rail without danger of removal except by tools. It is intended to prevent the theft of robes, raincoats, grips, gloves, dusters, packages and other articles from the car and also eliminates the necessity of dragging the robes into the restaurant or home when the car is stopped.

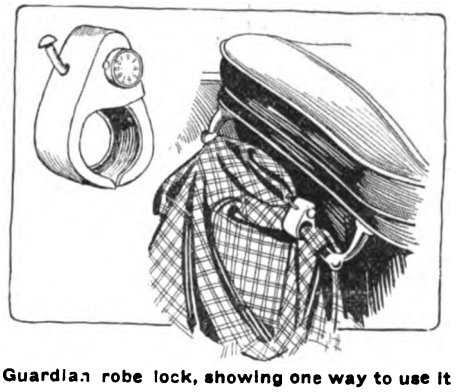
The Guardian lock operates by combination, thus obviating the necessity for a key which can be lost. There is no ratchet on the lock and it can be closed in any position. The device is 3¾ in. high by 2¼ in. wide when closed. The jaws which clamp over the robe are 1¾ in. wide. The lock is made of heavy sheet steel nickel plated. The price of the device is $1.—Mechanical Products Co., Cleveland, Ohio.



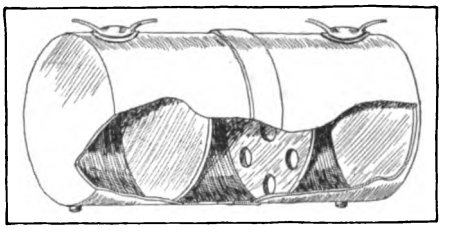
Two views of the Stewart Duplex carbureter which is really two carbureters in one



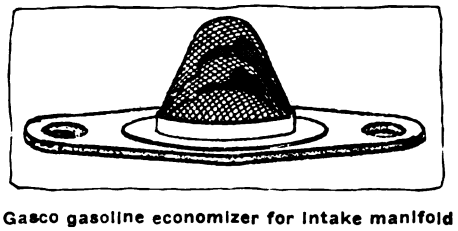
Magnalite piston, showing ribbing system



Guardian robe lock, showing one way to use it



Jasco partitioned tank for speedsters, etc.



Gasco gasoline economizer for intake manifold

Jasco Tank Improvements

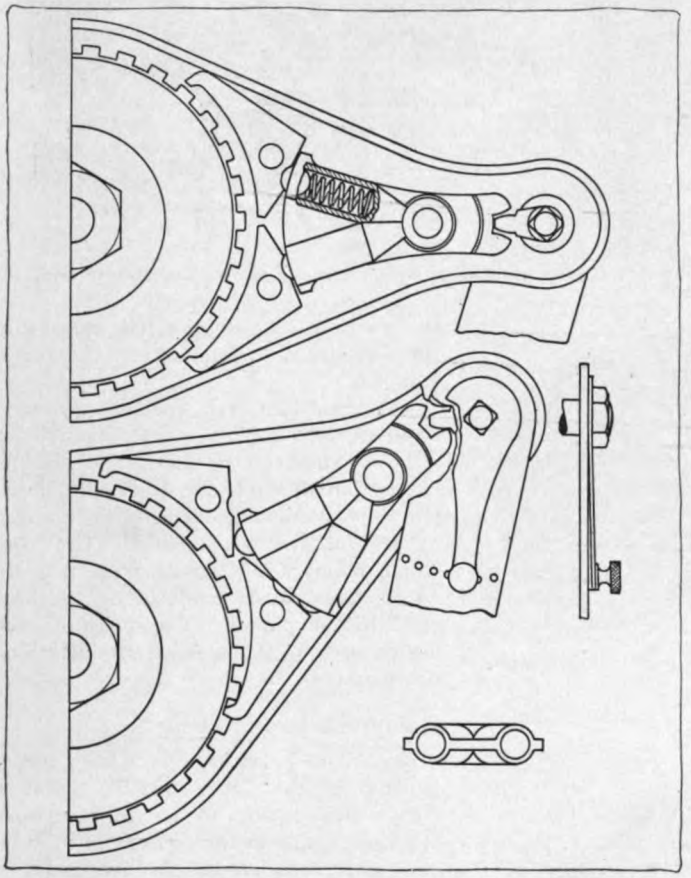
Several new features have been incorporated in the Jasco line of seamless drawn steel tanks. A rectangular tank has been added to the stock, and may be had with rounded or concave ends; a special square Packard tank, is supplied 12 by 14 by 32, holding 21 gal., and ready for installation, having all fittings. The price is $20, or, with gasoline gage, $23. A cylindrical tank is built for roadster, speedster or racing cars with a separate compartment in one end for oil and a splash partition in the middle of the gasoline compartment; these tanks are made in 14, 16, 18, 20 and 24-in. diameters and any length.—Janney, Steinmetz & Co., Philadelphia and New York City.

Gasco Gasoline Economizer

In order to more perfectly vaporize the fuel a device under the name of Gasco is being marketed which is placed in the manifold-carbureter connection. The Gasco device contains a set of screens intended to break up the globules of gasoline drawn from the carbureter. Another function of the screens is to prevent inflammation due to backfire as the screen will act in the same way as in a miner's lamp. The Gasco can be secured in any size, the prices ranging from $1 to $1.50.—The Gasket Supply Co., Philadelphia, Pa.

Absorber Permits Limited Free Motion

Device Invented by Lancaster Man Utilizes Ratchet and Pawl To Introduce Resistance to Violent Spring Action



Figs. 1-2—Shock absorber in normal position with pawls disengaged; shock absorber after obstruction is encountered with lower pawl engaged

A NEW shock absorber has been brought out in which the designer has endeavored to produce a device which will not offer any resistance within a certain amount of spring action. This permits the car to pass over smaller obstructions and depressions without any interference with the natural spring action. Beyond this range the action of the spring is checked in proportion to the severity of the depression or obstruction in the road. The inventor is E. H. Kreider, of Lancaster, Pa.

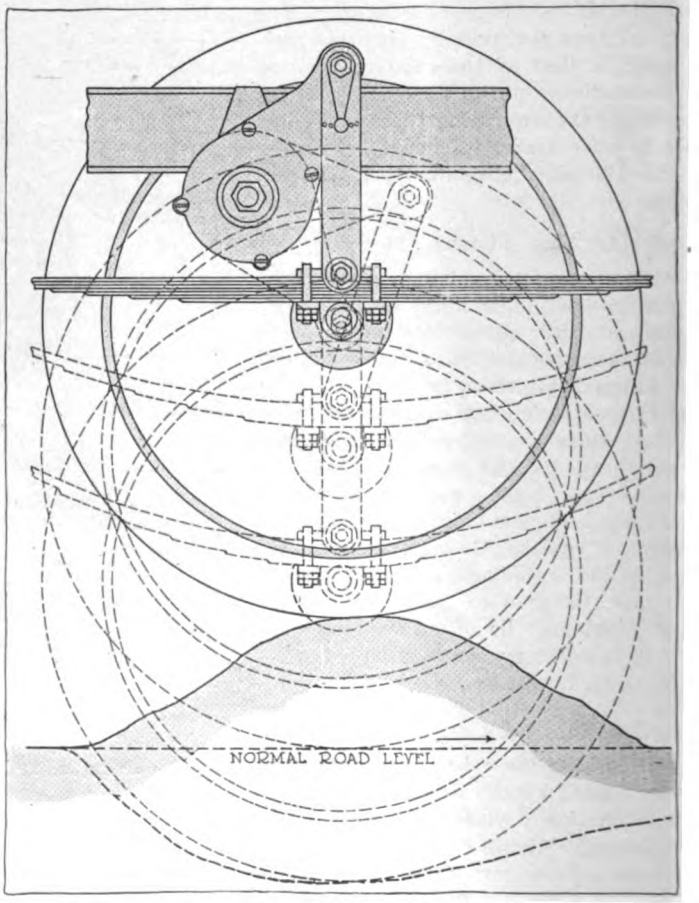
Uses Ratchet and Pawl

The means provided to accomplish this result are shown in Fig. 1 where it will be seen that the pawls of a ratchet and pawl action are both disengaged from the ratchet wheel and remain so for a limited amount of axle movement. When an obstruction higher than the above limit is encountered, the device, which is attached to the body of the car, will turn upward as in Fig. 2 and automatically drop the lower pawl into the ratchet, turning the ratchet wheel against resistance during the recoil movement of the spring. This prevents the up-throw of the body.

Assuming that the car has again taken its normal position with both pawls out of mesh and the wheel encounters a depression in the road, the wheel and axle will drop quicker than the body and thereby cause the shock absorber to turn downward when the upper pawl will engage the ratchet and at the time the body tends to drop, an upward pressure is exerted by the shock absorber. Thus in either case whether the car encounters a depression or an obstruction, the shock absorber is designed to adjust itself without resistance and only comes into action on the return movement.

As will be seen by Fig. 3, the greater the obstruction or depression, the more the device comes into action, that is if it requires 50 lb. to move the device at a point near the neutral position, it will require almost 100 lb. to move it when on a high obstruction or deep depression. This is brought out in Fig. 3, showing the shorter leverage at the extremes in a case of depression or obstruction at the extremes.

Assuming again, that the road conditions are such that the car has a tendency to rock up and down a number of times in succession and with such violence that the shock absorber will move beyond the free action space both ways, the pawls are so designed as to remain engaged across the neutral space and cause the device to act constantly until the body of the car again settles down to its normal position at which time both pawls again drop out, permitting free action of the springs as before. The index pin and latch shown at Fig. 4 is for the purpose of changing the position of the neutral space to compensate for various makes of cars and also for light and extremely heavy loads.



Figs. 3-4—The greater the obstruction or depression the more the device comes into action. This is brought out in the above illustration which shows the action of the device on encountering a large obstruction above the normal road level and also a depression

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, October 28, 1915 No. 18

THE CLASS JOURNAL COMPANY
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Entered at New York N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October 1903, and the Automobile Magazine (monthly), July, 1907.

Winter Driving

IF a national propaganda results from the resolution of the National Association of Automobile Accessory Jobbers to boost winter driving, every branch of the automobile industry will benefit. The car owner will benefit by the elimination of the idea that the automobile is merely a warm weather utility and will get nearly twice as much use out of his car. The manufacturer, the dealer, the garageman and the jobber will benefit because the industry will be more uniform in its demands the year round, rendering production and sales less a matter of seasons, and tending to straighten out the undesirable fluctuations of the demand and supply curve throughout the country, while the dead storage problem will be minimized. Such a condition may seem Utopian and at present unattainable, but results do not come without effort and the benefits involved are of such magnitude as to be worth every effort to attain them.

An editorial in THE AUTOMOBILE for Sept. 16, entitled The All-Weather Car, pointed out the increasing tendency of car owners to take advantage of the all-weather bodies for keeping their cars in active service during the cold weather when they have formerly put them in dead storage. The dealers report a steadily increasing demand for this type of car and, in fact, it would seem that conditions are auspicious for the launching of a boom for winter driving.

Automobile History

THE automobile industry in America has a history little understood not only by the masses owning automobiles but understood very little by several of the oldest pioneers, those who lived through the days of 25 years ago when the earliest efforts were being made. These pioneers are with us to-day, but so busy have they been in working out their own problems of design, manufacture and merchandising that they have had no time to pick up and bring together the threads of early endeavor.

This week THE AUTOMOBILE publishes the opening chapter of its History of the Automobile Industry in America, a work that has been in preparation for several years and on which much searching has already been done to lift the cover from early efforts before those who did the work have passed into the great beyond of forgetfulness. Although much has been gathered, much still remains to be told of a tale that stands without parallel in America. No other industry is more deserving of having its early efforts laid bare, and now that an industry with a manufacturing life of scarcely twenty-five years has attained such world-wide importance it is imperative that its development be accurately recorded.

Hotchkiss Drive

STUDY of the new chassis that have been described in THE AUTOMOBILE during the past six months shows that the Hotchkiss drive is distinctly on the upward trend in popularity. Commencing with small cars it is now being adopted for larger vehicles and is even making steady progress in the truck field.

Now, if it is satisfactory practice in a truck to take drive and torque stresses on the springs, there should be no doubt about the efficacy of the system for passenger cars; for the stresses in a truck are far heavier than in any lighter vehicle. There is much to be said on both sides, and the protagonists of torque and radius rods have much of the engineering theory in their favor, but in practice the advantage of simplicity ranks very high.

Trucks and Food

THE decision of the British government to withdraw the 33 1/3 per cent import duty on commercial vehicles will be of real assistance both to manufacturers in America and to consumers in England. From the British viewpoint it is important above everything else that the wheels of industry should run smoothly, and a plentiful supply of motor trucks has become a vital necessity to almost every trade; how vital has only been realized at the full in England since war absorbed the automobile equipment of industry throughout the United Kingdom.

A free supply of inexpensive trucks will prevent rise in price of almost everything that has to be handled in small quantities, especially foodstuffs, and had the tariff been maintained it would, after the war is over, have retarded the return to normal prices of all sorts of articles.

British Exempt Trucks from Tax

Englishmen Intervene to Free American Commercial Cars from 33⅓ Per Cent Duty

LONDON, ENGLAND, Oct. 15—The order of Chancellor of the Exchequer McKenna, imposing an import duty of 33 1/3 per cent on all foreign cars has been modified to exempt trucks and truck parts. This was brought about by an immediate storm of protest not by American manufacturers but by Englishmen who have learned the value of American trucks at this time. It was brought out that American trucks have been of great advantage to the armies of England and to merchants whose trucks have been commandeered for use by the British army.

—

Robinson Leaves Case

RACINE, WIS., Oct. 23—Richard T. Robinson, for many years secretary of the J. I. Case T. M. Co., Racine, Wis., has resigned and will move his residence to California. He is succeeded by W. F. Sawyer, who has been associated with the Case company for fourteen years and until now was manager of the sales department. Ellis J. Gittings succeeds Mr. Sawyer and R. B. Coleman is promoted to manager of the collection department. Mr. Robinson is one of the founders of the Case company. Thus far the company has made no announcement of the election of a general manager to succeed F. Lee Norton, who retired a short time ago.

—

New Era Touring Car $660

JOLIET, ILL., Oct. 23—Among the companies to enter the field for the first time with a car for 1916 is the New Era Engineering Co., this city, its product being the New Era touring car to sell at $660. The power plant is a four-cylinder 3⅛ in. by 4½ in., is block cast, the cylinders being integral with the upper half of the crankcase. Gear reduction is 4¼ to 1.

Cooling is obtained by the thermo-syphon system, ample space for circulation of water being allowed on all sides of the valve chambers, while several openings are provided between the cylinder proper and the cylinder head to eliminate as far as possible any restriction in the flow of water. A combined pump and splash lubricating system is used while the fuel supply is from a gravity tank located under the front seat, where it is readily accessible.

The electric starting and lighting system is an Allis-Chalmers, operating through a silent chain. The gearset is in a unit with the motor and is of the three-speed selective type. The gears are heat-treated chrome nickel steel and run on double rows of Hess-Bright bearings. Left drive and center control is furnished for domestic trade or right drive for export trade.

The clutch is a Raybestos-lined multiple disk dry-plate type. The rear semi-floating axle is fitted with chrome nickel steel shafts and Hyatt roller bearings. Service brakes are of the contracting band type and the emergency expanding bands inside the drums. An Atwater Kent ignition system with automatic spark control is used.

—

Overland Elects Officers—Earl a Director

TOLEDO, OHIO, Oct. 26—C. A. Earl was elected a director and one of the vice-presidents of the Willys-Overland Co. at the annual meeting of the stockholders this afternoon.

The following directors and officers were re-elected: President, J. N. Willys; vice-presidents, Isaac Kinsey, O. S. Jameson, H. L. Shepler, H. T. Dunn; secretary, R. R. Scott, and treasurer, Walter Stewart. Representatives of 165,000 shares of common stock voted.

Treasurer Stewart in a general report to the stockholders said: "The financial condition of the Overland company was never so good as now. The company owes nothing on merchandise notes. Its indebtedness to its bank represents its only outstanding paper. It is taking advantage of all discounts for cash, and its average cash balances for the last four months have been in excess of its total debts."

At the close of the stockholders' meeting the directors elected the following executive committee: J. N. Willys, H. T. Dunn, H. T. Shepler, C. S. Jameson, R. R. Scott and Walter Stewart.

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New Chase Truck for $1,650

SYRACUSE, N. Y., Oct. 21—The Chase Motor Truck Co., this city, has added a 1-ton model to its present line, known as model A. The new model will be a worm drive type with a four-cylinder unit power plant of the L-head type, 3½ by 5⅛. A few of the features are price of chassis in paint with cab, $1,650; wheelbase, 140 in.; front axle, I section, rear, Sheldon worm drive; Holley carbureter; water-cooled; Bosch ignition; Brown-Lipe selective sliding gear, three-speed transmission, case attached to flywheel housing; weight on rear axle, 53 per cent; payload on rear axle, 83 per cent; fuel tank capacity, 18 gal.; oil tank capacity, 1¾ gal., and loading space, 8½ ft. back of driver's seat. Electric lighting and starting equipment will be furnished at extra cost. Deliveries will commence Dec. 1.

French to Boycott Ford Cars

Manufacturers, Dealers and Owners Indignant at Anti-Loan Campaign

PARIS, FRANCE, *Special Cable to* THE AUTOMOBILE—French dealers have decided to boycott Ford cars from now onward and to do all they can to prevent their sale in France by making an appeal to the public to answer Henry Ford's notorious "tin can" utterance by shunning his car. The indignation created throughout France and England by Ford's anti-loan speeches is very great as shown in many letters to newspapers. It is probable that the sale of Fords, which has been very large in England and perceptible in France, will be reduced considerably for a time at least.

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Morris Eckhart Heads Auburn

AUBURN, IND., Oct. 23—Following the death of Charles Eckhart, president of the Auburn Automobile Co., this city, Morris Eckhart has been elected president. F. E. Eckhart is first vice-president, J. I. Farley, second vice-president and sales manager, W. H. Denison, secretary, and F. B. Sears, treasurer.

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I. H. C. Reduces Truck Prices

CHICAGO, ILL., Oct. 23—The International Harvester Co. of America has reduced the prices on four types of trucks, for loads of 1000, 1500 and 2000 lb., ranging from $600 to $1,500. Two new models have been added this year, one of 1500 lb. capacity selling for $950 and a ton-truck the chassis of which sells for $1,500.

Two six-story additions to the factory at Akron, Ohio, will double the present manufacturing equipment. The following list gives the new prices:

Model MA, 1000 lb., air-cooled	$600
Model M, 1000 lb., water-cooled	710
Model E, 1500 lb., heavy-duty motor	950
Model F, 2000 lb., chassis only	1,500

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Saxon Incorporates in Delaware for $3,750,000

DENVER, DEL., Oct. 27—The Saxon Motor Car Co. was incorporated in this State yesterday with a capital stock of $3,750,000. The incorporators are H. E. Latter, N. P. Coffin, and C. M. Egner.

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1000 Chevrolets for St. Louis

ST. LOUIS, MO., Oct. 23—The recently organized Chevrolet Motor Car Co. of St. Louis has arranged with the Chevrolet company of New York for the shipment to St. Louis of 1000 Chevrolet 4-90 cars between now and Jan. 1, when it is expected the local assembling plant of the company will be ready for operation.

Shortage of Gasoline in Paris

Fuel Famine for First Time Since War Began—Price Now 42 Cents

PARIS, Oct. 9—For the first time since the war began Paris has experienced a real shortage of gasoline. This week supplies have failed to reach the retail dealers, many of whom have ceased to supply customers, while others refuse to sell more than 1 gal. to any one person. The correct explanation of the shortage appears to be that vast supplies have been requisitioned at the various refineries by the military authorities. This is not surprising in view of the enormous aeroplane activities of the French, and the possibility of an advance, which will of course throw greater work on the automobile transport department. The recent attacks in the Champagne and Arras districts have been responsible for a great increase in gasoline consumption by reason of the thousands of trucks employed in carrying ammunition to the guns, in moving troops, and in clearing away wounded. It is obvious that the military authorities will lay hold of greater reserves than usual in view of the present attacks becoming general.

The average retail price of gasoline around Paris, excluding the city of Paris, where there is a special tax, is now 42 cents per gal. Some dealers are selling at 45 cents per gal. Three years ago the average price was 27 cents, and just before the war gasoline was sold round Paris at 33 cents. There has been no additional taxation during this period. Benzol, which was largely employed for commercial vehicles, taxicabs, and by manufacturers for chassis testing, has been unprocurable since the war, all supplies having been requisitioned for making explosives.

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Michigan Service Managers Organize

DETROIT, MICH., Oct. 26—Service managers and other factory representatives from most of the automobile manufacturing concerns in Michigan and Northern Ohio met in convention here to-day and formally organized the Automobile Service Managers' Association of Michigan. Its principal object and purpose is to determine the best methods of conducting the work of the manufacturers service and repair departments, to furnish a maximum of service to the mutual advantage of all concerned, to improve and facilitate co-operation among manufacturers, dealers and owners and to promote the more liberal policy of helpfulness to the purchasers of motor vehicles that is reasonable and equitable to all.

Among the cities in northern Ohio where automobile concerns are located and which are included in the new association, are Toledo, Bowling Green, Lima, Sibley and Fremont.

Cleveland has not been included on the list of manufacturing centers to be looked after by the new organization because it is generally thought that before long a service managers' organization will be started there.

Officers Elected

C. R. Lester, manager of the service department of the Packard Motor Car Co., was elected president of the association; E. V. Rippingale, Hudson Motor Car Co., vice-president; D. H. Haselton, Regal Motor Car Co., secretary and treasurer; H. G. Fitch, Willys-Overland Co.; J. L. Kenyon, Cadillac Motor Car Co.; Charles Gould, Maxwell Motor Co.; C. W. Matheson, Dodge Bros.; Pierre Schon, General Motors Truck Co., and A. O. Weise, Oakland Motor Co. were elected directors.

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Kelly-Springfield Tire to Reduce Common Par to $25

NEW YORK CITY, Oct. 27—At a special meeting the board of directors of the Kelly-Springfield Tire Co. adopted a resolution that the certificate of incorporation be amended so as to reduce the par value of the common stock from $100 per share to $25 per share.

A special meeting of stockholders will be held on Nov. 30 to act on the resolution. The par value of the 6 per cent cumulative preferred and the 7 per cent second preferred stock will not be reduced.

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Payne Is Manager of Gibson Co.'s Automobile Department

INDIANAPOLIS, IND., Oct. 23—J. H. Payne has been appointed manager of the automobile department of the Gibson Co. Prior to his present connection Payne was manager of the small motor department of the General Electric Co.'s local sales organization.

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Hayes Truck Wheel Co. Formed

ST. JOHNS, MICH., Oct. 26—The Hayes Motor Truck Wheel Co. has been organized in this city with a capital of $100,000. Officers have been elected as follows: President, C. B. Hayes; first vice-president, N. S. Potter; second vice-president and timber manager, W. C. Morrey; secretary-treasurer and general manager, A. D. Smith, and superintendent, H. J. Keller. The company, which is occupying the factory of the St. Johns Manufacturing Co., expects to be in operation by Nov. 1, and a sawmill will be operated in conjunction with the plant.

Canadian Ford Melon

600 Per Cent Dividend—Capital Increased from $1,000,000 to $10,000,000

DETROIT, MICH., Oct. 26—At the annual meeting of the Ford Motor Co. of Canada it was decided to increase the company's capital stock from $1,000,000 to $10,000,000. A 600 per cent stock dividend to shareholders has been recommended to the directors. Six million dollars par value of new stock is to be issued to the present stockholders who will receive six shares for every share they now hold. Six million dollars will be transferred from the company's surplus fund to capital stock.

Net earnings of the company during the fiscal year 1915 amounted to $3,200,000 in round figures and the surplus is about $7,000,000.

The directors of the company were reelected. They are: Henry Ford, James Couzens, Frank L. Klingensmith, Gordon M. McGregor and W. R. Campbell. The officers of the company now are: Henry Ford, president; Gordon M. McGregor, first vice-president, treasurer and general manager; James Couzens, second vice-president; Frank L. Klingensmith, third vice-president; W. R. Campbell, secretary.

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Canadian Ford Stock Up

DETROIT, MICH., Oct. 26—Shares of the Ford Motor Co. of Canada which were quoted $1,500 yesterday, were quoted $2,000 bid and $3,000 asked this morning on the local stock exchange. Some brokers predict that before the end of the week the stock will go up between $500 and $1,000 a share.

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Canadian Ford to Expand

FORD, ONTARIO, Oct. 23—By Jan. 1 a new mahcine shop, 700 by 45 ft., and a foundry, are to be ready for occupancy by the Ford Motor Co. of Canada, Ltd. This will give employment to over 500 more men. Now there are 1920 on the pay-roll, 1730 in the shops and 190 in the offices. There are eight concerns located in Windsor, Ford, Walkerville or vicinity, making parts for the Ford cars, and they employ all told 1153 men. The sociological department of the Ford company has gathered information tending to show that 15,363 people living within the vicinity of the plant are either directly or indirectly being supported by the company.

Although this the dull season and the lack of material is still prevailing, the Canadian company's business is increasing in such a way that this season's output will be more than 35,000 cars.

Packard Surplus $3,713,747.22

Gains $1,915,926.80—Assets $21,814,153.71—29,936 Cars and Trucks Built

DETROIT, MICH., Oct. 22—During the fiscal year ending Aug. 31, 1915, the surplus of the Packard Motor Car Co. was $1,915,926.80 ahead of the total at the end of the 1914 fiscal year, totaling $3,713,747.22 as compared with $1,797,820.42 in the previous business year, or an increase of over 50 per cent. The total number of cars and trucks built by the company to Aug. 31 was 29,936, nearly 8000 being trucks.

The assets of the company were $21,814,153.71 or $3,850,533.09 or over 20 per cent larger than those of 1914.

Among the assets one of the items which shows the greatest increase is that for tools, the total amount credited to the account being $1,194,101.65, or $522,089.70 more than in 1914. This, of course, is due principally to the fact that the construction of sixes and fours has been abandoned and that entirely new tool equipment was needed for the making of the twelves.

The next item which shows the biggest increase is that of construction work, which has passed the $500,000 mark while in 1914 it totaled less than $17,000. The raw material account shows an increase of over $1,000,000 totalling $7,423,875.93. This includes not only the raw material, but also completed cars and work in progress on cars or trucks.

The investments of the company in stocks, bonds and short time securities have been very heavy in 1915, this account showing an increase of over $1,100,000 as compared with 1914.

While the cash account for vehicles in transit to dealers is over $200,000 lower for 1915 than for 1914, the account as to cars in transit to branches shows an increase of over $310,000.

Among the liabilities the item most conspicuous is that of accounts payable and which means or represents such accounts as accrued payroll, current invoices, not due, deposits on vehicle orders, etc. The total for the past year is $2,335,907.57, or $1,449,126.58 over 1914.

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Beal with Marmon

INDIANAPOLIS, IND., Oct. 23.—W. A. Beal has taken a position with the Nordyke & Marmon Co. as traveling representative. Mr. Beal is well known in the automobile selling trade through his connection with the Stevens-Duryea Co. since 1911, first as Pacific representative with headquarters at San Francisco, and later in charge of outside territory between Kansas City and Chicago branches.

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Moon Buggy Builds Roadsters

ST. LOUIS, MO., Oct. 22—The John W. Moon Buggy Co. of St. Louis has submited a bid for the delivery of 500 roadsters in New York for shipment.

Packard Motor Car Co.'s Balance Sheet for 1912, 1913, 1914 and 1915

ASSETS

	1912	1913	1914	1915
Real estate, at cost	$ 285,312.49	$ 285,460.21	$ 285,864.21	$ 370,047.88
Buildings	*2,084,865.81	2,063,784.48	2,140,259.05	2,082,763.21
Machinery	*1,145,381.22	1,137,276.24	1,094,754.36	1,464,294.68
Equipment	*1,041,459.64	1,039,491.08	979,774.36	982,534.32
Fixtures, including office furniture	*245,756.15	290,041.89	307,475.94	327,656.49
Tools	*250,000.00	250,000.00	672,011.95	1,194,101.65
Construction work in progress	30,803.34	14,025.38	16,881.81	521,388.31
Development—Drawings, patterns, models, etc.	*138,000.00	180,870.00	342,438.58	429,443.63
Rights, privileges, franchises and inventions	†1.00	1.00	1.00	1.00
Investment in branch selling companies	1,446,079.02	1,481,893.61	1,515,288.87	1,916,225.16
Raw material, work in progress and finished vehicles	5,351,217.23	8,136,024.99	6,394,864.56	7,423,875.93
Stock option contracts with employees	112,200.00	42,500.00	201,950.00	186,200.00
Investments in stocks, bonds and short time securities	38,232.50	38,232.50	248,462.50	1,385,387.50
Cash	1,030,513.95	1,374,951.12	2,462,464.45	2,289,111.43
Vehicles in transit to dealers	340,090.27	191,724.05	279,308.26	53,102.95
Vehicles in transit to branches	672,136.23	411,761.32	263,146.11	577,306.29
Accounts receivable	132,290.80	187,708.20	138,196.16	137,288.92
Bills receivable	188,095.03	60,261.16	55,893.61	33,500.00
Expense paid in advance	130,864.18	153,840.87	97,083.81	94,924.36
Bills receivable from branches	.....	.....	467,500.00	345,000.00
Total	$14,663,298.86	$17,339,848.10	$17,963,620.62	$21,814,153.71

*1912—Depreciation for current year deducted, aggregating $1,230,485.85.
†1912—Reduced by action of Board of Directors from $3,274,958.89 to $1.00.

LIABILITIES

	1912	1913	1914	1915
Capital Stock—				
Common capital stock	$5,000,000.00	$5,000,000.00	$7,065,300.00	$7,065.300.00
Preferred capital	5,000,000.00	5,000,000.00	5,000,000.00	5,000,000.00
Debenture notes due Dec. 1, 1916	2,000,000.00	3,000,000.00	3,000,000.00	3,000,000.00
Accounts payable	1,175,710.33	1,154,874.94	886,780.98	2,335,907.57
Reserves—Accrued for interest, taxes, etc.	288,804.71	178,716.94	213,719.22	330,213.34
Deferred payments on real estate purchased for retail selling agencies	.....	.....	.....	368,985.58
Surplus—After deducting all charges	1,198,783.82	3,006,256.22	1,797,820.42	3,713,747.22
Total	$14,663,298.86	$17,339,848.10	$17,963,630.62	$21,814,153.71

Note—Of the common stock as shown in the repo rt for 1915, there are 70,653 shares outstanding and 9347 unissued.
Of the preferred shares, there are 50,000 outstanding and 30,000 unissued. Par value of both common and preferred shares is $100.

Elcar Is 1916 Name for Pratt

Elkhart Carriage & Motor Co. Is New Company Style—Car to Sell for $775

ELKHART, IND., Oct. 23—A change in both name of car and company marks the entrance of the former Elkhart Carriage & Harness Mfg. Co., this city, maker of the Pratt car, into the 1916 field. The car for 1916 will be known as the Elcar while the company's corporate name has been changed to the Elkhart Carriage & Motor Car Co.

The Elcar will be made in a touring and roadster model at $775. The four-cylinder motor is of the high speed, high-efficiency, long-stroke type, having cylinders and waterjackets block cast, the cylinders measuring 3½ by 5 in. Much attention has been given to an effort to lighten all reciprocating parts and for the attainment a well-balanced power plant.

The lubrication system is a combination of the splash and force feed, a plunger pump operated by the camshaft, forcing oil through all the main bearings, while the connecting-rods are fitted with scoops by which oil is distributed to the cylinder walls and pistons. Thermo-syphon cooling in connection with a tubular radiator and fan is used.

The motor, clutch and gearset form a unit, mounted directly to the main frame at three points, the third point in front being a large bearing on a common center with the crankshaft. Three speeds are provided with center control. Gears are nickel steel, heat treated, with annular ball bearings. The clutch is a cone type with easy engagement springs under the facing.

The electric system is complete and self-contained, ignition being gained through a Delco distributer, while starting is accomplished by an Aplco motor-generator operating through a silent chain inclosed in front of the motor gearshifts.

The wheelbase of the Elcar is 114 in. The full streamline effect is obtained in the Elcar, and the doors are wide with concealed hinges. Included in the equipment are one-man top, curtains and cover, windshield, electric lights and extra demountable rims and carrier and a full equipment of tools in both the five-passenger touring and roadster models.

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New Billings & Spencer Co. Formed

HARTFORD, CONN., Oct. 25—At a meeting of the stockholders of the Billings & Spencer Co., held this morning, the stockholders ratified the recommendations of the board of directors to dis-

pose of the assets, good will and business in consideration of 12,000 shares of the new company at $25 a share. The board of directors of the old company was also authorized to vote on the 12,000 shares of the new company in favor of the issue of 8000 additional shares at a par value of $25 to be sold at not less than $37.50, the right to subscribe being offered first to stockholders of the Billings & Spencer Co., and the price to be fixed by the directors of the new company. By vote of the stockholders the old company went out of existence.

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Townsend Brings Out Tractor

BELOIT, WIS., Oct. 22—The Townsend Mfg. Co., Beloit, Wis., is bringing out a new gasoline tractor for general purposes in the city and on the farm. It is propelled by a gasoline engine rated at 10 to 20 hp. and is built in several types. The tractor may be used for plowing, seeding, cultivating and similar work as well as for filling silos, hauling farm loads, etc. The tractor in a recent test handled three 14-in. plows in sod which had not been plowed for forty years and which averaged 8 to 11 in. in depth. It was turned over at a cost of 11.2 cents per acre for fuel and 3.5 cents for grease and other lubricants.

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Tower Truck in the Field

GREENVILLE, MICH., Oct. 23—R. J. Tower of this city is bringing out the Tower truck which is to be manufactured by a company to be known as the Tower Motor Truck Co. The first model was recently completed in the machine shop and foundry of Mr. Tower. It has a Continental four-cylinder block motor, 135 in. wheelbase and Timken axles.

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New Continental Drop Forge Plant

MUSKEGON, MICH., Oct. 22—Work has been begun on the construction of the new drop forge plant of the Continental Motor Manufacturing Co. A building 60 by 180 ft. will be erected on half of property fronting on Muskegon Lake, the site having been recently purchased, and the other half of the site will be kept open for future building operations.

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Toledo Firms to Enlarge

TOLEDO, OHIO, Oct. 22—Nearly $300,000 will be spent immediately on extensions of two local makers. The Toledo Machine & Tool Co., will build a three-story addition costing $200,000 to be 400 by 100, of steel, brick and concrete construction. The new structure will increase the plants capacity 35 per cent.

The Electric Auto-Lite Co. has broken ground for a $74,000 addition to its Champlain Street plant. It will be 385 by 103, three stories and of concrete and steel construction. The plan provides for a fourth story.

Record Year for Locomobile

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Truck Orders Large—Domestic Business Shows 12% Gain Over Last Year

BRIDGEPORT, CONN., Oct. 25—Due to the war the Locomobile Co. of America has enjoyed the most prosperous year in its history. Although officials of the company are reticent when questioned about war orders, it has been learned from an authoritative source that nearly 700 trucks of the 3-ton type have been shipped to the Allies, in addition to 100 pleasure cars for the Russian army, a special car for the Grand Duke Nicholas, and 140 pleasure-car chassis for the Russians. The latter will be equipped with soup kitchens.

It was announced to-day that with the year ending Aug. 31, the domestic business had shown a 12 per cent increase over last year, practically all passenger car trade.

Increase in the Locomobile company's business has meant much to other Bridgeport industries which were more or less affected by the tariff regulations. The Locomobile company has divided a great deal of its work among Bridgeport factories, principally the foundries.

—

Six Entries to Date for Sheepshead Meet

NEW YORK CITY, Oct. 27—Six entries for the 100-mile invitation race for the Harkness gold cup have been made to date for the Sheepshead Bay Speedway meet on Election Day as follows: Resta, Burman, Aitken and Mulford, in Peugeots; Rickenbacher, Maxwell, and De Palma in his Mercedes. De Palma, it is expected, will get his car into shape for the race. The trophy is open only to drivers who have won big races this year and is to be the object of competition annually. A gold miniature of the cup will be presented to the winner on Election Day.

Burman in his Blitzen Benz, will try to make a lap in a minute or less, or at the rate of 120 m.p.h. Juan Domenjos will make several flights in his aeroplane and several flights will be made by Frank Goodale in the Stevens dirigible.

Prince Paul Troubetzkoy is planning to race President Harkness in a match race at the track on that date.

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New Six-Story Addition for Brown-Lipe-Chapin

SYRACUSE, N. Y., Oct. 26—The Brown-Lipe-Chapin Co., this city, has begun an enlargement of its plant which will give it at least 50 per cent greater capacity and will involve an expenditure of $750,000. The factory structure upon which work is now under way is to be six stories, 190 by 70 ft., and will be built of reinforced concrete, corresponding in exterior appearance with the main building erected six years ago.

Extension of the case-hardening plant, to be made at once, will be in proportion to the general plan of doubling the entire plant capacity. Five months are allowed for the completion of the six-story addition.

More than 1600 persons are employed in the factory and office of the company. After the addition is finished at least 500 more will gradually be placed on the pay-roll.

With the plant capacity doubled, it will probably be possible to do away with night work. For several months the plant has been operating 24 hr. a day.

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Splitdorf Plans 75% Expansion

NEWARK, N. J., Oct. 18—The Splitdorf Electrical Co. has adopted plans for additional factory facilities in the shape of a new building 300 ft. long by 50 wide and six stories high, to be erected adjoining the present main factory in this city. It will be built of brick, and will increase the present plant space 75 per cent or about 100,000 sq. ft.

The new factory is expected to be finished within six months and will contain much additional equipment.

At the present time, the output of magnetos is 1500 a day, but plans contemplate an output of 2000 a day by next spring when the new building is completed. There are 1500 employees in the main plant, 300 in the Sumter, 300 in the Apple and 200 in the third plant.

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May Forbid Starting Engines Before Ferry Docks

NEW YORK CITY, Oct. 21.—Ferry companies in this city are being fined $500 for each offense by the United States Government for allowing automobiles to start their engines before the boats are actually tied up in their slips. Under the Federal law governing ferry boats the companies may refuse to permit an automobile on any of their boats until the gasoline tanks are emptied, and it is stated that if the drivers of cars continue in violating the law by running their engines, the ferry companies will enforce the last named one in regard to the use of gasoline.

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Dingley to Undergo Operation

LOS ANGELES, CAL., Oct. 20.—Bert Dingley, the veteran race driver and well-known automobile man of this city, who was injured in the wreck of the Ono car on the Tacoma speedway, July 4, 1914, has returned to the Tacoma General Hospital to undergo another operation in an effort to save his foot.

Co-operation the Slogan Brought Out at Electric Vehicle Assn. Convention

To Develop Business All Must Pull Together— Central Stations Must Do Their Share, Especially in Promoting Sales of Electrics for Municipal Work

CLEVELAND, OHIO, Oct. 22—Reviewing the work of the sixth annual convention of the Electric Vehicle Association of America, which closed here to-night, the outstanding feature was the plea for co-operation between the various branches of the industry. It was recognized that in order to develop the business and make it grow, all who are in any way interested in it must pull together. Competition with other classes of motor vehicles was taken full account of, and petty differences within the industry must be forgotten.

That the central station is a big factor in the promoting of the industry was most strongly emphasized, and while it is not expected that the central station interests will do more than their share in the developing of fields for electrics, the manufacturers expect them to at least do their part. As to the selling of electrics for various municipal work, such as fire, police, ambulance, street cleaning and other service, the central stations were pronounced the one big factor, for it is through their interests that the city officials can be properly approached and influenced.

The electric taxicab came in for a great deal of interest, as well as the light delivery electric, for which there is very evidently a big field.

Close Relations with N. E. L. A.

Along the line of co-operation, the association formally voted to get into closer harmony with the National Electric Light Association, which is a very strong organization in its field. It was immediately realized that the interests of the two organizations are very closely allied, and that each can help the other. Hence the convention instructed its incoming officers to do all they can to promote a close relationship, with possible affiliation with the N. E. L. A. as the goal. There was strikingly little dissention from this future plan.

One other point on which great emphasis was placed was as to the selling of electric commercial cars in fields for which they are best adapted, and not trying to force them in cases where it is a well-known fact that gasoline types are better. There is a distinct field for both the electric and the gasoline truck, it was insisted, and it is a big mistake to try to sell on other than scientific lines. The first step in a sale is to analyze the transportation problems involved and then to be assured that the machines will pay. Unsuccessful installations are bad advertisements and do not promote additional sales.

That electric garage service is not at all satisfactory at the present time was brought out. The makers and central station men feel that the trouble is largely along this line, for people must be assured of good and efficient care of the vehicles else they will not buy. The properly equipped electric garage, in fact, is positively necessary to the development of the electric vehicle industry.

Nearly 300 in Attendance

The attendance ran close to 300, and a good proportion were central station men. There were eighty-seven central station operators on hand, fifty-two battery men, forty vehicle manufacturers or their representatives, sixty-five electric accessory men and forty-five having miscellaneous connection with the industry.

The registration records showed that the gathering was by no means from any one section of the country, nearly all large cities being included. For instance, an unofficial count showed that there were fourteen from New England, ten from Philadelphia, sixteen from Detroit, two from Los Angeles, fifty-one from New York City, and one or more from many other localities. Naturally, due to convenience, many of Cleveland's electric men came, the total from the city being 115.

The convention elected as officers for the coming year four who are connected with current producing companies, two who are members of electric car manufacturing businesses, and one identified with an electric engineering concern. W. H. Johnson, vice-president of the Philadelphia Electric Co., Philadelphia, was made president. Other officers are E. S. Mansfield, Superintendent Operating Bureau of Accounts, Edison Electric Illuminating Co., Boston, vice-president; H. M. Edwards, auditor, New York Edison Co., New York, treasurer; W. H. Blood, Jr., Stone & Webster Management Assn., director; P. D. Wagoner, president, General Vehicle Co., Long Island City, N. Y., director; G. H. Kelly, secretary-treasurer, Baker, R. & L. Co. Cleveland, director, and the retiring president of the association, J. F. Gilchrist, vice-president, Commonwealth Edison Co., Chicago, director.

Although no statement was made relatively to these selections, which were voted unanimously by the convention, it is probable that the central station people were made vitally interested in the association in this way in order to cement their co-operation with the manufacturers more and more.

Convention in Detail

Following the welcoming of the delegates to the City of Cleveland by Bascom Little, president of the Cleveland Chamber of Commerce, the convention got under way with the address by President J. F. Gilchrist. He said in part:

"It may be said that the work of the Association this year has been consistent and persistent, rather than spectacular. A great deal of attention has been given to the accumulation of data and information useful to the members, and equal attention has been paid to publicity of value to the industry in the shape of articles prepared for the information of the *general* public. The membership has shown a very good growth during the year.

The national highways were also favored by Mr. Gilchrist. "While we may not all consider the electric passenger car a touring car at the present time," said he, "nevertheless, we should all, I believe, take an intelligent interest in the great national highways. Do not forget that the use of these highways may be found very important for commercial electric vehicles.

"The year has witnessed a considerable development in the various plans for selling electric vehicles without batteries," he continued, "giving battery service on some rental or battery exchange plan. It is perhaps too early to express an opinion as to the ultimate result of this movement. It is most important, and I do not hesitate to say that some plan of this sort must be worked out to a successful conclusion before the electric delivery wagon or truck is to be regarded as an entire success for the use of the small merchant. The large user has a great success with the electric wagon at the present time, but it seems to me that we must certainly extend a helping hand to the small user in the matter of battery maintenance.

The Garage and Rates Committee reported that early in this year a meeting was held in Chicago to which the representatives of all of the commercial vehicle manufacturers having offices in that city were invited. At this meeting the representatives expressed an unanimous opinion that:

1. A battery service system would make it possible to increase their sales 100 per cent in the district where a suitable service was available.

2. If the battery service could be rendered through independent reliable garages it would be preferable.

3. That more sales effort must be spent

on prospects. At present in this district there are thirty gas truck salesmen to one electric.

Recommend New Sign

This committee has recommended a new sign which measures 24 in. across and has a blue background with a red cross-bar and letters of white. The wording is "electric charging station."

C. E. Smith of the Walker Vehicle Co. spoke on the results so far attained and the experience gained by his company by the new scheme which the concern has adopted in Chicago of renting batteries, selling the cars without them and at a reduction. He outlined the plan of giving the electric garage dealer the benefit of the battery plan, and said that it has been a great stimulation to sales of these cars in the Chicago territory. It enables them to sell the cars at a lower first cost, and then there is a fixed monthly rate for battery rental and charging.

W. H. Conant asked if there are any mileage limitations on the scheme, or where the car is run, or who operates it. He also wanted to know if the condition of the car made any difference in the rental charge. His idea is that the contract should not ignore accidental injury, nor should there be a definite rate for current when cars are run so differently as regards total distance by different people. He questioned as to who is responsible if the car is damaged and the battery hurt, and wondered if it is good business to sell an article of a definite life on a partial or deferred payment plan.

Central Station Co-operation

The report of the committee on central station co-operation was received with a great deal of enthusiasm by the convention, dealing as it does with a subject so vital to the interests of both manufacturers and those who supply current.

George H. Kelly had no written paper to present in attacking his subject of the "Problems We are Facing and How They May Be Met," but he electrified the convention with some most appropriate and rapid-fire extemporaneous logic.

Co-operation Is Better

The past year has shown marked development in the co-operation between the different branches of the electric vehicle industry, Mr. Kelly stated. There are two questions before the industry. One is the creating of a demand, and the other is how to care for the cars after they are sold. The electric car of to-day is a vehicle of utility and service, and not to do stunts with, he said. For city use, the electric answers the question of transportation and utility for 99 per cent of the users to-day. Its possible speed is in excess of the speed limits of any city in the country, and its mileage is greater than anyone requires. The people, according to Mr. Kelly, are beginning to realize more and more that the electric is a preeminent town car.

He says that the big problem is how to prove this to the great majority of the people, and he believes that educational publicity is best. But the members of the industry must be absolutely convinced themselves first. If there were enough of the vehicles manufactured absolutely sold on the great saving of electric trucks, and they would convince the buying public, there would not be enough electric truck makers to meet the demand.

Care A Problem

The other big problem is the care. Mr. Kelly says all must admit that the electric car is unable to get the expert care that the gasoline vehicle can get to-day. In order to be assured of proper electric care, one must go to an educated electric man. There are not over a dozen electric garages of merit in Cleveland, for instance, while there are over 150 gasoline garages, according to Mr. Kelly. It is easy enough to sell the cars, he says, but it is difficult to keep them sold and to get repeat orders under existing service conditions. He emphasized the point that all must make sure of the facilities for care of the cars, and that is where the central station people can be of greatest assistance—in co-operating with the manufacturers. He thinks the new battery service schemes are going to have a tremendous helpful influence. He has already noticed the impetus given the business due to them.

The wise car buyer of to-day, says Mr. Kelly, is not so much interested in the first cost as he is in the operative cost, and battery care is the big problem from this standpoint.

Speaking of the electric taxicab, Mr. Kelly said that as an advertisement it is the greatest thing that the electric vehicle business has ever had. In five years he predicts that the electric cab will so far outnumber any other type that the other will be almost forgotten.

Touching upon the 10 to 15 per cent price reductions of all electric vehicles during the past year, Mr. Kelly emphasized the fact that the reductions are absolutely dependent upon the market to make a dollar. The manufacturers must have the production to make money. They cannot compete in price with the low-priced gasoline car, he says, and the great problem for all is to get together and get more soul into the business.

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Northwestern Motor Co. at Pottstown

POTTSTOWN, PA., Oct. 21—The Northwestern Motor Co., this city, will lease space in a local plant to manufacture a motor. New York capital is back of the company and will send here part of the equipment of the Hazard Motor Co., Rochester, N. Y.

Lavine Gear Co. Is New Name

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Co. Reorganized and Capacity To Be Doubled—H. A. Uihlein, of Schlitz, President

RACINE, WIS., Oct. 23—The Lavigne Gear Co., Racine, Wis., one of the most extensive manufacturers of steering gears for pleasure and commercial vehicles in the United States, has been reorganized and has put into effect an extension program which will practically double its capacity. The name of the corporation has been changed to Lavine Gear Co., to simplify pronunciation. Officers are: President and treasurer, Herman A. Uihlein, Milwaukee; vice-president, P. B. Wohlrab; secretary, D. L. Robertson; sales and advertising manager, E. M. Caskey. Mr. Uihlein is a member of the well known Uihlein family of Milwaukee, owning the Schlitz brewing interests. Mr. Wohlrab was for several years production manager of the Lozier Motor Car Co., Detroit, Mich., and Plattsburg, N. Y., and also formerly master mechanic of the Maryland Steel Co. Mr. Robertson was for ten years with Crerar, Adams & Co., Chicago, in charge of purchasing and orders. As secretary, Mr. Robertson will be purchasing agent and office manager of the Lavine company. Mr. Caskey formerly was engineering sales manager of the S. F. Bowser Co.'s Western division.

The Lavine company is experiencing a greatly increased demand for its products from both foreign and domestic sources and is enlarging the shops and installing much new equipment to accommodate the demand.

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Woods Mobilette Buys International Cycle-Car and Accessories Co.

CHICAGO, ILL., Oct. 23—At meetings of stockholders of the Woods Mobilette Co., and the International Cycle-Car and Accessories Co., held about two weeks ago, action was taken whereby the Woods Mobilette Co., purchased the entire business, assets and good will of International Cyclecar and Accessories Co.

The latter company will, therefore, pass out of existence entirely just as soon as the necessary legal requirements can be complied with.

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Automobiles Cut S. P. Earnings

NEW YORK CITY, Oct. 25—The Southern Pacific Co., in its annual report states that automobile traffic during the past year made big inroads on its earnings. About two-fifths of the $8,600,000 loss in operating revenue, was due to passenger traffic in automobiles.

Zimmerschied Tells Safety First Men of Engineers' Contribution

Advocates Standard License Plates and Methods of Attaching, Standard Gearshift Gates, Location of Engine and Car Numbers and Anti-Glare Provision for Headlights

DETROIT, MICH., Oct. 22—On the second day of the Safety First Federation of America's convention, the two most important matters discussed were the model street traffic ordinance suggested principally by John Gillespie, Police Commissioner of Detroit, and the suggestions made by Chairman Karl W. Zimmerschied of the standards committee of the Society of Automobile Engineers, on the Contribution of Automobile Engineers to the Movement of Safety First.

Among the principal provisions in the ordinance is the one providing that the driver of any automobile must be licensed, owner or chauffeur, and that his minimum age be sixteen years, and that he be free from any physical ailment which possibly might affect him from properly handling a motor car. Special attention should be given to intoxicated drivers, who, when discovered, should have their license taken away.

Briefly stated the ordinance provides for:

1. Education and special instruction of policemen before assigning them to traffic duty.
2. Standard code of hand signals to be used by traffic officers.
3. Fixed locations for traffic officers at intersections to be distinctly marked.
4. Elimination of glare of head and side lights.
5. Use of muffler cut-outs to be prohibited.
6. Standardization of left-hand turns at intersections.
7. Near-side stops for street cars.
8. Rear lights on all horse-drawn vehicles.
9. Elimination of steps on all horsedrawn and motor trucks.
10. Standard color, size, design, and means of attachment for all street traffic signs, including school, hospital, church, safety zones, fire hydrants, railroad and street railway crossings, alley, mail box, playground, crosswalks, parking, etc.
11. Designation of safety zones and crosswalks as embodied in the Detroit plan of painting.
12. Education of the public to use crosswalks at intersections and authorizing police departments to control pedestrian travel as provided in section 2 of the Detroit traffic ordinance.
13. Standard traffic ordinance and code of regulations for adoption by all cities.
14. Licensing of drivers or operators of all motor vehicles.
15. Exclusive use of siren whistles on police and fire whistles.
16. Standardization of accident reports by municipalities.
17. Chain guards on vehicles driven by the side chains.

Most of these provisions were discussed previously by the traffic committee at its meeting held June 4 in Detroit.

Speaking as chairman of the standards committee of the Society of Automobile Engineers, Karl W. Zimmerschied suggested four regulations which he believes will help the safety first movement a great deal. These suggestions are:

1. Standard license plates and methods of attaching them.
2. Standard gearshift gates or progression.
3. Standard location of engine and car numbers.
4. Anti-glaring provision for headlights.

In the course of his address, which was entitled "The Contribution of Automobile Engineers to the Movement of Safety First," Mr. Zimmerschied spoke as follows:

"It goes without saying that the very first concern of the automobile engineer in his individual capacity as a designer is the securing of increased dependability in the finished vehicle; especially in such details as steering and braking mechanism, commonly known as the control.

Improvement in Design

"Better steels, properly treated and used in adequate sections, are now the rule rather than the exception in such vital parts as axles, steering knuckles, reach connections and brake rods. Brake bands are lined with better materials than formerly, mounted so as to have the maximum life and holding power. Spring suspensions have been redesigned so as to make the car 'hold the road' better than formerly, and the center of gravity of the whole car has been lowered so as to decrease skidding and to lessen the liability of the vehicle to capsize.

"There is little or no mechanical advantage to be gained by locating the steering column either on the right or left, but the majority of engineers have adopted the left hand drive largely in the interest of the driver's safety, since this position decreases the chances of collision.

Standard Location for Numbers

"Taking the last first, the committee has adopted a standard position for car, chassis, and engine numbers so that police departments can identify vehicles with the minimum of trouble and loss of time. It recommends that the car number be indented in the right frame member, as near the spring horn as possible.

"The engine number shall be on the crankcase, as far forward as possible, on top and as near the middle, crosswise, as possible, preference to be given the right hand side. This ought to act as some deterrent against the stealing of cars, and certainly will be of great benefit in restoring cars that have been stolen.

Standard License Plates

"Standards for the details of license plates, with recommendations designed to secure greater legibility and more adequate lighting of the same have passed the standards committee and are ready for final action by the society. We wish to lay considerable stress upon these standards, calling the attention, especially to those who have any influence in legislation to the great desirability of obtaining uniformity at least with respect to methods of affixing license plates throughout the various States.

"The maker's interest begins with the necessity for providing a standard bracket for attaching these plates; as long as almost every States uses a different size and shape, it is evident that the designing of a bracket which will accommodate all plates is exceedingly difficult, if not impossible.

"Many of the present brackets are either useless in themselves or require annoying operations on the part of the final user in order to attach the plates at all.

Standard Gearshift Gates

"One of the cardinal principles of safe driving is of course that all the manipulations necessary to control a car should be performed by the driver as a matter of unconscious habit. Steering, braking, accelerating, and shifting of gears must come as natural as walking, and in attaining this end, especially in the case of those who have to drive more than one make of car, the standard provisions for the control are of the greatest importance. The location of the clutch pedal on the left and the service brake pedal on the right has become practically universal; the successive positions through which the gear shifting lever has to go in progressing from one speed to another have been standardized by the society and are closely followed by the majority of cars using selective transmissions.

"It is most disconcerting to a driver who has become used to one of these standard progressions to try to drive a car with any other order, so that the society is using all its influence to obtain adherence to the preferred form.

"The accelerating pedal is sometimes located between the other two control pedals and sometimes to the right of both; it is not unusual for a man in a strange car to depress the accelerator pedal instead of the brake pedal and it is therefore desirable that this location should be standardized also. Some throttle and spark levers are opened or advanced with a counter-clockwise motion—often the opposite is the case. As in the case of accelerator pedals this practice should be unified also."

New York S. A. E. Talks Metallurgy

Hears That Recrystallization Is Non-Existent and Sees Movies on Tube-Making

NEW YORK CITY, Oct. 22—At the regular October meeting of the Metropolitan Section of the Society of Automobile Engineers held at the Automobile Club of America last night two lectures on metallurgical subjects were given. Prof. William Campbell of Columbia University made an address on the elements of metallography and C. F. Roland of the metallurgical department of the National Tube Co., delivered a lecture on steel tubing from ore to tube accompanied by three reels of motion pictures showing the progressive stages of manufacture from the time the ore is taken from the ground until the tube is finally stamped with the nameplate of the manufacturer.

Professor Campbell's talk brought out the difference between the chemical analysis method of determining the qualities of the steel and the newer and rapidly growing method of determining the merits of material by its structure under the microscope. The lecture was accompanied by a series of stereopticon views showing photo micrographs of different classifications of material. The granular structure of the metals was illustrated and the pith of the address brought out clearly how the inter-relationship of the granules determined the strength of the material, and its ability to resist various kinds of stresses.

Recrystallization a Myth

One of the most important points brought out in the address was the non-existence of the so-called re-crystallization which many engineers still believe to take place when the metal becomes fatigued. Professor Campbell illustrated by the photo-micrographs thrown on the screen that these so-called crystallization fractures are nothing more than breaks due to the development of a weak spot, caused by the action of one grain upon another, thus breaking up the closely knit structure necessary to strength. The distorted area of the metal loses its strength and the piece fails when the section has been reduced to such a degree that it is stressed to the ultimate.

The lecture by Mr. Roland was of an explanatory nature dealing with the subject shown by the three reels of motion pictures. The first picture shown, illustrated the prospective process of drilling the ground and then forcing by means of a stream of water samples of the ore to the surface. If the ore thus found is sufficiently rich in iron, mining operations are started. The next step shown was the removal of the useless surface dirt and then the giant steel grab buckets, which pick up practically a ton of ore at a time and place it into the waiting ore cars in long trains of which it is conveyed to the coke fields where the blast furnaces are located. It is cheaper, Mr. Roland explained, to bring the ore to the coke, than it is to bring the coke to the ore, and since coke is necessary in the manufacture of pig iron, all the ore is transported first by car and then by lake steamer in this instance, to the coke fields.

The products of the blast furnace or the pig iron is refined into steel and the billets are rolled into longer billets and finally into skelt, or plating from which the tubing is manufactured, either by the butt welding process or the lap welding process. The two methods, as the names imply, indicate the manner of joining the ends of the plate in fastening the tube. In the butt welding the ends are brought together end to end and the weld completed while in the lap welding, one end is brought over the other and hammered into position at forging temperature. The pictures illustrated the rolling and welding operations step by step and finally showed the inspection of the finished tubes and the methods of testing.

Testing the Quality

Portions of the end of each tube are cut off and submitted to bending and flanging tests to determine the quality of the material and the efficiency of the weld. Tubes such as those used in boilers, or for other work where a high degree of strength and reliability are necessary, are clipped at both ends and subjected to a double test. Throughout the entire series of films, the audience was impressed by the great amount of automatic electric machinery employed and the absolute uniformity which seemed to be secured from the time that the ore left the mines, until the tube was ready for shipment from the huge mills.

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Detroit S. A. E. Publicity Committee

DETROIT, MICH., Oct. 25—A publicity committee for the Detroit Section of the Society of Automobile Engineers has been appointed by chairman George W. Dunham of the section. The members are: H. W. Ford, chairman; Lee Olwell, K. W. Zimmerschied and J. C. Weed.

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Ward Electric Shows Economy

NEW YORK CITY, Oct. 21—The Ward electric delivery car which left this city for Clevelend on Oct. 6 and arrived in the latter city on Oct. 17, covered the 733.8 miles with a total current consumption of 1564 amp.-hr. Only twenty-five charges of the battery were necessary.

Army Wants Motor Ambulances

Surgeon General Orders Convening of Board to Select Type—Horses To Stay

WASHINGTON, D. C., Oct. 23—Acting under the belief that the time has arrived when there may be greater dependence upon motor transportation as ambulances and for for field sanitary units, the surgeon general of the army has directed the convening of a board for the purpose of ascertaining what type of automobile ambulance it is desired to adopt for the use of the medical department. The board is composed of Major A. W. Williams, Captain Percy L. Jones and Captain Arthur W. Christie, and all of the medical corps on duty in this vicinity.

There are about twenty automobile ambulances now in the service, all of them equipped with the standard ambulance body. Department officials point out, however, that this does not mean that there will be dependence upon motor transportation for the medical department to the exclusion of the animal-drawn vehicle, which is destined, they say, to remain of practical use in certain places where the motor vehicle cannot be used to advantage.

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Propose Changes in Bay State Automobile Laws

BOSTON, MASS., Oct. 22—The Massachusetts Highway Commission is now making preliminary notes on what recommendations it will present to the next Legislature on motor topics, and one of the principal requests will be to have the law changed so that the initial suspension of a driver's license when convicted of operating recklessly or under the influence of liquor will be lengthened from the present period of 60 days to several months or a year.

"The board will also advocate again, no doubt a flat rate of 25 miles an hour on the State highways," says Commissioner James D. Synan. "Something should be done toward uniformity in the matter of city and town regulations, and the board will welcome some such legislation. Now there are so many conflicting regulations that drivers do not know where and how to proceed through some of our cities and towns without breaking a law. When this is done the number of accidents should be lessened. Our board is doing its share to try to lessen them by our suspensions and making people who have had accidents submit to an examination as to fitness sometimes, together with requesting those who drink to sign a pledge not to drive after drinking.

$74,000,000 Exports in 1915

Increase Over 1914 Is $36,000,000—Trucks Gain and Passenger Cars Lower

WASHINGTON, D. C., Oct. 23—A statement issued by the Department of Commerce says that American automobile manufacturers doubled their sales abroad last year, their exports of automobiles and parts thereof in the year ending June 30, 1915, having aggregated over $74,000,000, against $38,000,000 in 1914, $2,000,000 in 1904 and $1,000,000 in 1902, the first year of record. The gains were most pronounced in the second half of the fiscal year, and if the record made by July is maintained until the end of December, which seems probable from present indications, the total exports of automobiles in the calendar year 1915 will be well above $120,000,000.

All parts of the world are buying American motor trucks and passenger automobiles, about eighty different countries being represented in the year's sales. Our motor trucks are being sold most largely in England, France, and Russia. In Greece, Denmark, Sweden, and Servia sales have also reached unparalleled proportions. Increased sales are likewise being made in many countries far removed from the war zone, including Canada, Cuba, Central America, Java, Australia, British South Africa, and in our own territories of Hawaii, Porto Rico, and Alaska.

The year's exports of passenger automobiles were slightly less than those of 1914. Large gains in exports to the United Kingdom, Asiatic Russia, Cuba, Central America, the British West Indies, British Guiana, Venezuela, and British East Africa were more than offset by decreases occurring elsewhere, notably France, Germany, and various countries in Europe, South America, and Asia.

The constituent factors in the automobile export trade for the last two fiscal years are as follows:

Value of—	1914	1915
Commercial automobiles	$1,181,611	$39,140,682
Passenger automobiles	25,392,963	21,113,953
Automobile tires	3,505,267	4,963,270
Automobile engines	1,391,893	1,405,334
Automobile parts	6,624,232	7,853,183
Total exports to foreign countries	$38,095,966	$74,476,422
Total to Alaska	68,435	91,381
Hawaii	1,285,258	1,514,585
Porto Rico	686,906	775,879

A complete record of the United States export trade in automobiles is contained in the table which follows. It shows the number of automobiles of each class exported to the different countries in the fiscal years 1914 and 1915 and the value of the exports in the latter year, expressed in thousands of dollars.

Exported to—	MOTOR TRUCKS Number 1914	MOTOR TRUCKS Number 1915	MOTOR TRUCKS Value 1915	AUTOMOBILES Number 1914	AUTOMOBILES Number 1915	AUTOMOBILES Value 1915	PARTS Value 1914	PARTS Value 1915
Total	784	13,996	39,141	28,306	23,880	21,114	6,624	7,853
England	243	5,306	14,042	6,992	8,321	6,849	1,282	3,283
France	2	4,990	13,514	1,427	451	253	179	481
Russia, European	2	2,251	7,667	926	907	1,528	14	124
Greece	1	142	427	25	36	28	.....	2
Belgium	...	100	365	244	12	15	21	.....
Denmark	...	44	25	263	219	156	9	14
Italy	1	1	8	342	114	70	51	65
Norway	2	3	5	145	125	89	2	16
Sweden	1	10	18	324	137	109	6	4
Austria-Hungary	3	.....	.....	314	4	2	5	1
Germany	24	4	3	1,411	16	17	213	14
Finland	...	.....	.....	106	17	9	3	1
Scotland	...	4	11	25	143	83	23	29
Ireland	...	1	7	2	159	157	.....	.....
Netherlands	1	9	19	141	96	132	8	3
Portugal	8	5	10	59	14	18	2	3
Servia and Montenegro	...	10	6	4	2	3	.....	.....
Spain	...	1	2	83	71	60	6	7
Switzerland	...	.....	.....	79	2	1	1	.....
Turkey, European	1	2	8	35	.....	.....	.....	.....
Gibraltar	...	.....	.....	64	9	6	.....	.....
Azores and Madeira	...	.....	.....	20	18	10	.....	.....
Bulgaria	...	.....	.....	43	.....	.....	.....	.....
Iceland	...	.....	.....	5	3	2	.....	1
Canada	247	306	705	4,377	4,127	3,723	3,664	2,741
British Honduras	...	.....	.....	4	1	1	.....	1
Central American Republics	13	14	29	118	176	131	28	41
Mexico	12	8	14	155	70	67	42	31
Newfoundland	1	1	1	5	17	12	.....	4
West Indies: Cuba	19	21	35	297	1,359	746	48	101
West Indies: Danish	...	.....	.....	3	3	1	.....	1
West Indies: British	4	3	7	140	196	129	44	52
West Indies: French	...	2	4	65	54	35	8	7
West Indies: Dutch	1	1	1	13	24	17	.....	5
West Indies: Haiti	...	.....	.....	2	.....	.....	.....	.....
West Indies: Dom. Republic	1	2	3	11	28	15	.....	4
Argentina	48	3	3	940	626	294	93	50
Bolivia	...	.....	.....	4	10	5	1	3
Brazil	13	3	3	297	81	53	85	29
Chile	2	.....	.....	195	86	51	22	27
Colombia	...	1	1	79	39	35	20	10
Ecuador	...	.....	.....	21	20	11	6	4
British Guiana	...	1	1	16	45	24	5	5
Dutch Guiana	...	.....	.....	7	9	4	1	2
Paraguay	...	.....	.....	.....	5	2	.....	1
Peru	3	2	3	36	24	21	6	5
Uruguay	1	.....	.....	183	45	26	21	14
Venezuela	12	3	7	126	227	143	36	29
Aden	...	.....	.....	28	9	7	2	.....
China	7	.....	.....	144	103	104	6	21
French China	...	1	2	.....	.....	.....	.....	.....
Chosen (Korea)	...	.....	.....	2	2	2	3	.....
India	7	7	9	437	315	275	48	45
Russia, Asiatic	...	596	1,903	12	551	1,478	.....	107
Straits Settlements	7	.....	.....	262	77	70	25	20
Other British East Indies	...	1	3	82	25	20	4	4
Dutch East Indies	7	11	10	290	105	87	15	15
Hongkong	...	1	1	11	2	1	1	1
Japan	1	1	3	96	28	28	36	26
Siam	...	.....	.....	37	13	10	5	2
Turkey, Asiatic	1	5	26	7	1	1	.....	.....
Australia and Tas.	32	57	84	3,099	2,159	1,768	202	199
New Zealand	39	20	32	1,065	938	784	54	48
Philippine Islands	38	27	62	614	407	425	70	40
French Oceania	4	.....	.....	46	8	7	8	5
British Oceania	...	.....	.....	9	2	2	1	.....
British South Africa	12	15	40	1,618	695	731	157	100
British East Africa	...	.....	.....	49	120	75	3	4
British West Africa	1	.....	.....	32	42	21	6	7
Egypt	...	.....	.....	22	1	1	.....	1
Morocco	...	.....	.....	63	25	11	.....	3
Other Africa	2	.....	.....	77	40	24	5	6
German Oceania	...	.....	.....	.....	1	5	.....	.....

Note—The shipments to American territories included: Hawaii, 864 automobiles valued at $972,000; Porto Rico, 548 valued at $433,000; Alaska, 59 valued at $80,000 in fiscal year 1915.

Multibestos Maker Buys Former Walpole Plant

FRAMINGHAM, MASS., Oct. 23—The Standard Woven Fabric Co., this city, maker of Multibestos products and rubber specialties, has purchased the entire plant formerly operated by the Walpole Tire & Rubber Co. at Walpole and will take possession about Dec. 1. This plant will be used for the making of the company's own asbestos yarn sent direct to it from its asbestos mine. Part of the plant will be used for the manufacture of mechanical rubber goods, friction tapes, splicing compounds and other products.

F. J. Gleason, formerly of the Walpole company, will be in direct charge of manufacturing.

Anderson Rolled-Gear Plant in New Hands

TOLEDO, OHIO, Oct. 25—The Shaw-Kendall Engineering Co., this city, has signed a contract to take over the plant of the Anderson Rolled Gear Co. of Cleveland, and will manufacture the patented gears controlled by the Cleveland company. The Cleveland plant at which the experimental work has been done will be moved to Toledo, where the local concern will employ 1000 men within a year.

Columbia Commercial Car Moves

PONTIAC, MICH., Oct. 26—The Columbia Commercial Car Co., which is to locate here, is bringing its machinery from Kalamazoo, Mich., along with an order for fifty trucks to be delivered at the earliest possible date. Work will be begun at the local plant within a very short time.

Reo to Add 10-Acres Floorspace

Plans to Partially Construct and Assemble Most 1915-16 Output in New Plants

LANSING, MICH., Oct. 26—The Reo Motor Car Co. is constructing new buildings and additions which will add between 10 and 11 acres of floorspace to the plant, and work is being rushed that the additional space may be utilized at the earliest possible moment. It is planned to partially construct and assemble most of the 1915-1916 output in the new building space.

It is believed that within the next month the addition to the engineering building will be completed. The new building is three stories, of fireproof construction. The assembly room and body room will have double the present floorspace, as will the machine room on the second floor. The blueprint room will be located in the new structure and the old blueprint room will be given over to the drafting department.

With the completion of the addition the company will make its own photographs. The studio, which will be located on the third floor, will have ample space for the showing of complete cars and allow various views to be taken.

The following departments will be enlarged with the completion of the addition: Designing, drafting, machine shop, body engineering, body finishing, chemical, physical and motor testing.

One of the largest buildings will be the new receiving warehouse, which will be of brick, three stories, 52 by 121 ft. A Grand Trunk railway spur already has been laid to this location which is east of Platt Street and north of the other Reo buildings, and the contract calls for a 20 ft. receiving dock along this spur. A basement under the building will be used as a general stock storage room, as will the first floor. The second floor will be utilized for body and paint storage and the third floor will be used as a repair storage room.

New Truck Plant Largest

The largest building is the new truck plant which will be 667 by 250 ft., one story. The foundation of this building has been completed, and work is being rushed on the placing of the new steel windows and the erection of the walls. According to R. H. Scott, vice-president and general manager, it has not been decided whether the truck plant on North Grand Avenue will be discontinued with the completion of the new building or whether both will be operated.

Work on the new building at Baker Street and Washington Avenue, which joins the newly-erected assembly building, practically has been completed, and a portion of it already is in use. This building is of steel construction, 126 by 292 ft., three stories and basement, and will be used in the various assembling operations.

The present stock receiving room is undergoing the addition of two stories, and the excavation for the new Reo clubhouse is practically complete.

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Detroit Steel Products Celebrates Record Breaking Business

DETROIT, MICH., Oct. 22—Officers and heads of department of the Detroit Steel Products Co. were entertained at a dinner given them by General Manager J. G. Rummey, at the Detroit Athletic Club. The reason was to celebrate the record-breaking business of the company. Practically all departments are working overtime and with night shifts. In the spring department there are three shifts and there is a 24-hr. working schedule. An average of 720 springs are turned out a day.

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Chalmers to Add Again

DETROIT, MICH., Oct. 22—Further additions to the plant of the Chalmers Motor Co. have been decided upon, although several new buildings were completed only during the last few days. The new building now contracted for will be a four-story structure, 60 by 200 ft. to be used as machine shop and stock room. It will provide about 50,000 additional square feet of floorspace.

The convention hall is completed and will be inaugurated in conjunction with the annual Chalmers dealers convention, which will be held Nov. 15 to 17.

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Strike at General Vehicle Plant

NEW YORK CITY, Oct. 21.—Machinists in the plant of the General Vehicle Co. plant in Long Island City to-day went on strike in sympathy with the strikers at the Schenectady plant of the General Electric Co., of which the General Vehicle Co. is a subsidiary.

It is stated that the strikers, numbering from 250 to 600, will not return until the 48-hr. week and other concessions which they asked for are given their fellow-workers at Schenectady. About 40,000 men are employed in the General Electric plants throughout the country.

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Peerless Employees Strike

CLEVELAND, OHIO, Oct. 22—One thousand employees of the Peerless Motor Car Co. went on strike to-day. The strike comes because demands for the 8-hr. day and other concessions had been refused.

50,000 Model 83 Overlands

Motor of New Series To Be Block Type—Upholstery of Fabrikoid

TOLEDO, OHIO, Oct. 25—To date 50,000 model 83 Overland cars have been sold at $750 in touring form and $725 as roadster. Beginning the first week in November, shipments of the second series of 50,000 will be commenced by the Willys-Overland Co.

Several changes have been made in the model for this second series. Instead of having a motor with separately cast cylinders the power plant will be of the block type, with inclosed valves and removable cylinder heads. The bore and stroke remain the same, 4⅛ by 4½, also the five-bearing crankshaft. Another change is to be found in the upholstery. Instead of cloth, Fabrikoid will be used. Otherwise the cars will be identical with those of the first series.

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Franklin Adds Three Buildings

SYRACUSE, N. Y., Oct. 25—The H. H. Franklin Mfg. Co., this city, has now under way additions which will increase its floorspace about 33 per cent. The additions will cost approximately $500,000 when finished and will bring the total floorspace up to 10½ acres.

The first additional unit consists of a two-story building with basement, that will be devoted exclusively to the die-casting department, with a capacity of 5,000,000 die castings annually. This is now practically ready for occupancy.

The second unit, a two-story saw-tooth building, will be used for a machine shop, experimental department and chassis tests, furnishing 24,000 sq. ft.

The last addition will be six stories high and will represent approximately 136,000 sq. ft., costing $200,000. It will be equipped about the first of 1916 and will be the largest plant in Syracuse when made a unit with a companion building already in use, according to the company.

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Crowther Plant Nears Completion

ROCHESTER, N. Y., Oct. 24—Construction is rapidly progressing on the building being erected for the Crowther Motor Co. at Ridgway and Woodrow Avenues, this city. The first unit of what is ultimately intended to be a large plant is 145 by 150 ft., with a concrete floored shipping platform 20 ft. wide. The building will be completed for occupancy by Dec. 1. The company will manufacture a low-priced runabout, touring car and light delivery wagon, featuring the roller friction drive developed by C. E. Duryea.

Finds Prosperity Gaining in West

Studebaker Man Impressed by Widespread Improvement of Conditions in West

DETROIT, MICH., Oct. 23—"From my observations during my recent visit to Studebaker distributors throughout the Middle West and Southwest, there seems to be no possible doubt that we are at the beginning of the most prosperous period in the history of the country." This is, briefly stated, the way George L. Willman, assistant sales and adveritsing manager for the Studebaker Corporation, expressed himself upon his return.

"What impressed me most is that the condition of prosperity is general. Formerly we had cases of great prosperity in one or several states and either a stationary condition, or even a less healthy condition in other states. From what I have seen, and from what I hear from every one, the condition is general throughout the country. All through the corn belt reports are the same, namely, that the crops of this year are the best ever produced. Throughout the cotton region, although the production as to quantity is not as heavy as formerly, it will, however, be of greater money value and there will be no overproduction. The fruit crop, apples especially, I hear, will be one of the best ever seen. The farm products are good all around and the farmers have been getting more for them. In the mining districts prosperity is greater than at any time the oldest settlers can recall.

"This all means that the automobile industry will still further benefit by the general conditions.

Russell Has $2,000,000 Orders

MONTREAL, QUEBEC, Oct. 21.—The annual meeting of the Russell Motor Car Co. will be held in Toronto on Oct. 28. The total orders on the company's books for the new year opening Aug. 1, 1915, amounted to $2,000,000. The report, summing up the present position of the company, says: "The past two years have been most trying to your board. Without attempting any forecasts for the future, they feel justified in stating their belief that the working out of the business at present in hand, together with that to be secured from the regular branches of the company's operations, will enable them to meet their problems and assure the shareholders of the successful carrying on of its operations."

The results of the two years, as indicated in the profit and loss account, show a deficit of $741,670. The loss for the first year was $356,223 and for the second $140,388.

The company has few new cars or second-hand cars in stock. The program for this year contemplates the sale of two models, the Knight 32 and a lighter, smaller car than any yet produced by the company. It was deemed advisable to sell the company's business in Australia, payments for which will extend over a number of years.

Gray & Davis Increase Capital

BOSTON, MASS., Oct. 23—Because of constantly increasing business and heavy orders recently received, Gray & Davis, Inc. have enlarged the capitalization of the company from $1,750,000 to $2,000,000. A new issue of capital stock amounting to $250,000 has been authorized.

Market Prices Steady

NEW YORK CITY, Oct. 26—With the exception of rises in a few of the metals, prices in last week's markets were steady. Trading was brisk in most of the markets. Lead featured the metals markets with a rise of 25 cents per 100 lb. Copper was weaker, due to the demoralized foreign exchange situation. A fair business in copper was booked yesterday at 17¾ cents a pound. Tin was steadier and active with good trading in spot. The market yesterday went up to $33.63, a net gain of 38 cents for the week. Aluminum, with a fair demand, went up yesterday to 53 cents for No. 1 ingot in ton lots.

Trading conditions in Up-River Para was a little more active last week. The prices remained unchanged throughout the week at 57 cents. The oils and lubricants markets, with the exception of a 2-cent rise in linseed oil, remained unchanged.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Frl.	Sat.	Mon.	Week's Changes
Aluminum	.50	.50	.50	.50	.50	.53	+.03
Antimony	.28½	.29	.33	.33	.33	.34	+.05½
Beams and Channels, 100 lb.	1.57	1.57	1.62	1.62	1.62	1.62	+.05
Bessemer Steel, ton	24.50	24.50	24.50	24.50	24.50	24.50	...
Copper, Elec., lb.	.17¾	.17¾	.17¾	.17¼	.17¼	.17¾	...
Copper, Lake, lb.	.17¾	.17¾	.17¾	.17¼	.17¼	.17¾	...
Cottonseed Oil, bbl.	7.74	7.70	7.80	7.90	7.90	7.70	—.04
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.42	.42	.42	.42	.42	.42	...
Gasoline, Auto. bbl.	.17	.17	.17	.17	.17	.17	...
Lard Oil, prime	.85	.85	.85	.85	.85	.85	...
Lead, 100 lbs.	4.50	4.50	4.75	4.75	4.75	4.75	+.25
Linseed Oil	.60	.62	.62	.62	.62	.62	+.02
Open-Hearth Steel, ton	25.00	25.00	25.00	25.00	25.00	25.00	...
Petroleum, bbl., Kans., crude	.80	.80	.80	.80	.80	.80	...
Petroleum, bbl., Pa., crude	1.75	1.75	1.75	1.75	1.75	1.75	...
Rapeseed Oil, refined	.80	.80	.80	.80	.80	.80	...
Rubber, Fine Up-River, Para	.57	.57	.57	.57	.57	.57	...
Silk, raw, Ital.	4.10	...	4.10	...	...	4.10	...
Silk, raw, Japan	3.87½	...	3.87½	...	...	3.70	—.17½
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	33.25	33.50	33.38	33.38	33.38	33.63	+.38
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¼	.04⅜	—.00⅜

Olds Export Trade Gains

LANSING, MICH., Oct. 23—Since the beginning of its active campaign for more foreign business, which was started four months ago, the Olds Motor Works reports, that it has met with much success. At the beginning of July the concern had representation outside of the United States and Canada, in Porto Rico, Cuba and the Hawaiian Islands only. Now there are Oldsmobile dealers in Great Britain, Holland, Norway, India, South Africa, Japan, Australia and New Zealand, while arrangements are being made for the car to be handled in practically all other countries in the world. The export business has been exceptionally satisfactory, states Export Manager W. von Zimmermann, considering the high ocean freight rates and the prohibition act of the British Government against shipping tires on cars.

New Departure Elects Directors

BRISTOL, CONN., Oct. 21—At the annual meeting of the board of directors of the New Departure Mfg. Co., this city, held on Oct. 19, at which DeWitt Page was elected president, as reported in THE AUTOMOBILE last week, F. P. Furlong, vice-president, C. T. Treadway, treasurer, and A. C. Hitchcock, secretary, the following directors were also elected: DeWitt Page, C. T. Treadway, F. P. Furlong, C. F. Pope, E. R. Burwell, A. C. Hitchcock, T. G. Treadway. Mr. Hitchcock succeeds Mr. Page. The new directors are Mr. Hitchcock and T. G. Treadway.

Elect Baker, Rauch & Lang Directors

CLEVELAND, OHIO, Oct. 25—Filling vacancies in the board of directors, stockholders of the Baker, Rauch & Lang Co., at an annual meeting last Tuesday, elected J. H. Wade, W. J. Mather, D. Z. Norton, J. H. Kling and C. L. F. Wieber, Jr.

Milwaukee Jobber Lowers Grade of Gasoline in Price War

MILWAUKEE, WIS., Oct. 23—The Bartles-Maguire Oil Co., one of the largest independent jobbers of gasoline and other petroleum products in Wisconsin, has issued notice to its customers in Milwaukee that owing to the shortage of high grade crude oils, it can no longer sell straight run distilled 62 deg. gravity

gasoline to compete with the 59 deg. gravity sold by Standard Oil. In consequence, the company offers a new grade, designated 59 deg. gravity gasoline. The new scale of prices now in effect, is as follows:

Gravity	Filling Station (Cents)	Tank Wagon Delivery (Cents)	Tank Wagon, 100 Gals. Delivery or More (Cents)
59 degrees...	12.5	11.6	10.6
62 degrees...	13.5	13.0	12.0
65 degrees...	16.5	16.0	15.0
70 degrees...	19.5	19.0	18.0

It is expected that the other independent jobbers, four in number, will follow suit in order to make uniform the prices for fuel in competition with the Standard. Nearly 125 filling stations are operated by the jobbers in various parts of Milwaukee.

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Gasoline Up in Indiana

CHICAGO, ILL., Oct. 23—The Standard Oil Co. of Indiana will advance the price of gasoline 1 cent to 12½ cents and to 11½ cents for 100-gal. lots. The price of refined oil will be raised ½ cent to 7 cents.

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142,000 Tons of Rubber Predicted

AKRON, OHIO, Oct. 23—A Goodyear Tire & Rubber Co. expert states that the world's production of crude rubber for this year will reach 142,000 tons, a substantial increase over 1914. Of this, 75,000 tons will be used in the United States, and fully one-half of it will find its way to the rubber factories of Akron. The acreage of plantation or cultivated rubber has increased from 75,000 in 1905 to about 1,330,000 in 1915.

Plantation rubber now comprises about two-thirds of the world's output.

General Advance in Securities

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Firestone Tire with 145-Point Rise Features Market—Motor Issues Strong

NEW YORK CITY, Oct. 25—Automobile securities last week closed with unprecedented gains, ranging from a fraction to 145 points. Tire issues, especially, showed unusual strength. Firestone Tire common which reached the high mark of 804 on Friday, closed the next day at 720 at a record gain of 145 points. This represents a gain of 460¼ points in the last six months. No early realignment of the stock is said to be contemplated. Excess earnings are to be devoted to extending the plant and not to big dividends, officials of the company state.

General Motors, after a 15-point drop, rose last week to 372, a gain of 46 points. Studebaker, Overland and Maxwell also showed substantial gains, there being a scarcity of these issues for sale. Chevrolet, stock, which will be ready for delivery Oct. 27, closed on Saturday at 125, a drop of 5 points. Studebaker common went up 27 points, Overland 11 points and Maxwell 13 points. The latter stock was one of the strong features of the market. It is expected that the earnings for the current year may be as high as 15 per cent on the common stock. It is understood that the company has more than earned the full year's dividend on the first and second preferred stocks in the first three months of the current fiscal year, so that all earnings for the balance of the year will accrue to the common stock.

Most of the tire issues showed gains. Kelly-Springfield common rose 32 points; Goodrich, 1½; Goodyear 2, and Miller Rubber, 7 points.

A majority of the issues in the Detroit markets showed gains. General Motors closed at 375 with a gain for the week of 60 points. Studebaker common rose 32½ points and Continental Motor, 20 points.

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$3,000,000 Bearing Co. Formed

DOVER, DEL., Oct. 23—The Killian Roller Bearing Corp., has been organized to manufacture roller bearings. Its capital is $3,000,000. The incorporators are: H. E. Latter, H. P. Coffin, and C. M. Egner.

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$250,000 Tire Company Formed

CLEVELAND, OHIO, Oct. 23—The Mason Tire & Rubber Co. has been incorporated with a capital of $250,000 to manufacture automobile tires and inner tubes, and other rubber articles. The incorporators are: D. M. Mason, M. B. Mason, Robert G. Berlekemp, W. E. Sexton and O. M. Mason.

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Victor Rubber Capital $400,000

SPRINGFIELD, OHIO, Oct. 23—The capital stock of the Victor Rubber Co. has been increased from $150,000 to $400,000 to allow for improvements and additional equipment.

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International on War Orders

PLAINFIELD, N. J., Oct. 23—The International Motor Co. has closed an order for 700 5-ton trucks for Russia.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			102	..	..
J. I. Case, pfd			79	81	..
Chalmers Motor Company com			155	165	—15
Chalmers Motor Company pfd			102	104	+3½
Chevrolet Motor Co			125	130	—5
Electric Storage Battery Co			71	72	..
Firestone Tire & Rubber Co. com			720	750	+145
Firestone Tire & Rubber Co. pfd			112	..	..
General Motors Company com			372	374	+46
General Motors Company pfd			112	114	..
B. F. Goodrich Company com			77½	79	+1½
B. F. Goodrich Company pfd			110	111	+1
Goodyear Tire & Rubber Co. com			332	337	+2
Goodyear Tire & Rubber Co. pfd			110	112	+1½
Gray & Davis, Inc. pfd			..	..	..
International Motor Co. com			46½	48½	+14
International Motor Co. pfd			68	72	+8
Kelly-Springfield Tire com			247	256	+32
Kelly-Springfield Tire 1st pfd			91½	93	+1½
Kelly-Springfield Tire 2nd pfd			225	235	..
Maxwell Motor Company com			74	75½	+13
Maxwell Motor Company 1st pfd			97	99	+1
Maxwell Motor Company 2nd pfd			56	57	+6
Miller Rubber Company, com			235	242	+7
Miller Rubber Company pfd			109	110	..
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Company com			135	140	—5
Packard Motor Car Company pfd			100	104	—1
Paige Detroit Motor Car			440	460	+5
Peerless Motor Car Co. com			122	130	..
Peerless Motor Car Co. pfd			92	94	..
Portage Rubber Co. com			55	56	+1
Portage Rubber Co. pfd			93½	94½	+1½
Regal Motor Co. pfd			13	17	..
*Reo Motor Truck Company			19½	21	..
*Reo Motor Car Company			38½	40	..
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp. com			74½	76½	—1½
Stewart-Warner Speed. Corp. pfd			106	..	..
Studebaker Corporation com			188	189½	+27
Studebaker Corporation pfd			111	113	+1
Swinehart Tire & Rubber Co			90	92	..
Texas Company			162	164	—3
U. S. Rubber Co. com			53¾	54⅝	+¾
U. S. Rubber Co. 1st pfd			106	107	+½
Vacuum Oil Company			215	220	..
White Company, pfd			110	..	..
Willys-Overland Co. com			258	260	+11
Willys-Overland Co. pfd			108	110	..

No quotations available at this time on account of war.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	97	..	165	—2
Chalmers Motor Co. pfd	..	94½	100	104	+1
Continental Motor Co. com	155	180	340	400	+20
Continental Motor Co. pfd	..	75	90	94	+3
General Motors Co. com	..	64½	375	385	+60
General Motors Co. pfd	..	83	112	114	—1¼
Maxwell Motor Co. com	10⅞	11½	71	75	+12¼
Maxwell Motor Co. 1st pfd	33½	36	97	99	+1
Maxwell Motor Co. 2d pfd	13½	16½	53½	56½	+6¼
Packard Motor Car Co. com	..	103	..	139	—3
Packard Motor Car Co. pfd	90	..	100	..	..
Paige-Detroit Motor Car Co	..	..	440	..	+5
*Reo Motor Car Co	20¼	..	38½	39½	+⅛
*Reo Motor Truck Co	10½	..	19¾	20⅜	..
Studebaker Corp. com	..	..	190	195	+32½
Studebaker Corp. pfd	..	..	109	112	+3

INACTIVE STOCKS

*Atlas Drop Forge Co	21	..	..	29	..
Ford Motor Co. of Canada	..	500	1450	..	—50
Kelsey Wheel Co	185	..	205	..	..
*W. K. Prudden Co	18	20	22	24	+½
Regal Motor Car Co. pfd	25	..	..	21	..

*Par value $10.

N. A. A. A. J. Closes 4 Day Convention

50 Accessory Manufacturers Represented—Jobber and Manufacturer Defined

KANSAS CITY, MO., Oct. 22—The National Association of Automobile Accessory Jobbers, in which there are about fifty accessory manufacturers as associate members, concluded its four-day autumn meeting to-day with excellent results. Several trade abuses received attention and progress was made toward a better condition in the field of the jobber and manufacturer.

One of the important works was the compilation of a list of jobbers; there are 254 in the list, but it may be changed if the future develops a necessity for alteration. This will eliminate the dealer or would-be jobber who in the past has been able to secure a syndicate catalog or other credentials and has secured a jobbers' price from the manufacturer. These jobbers' prices, it was stated, have in many cases been used to cut prices under the legitimate dealer, the goods being sold to the consumer instead of being jobbed. Both jobber and manufacturer were defined as follows:

Definition of a Jobber

A jobber of automobile accessories is one who buys in bulk or quantity for re-sale to established retail dealers in accordance with established trade methods. It is required that the major portion of the business be wholesale, and that he maintain sufficient general stock to meet the requirements of his trade.

Definition of a Manufacturer

An eligible manufacturer is one who produces one or more accessories on which his policy is to establish a consumer's, a dealer's and a jobber's scale, does not solicit consumer's business and maintains his own scale to both dealer and jobber. Legitimate exceptions to be considered according to established customs of the trade conditions of each member.

Future dating was condemned as unbusinesslike and a burden on the seller, who by this practice is obliged to carry the obligations of the buyer for a term of months without compensation.

The syndicate catalog was condemned, despite the eloquent plea made on the floor by a representative of a Chicago catalog publisher. It was held that this catalog, which can be bought in quantities, by a jobber or dealer, is often used by a non-jobber to get jobber's prices. The jobbers agreed that the use of a general catalog of this description by all jobbers would submerge the jobber's individuality.

Especial condemnation was accorded to the syndicated catalog of some jobbers. The manufacturer is often, it was stated, held up for payment for the space occupied by his goods. This was aimed at one jobber in particular. The only relation between the manufacturer and such catalogs in the future will be the furnishing of standard electrotypes for use in their pages. No payment will be given for their use and no inserts will be furnished.

To Support Stevens Bill

The Stevens bill, which would permit the manufacturer to maintain prices on his goods, was discussed by G. A. Waddle of the Goodyear Tire & Rubber Co., and after his address the association went on record as in favor of it. Members elected to urge their congressmen to support it.

Mail order houses and leagues were placed under the ban and the members ruled that goods should not be sold to them. It was also voted that there is no field for purchasing syndicates.

The member who has legitimate branches will not be required to take out additional memberships for his branches.

The next meeting will be held in New York, Jan. 7 and 8 and 10 and 11, the last two days of the show and the first two days of the following week. The first two days of the meeting will be taken up by committee work and Jan. 10 and 11 by open sessions.

At this time the association will bring up the question of: What is a proper discount for the jobber? Figures given at the convention showed that it costs 17½ per cent to do business and that unless the jobber gets at least 35 per cent on his selling price he cannot make money. A seal and insignia are to be prepared.

Winter Business Problems

A valuable discussion centered around winter business, led by H. R. Williams of the Gibson Co., Indianapolis, a jobber, and William K. Norris of the McQuay-Norris Mfg. Co., St. Louis, a manufacturer.

Williams showed a curve of the business of three jobbers, which curve went away up in the summer and slumped far down in the winter. The overcoming of this difference is the problem.

Both manufacturers and jobbers agreed that winter business must be stimulated, and Williams proposed an installment repairs plan, which he said he and his salesmen worked with some success last winter. The salesmen went to garagemen in the smaller towns of the Middle West, where many of the garages close up in the winter, and urged the repairmen to get cars in for overhaul during the winter. The car owners paid for this work in monthly installments and the shop was kept busy. Incidentally this developed some business in accessories and supplies for the jobber; seventy garages, that would otherwise have closed, were kept open.

To Boom Winter Driving

Williams and Norris both recommended a propaganda in favor of the use of cars in winter. Manufacturers of cars have in some instances run advertising of this kind, the McQuay-Norris company itself has run some, and it was urged that every manufacturer of accessories and cars do likewise. There was laid out a wide field of operation for salesmen in missionary work of the kinds mentioned.

Following the sessions the McQuay-Norris Mfg. Co., took fifty members to St. Louis on a special train of Pullmans to be the company's guests in that city. The entertainment included an inspection of the factory, golfing, dinners and theaters.

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Dixie Tourists on Florida's Sandy Roads

LIVE OAK, FLA., Oct. 20—Swaying over the wet, sand highways of Florida, the ten cars participating in the first inspection trip of the Dixie highway, covered 97 miles to-day in their run from Tallahassee to Live Oak, which is about half way between the capital of the State and the metropolis on the Atlantic seaboard.

The roads of Florida in this section of the State are several stages removed from boulevards, being composed mostly of sand with some short stretches of red clay. In dry weather the cars travel in deep ruts. When it rains hard, as it did to-day, the highways are a combination of sticky mud and water. Little provision has been made for drainage and for the greater part of the way the highways through the dense pine forests are too narrow to permit machines to pass. There are some places on the primitive trails where the tops scraped against the trunks of trees.

Reach Jacksonville

JACKSONVILLE, FLA., Oct. 21—For the first time since the Dixie highway tourists left Chicago and the shores of Lake Michigan fourteen days ago, the motorists gazed upon a large body of water this afternoon when Jacksonville, cooled by the breezes of the Atlantic Ocean, was reached after an arduous 87-mile trip from Live Oak, last night's stop.

The run across the northern counties of Florida, where the natives apparently are living a hand-to-mouth existence, was made over soft sand roads through which the cars staggered on low speed. An attempt had been made by the good road boosters of the section to make the going less tortuous by scattering pine needles, sawdust and pine shavings on the pristine trails through the turpentine

camps and practically untraveled swamp land.

Northern Florida does not lack good roads enthusiasm. This was evident all along the route and at every stop, where a rousing welcome was extended the tourists. This section of the State, however, is shy on funds and because of the small population, bonding the counties for any large amount is impossible. Baker County, for example, has 30 miles of Dixie highway, more miles than any other county through which the Chicago-Miami thoroughfare passes. But Baker County is 30 miles square and has a population of only 4,000, of which number but 500 are land owners.

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Maxwell Makes Detroit to Indianapolis and Return in 20:1

DETROIT, MICH., Oct. 21—From Detroit to Indianapolis and return in 20 hr. and 1 min. for the 597.2 miles, is the run made by Ray McNamara, of the engineering department of the Maxwell Motor Co. in a Maxwell stock car. He was checked at the start and finish by W. D. Edenburn, local representative of the contest board of the A. A. A., while in the Indiana city the checking was done by Jack Baci, A. A. A. representative for Indiana. On the run to Indianapolis the 298.6 miles were covered in 8 hr., 58 min., or an average of 33 m.p.h. This run was 1½ hr. faster than the fastest railroad run. The start was made at 4.11 a. m. from the Maxwell headquarters on Woodward Avenue and McNamara reached Indianapolis at 1.09 p. m. After a stop of 14 min. he restarted and arrived here at 12.26 a. m.

Tom Orr also made a fast trip in another Maxwell stock car, although he was considerably delayed by a series of tire troubles en route.

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Henney Buggy Will Build Bodies

FREEPORT, ILL., Oct. 23—The Henney Buggy Co., this city, will hereafter devote its plant largely to the manufacture of bodies for commercial trucks to be attached to Ford chassis. After a series of experiments, the plant has turned out a line of models to suit various industries, ranging from the small package box or open body that can be fastened at the back of the seat on the Ford runabout, to the large steel paneled-inclosed body that is used largely by clothing, dry goods, and laundry firms, the bodies ranging in price from $18 to $100 according to the requirements of the trade.

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Master Carbureter on Owen

DETROIT, MICH., Oct. 25—The Master Carbureter Corporation announces that the Owen Magnetic Co., New York City, which makes the Owen cars, has contracted for Master carbureters as standard equipment.

Aluminum Alloy Piston for Fords

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McQuay-Norris Mfg. Co. To Sell Set with Leak-Proof Rings for $30

ST. LOUIS, MO., Oct. 22—The McQuay-Norris Mfg. Co., this city, maker of Leak-Proof piston rings, has announced a die-cast aluminum alloy piston, completely equipped with Leak-Proof piston rings and suitable for Ford cars. The company has adopted a new alloy, a product of the French patented Cothias process, which is composed largely of aluminum and known to the trade as Lynite.

The conductivity of Lynite, it is stated, is calculated at three times that of cast iron and coefficient of friction is several per cent less than that of cast iron.

The company sells four Lynite pistons for $30. This equipment will be in the hands of jobbers throughout the country in the near future and can be had for Ford motors that have been rebored to 0.031 oversize.

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Miller Aluminum Alloy Carbureter

LOS ANGELES, CAL., Oct. 19—Harry A. Miller, this city, has placed a new carbureter on the market known as the Miller. It is constructed of Miller metal, an aluminum alloy discovered while experimenting on a carbureter for military aeroplanes.

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Aluminum Piston Ring Tried

LOS ANGELES, CAL., Oct. 24.—The Harry A. Miller Mfg. Co. has run a successful 12-hr. test of a new aluminum alloy piston ring in a motor with pistons also of aluminum. The new ring is a double, concentric pattern with light wall pressure and it is said that the effect of the run was merely to put a gloss on the surface of the rings.

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15 per Cent Raise for Rubber Men

AKRON, OHIO, Oct. 25—About 1500 machinists employed by Akron rubber companies and allied industries were notified to-day that their wages would be increased 15 per cent. The increase is made voluntarily by the employers and adds about $1,000 a day to the income of local machinists.

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Goodyear Sales Officials Meet

DETROIT, MICH., Oct. 22—A conference was held this week of the Detroit district sales representatives of the Goodyear Tire & Rubber Co. Business conditions and policies were discussed. Among the officials who were present were C. W. Martin, manager of the automobile truck department at the plant in Akron, Ohio; H. G. Palmer, assistant manager of the automobile tire department in Akron, R. S. Burnham, special manufacturers representative, R. H. Daniels, special sales representative from Akron; E. F. Jackson, district manager; C. W. Hockler, assistant district manager; W. A. Hazlett, city manager; Harry Ammon, assistant city manager; J. P. Kennedy, manager of the local truck tire department; J. D. Harding, manager of the electric tire department.

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$10 a Week Buys a Ford

BOSTON, MASS., Oct. 23—What is claimed to be the first offer of its kind, a Ford club financed by the Dorchester Trust Co., has been started in Boston. It originated with Wilbur F. Beale, treasurer of the trust company, who worked out all the details and then began advertising it in the papers. The plans call for a person agreeing to deposit $10 a week with the trust company from now on for a period of thirty or thirty-five weeks depending upon whether a runabout or a touring car is wanted. The bank will pay interest upon the deposits, but those who enter the plan must agree not to withdraw any of the money until the time limit is up. Then if the depositor decides that he does not want a car he can have his money and the interest back. It will be paid over to him and he will be sent to a garage if he decides he wants a car and there he will get a new Ford machine. If he wants any extras put on there is a clause in the contract requiring the depositor to continue puting $10 a week in the bank until the extras are all paid for. If depositors prefer a more expensive car arrangements may be made later to carry along deposits for such a one.

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Garford Men Study Worm Drive

PHILADELPHIA, PA., Oct. 22—Fifty owners and drivers of Garford trucks together with the Garford organization in Eastern Pennsylvania assembled at the salesroom and service station of the Garford Philadelphia Co., last evening, to study the construction and operation of the Sheldon worm gear drive axle used on the Garford truck. E. A. Shelly, advertising manager of the Sheldon Axle & Spring Co., discussed the salient points of worm gear constructions.

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Manzel Pump Reduced to $15

BUFFALO, N. Y., Oct. 21—The price of the two-cylinder engine-driven tire pump made by the Manzel Bros. Co., this city, has been reduced from $20 to $15. This price will include all fittings ready for immediate installation.

To Make Trailers—The Lowell Cutter Co., Lowell, Mich., has added the manufacture of automobile trailers to its activities.

Timken Roller Bearing Adds—The Timken Roller Bearing Co., Canton, Ohio, is building an addition to its grinding room.

Beach Creek Co. Builds—The Beach Creek Auto Co., Beach Creek, Pa., will build a two-story factory. The estimated cost is $25,000.

Guide Motor Co. Adds—The Guide Motor Mfg. Co., Cleveland, Ohio, will construct an addition to its plant at Madison and West 114th Street. The estimated cost is $3,000.

Rutenber Adds—The Rutenber Motor Co., Marion, Ind., has contracted for the building of a third story to its plant, which will give the company 30,000 ft. more floor space and will increase its capacity 40 per cent.

McQuay-Norris Adds—The McQuay-Norris Manufacturing Co., St. Louis, Mo., maker of Leak-Proof piston rings, has purchased a tract just east of its present building at 2808 Locust Street and will begin the erection of an addition immediately.

Heron Adds—The Heron Mfg. Co., Utica, N. Y., will build a two-story addition, 85 by 150 ft., costing about $100,000. This will practically double its present working force. The company recently received a large order for the manufacture of a daily minimum of 4000 connecting rods for engines.

Milwaukee Engine Plant Started—The Milwaukee Auto Engine & Supply Co., 708 Winnebago Street, Milwaukee, Wis., has broken ground for its new factory and machine shop at Twenty-ninth Street and Meinecke Avenue. Work will be rushed so that occupancy may be taken early in December. The shop will cost about $15,000.

Hoosier Auto Parts Co. Incorporates—The Hoosier Auto Parts Co., Muncie, Ind., has incorporated with a capital of $100,000. The company is putting its plant into first class condition and operations are expected to commence the manufacture of parts for clutches, universal joints, etc., as soon as conditions will permit. A service department will be maintained for supplying repair parts on jobs formerly turned out by the B-T-K Gear & Engine Co., the plant of which was recently bought by the Hoosier company at a receiver's sale.

F.-W.-D. Adds—The Four Wheel Drive Auto Co., Clintonville, Wis., will enlarge its headquarters and add to its equipment. A new stock room 46 by 120 ft. is being built. A number of new heavy duty turret lathes, milling machines, boring bars and drill presses are being installed. There will be a new machine section, 54 by 120 ft. A new heat treating and tempering room, 20 by 40 ft. This latter room is completed. The company has just completed a building entirely separate from the plant. This building is entirely of steel, is fireproof, and will be used for the storage of oils, grease and paints.

Wallis Tractor Plant to Move—The plant and headquarters of the Wallis Tractor Co., Cleveland, Ohio, owned principally by Racine, Wis., capital, will be moved to Racine by the end of October. The concern was organized about eighteen months ago by H. M. Wallis, president of the J. I. Case Plow Co., Racine, whose son is the designer of a farm tractor. A plant was established at Cleveland, in charge of the son. It is now desired to concentrate production t Racine, and a large part of the former Racine-Sattley Co.'s Racine works have been leased as a permanent home for the tractor company.

Kellar Tool Busy.—The Kellar Pneumatic Tool Co., South Brooke Street, Fond du Lac, Wis., specializing in the manufacture of special tools, dies, punches and similar tools for manufacturers of motors and motor vehicles, has been obliged to put on a night shift to accommodate the extraordinary demand. According to Julius Kellar, Jr., general manager, the company has enough orders from one motor car manufacturer alone to keep the plant taxed to capacity night and day until the ened of the year. Mr. Kellar also said that during the last four or five months the company has turned down from $2,000,000 to $3,000,000 worth of war business.

The Automobile Calendar

Oct. 29.....Indianapolis, Ind., Claypool Hotel, S. A. E. Meeting of Ind. Section.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 2.....New York City, Sheepshead Bay Speedway, 100-Mile Race.
Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 18.....New York City, S. A. E. Met. Sec. Meeting.
Nov. 22-27.....Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

1916

Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Fort Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

Milburn Electric in Hartford — The Thomas A. Stewart Co., 69 Pearl Street, Hartford, Conn., has been appointed distributor of the Milburn electric in Hartford, Tolland, Litchfield and Middlesex counties. P. A. Wainwright of Hartford has been placed in charge of the automobile department. Temporary vehicle quarters have been secured in the Cole Service station at 67 Mulberry Street and later the company will be located in the remodeled Heublein garage. This is the initial appearance of the Milburn in this section of the State.

New Delion Tire Sub-Agencies—The Delion Tire Sales Co., 203 Allyn Street, has appointed the following sub-agents: W. E. Luettgens, South Manchester; H. H. O'Neil, New Britain; the B & S Tire Repair Co., Middletown.

Late Ohio Trade News—E. T. Paul, 123 Parsons Avenue, Columbus, Ohio, has taken the central Ohio agency for the Quaker line of tires.

The Cott-McKelvey Company, 448 North High Street, Columbus, has opened a service and repair department in conjunction with the Pullman and Jackson agencies.

The Griswold-Sohl Co., Columbus, has purchased the stock of Harry E. Smith, automobile dealer at 43 West Broad Street,which will continue the business at present at the same location. Later on the stock may be moved to the Griswold-Sohl Building.

Spokane News—The C. H. Hornburg Co. has moved into new quarters at 1421 Second Avenue. It will continue to handle the Regal line.

The latest addition is the Oldsmobile Co., incorporated for $50,000, and composed of G. K. Marsh, F. M. Marsh, Henry Madigan and R. L. Strickie. This company will distribute Oldsmobile cars in eastern Washington, except three counties south of the Snake River, and all of northern Idaho. Headquarters are at 2122 Walnut street.

Opens Portland Tire Shop—G. M. Thomas, inventor of a stretchless inside tire, with stores in Los Angeles and San Diego, Oakland and San Francisco, Cal., has opened a tire shop at 82 Broadway, Portland, Ore.

Seattle Truck Co. Moves—Gerlinger Motor Car Co., distributors of Federal trucks, have moved into its new home, 2319-23 Fifth Avenue, Seattle.

Late Louisville News—Robinson Bros. & Co., 609 West Main Street, has acquired the agency for the Globe tire.

The Paige Motor Sales Co., 725 South Third Street, Louisville, Ky., has secured the agency for the Grant in the Louisville territory. This concern also handles the Paige.

The Breyfogle-Green Co., 1600 South Second Street, has secured the agency for the Allen.

The Louisville Auto Top Co. has opened an office and shop at 304 West Breckenridge Street. The concern, of which R. P. Bottorff is the manager, will make a specialty of auto trimming.

The National Auto Sales Co. will move on Oct. 15 from 728 South Fourth Street to 931 South Third Street, the former location of the Louisville branch of the Ford Motor Co. The National company will handle tire accessories and used cars, and will also engage in general repair and garage business.

New Savage Tire Agencies—The Savage Tire Co. of California, manufacturer of Savage tires, has established representation in Seattle with the Tyre Shop, 607 East Pike Street, Seattle, Wash., of which H. B. Wilbur is manager. The firm will act as distributor in Seattle and the territory north to the Canadian boundary line. The Savage Tire Co. also has established a distributing agency for the State of Oregon at Portland.

New Gasoline Stations in Los Angeles—With the completion of ten gasoline service stations in Los Angeles, the Ventura Refining Co. is now in better position to supply the trade. The service stations conform in detail to the style of architecture found in the old California missions. Aside from the unique style of architecture, a striking feature is an absence of gaudy signs. Only a small gold-lettered sign giving the name of the company and a mission bell, the trademark of Ventura gasoline.

Recent N. Y. Leases—The Jandorf Automobile Co., New York City, has leased the fourth floor of 239-241 West Fifty-sixth Street, and also the entire building at 303-307 West Fifty-ninth Street. The Hayes-Diefenderfer Co. has leased the second floor at 239-241 West Fifty-sixth Street. The C. T. Silver Co. has leased the top floor of 3-7 West Sixty-first Street. This company has moved to its permanent home in the Silver Building, corner North Broadway and Manor House Square, Yonkers. The Globe Tire Co., formerly at 228 West Fifty-eighth Street, has moved to 1853 Broadway, where larger quarters have been attained. The Holbrook Body Co. has leased 28,000 sq. ft. in the block Forty-third to Forty-fourth Street, Eleventh and Twelfth Avenues. The Ford Steel Pneumatic Shock Absorber Co. has leased space in the Circle Building, Columbus Circle. The Akron Tire Co. has taken space in the Thoroughfare Building, 1777 Broadway. The third floor at 319-320 West Forty-eighth Street has been leased to the Maxwell Motor Sales Co.

A lease has been made by the Kent Motors Corp. for one-half of the fifth floor in the building at 1700 Broadway The Pullman Motor Car Co. has leased space at 1922 Broadway. The building at 233 West Fiftieth Street has been taken by the Northern Pacific Motor Co.

Denver Trade News—The Platt-Fawcett Motor Co., 1249 Broadway, Denver, Stearns, Paige and Mitchell distributor for Colorado and Wyoming, has dropped the Mitchell and is handling the other two exclusively.

The Maines-Hough Motor Co., 439 Broadway, Colorado and Wyoming distributor for the Chevrolet and Monroe, has added the Mitchell agency for the same territory.

Shannon G. Loes, formerly sales manager for the Jones Motor Car Co., Inc., Richmond, Va., Cadillac distributor, has taken the position of sales manager for the Charles F. Cole Corp., 35 East Colfax Avenue, Denver, Pathfinder distributor for Colorado and Wyoming.

W. R. Woods, formerly Hupmobile agent in the Cripple Creek, Col., district, has been made sales manager for the Hupp Motor Sales Co., 1260 Broadway, Denver, Colorado and Wyoming distributor for the Hupmobile and Locomobile. George De Witt, formerly district salesman for the Cadillac in Texas and Louisiana, and also formerly well known as a Buick racing driver, has been made assistant sales manager and given charge of the city sales for the new Hupmobile concern.

The Denver local agency for the National has been transferred from the A. T. Wilson Auto Co. to W. F. Bell, 1616 Broadway.

Tom Botterill, 1278 Broadway, Denver, Dodge, Pierce and Hudson distributor for Colorado, Wyoming and Utah, has left for Detroit and Buffalo to visit the three factories. He is accompanied by Frank Botterill, a brother and manager of his Salt Lake City branch, which is known as the Tom Botterill Automobile Co.

W. W. Beeson, Colorado and Wyoming distributor for the National, has opened permanent headquarters at 1616 Broadway, Denver.

The Victor Auto Co.'s garage, Victor, Col., has been established as official Hupmobile service station, to work in connection with the Woods Auto Co., Hupmobile agent for the Victor district.

W. F. Bell has secured the Colorado and Wyoming territory for the Monarch, and has established headquarters at 1616 Broadway.

Plans have been completed by the Northwest branch of the Metz Company for a three-story fire proof building on East Pike Street, Seattle. The building will be completed by March 1 at an estimated cost of $25,000.

Paterson Agency Moves—R. W. Vining, who has the New England distribution for the Paterson, has just moved into new quarters in a building at 1121 Commonwealth Avenue, Boston, Mass.

Automobile Agencies Recently Established

Alabama

Birmingham	King	Birmingham Motor Co.

Arkansas

Hope	King	C. C. Spragins
Paragould	Halladay	W. S. Coleman & Sons

California

Hollywood	Apperson	Ralph H. Clark
Los Angeles	Enger	Irving Motor Car Co.
Los Angeles	Grant	Bekins-Speers Motor Co.
Los Angeles	Hollier	Stone-Dancy Motor Sales Co.
Los Angeles	Kelly-Springfield	Stone-Dancy Motor Sales Co.
Monrovia	Chevrolet	Foulke & Deatherage
Redlands	Chandler	Park Garage
Redlands	Oakland	Park Garage
Redlands	Chevrolet	C. H. Clem

Colorado

Akron	Grant	City Garage
Boulder	Stearns	F. Deckelman
Boulder	Metz	J. A. Outhier
Buena Vista	Haynes	W. C. Fletcher
Burlington	Metz	G. Danforth
Calhan	Grant	R. Gates
Canon City	Grant	J. E. Myers
Cheyenne Wells	Metz	D. R. Purdy
Colorado Springs	Grant	H. N. Richmond & Sons
Colorado Springs	Stearns	Ferguson & Ingersoll
Colorado Springs	Haynes	E. D. Marr
Delta	Ford	Allen Garage
Denver	Abbott-Detroit	J. M. Patrick
Denver	Paige	Platt-Fawcett Motor Co.
Denver	Denby	A. C. Wagner
Eaton	Grant	C. W. Schultz
Elizabeth	Grant	R. Gates
Fair Play	Apperson	H. Bergstrand
Flagler	Metz	Lewis Clark
Fort Collins	Metz	L. W. Van Dyke
Fort Collins	Inter-State	C. B. Moasman
Fort Morgan	Metz	J. M. Scofield
Ft. Collins	Studebaker	E. O. Sinard
Ft. Morgan	Grant	A. C. Gillette
Grand Junction	Ford	R. G. Miller
Greeley	Ford	Universal Motor Car Co.
Greeley	Inter-State	C. C. Kersey
Greeley	Metz	F. P. Meeker
Haxtum	Metz	M. Anderson
Idalia	Grant	G. F. Conrad
Iliff	Metz	W. F. Alexander
Leadville	Haynes	Cloud City Garage
Limon	Grant	R. Gates
Longmont	Grant	L. L. Swenson
Longmont	Inter-State	Watts & Hylton
Longmont	Metz	F. Hildreth
Loveland	Inter-State	A. Straight
Loveland	Grant	C. W. Coffman
Manzanola	Grant	Manzanola Mer. Co.
Mattison	Metz	K. Koontz
Montrose	Dodge	Silver Motor Co.
Ordway	Studebaker	E. W. Cleverly
Ouray	Ford	W. F. Wheeler
Ouray	Dodge	Silva Auto Co.
Pueblo	Metz	F. Hamilton.
Pueblo	Grant	Richard Birge
Pueblo	Studebaker	G. G. Russell
San Luis	Apperson	W. S. Parrish
Steamboat Springs	Dodge	J. A. Brobeck
Steamboat Springs	Grant	A. H. Poppen
Sterling	Inter-State	Ideal Auto & Mch. Co.
Trinidad	Metz	J. I. Glendenning
Uma	Grant	O. E. Stimson
Vilas	Metz	C. F. Wheeler
Walsenberg	Metz	C. B. Blanton
Wray	Metz	McGinnis Bros.

Connecticut

Norwalk	Kissel	F. E. Lockwood & Co.

Georgia

Columbus	Apperson	B. Y. Hill Garage

Illinois

Abingdon	Maxwell	Reynolds & Fields
Alton	Haynes	C. G. Luft
Bloomington	Stearns-Knight	C. W. Frey
Cairo	Chalmers	A. W. Neff
Champaign	Milburn Elec	R. C. Nelson
Chicago	Oldsmobile	P. Lorenzen
Chicago	Enger	Central Sales Co.
Colfax	Ford	F. M. Hager
Decatur	Mitchell	L. W. Cook
Freeport	Mitchell	M. L. Miller
Jacksonville	McFarlan	Donald Joy
Jacksonville	Jeffery	Jacobs & Meyer
Jacksonville	Haynes	W. C. Hamm
Manito	Oakland	Frank Wilson
Mendota	Franklin	Thier & Fahler
Murphysboro	Chalmers	George Huthmaker
Murphysboro	Oldsmobile	P. B. Outhouse & Co.
Pekin	Davis	H. A. Reuling & Son
Rockford	Paige	F. Carlson
Shirley	Reo	Charles Hutchinson
Springfield	Oldsmobile	White Garage
Springfield	Chevrolet	C. E. Knecht
Strawn	Dodge Bros.	Stottler Brothers
Weldon	Reo	M. H. Shinneman

Indiana

Evansville	Packard	Walton Motor Co.
Fort Wayne	Westcott	Furhman Auto Co.

Iowa

Anamosa	Kissel	Anamosa Auto Co.
Cedar Rapids	Vim	P. Perley
Des Moines	Stearns	Hal Wells
Des Moines	Kissel	Guarantee Motor Co.
Fonda	Kissel	Kenning Auto Co.
Glidden	King	E. O. Potter
Grinnell	King	Hawkeye Motor Sales Co.
Hebron	Chandler	Hayes Company
Manilla	Dodge	J. J. Meehan
Mt. Ayr	Briscoe	H. Reynolds
Mt. Ayr	Hudson	H. Reynolds
New Hall	King	N. Tvedt
Waterloo	Abbott-Detroit	G. W. Campbell Co.
Waukon	Oldsmobile	J. G. Minert Auto Co.

Kansas

Chapman	Ford	Arnold & Son
Cimmarron	Ford	Luther & Sons
Coldwater	Overland	O. Taylor
Great Bend	Franklin	F. Selle
Harper	Paige	Cunningham & Williams
Horton	Buick	Winterschedit & Sautter
Hutchinson	Detroit Electric	Walnut Street Garage
Sterling	Ford	Farmers Supply Co.
Topeka	Saxon	Capital Auto & Supply Co.

Kentucky

Carrollton	King	Thomas Garage
Louisville	Scripps-Booth	Callahan Motors Co.
Louisville	Grant	Paige Motor Sales Co.
Louisville	Allen	Breyfogle-Green Co.

Maine

Greenville	Chandler	W. R. Dailey
Portland	Allen	Paterson Garage Co.

Maryland

Baltimore	Standard	Little Giant Sales Co.
New London	Apperson	J. R. Brandenburg

Massachusetts

Boston	Westcott	Bishop Motor Sales Co.
Boston	Pullman	W. J. Hurley
Brockton	Kissel	KisselKar Brockton Br.
Lowell	Dodge Bros.	L. Rochette
North Adams	Oldsmobile	M. O. Haggerty
S. Deerfield	Oldsmobile	T. J. Ahearn
Springfield	Haynes	Springfield-Haynes Co.
Weymouth	Pullman	C. R. Potter
Worcester	Jackson	Greene Hale Co.
Worcester	Stearns-Knight	H. E. Plimpton
Worcester	King	H. B. Pulsifer

Michigan

Adrian	Dodge	Wilcox Hardware Co.
Addison	Maxwell	Frank Barnaby
Ann Arbor	Overland	Del. Begole
Baldwin	Ford	G. F. Duffing
Baldwin	Studebaker	W. T. Wilkinson
Battle Creek	Paige	C. H. Haagland
Carson	Dodge	Carson City Auto Co.
Carson	Oakland	Carson City Auto Co.
Charlevoix	Haynes	A. L. Hart & Son
Dowagiac	Ford	Scammon & Adams
Dundee	Chalmers	McIntyre Bros.
East LeRoy	Ford	F. E. Riley
Fair Haven	King	Guy La Bounty
Grand Ledge	Studebaker	R. Watson
Grand Rapids	Pullman	S. A. Dwight
Grass Lake	Studebaker	E. A. Croman
Hancock	Eagle	M. J. Carroll
Hartford	Regal	C. G. Warren & Son
Ionia	Dort	Benedict Buick Co.
Ionia	Oldsmobile	C. H. Welker
Ishpeming	Buick	A. J. Hasselblad
Kalamazoo	Imperial	O. Baker & Son
Lansing	Auburn	D. H. Mills
Lansing	Dort	Dort Motor Sales Co.
Litchfield	Overland	F. S. Sackett
Marcellus	Dodge	R. T. Loveridge
Marquette	Buick	Cleophas Meilleur
Mt. Clemens	Oakland	E. H. Donald
Ontonagon	Briscoe	C. W. Brown
St. Johns	Briscoe	Hunt & Allison
St. Johns	Jeffery	Steel & Valentine
Sheldon	Overland	J. M. Wilson Auto Co.
Sheldon	Hudson	J. M. Wilson Auto Co.
South Lyons	Dodge	C. E. Arms & Son

Minnesota

Ada	Allen	Ada Auto Co.
Aitkin	Franklin	Northwestern Service Co., Inc.
Buffalo Lake	New Era	Wm. Grunke
Chaska	New Era	J. G. Bierlein
Cokato	King	Christofferson & Larson
Duluth	Munroe	J. M. Ford
Duluth	Rauch & Lang	S. L. Potts
Duluth	Stearns-Knight	S. L. Potts
Duluth	Pullman	S. L. Potts
Hastings	Kissel	A. R. Walbridge
Luverne	Allen	W. Nelson
Luverne	Hudson	W. Nelson
Minneapolis	Herff-Brooks	Eagle Motor Works
Morris	King	S. Stewart
Redwood Falls	Franklin	C. D. Thompson
Red Wing	Studebaker	M. A. McNiff
Rochester	Dodge Bros.	R. N. Sweet
St. Clair	Maxwell	Leo Hardware Co.
Springfield	Oakland	B. F. Mowry
Virginia	Dodge Bros.	Carl Shapiro
Winona	Maxwell	Gate City Motor Co.

Missouri

Centralia	Reo	L. & H. L. Roemer
Cape Girardeau	Chalmers	W. D. Black
Flat River	Chalmers	B. A. Eaton
Kansas City	Enger	Packard-Missouri Co.
Springfield	Stutz	Joe Keet
St. Louis	Elco	Motor Car Repair & Supply Co.
St. Louis	King	Brinkman Motor Car Co.
Shelbina	Buick	Byron Maupin
Shelbina	Dodge	J. C. Jewitt

Montana

Billings	Oakland	Batty Motor Co.
Dodson	Ford	J. H. Moore
Lewiston	Oldsmobile	J. W. Drake

Nebraska

Cozad	Oldsmobile	W. Robertson
Fremont	Apperson	Hall & Steele
Lincoln	Kissel	A. H. Meyers
Omaha	Enger	Foshier-Enger Co.
Omaha	Moline-Knight	R. G. Davis

New Jersey

Bradley Beach	King	E. S. Thomas
Matawan	King	J. C. Bushnell

New Mexico

Albuquerque	Metz	F. E. Dearth

New York

Buffalo	Hupmobile	Buse-Patten Motor Car Co.
Buffalo	Inter-State	Blackburn Sales Co.
New York	King	Mineola Garage
Rochester	Enger	Helber Motor Car Co.
Schenectady	Kissel	Wm. D. Havens
Shelter Island	King	G. B. Wells
Silver Creek	Oldsmobile	Wm. J. Dickerson
White Plains	Kissel	KisselKar Garage Co.

North Dakota

Flasher	Overland	F. Swanson
Velva	Grant	E. R. Teich

Ohio

Alliance	Alter	E. R. Coleman
Alliance	King	J. F. Brannon
Bucyrus	Enger	F. J. Norton Sons
Columbus	Madison	Miller & Carpenter
Portsmouth	Vim	R. S. Prichard
Rayland	Oldsmobile	W. D. Hoge
S. Charleston	Oldsmobile	Sullivan Auto Co.
Toledo	Grant	Union Supply Co.
Xenia	King	Page-Maxwell Sales Co.

Wyoming

Sheridan	Grant	W. C. Reid

Oklahoma

Oklahoma City	Marion	Sutter-Johnson Motor Co.

Pennsylvania

Addison	Enger	Straw & Dean
Germantown	King	Delmar Garage
Harrisburg	Studebaker	Ford Sales Co.
Hawley	Dodge Bros.	Gottlieb Matter & Sons
Hazleton	Enger	G. W. Wilmot
Lancaster	Enger	O. H. Shenk
Monessen	Oldsmobile	H. N. Odbert
Parkers Landing	Apperson	Gibson & Sorgen
Philadelphia	Kissel	Baker-Price Co.

South Dakota

Sinai	King	F. H. Folberg

Texas

Fort Worth	Franklin	G. L. Omohundro
Houston	Apperson	Young & Dwire Co.
Marble Falls	Oldsmobile	Marble Falls Garage
Mesquite	Kissel	Humphreys & Vauston

Vermont

Burlington	Kissel	Todd & Tupper

Virginia

Big Stone Gap	Enger	Dominion Motor Car Co.

Washington

Spokane	Velie	Franklin Auto Sales Co.
Tacoma	Enger	W. E. Newton
Walla Walla	Hupmobile	Alvin Coyle

Wisconsin

Eagle	Oldsmobile	Smart Bros.
Eau Claire	Velie	Murphy & Costello
Eau Claire	Allen	Murphy & Costello
Elkhorn	Ford	Smart Bros.
Fox Lake	Chalmers	Murphy Garage
Hartford	Kissel	Schauer Brothers.
Janesville	Chalmers	Prielipp & Conway
Kewaskum	Chalmers	L. Rosenheimer
Manutowoc	Chalmers	L. J. Anderson Co.
Marion	Kissel	F. J. Haufe
Milwaukee	King	Lauson-Salestine Co.
Milwaukee	Allen	Lauson-Salentine Co.
Milwaukee	Westcott	Collins Garage Co.
Milwaukee	Princess	Milwaukee Motor Sales Co.
Milwaukee	Hollier	Wells Garage Co.
Minneapolis	Stearns-Knight	Rauch & Lange Electric Car Co.
Oconto	Studebaker	Henry Bradley
Oconto	Jeffery	H. Lingelbach
Platteville	Dodge Bros.	The Eagle Garage
Sheboygan	Chalmers	G. & H. Motor Co.
Sheboygan	Oldsmobile	Prange Motor Co.
Sheboygan	Chevrolet	Prange Motor Co.
Sargeant	New Era	Grimm Bros.
Westfield	Dort	Schauer Bros.
Watertown	Oldsmobile	The Service Co.

Wyoming

Basin	Metz	G. R. Hoover & Co.
Dayton	Metz	R. W. Ratcliff

VOL. XXXIII. NEW YORK—THURSDAY, NOVEMBER 4, 1915—CHICAGO No. 19

The AUTOMOBILE

Vast Progress in Motor Design

Nearly All Engines of Recent Design Are Years Ahead of 1915 Models—Higher Pressures and Higher Speeds the Rule —Better Lubrication—Less Vibration— Greater Economy

By A. Ludlow Clayden

NEVER in the whole history of the automobile has the design of any part progressed so much in one year as has that of the American automobile engine during 1915. Owing to a variety of causes, change was forced upon the motor manufacturer and upon the automobile makers. The opportunity has been seized upon by engineers to let loose the pent up knowledge they had accumulated through the several years previous, so American engine design and construction has leaped forward in a year as far as Europe advanced in the previous three or four. From a position in the rear, in the engineering sense, the American motor has made a forced march to the van and stands alongside the best of foreign products.

Higher Speed

It is greatly to be regretted that the habit ever arose of estimating speed by revolutions per minute. The speed that counts in an engine is the speed of piston movement in feet per minute and it is easier to get high crankshaft speed than high piston speed. On a 3-in. stroke 3000 r.p.m. means just the same piston speed as does 1500 r.p.m. for a 6-in. stroke, so there is little sense in calling the former a high speed and the latter a slow speed engine.

Similarly, horsepower ought to be plotted against piston speed rather than against revolutions, and the quality of the engineering in a motor is better judged by a curve of brake-mean-effective-pressure plotted against piston speed, than it is by any ordinary power curve plotted to revolutions. Of course, both curves show the same forces and velocities in different forms of expression, but the ηp-piston speed curves are at a glance, indicative of the relative quality of two motors while the hp.-r.p.m. curves are not.

Still, however the plotting is done, the fact remains that piston speeds have risen enormously this year, and in conjunction gas speeds through valves and passages. Simultaneously, modern motors are expected to operate at slower speeds than formerly, so the total range of speed has been widened at both ends. This has made things distinctly difficult for carbureter makers, but they have risen to the occasion very well.

Demands of User Complex

The automobile engineer has this year been asked to give the following new features to his engine:

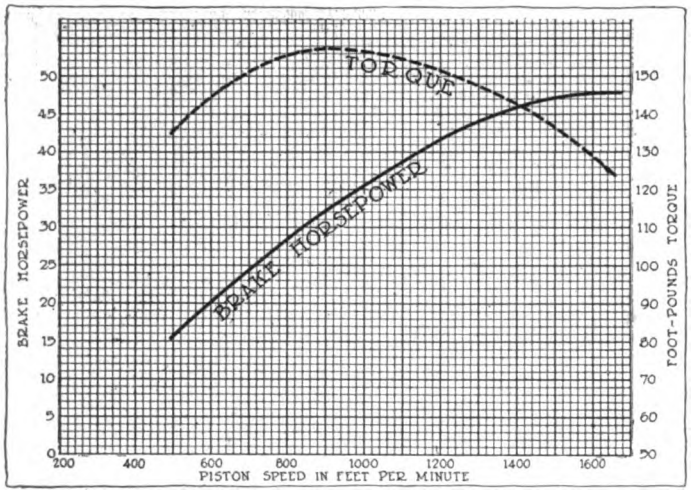
Higher maximum speed.
Lower minimum speed.
More power at all speeds.
Greater quietness.
Better gasoline economy.
Lighter weight.
Less vibration.
Better oil economy.
Smoother torque.
Cheaper construction.

These make up a fairly formidable array of problems.

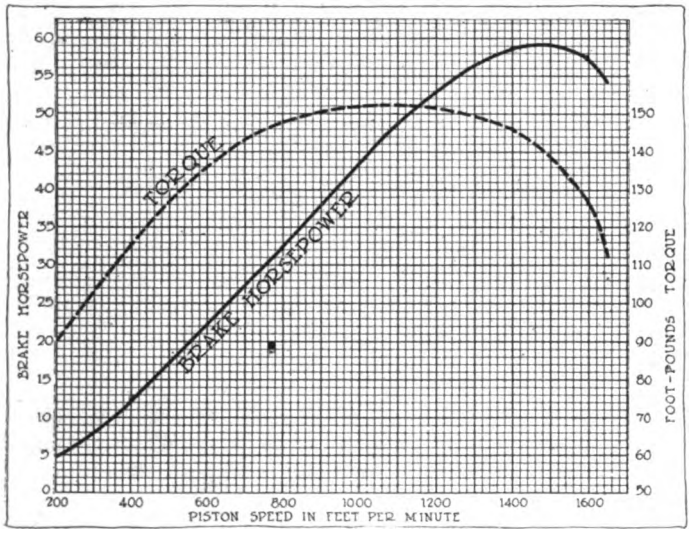
To get the nearest approach to satisfaction of all these demands there has been produced:

The eight.
The twelve.
The aluminum piston.
The aluminum cylinder.
Larger crankshafts.
Higher pressure lubrication.
Higher compression.
Larger valves.
More elaborate cams.
Simplified gas passages.
Greater rigidity.
Less machining.
New machine tools.

Much credit for the progress made belongs to [illegible] shop men, the factory superintendents and [illegible]



Power and torque curves for the Continental light six, 3½ by 5 in.



Power and torque curves for the Ferro eight, 3¼ by 4 in.

whose names never reach the automobile public. Without the able support and help of these men the automobile engineers would have been handicapped heavily, for the all important requirement of inexpensive manufacture would have been impossible to combine with better performance.

Overhead Valve Position Speculative

Before descending into detail on what has been done, there are a few trends which should be noticed. A conspicuous one is that toward the overhead valve and this is likely to persist. The old idea that an overhead valve is essentially noisy is exploded utterly, the present trouble in the main is to control the lubrication of rockers and parts above the cylinders without flooding the valves themselves.

Intimately bound up with the overhead valve is the detachable cylinder head that is returning to popularity, both for cheap motors and engines of the very highest class. Whatever the type of valve, the detachable head is a great advantage to the car owner, because it renders carbon removal and valve grinding far easier than with any one-piece L- or T-head motor. It is a manufacturing advantage with most designs, and there is now no difficulty in replacing a head so that the water and gas joints are tight. Probably less leakage occurs with the detachable cylinder head than normally is found around the valve plugs in the other type.

Given the detachable head and the necessity for valve cages disappears, and it is the cage that has been liable to give most trouble in overhead valve motors.

Cages are satisfactory if the volumetric efficiency is not very high, but as soon as pressures and temperatures rise there occurs trouble in cooling the valve cage seating and danger of cracking the cage. It is only on racing motors that valves with seats in a non-detachable cylinder head are permissible, because valve grinding under such conditions is almost a factory job, as was found by the Hispano-Suiza Co. with a model of car that cost them much trouble and distress two years ago.

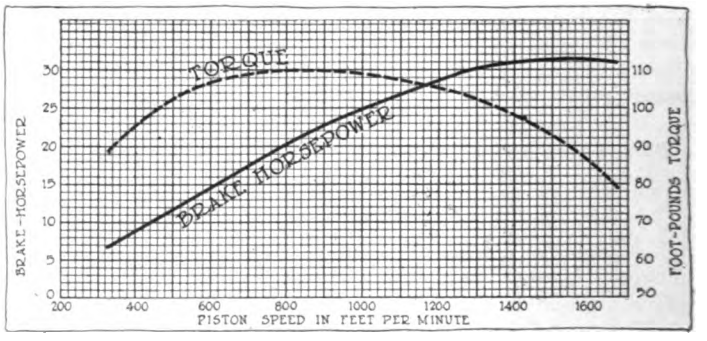
Overhead Camshaft Not Popular

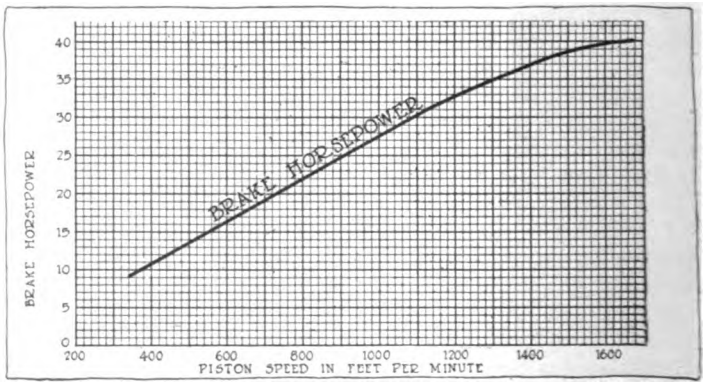
While it becomes universal for racing, the overhead camshaft is not too attractive for touring car engines, because a quiet drive is difficult of attainment and lubrication is rather complicated. With the camshaft in the usual place and long, light push rods, it is now easy to design an enclosed rocker mechanism which will be self-lubricating without a pump feed, and the final arrangement will be more accessible than any overhead camshaft job.

Of course the overhead shaft is comparatively new and development may easily show some scheme for simplification. The present situation is that the overhead valve presents no specially difficult problems, while the overhead camshaft still does. The self-lubricating bushing in which graphite is used as a part of the bearing surface has been applied successfully to the rockers of overhead valves and this needs little, if any, oil to keep it in good condition. Also there is the spherical end type of rocker like that used on the Brush engines, which contains its oil and uses all the lubricant without waste. The main reason for the overhead camshaft is to reduce to the minimum the reciprocating weight of the valve operating parts. For an engine to be used in a touring car the lightness obtainable by employment of an overhead camshaft is not *yet* necessary, wherefore it is more likely that overhead valve development will be mainly in connection with camshafts in the crankcase position.

Chain Drive Camshafts Slow

The chain-driven camshaft has not developed to the extent expected, and the reason is mainly that manufacturers have been loath to spend enough to insure good chain. Good chain is expensive to make and cannot be sold cheaply, and there are only a very few firms in the world who can make really

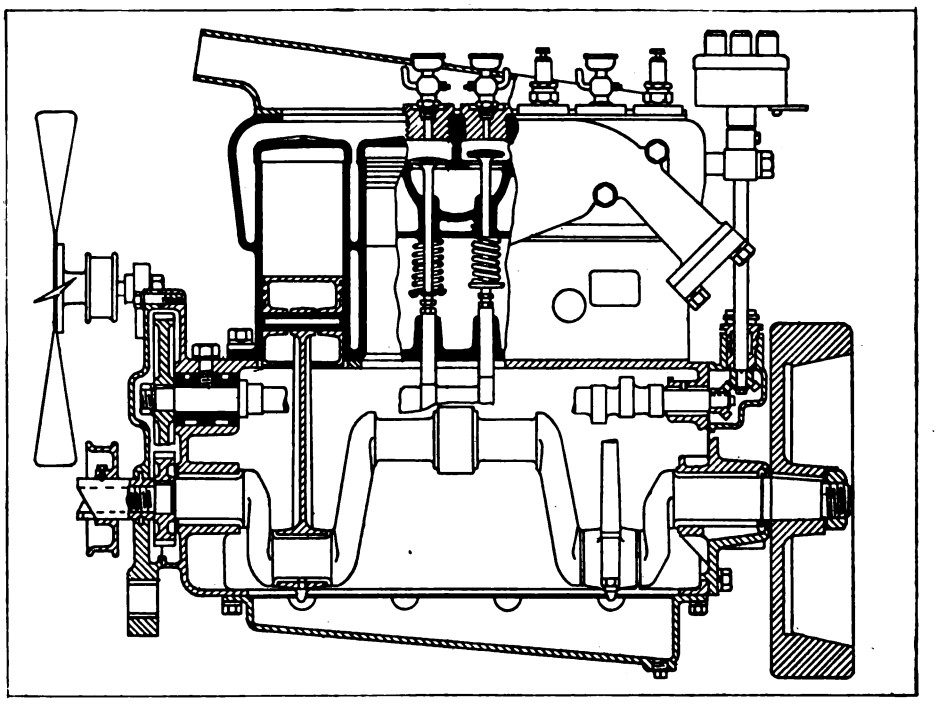




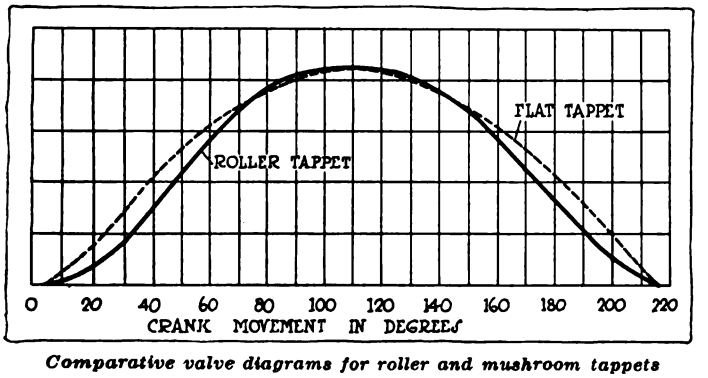
Power and torque curves for Northway four, 3½ by 5 in. and power curve for Rutenber eight size 3 by 5 in.

good chain. Also, the application of a chain drive needs expert knowledge and automobile designers have often used chain in a way that no chain maker would approve. In such cases failure is usually blamed on the chain, which is totally unjust.

On the other hand, those few people who have used chain intelligently are extremely pleased with the result, and especially comment should be made on the success of the Packard-Morse automatic adjustment. It will be remembered that the Packard twin six has a triangular chain drive and that the sprocket which drives the pump and the generator contains within it an Oldham coupling which is in permanent operation. This coupling has taper tongues and this prevents the development of slack, while spring pressure takes up what little wear may occur. The device is simple, and has proved thoroughly effective, it is an American idea used with American chain and the results are better than the average attained with imported chain which was the most reliable sort in the first attempts made by motor builders at chain layout.



The Perkins four; a well-known small engine of great simplicity and featured by the small number of parts. Several sizes are made of correspondingly clean design



Comparative valve diagrams for roller and mushroom tappets

TABLE I

Port Beneath Valve Diam.	Valve Area	Equivalent Valve Lift For— Flat	30°	45°
1	0.785	0.25	0.26	0.35
1 1/16	0.886	0.26	0.27	0.37
1 ⅛	0.994	0.28	0.29	0.39
1 3/16	1.107	0.29	0.31	0.42
1 ¼	1.227	0.31	0.32	0.44
1 5/16	1.353	0.33	0.34	0.46
1 ⅜	1.485	0.34	0.36	0.48
1 7/16	1.623	0.35	0.37	0.51
1 ½	1.767	0.37	0.39	0.53
1 9/16	1.917	0.39	0.40	0.55
1 ⅝	2.074	0.40	0.42	0.57
1 11/16	2.236	0.42	0.44	0.59
1 ¾	2.405	0.44	0.45	0.62
1 13/16	2.580	0.45	0.47	0.64
1 ⅞	2.761	0.47	0.48	0.66
1 15/16	2.948	0.48	0.50	0.68
2	3.142	0.50	0.52	0.70
2 1/16	3.338	0.51	0.53	0.73
2 ⅛	3.546	0.53	0.55	0.75
2 3/16	3.758	0.55	0.56	0.77
2 ¼	3.976	0.56	0.58	0.79
2 5/16	4.200	0.58	0.60	0.81
2 ⅜	4.430	0.59	0.61	0.84
2 7/16	4.707	0.61	0.63	0.87
2 ½	4.909	0.62	0.65	0.88

Where gears are used for camshaft driving it is often found that a chain is used for the generator shaft. That is an anomaly which cannot endure and it is reasonable to expect that the complete adoption of chain driving will follow.

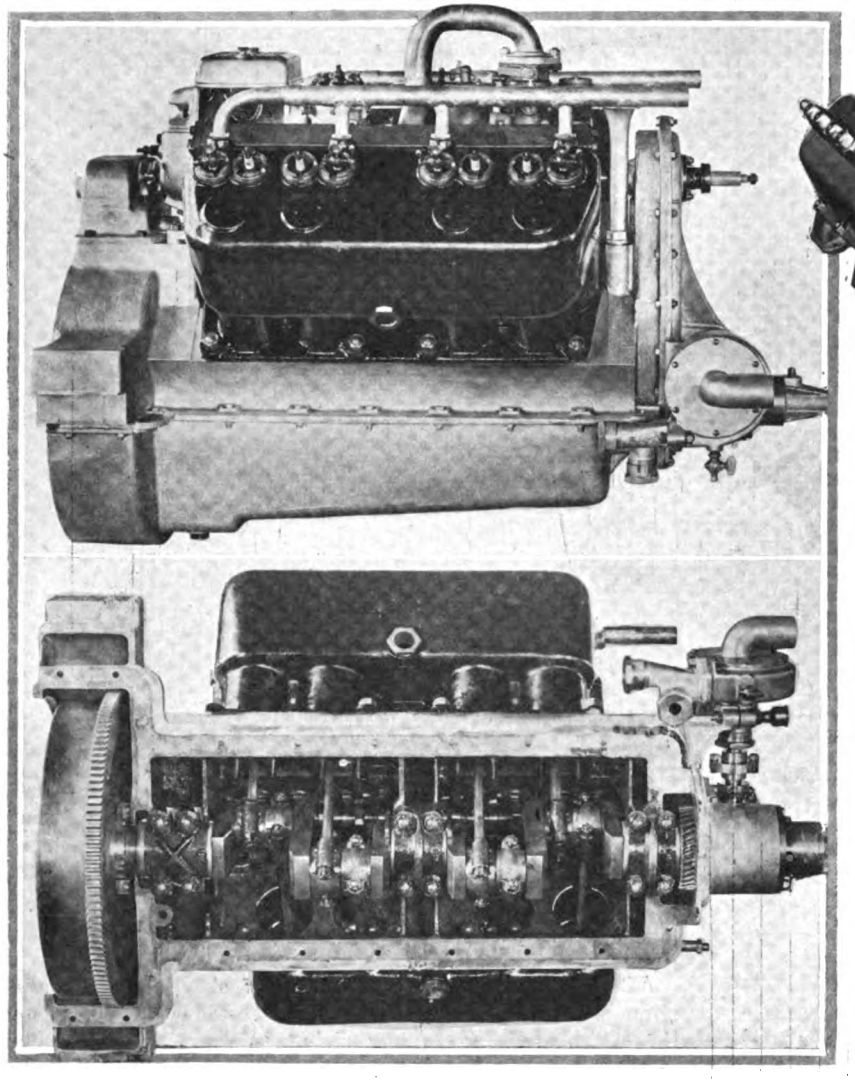
Aluminum Pistons Arrive

After years of experiment, years of skepticism, the aluminum alloy piston has been accepted and bids fair to become the standard. The rapidly rising price of aluminum has retarded this development, but despite the high price aluminum pistons are now fitted to motors on quite cheap automobiles. The aluminum piston, weight for weight and strength for strength, is the cheapest type. The light weight is necessary because of high piston speeds and it is cheaper to obtain it by using aluminum than by elaborately careful machining of iron or steel. There is less machining on an aluminum piston than on any other type, and it is easier machining too. Between die-cast and sand-cast pistons and pistons cast by a combined process part die and part sand, much argument remains which time alone will settle. It must be remembered, however, that die-casting is still in its infancy, while sand casting is not and the tendency is towards die-casting. It may prove to be but a temporary trend, but that it should so do seems improbable.

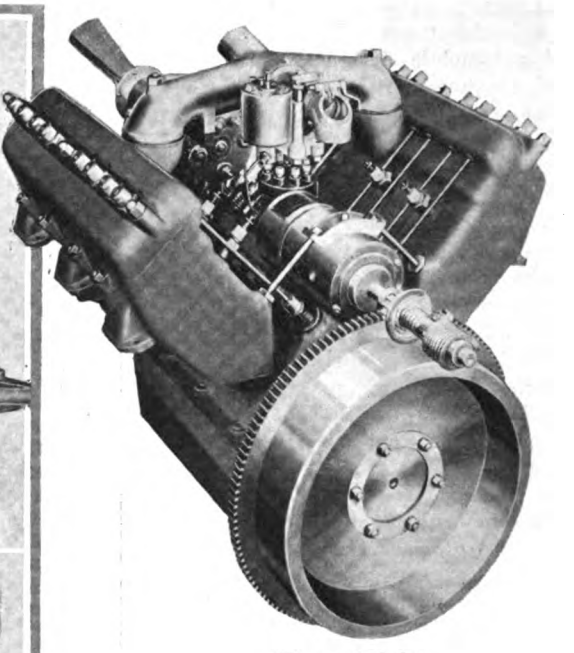
Aluminum Cylinders on Trial

In the race for lightness, the aluminum motor makes its debut as a standard product on one 1916 car alone. Naturally this is a high-priced car, for aluminum cylinders are out of reach of the cheap car maker with the metal at its present price. During 1915 something like fifty cars have been in use with aluminum cylinders, and none have given trouble on this account. Each automobile was some 80 to 120 lb. lighter on this account and so great a saving is well worth a small price increase. Development along this line depends entirely on the price of aluminum; should this fall the aluminum motor will become common very rapidly, but if it rises the day of aluminum cylinders will be postponed. At present that is all there is to be said.

A gear ratio of 4.5 to 1 on high gear means a crankshaft speed of 2000 r.p.m. at 50 m.p.h. approximately. Again

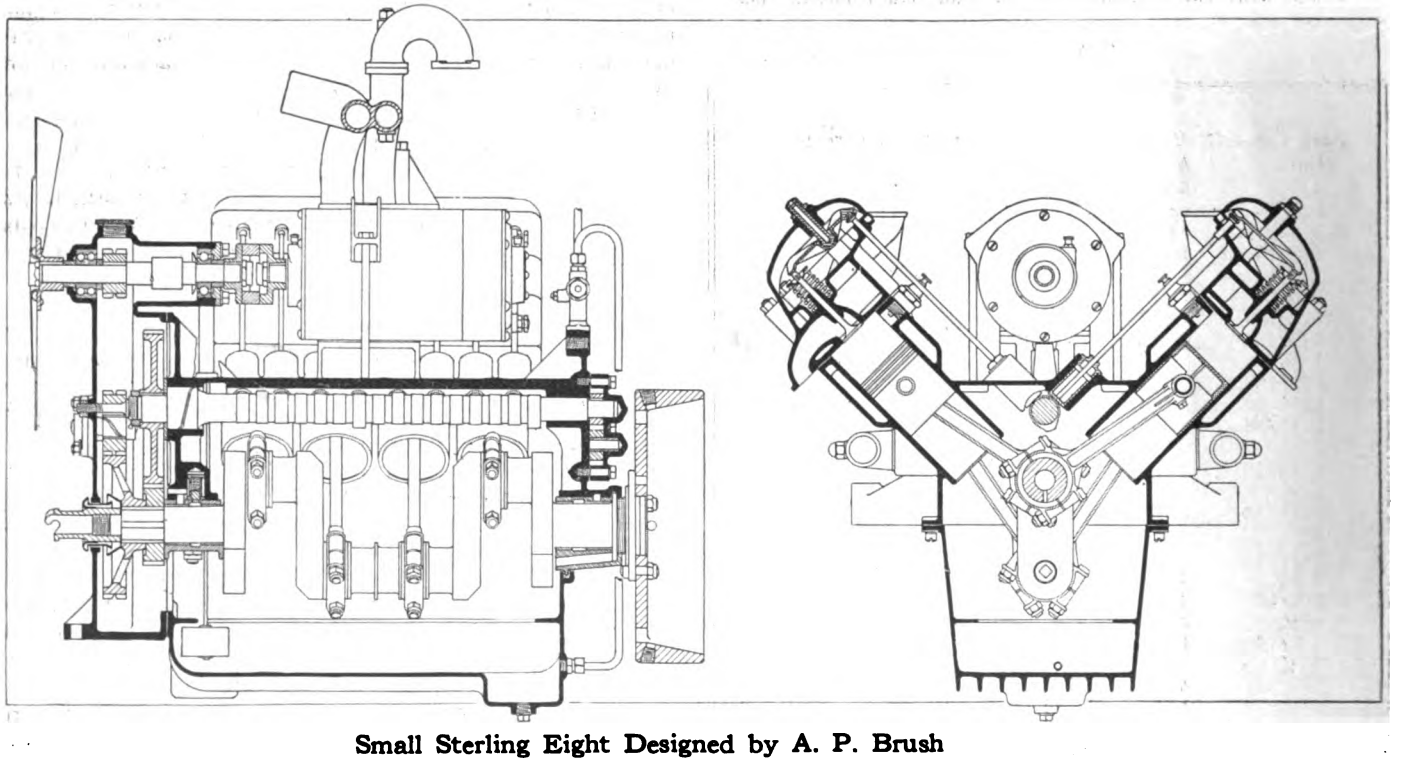


Herschell-Spillman Eight

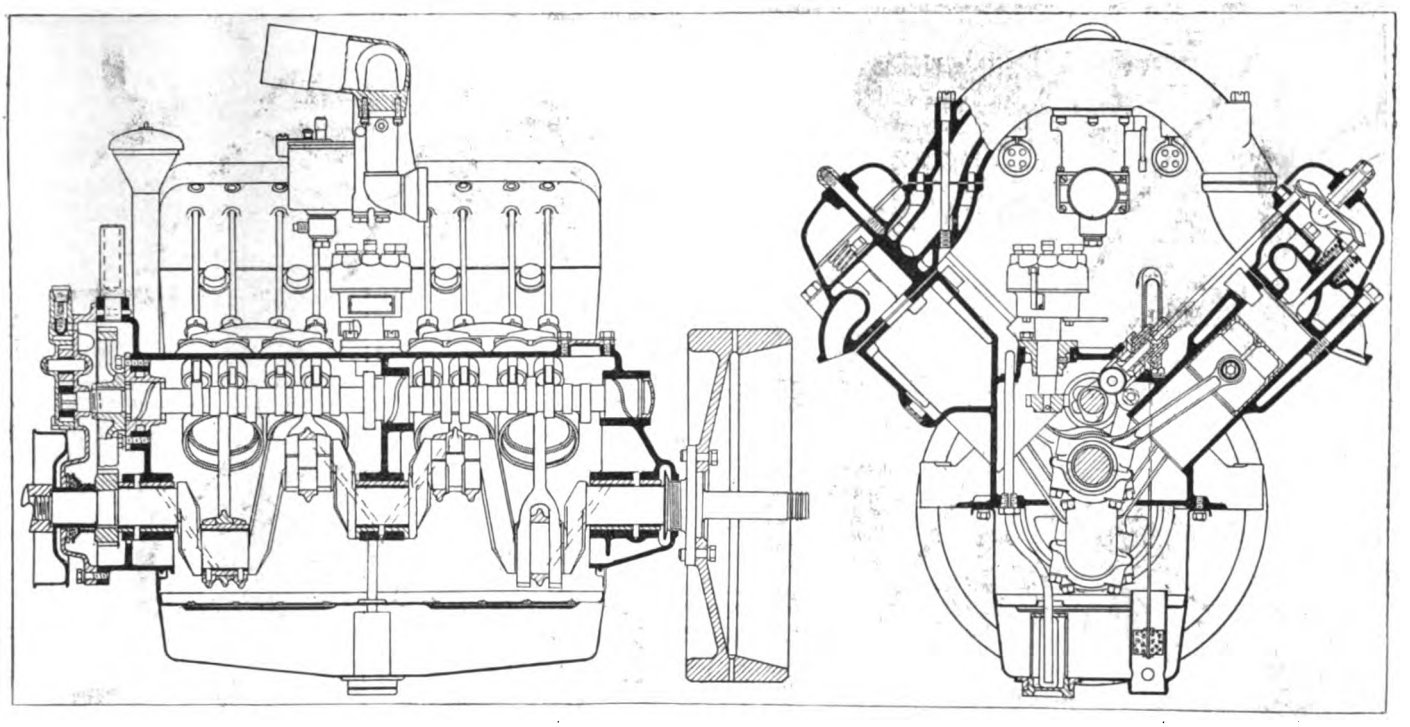


Ferro Eight

SIX DIFFERENT EXAMPLES OF V-TYPE EIGHT CYLINDER MOTORS ILLUSTRATING ALL PRINCIPLES OF DESIGN

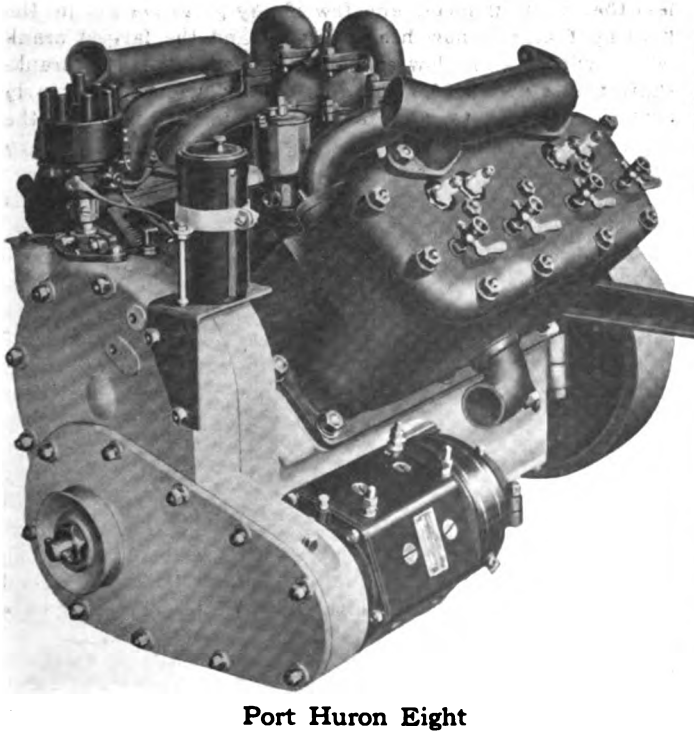


Small Sterling Eight Designed by A. P. Brush

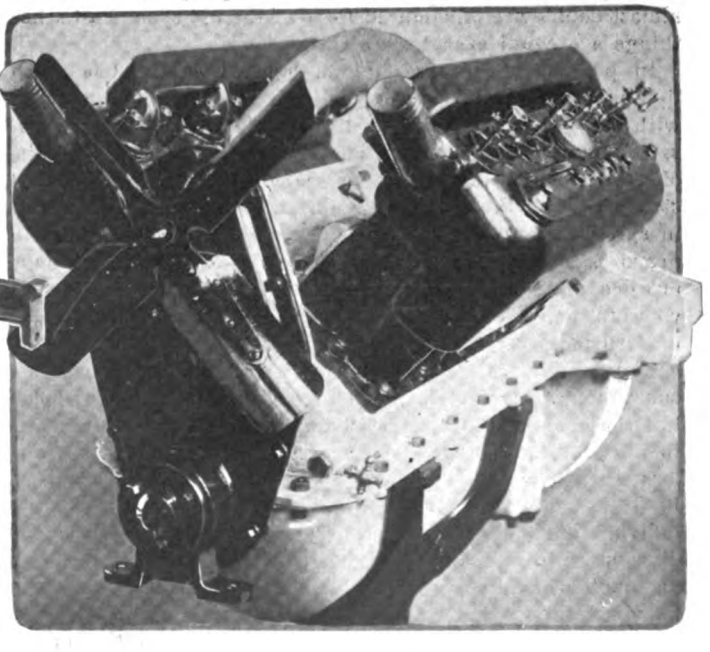


A contrast in eights is provided by a Herschell-Spillman on the left of page 824 seen from the side and from beneath, and the Ferro beside it. The former is an L head motor and has the side by side connecting rod arrangement, while the latter is provided with the most up-to-date idea in overhead valves and use the forked connecting rod system. The great rigidity of the bearing support in the Herschell-Spillman motor is observable. The bearings in this motor are finished by an unique burnishing process. Connecting-rod bearings can be taken up just as for any other type of motor. At the bottom left of this page is the Port Huron eight, which is distinctive by having the camshaft very high up. The valves are inclined at an angle of 135 degrees, which enables one cam to be used for each opposing pair of valves with straight push rods and no rockers. Detachable cylinder heads make the valve heads accessible and the wide angle brings the tappets into a position where they can be reached without as much trouble as usual in L head eights. Beside it is the Buda eight, a robust motor with all the characteristics of high quality workmanship that have given the Buda fours and sixes their reputation for long, trouble-free service.

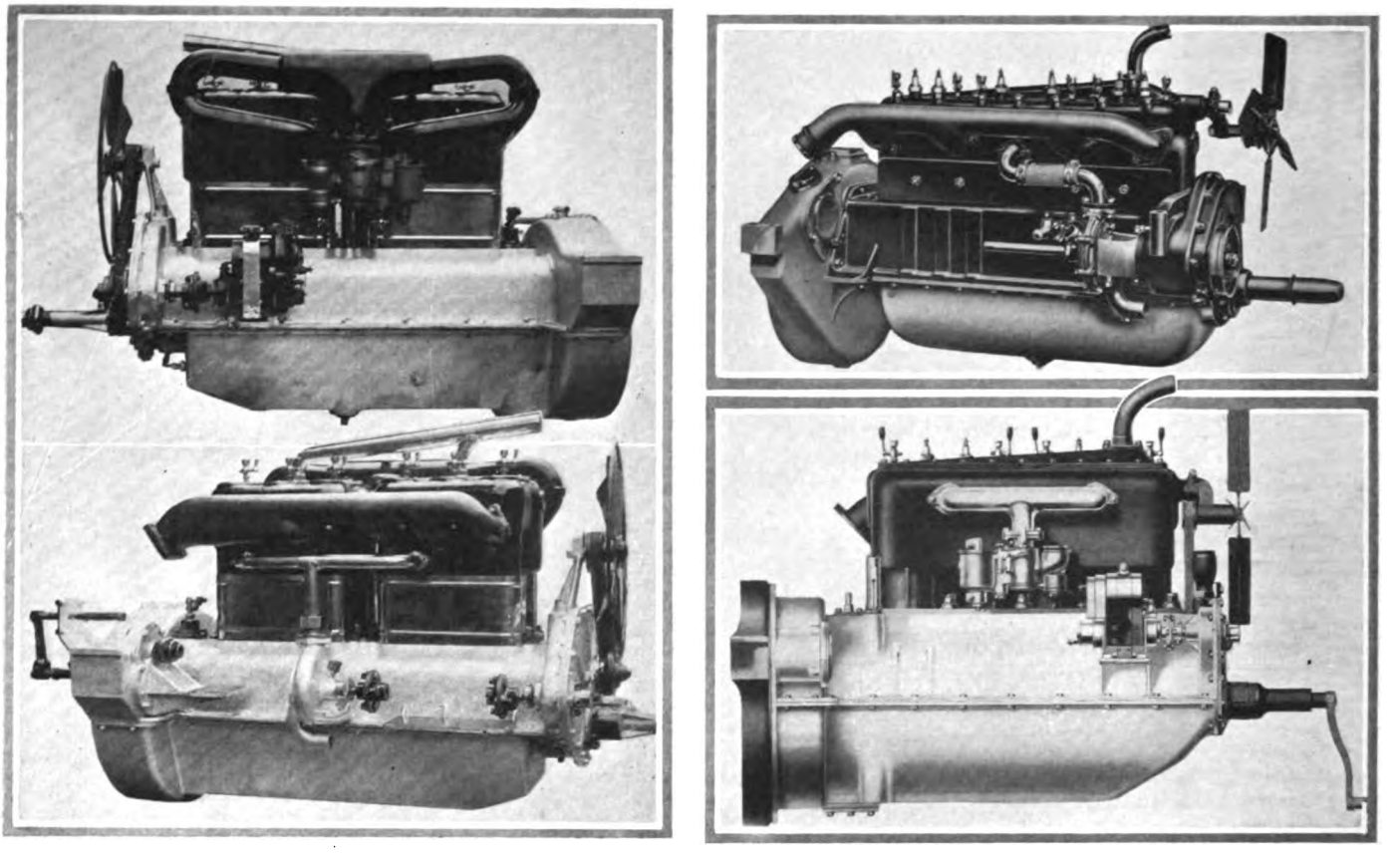
The drawings show two examples of the eights designed by A. P. Brush. That on this page is the Ferro and that on the page opposite is the Sterling. They have many points of similarity, of which the principal one is the overhead valves, the special type of rocker operation, and the casting of the two blocks of cylinders in one piece with the upper half of the crankcase. As can be seen in the cross sections, the rockers seat on ball shaped bolt heads instead of on the ordinary pin joint, and this facilitates adjustment because the bolt can be screwed down a little from outside the motor, so lowering the whole rocker and taking up any slack. Points of difference are that the Ferro, which is the larger, uses three crankshaft bearings and forked connecting rods, while the Sterling has the other kind of rod and only two crankshaft bearings



Port Huron Eight



The Buda Eight



These are three typical and different motors. On the left two views of the Herschell-Spillman six, a large and powerful T head design. The intake is a Herschell-Spillman specialty. Excellent accessibility is a conspicuous feature as can be seen by the ample space round every part. Top right is the popular Continental light six, a new motor this year. It has a one-piece cylinder block and crankcase upper half and is 3½ by 5. The oil pump is a plunger, driven off the camshaft and so very accessible, while valve accessibility is assured by the detachable cylinder head. Right lower, is quite a different sort again, being a heavy duty Wisconsin four. This is the only motor in the group with an L head cylinder and it may be seen that the carbureter and magneto are very easy of access

approximately, this gives a piston speed of 1700 ft. per minute at 50 m.p.h. or 70 per cent above the speed on which the formula horsepower is based, if we assume an engine with the extremely popular stroke of 5 in. This increases the amount of any unbalanced force, or the pressure on the bearings due to inertia of the reciprocating masses as much as 89 per cent. In other words, the high-speed engine has almost double the unbalanced force of the old type if all other things are equal except gear ratio.

In practice, of course, the high-speed engine has much lighter parts, and therefore is able to run at high speed with no greater vibratory stresses than the larger slow-speed motor, but the public have not been satisfied with the old type; so it has been necessary to reduce unbalanced stresses below the old level simultaneously with an increase in speed. Increasing the speed increases vibratory stress in proportion to the square of the speed and dimensions have not decreased in proportion to the square root of anything, wherefore much higher engineering quality is necessary in modern motors.

The weight of reciprocating masses has been reduced enormously, size for size, and pressure on bearings reduced likewise, so that the balanced and unbalanced stresses due to the reciprocating masses in a 1916 engine may easily be less than in a 1915 engine of the same piston displacement. Multiple cylinders reduce the unbalanced forces by reducing individual piston weights, and higher speed sixes have allowed dimensions to be cut and weight reduced in proportion. With any motor having more than four cylinders it has been the balanced forces that have proved most troublesome.

An automobile engine is balanced by virtue of the ability of the crankshaft to hold adjacent pistons so truly in relative positions that the unbalanced forces due to the pistons individually cancel out. As the stresses increase in proportion to the square of the speed the strength of the crankshaft has been forced up likewise, and thus we see cranks on motors of 3 in. bore now often of well over 2 in. diameter. This vibration question has destroyed any idea that may have existed as to proportion between bore, stroke and crank diameter. In practice few modern motors have crankshafts less than 2 in. diameter and few if any go above 2½ in. the limiting factor is now bearing speed and the largest crank which will keep this low enough is employed. A 2-in. crankshaft turning at 3000 r.p.m. has a bearing speed of nearly 1600 ft. per minute, and 1800 ft. per minute is above the safety limit for ordinary bearing materials and ordinary lubrication.

Though it has so far appeared on one car only, the use of the Lanchester damper for eliminating the effect of torsional vibration from crankshafts marks a stage in development, because it belongs to a class of fitting hitherto considered "uncommercial." There are now so many motors which run without perceptible vibration up to road speeds of 40 m.p.h. or over that the automobile user is going to get extremely critical. For this reason it is safe to predict that the moderately large number of coarse running, roughly made engines still manufactured are entering their last season.

Cheaper cars and better equipped cars has been the cry for many years and the leaders of industry have stood still on engineering quality. Now, engineering quality is improving rapidly in the more costly cars and the cheaper field is following fast. Nineteen hundred and sixteen has marked the beginning of a change which will take three or four years to consummate.

Valves Are Larger

In Europe two years ago, it was obvious that the stock motor makers had picked upon a valve diameter equal to half

the cylinder bore as the practical maximum, and large valves with a small lift were used generally because this combination gave the greatest opening with the least noise. To-day the best American engines have valves of just about this same proportion and it is customary to find the lift is such that the full port area is available at maximum opening. Table 1 shows the lift of valves with flat and angular seats to give maximum opening for 1 in. to 2½ in. ports.

Now, maximum lift and large diameter is not all that requires consideration for the important thing from the viewpoint of volumetric efficiency is the average valve opening during the cycle. The constant acceleration cam profile is usually considered the ideal, but it is worked to very seldom, because to form a cam of this character calls for very delicate machining and the use of grinding wheels which have a very short life. The flat sided cam gives commercially good results on moderately priced jobs, but the fact that the more elaborate profile is really much better offers a great opportunity to the ingenuity of the machine tool trade. There is a huge field for a robust cam-grinding tool which will produce small, constant acceleration cams at reasonable cost.

Quietness of valve operation has been shown to be affected greatly by the weight of the tappets, and a light tappet enables a lighter valve spring to be used. Everything which will reduce the inertia of the valve, tappet and valve spring is desirable. It is the search for quietness that has caused the roller ended tappet to gain in favor, for a slightly better diagram is obtainable with the mushroom type, when a flat side cam is used. Curves on page 823 show characteristic diagrams for cams of different forms with differing tappets.

It must be remembered, however, that the diagram obtained at high speed may differ greatly from the theoretical, as the tappet has a tendency to "float" and actually does so as a rule at speeds exceeding 1500 r.p.m. In this connection it is claimed that there is advantage in using two light springs instead of a single heavy one, the theory being that all springs have a certain amount of hysterisis and that this is lower in the case of two small concentric springs than in one large spring of heavier section. This is by the way, however, as there is no stock motor yet in which two springs are used on each valve.

Lubrication a Difficulty

With the coming of higher piston speeds lubrication has become troublesome. Particularly in engines with many small cylinders, where the total piston periphery is large in proportion to the piston displacement, there has been a tendency for water to deposit in the crankcase and this has given great distress to several manufacturers. The reason is that the loose pistons deemed necessary for high speeds have allowed products of combustion to pass freely at low speeds, and the water from these products has condensed. Hence the efforts of V motor makers have been rather to insure the presence of plenty of oil in the cylinders than otherwise. The trouble is new this year, and is serious, because the water has a terribly destructive effect.

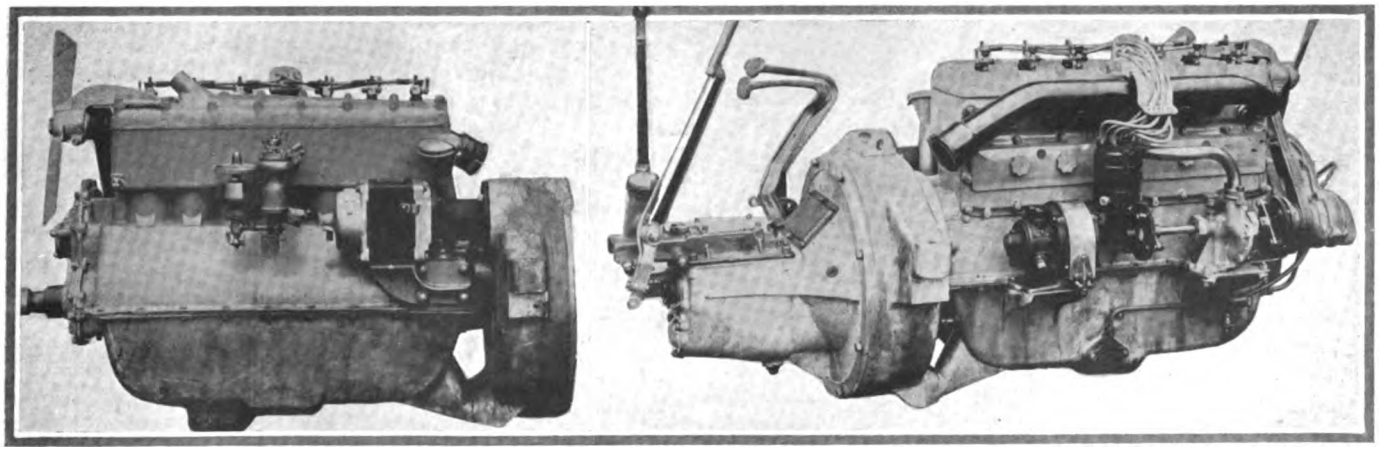
To overcome it, for it has been overcome, pistons have been tightened a little and bottom rings or V shaped "lifting" grooves have been put in the piston skirt. None the less the user of a new car may find it worth while to change the oil a little more often than he had to do with older cars.

The most striking development of lubrication has been the coming of the pressure system. This has gained steadily for years, but has been regarded as complicated for some mysterious reason. A splash system needs a pump to maintain constant level, crankshaft bearings will wear longer in proportion to the pressure of the oil entering them, to join the pump to the bearings by direct pipes is *simpler* and just as cheap as to make gutters and pockets to catch splashed oil. Hence to call pressure feed to the main bearings complicated is absurd.

Then for the crankpins, what could be simpler than a drilled crankshaft? It costs more than the dip troughs, but a hole through a shaft is less complicated than a system of troughs and feed pipes and guides and splashers. Say that the pressure system is more expensive, and the case is unarguable, but the extra cost is not great and the extra life of bearings, in a high-speed engine, is very great. Any engine that has a good bearing life with splash oiling will have a longer life with pressure oil. This being realized by the engineering leaders of design, we see many more motors appearing with the best system.

A drawback to high-pressure oil which caused much trouble in European development was that there exudes from the ends of the crankshaft bearings a whirl of oil spray which has a tendency to soak the cylinders. Fortunately for the American engineers, the aluminum alloy piston can be made of greater length than the European practice without increased weight and this, together with improved means for scraping the walls, has enabled oil pressures up to 50 lb. per square inch to be used without the production of smoke.

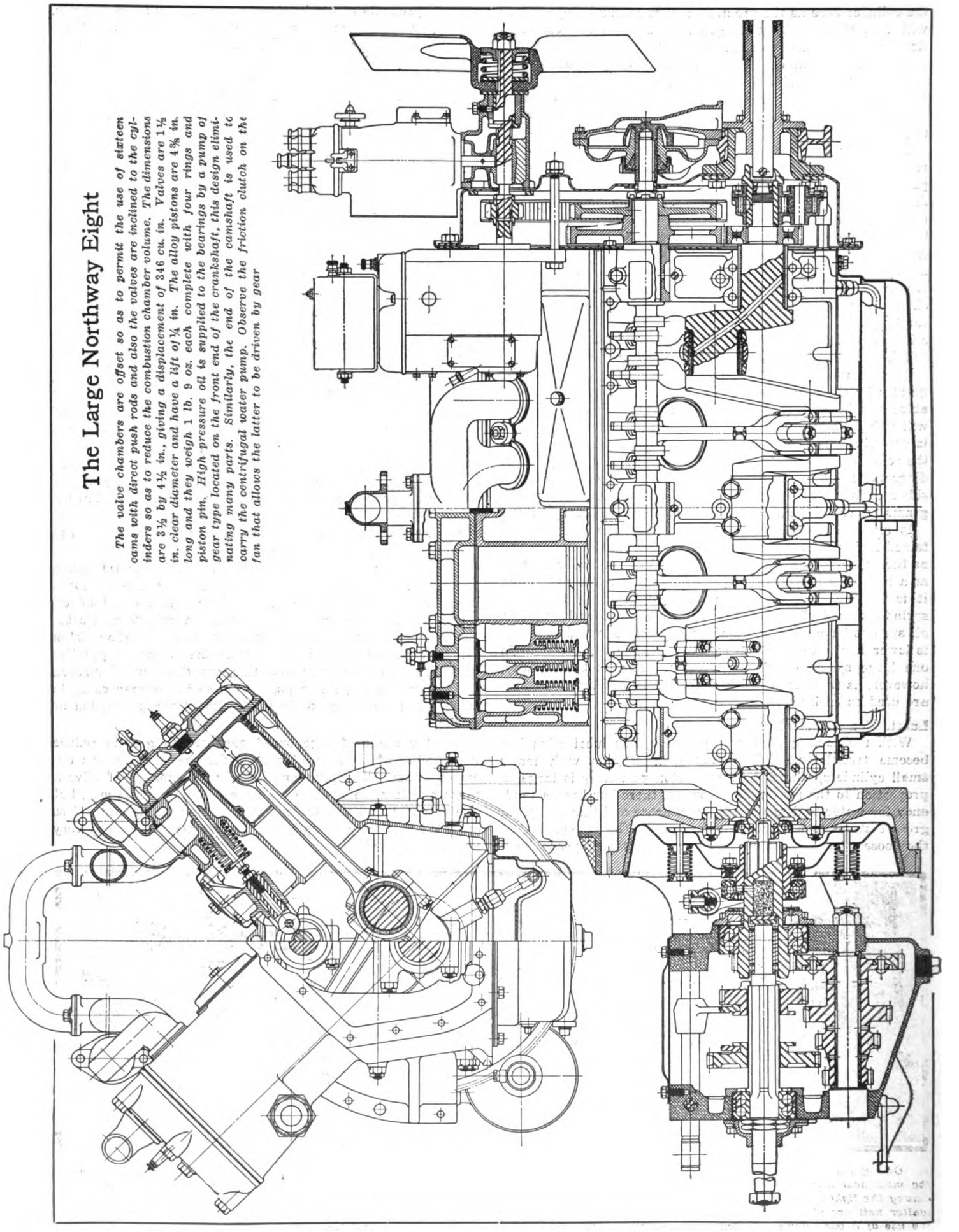
Another effect of high speed has been to greatly reduce the number of plunger oil pumps, for the gear pattern operates better. The plunger pump has a number of advantages and is more positive than the gear at slow speeds, but like valves, it is liable to float at high revolutions and unless operated positively in both directions when it becomes very expensive indeed.

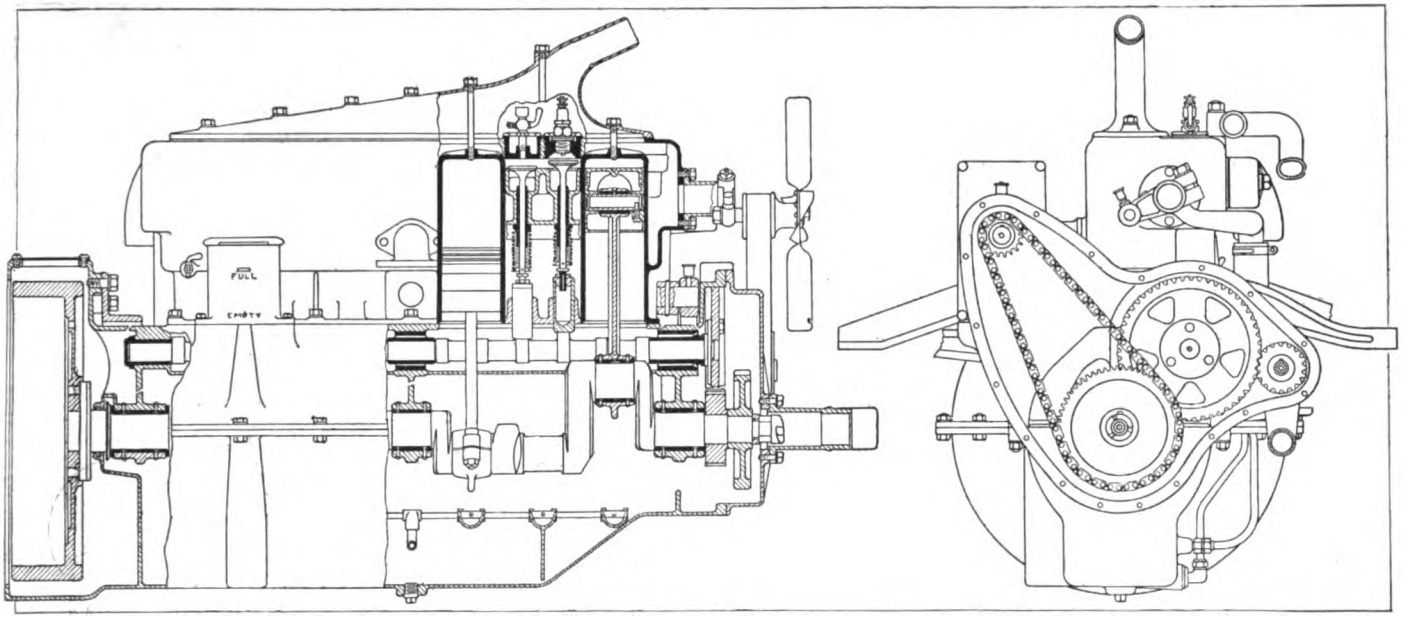


One of the most popular of the light sixes, and one of the most successful, the Rutenber 3 by 5-in. motor. This engine is one of the most neat and clean examples of the one-piece cylinder block and crankcase variety, and has the extra credit of being a pioneer among the light sixes of the year. All the intake manifolding is done within the casting, and the water pump with the generator and igniter unit are placed low enough to render tappet adjustment easy without removing more than the cover plate. A peculiarity is the use of a vane pump situated on the extreme front end of the cam-shaft for oil circulation, this also being very accessible

The Large Northway Eight

The valve chambers are offset so as to permit the use of sixteen cams with direct push rods and also the valves are inclined to the cylinders so as to reduce the combustion chamber volume. The dimensions are 3½ by 4½ in., giving a displacement of 346 cu. in. Valves are 1½ in. clear diameter and have a lift of ¼ in. The alloy pistons are 4⅝ in. long and they weigh 1 lb. 9 oz. each complete with four rings and piston pin. High pressure oil is supplied to the bearings by a pump of gear type located on the front end of the crankshaft, this design eliminating many parts. Similarly, the end of the camshaft is used to carry the centrifugal water pump. Observe the friction clutch on the fan that allows the latter to be driven by gear





A typical example of modern high-efficiency six-cylinder design is the Model motor made by the Pittsburgh Model Engine Co. The dimensions are 3 by 5 in., giving a piston displacement of 212 cu. in. The pistons are light iron castings and the crankshaft 1¾ in. diameter with three bearings. It will be noticed that the piston pin is fixed to the piston, a practice that is gaining favor. The valves are 1⅝ in. diameter with ¼ in. lift and the tappets are of light, hollow section with flat heads. In the front end gears are used for the camshaft drive and an adjustable chain for the generator drive

It is good to see that a few pioneers are taking up the matter of controlled oil supply and varying the pressure to the speed, or to the effort of the motor. This is absolutely rational as it saves oil and maintains the oil pressure in proportion to bearing load.

Stock Motor Lubrication

In stock motors, such as are most commonly used in cars built on the assembly system, the lubrication is almost universally by dip troughs in combination with separate leads to the main crankshaft bearings. A few motors have drilled crankshafts, but they are rare and not used on many cars. At one time a very popular stock motor system was to feed the dip troughs from an oil tank by an automatic "vacuum" air entering through a hole in the bottom of the tank when the level in the crankcase fell far enough and allowing a few drops of oil to escape. This was a fairly good system and did away with the pump, but it is not so accurate as pump filling for the troughs and is seldom used to-day.

With very few exceptions, where plunger pumps are employed, they are driven from an extra cam on the camshaft, the plunger being lifted by the cam and depressed on the suction stroke by a spring. Where there is a gear pump it is most often located in the crankcase and driven by a special vertical shaft off the camshaft. Of course the plunger is cheaper and it is just as good for speeds up to 1800 r.p.m. or a little over. It also has the advantage that it is easily accessible for cleaning.

In all motors almost, whether stock or special, there is room for improvement in the means provided for removing the filtering screen, but it is noteworthy that the 1916 stock motors are generally better provided with screening gauzes. Higher crankshaft speeds call for more perfect oil, as well as for better distribution of that oil.

Lubrication of Eights

When the Cadillac eight made its first appearance on the drafting board it was already the intention to make it a high-efficiency motor, to use high-working pressures and high-bearing pressures. Thus it was designed with a full pressure lubrication system as had been common on high-class fours and sixes abroad.

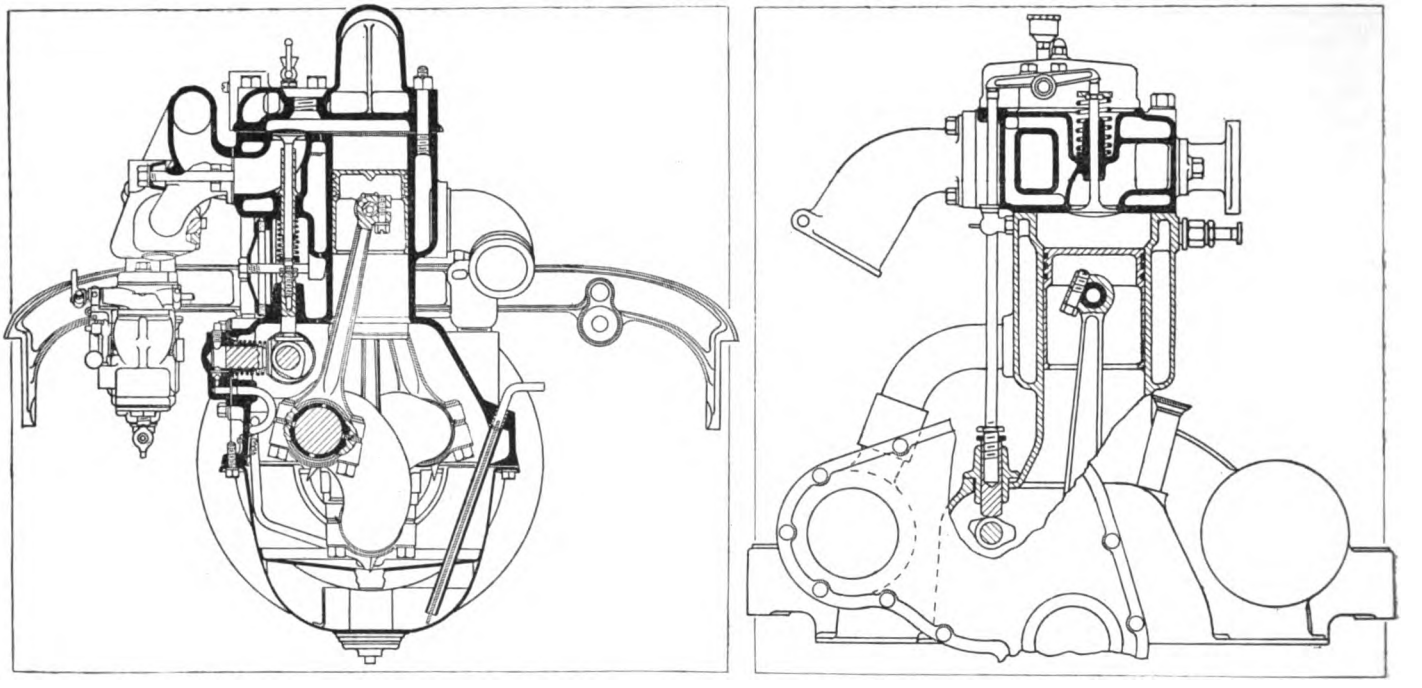
As the other eights appeared the desire to make them highly efficient as well as novel, persisted, so other designers and engineers turned to the pressure system, naturally. There then arose an impression that the eight *had* to have a pressure oiling system, for some mysterious reason, though this is not necessarily true. The fact is that to drill the simple four-cylinder crankshaft for internal oiling is much less expensive than to perform the same operation for a six, so the better system could be used without extravagance. Also the lower end bearings of the connecting-rods of the various patterns were all experimental to some extent, and the manufacturers felt safer with oiling that could not fail. Experience suggests that, if the maximum speed is not too high, trough oiling is quite practical for eights or even twelves. There has been remarkably little trouble with V-motors due to one set of cylinders getting more oil than the opposite set, as was anticipated at first, and it is quite possible that the absence of dip troughs has helped in this respect.

Effect of Eight on Other Types

This year has seen almost every engineer more interested in the V-motor than in anything else, so we often find that a big motor manufacturer has made his eight the principal new model, embodying most improvements, and has left the remainder of his product fairly well alone. The high pressures of the new eights have not caused trouble, the lubrication systems have worked out well and so on; wherefore it is to be expected that next year will show us various high-pressure, high-efficiency sixes and fours in which the experience gained with the eight will show up.

The tendency in this direction is shown by the various light sixes, which are designed to run up to speeds of 2000 to 2500 r.p.m. and are proving not only lighter, but actually more powerful than the older, larger motors. The light six stock motor is now to be found in the range of almost every manufacturer. Usually it is also an inexpensive engine, so in making it a great many desirable things have been combined.

Fours are so often made solely for cheapness that the efficiency enthusiasm has not yet put its mark upon stock motors of this number of cylinders. Here and there new designs have valves made larger, bearings bigger and everything stiffer, to permit increased revolutions, but the movement which is well advanced in the eights and is started and on



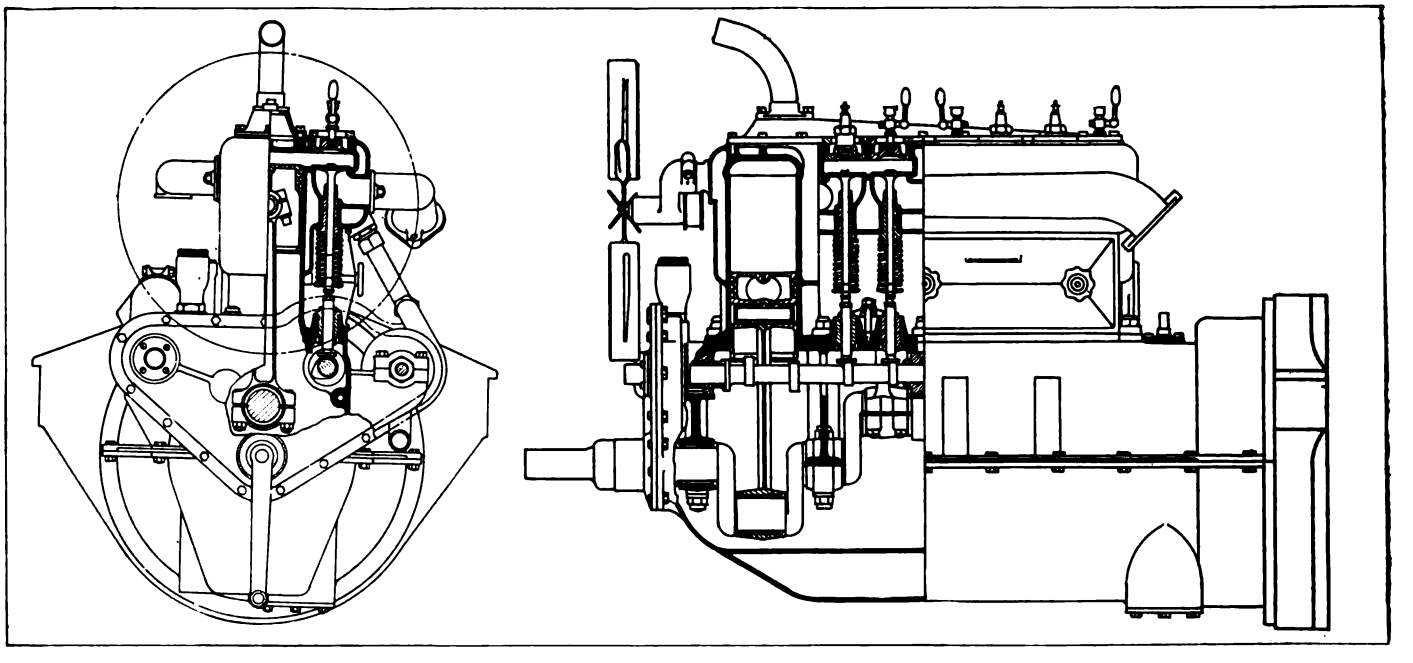
Left—One of the smallest and most widely used sixes is the Continental power plant of the little Saxon car. Note that the oil pump is operated off one of the exhaust cams and that there is a detachable cylinder head. Large waterways and free gas passages are also characteristics. Right—Section through the cylinder head and valve gear of a Falls motor cut through one of the exhaust valves. This section is instructive because it shows the way the intake manifold is carried through the water jacket on the head block, this being the inner rectangular black section just to the left of the valve

its way with the sixes is only to be observed in the stock fours by very close observation.

Water-Cooling Innovations

For circulating cooling water the centrifugal pump still is king. Thermo-syphon cooling gains slowly, but it does seem to be specially applicable to V-engines, because the low altitude of the latter allows a good head of water in the radiator and a good head is the life and soul of a successful syphon system of circulation. The thermostat, for controlling the flow of water in the circuit, has been perfectly satisfactory, but so also have systems without a thermostat. Probably the most correct view would be to say that the thermostat is a refinement which aids carburetion, especially in cold weather, but is an item of cost the moderate-priced car can afford to do without.

The most striking thing about water systems is not to be observed from outside a motor and seldom to be appreciated from sectional drawings, as it is the increased amount of water space allowed around the valve ports and pockets. In raising the efficiency of an engine the valves soon suffer if they are not well cooled, and also, which is more important to the average owner, if the valves are overheated and their accuracy of closing injured, slow running becomes uncertain.



Though primarily a heavy duty motor this example of Wisconsin manufacture is typical in outline. The four crankshaft bearings are a peculiarity which is favored by the Wisconsin engineers and give an exceptionally firm support for a four-cylinder crankshaft. The crankcase is all aluminum and lubrication is by pressure. Notice the very large water spaces behind the valve pockets, between the valves and the cylinders, also the light mushroom headed tappets. Slender valves are also a striking characteristic of this engine

It has been remarked that carbureter makers are being called upon to supply instruments which will give gas at very low speeds, and to do this a steady suction is imperative. If the valves are not functioning perfectly the suction will vary and the carburetion be upset. Hence, it is rendered doubly important that the valves should be in the best possible condition all the time.

Materials of Construction

The materials used for engine parts have undergone some change but not a great deal. The rising price of aluminum has rather encouraged the use of iron for the upper half of the crankcase, as instanced by several of the light sixes, and the popularity of the detachable head has helped this system of construction because it simplifies the foundry work. Casting an L-head motor with crankcase and cylinders in one with a fixed head is difficult because the cores become rather complex, but with the loose head the casting is easier than for an L-head cylinder block without the crankcase portion.

Probably, when the price of aluminum falls again, it will find the readiest application to cylinder casting by straight replacement of the all-iron designs, as the casting advantage is more than ever valuable with the lighter metal.

Steel as used for crankshafts is usually of about the same strength and character as that employed last year, as the upward trend in size of shaft enables more than enough strength to be obtained without the use of very high tensile material.

For valves tungsten steel would have been the rule, had the supply of the tungsten ore not been almost cut off by the war. Cast-iron heads welded to steel stems are still fairly popular, but are giving way slowly before the improved valve steels which mostly have tungsten as an element. The valve steel which gives best service in a high duty motor has some resemblance to the high speed steels that are most durable for cutting tools on high-speed machines.

Piston Valve Motor Provides Compressed Air

A NEW engine which has several features of interest including a device for air braking has been recently patented by E. U. Stewart of Long Beach, Cal. The motor is shown in section below. The primary object of the motor is to eliminate the poppet valve and to secure more even compression at all times by using piston valves instead. It is also hoped by the use of the piston valve to increase the efficiency of the motor without the addition of weight.

One of the purposes of the piston valves which are clearly shown in the illustration is that in making their working strokes they will pump air on the descending stroke and on the ascending stroke they will force the air into a storage tank attached to the motor. The general purpose of this air is to be used for air brakes, it being one of the inventor's ideas that it would not be necessary to use the foot or hand brake on long descents.

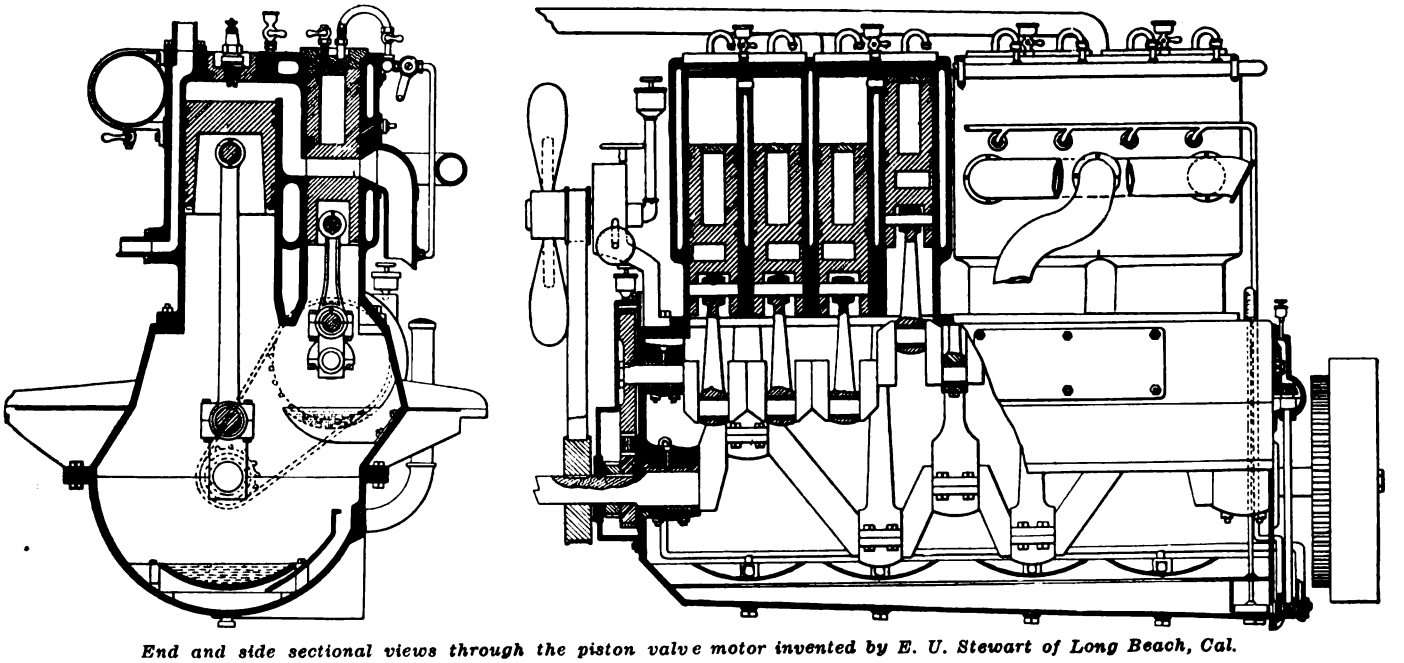
The air is also used for starting the motor, inflating tires, cleaning and dusting the car, raising an air jack, producing air for the carbureter and any other purposes for which compressed air in a clean, pure condition may be employed. The over-production of air passes through the exhaust to keep it clean.

In general, the motor is a four-cycle design which other than the valve mechanism does not vary materially from common practice, the oiling system is splash and force feed with rocking oil pockets. As may be noted from the illustration the piston valves are driven by a short throw crank and connecting-rod from an auxiliary shaft which could be driven by silent chain from the crankshaft. The inventor believes that by careful carrying out of the details of this design no material weight will be added while the advantages of the compressed air and piston valves will be obtained.

Design Has Possibilities

The novel idea in this motor is, of course, the suggestion that the piston valves should be used as air compressing pumps, and it is conceivable that on this account the engine might find some special sphere of usefulness. It would, like all piston valve motors, be rather expensive to make, and it would not be easy to get very large port openings.

For very large, heavy motors such as can be used for fire department vehicles or for boats would appear to be the most promising field of application at the moment, and the idea seems to have merit enough to warrant further investigation and experiment. It will be interesting to see if the motor succeeds in reaching the practical stage.



End and side sectional views through the piston valve motor invented by E. U. Stewart of Long Beach, Cal.

Piston Displacement of Twelve-Cylinder Engines in Cubic Inches

Stroke—Inches	Bore—Inches																											
	2½	2 5/16	2⅜	2 7/16	2½	2 9/16	2⅝	2 11/16	2¾	2 13/16	2⅞	2 15/16	3	3 1/16	3⅛	3 3/16	3¼	3 5/16	3⅜	3 7/16	3½	3 9/16	3⅝	3 11/16	3¾	3 13/16	3⅞	3 15/16
2½	107.3	113.4	119.2	127.0	132.5	139.2	146.1	153.1	160.3	167.7	175.3	183.0																
2⅝	113.3	119.7	125.6	134.1	140.0	147.0	154.2	161.6	169.3	177.1	185.0	193.1																
2¾	119.3	126.0	132.1	141.2	147.2	154.7	162.3	170.2	178.2	186.4	194.8	203.3																
2⅞	125.2	132.3	138.5	148.2	154.6	162.4	170.4	178.7	187.1	195.7	204.5	213.5																
3	131.2	138.6	145.0	155.3	162.0	170.2	178.6	187.2	196.0	205.0	214.2	223.6																
3⅛	137.2	144.9	151.4	162.3	169.3	177.9	186.7	195.7	205.0	214.3	223.9	233.8																
3¼	143.1	151.2	157.9	169.4	176.7	185.6	194.8	204.2	213.8	223.7	233.7	243.9	254.4	275.2														
3⅜	149.1	157.5	164.3	176.5	184.1	193.4	202.9	212.7	222.7	233.0	243.4	254.1	275.0	276.2	287.6	299.2												
3½	155.1	163.8	170.7	183.5	191.4	201.1	211.0	221.2	231.6	242.3	253.2	264.3	275.6	287.2	299.2	311.2	323.6	336.0										
3⅝	161.0	170.1	177.2	190.6	198.8	208.8	219.1	229.7	240.5	251.6	262.9	274.5	286.2	298.4	310.6	323.2	336.0	349.0	362.4	375.8								
3¾	167.0	176.4	183.6	197.6	206.2	216.6	227.2	238.2	249.4	261.0	272.7	284.6	296.8	309.4	322.2	335.2	348.4	362.0	375.8	389.8	404.0	418.6						
3⅞	173.0	182.7	190.1	204.7	213.5	224.3	235.3	246.7	258.3	270.3	282.4	294.8	307.4	320.4	333.6	347.2	360.8	374.8	389.2	403.8	418.6	433.6	449.0	464.6				
3 15/16	178.9	189.0	196.5	211.7	220.8	222.0	243.4	255.2	267.3	279.6	292.1	304.9	318.0	331.4	345.2	359.0	373.4	387.8	402.6	417.6	433.0	448.6	464.4	480.6	497.0	513.8		
4	184.9	195.3	203.0	218.8	228.2	239.8	251.6	263.7	276.2	288.9	301.9	315.1	328.6	342.6	356.6	371.0	385.8	400.8	416.0	431.6	447.4	463.6	480.8	496.6	513.6	530.8	548.4	566.2
4⅛	190.8	201.6	209.4	225.9	235.6	247.5	259.7	272.2	285.1	298.2	311.6	325.2	339.2	353.6	368.2	383.0	398.2	413.6	429.4	445.4	461.8	478.4	495.4	512.6	530.2	548.0	566.0	584.4
4¼	196.8	207.9	215.9	232.9	243.0	255.3	267.8	280.7	294.0	307.6	321.3	335.4	349.8	364.6	379.6	395.0	410.6	426.6	442.8	459.4	476.2	493.4	510.8	528.6	546.8	565.0	583.8	602.8
4⅜	202.7	214.2	222.3	239.9	250.3	263.0	275.9	289.3	303.0	316.9	331.0	345.6	360.4	375.6	391.2	407.7	423.0	439.6	456.2	473.4	490.6	508.4	524.0	544.6	563.2	582.2	601.4	621.0
4½	208.7	220.5	228.7	247.0	257.7	270.7	284.0	297.8	311.8	326.2	340.8	355.8	371.0	386.8	402.6	419.0	435.6	452.4	469.6	487.2	505.2	523.4	541.8	560.6	579.8	599.4	619.2	639.2
4⅝	214.7	226.8	235.2	254.1	265.0	278.5	292.1	306.3	320.7	335.6	350.5	365.9	381.6	397.8	414.2	431.0	448.0	465.4	483.0	501.2	519.6	538.2	557.4	576.6	596.4	616.4	636.8	657.6
4¾	220.6	233.1	241.6	261.2	272.4	286.2	300.2	314.8	329.6	344.9	360.3	376.1	392.2	408.8	425.6	442.8	460.4	478.2	496.6	515.0	534.0	553.2	572.8	592.8	613.0	633.6	654.6	675.8
4⅞	226.6	239.4	248.1	268.2	279.8	293.9	308.3	323.2	338.5	354.2	370.0	386.3	402.8	419.8	437.2	454.8	472.8	491.2	510.0	529.0	548.4	568.2	588.2	608.8	629.6	650.8	672.2	694.0
4 15/16	232.6	245.7	254.5	275.3	287.1	301.7	316.5	331.8	347.4	363.5	379.8	396.4	413.4	431.0	448.6	466.8	485.4	504.2	523.4	543.0	562.8	583.2	603.8	624.8	646.2	667.8	690.0	712.4
5	238.5	252.0	260.9	282.3	294.5	309.4	324.6	340.3	356.3	372.8	389.5	406.6	424.2	442.0	460.2	478.8	497.8	517.0	536.8	556.8	577.2	598.0	619.2	640.8	662.6	685.0	707.6	730.6
5⅛	244.5	258.3	267.4	289.4	301.8	317.1	332.7	348.8	365.2	382.2	399.2	416.8	434.8	453.0	471.8	490.8	510.2	530.0	550.2	570.8	591.8	631.0	634.8	656.8	679.2	702.0	725.2	748.8
5¼	245.5	264.6	273.8	296.4	309.2	324.9	340.8	357.3	374.2	391.5	408.9	426.9	445.4	464.0	483.2	502.8	522.6	543.0	563.6	584.6	606.2	628.0	650.2	672.8	695.8	719.2	743.0	767.2
5⅜		270.9	280.3	303.5	316.6	332.6	348.9	365.8	383.1	400.8	418.7	437.1	456.0	475.2	494.8	514.6	535.0	555.8	577.0	598.6	620.6	643.0	665.6	688.8	712.4	736.4	760.6	785.4
5½		277.2	286.7	310.6	333.9	340.3	357.0	374.3	392.0	410.2	428.4	447.3	466.6	486.2	506.2	526.6	547.6	568.8	590.4	612.6	635.0	657.8	681.2	704.8	729.0	753.4	778.4	803.6
5⅝													477.2	497.2	517.8	538.6	560.0	581.8	603.8	626.4	649.4	672.8	696.6	720.8	745.6	770.6	796.0	822.0
5¾													487.2	508.2	529.2	550.6	572.4	594.6	617.2	640.4	663.8	687.8	712.2	736.8	762.0	787.6	813.8	840.2
5⅞													498.4	519.4	540.8	562.6	584.8	607.6	630.8	654.2	678.2	702.8	727.6	753.0	778.6	804.8	831.4	858.4
6													509.0	530.4	552.2	574.6	597.2	620.4	644.2	668.2	692.8	717.6	743.0	769.0	795.2	822.0	849.2	876.8

The FORVM

HOTCHKISS DRIVE ADVOCATED FOR HEAVIEST CLASS OF TRUCKS —EFFECT OF CONDUCTIVITY OF PISTON IN COOLING DISCUSSED

Hotchkiss Drive for Trucks

By A. M. Laycock
Chief Engineer Sheldon Axle & Spring Co.

EDITOR THE AUTOMOBILE:—At the present time, when live axles are being used so extensively for heavy motor vehicles, there is no more debatable point than the question of driving through the springs as against the use of radius rods and torsion members. Driving through the springs has been very successfully used in the pleasure car field for a good many years, particularly in racing cars, but in this discussion I would much prefer to confine my remarks to its application to worm gear design as applied on very heavy motor truck construction.

On the 1000-lb., 1500-lb., 1-ton and 2-ton sizes, it is generally conceded that this form of drive cannot be improved upon, but there is quite a little misunderstanding in regard to its application to 3-ton and 5-ton chassis and upwards. In the writer's estimation on the 3-ton and 5-ton class the forces acting on the spring eye are very much less in proportion than on the lighter vehicles, the speed factor being the important item.

In England, in the early days of the automobile, it was thought impossible to operate successfully any worm gear axle without the parallel radius rods and cantilever spring suspension as brought out by Lanchester on his first model, Lanchester at that time claiming that to work worm gears successfully there must be some parallel motion given to the axle which would at all times maintain a uniform velocity on the pitch line and cut down the unit pressure per square inch which was at that time the all-important consideration.

Then, as now, the successful operation of the worm was entirely dependent upon the retention of the oil film, particularly under high pressure, and unless the radius rods gave to the axle a parallel motion, as in the Lanchester suspension, the load came on the bronze gear with rapidly varying force as compared with a uniform pressure when the parallel motion was employed. Up to the present time in the United States there has not been a single adoption of the Lanchester suspension in its entirety.

The particular and all-important point of which designers in general have lost sight is, that the center line of the worm shaft must at all times be parallel to the center line of the engine power plant, which of course gives an equal angle to the rear universal joint as obtained on the forward one, transforming the uniform velocity into a variable in the propeller shaft and then changing it back into a uniform velocity (owing to the equal angles) and maintaining that uniform pressure which is so desirable in worm gear operation. The stresses created in some of our heavier 5-ton vehicles, equipped with radius rods and torsion members must be very high as compared with the sweet, harmonic motion of similar trucks equipped with the Lanchester drive.

Hotchkiss Drive Gives Parallel Movement

The point must be conceded, however, that very successful results have been obtained as regards the life of the worm unit, differential and the various parts influenced, but the question still remains—how much longer life would these same parts have if no radius or torsion members were used?

The illustrations as shown in Figs. 1 and 2 are anything but conventional designs, but the worm has been purposely underslung in order to describe and exaggerate the angles and bring out the points more clearly. In Fig. 1 you will notice there is no angularity whatever on the rear joint, but the torsion member tilts the rear axle up, generally pointing the worm shaft to the forward universal joint center. If the torsion member is raised somewhat and the worm shaft is tilted up more, one can obtain fairly satisfactory results, particularly when the eye of the torsion member is in the center of the propeller shaft longitudinally, for this also gives equal angles on both universals and so an unvarying worm velocity, but this construction has been very rarely carried out in practice.

It might be well to notice the action of the flat spring under load as this approaches very close to the Lanchester suspension, but cuts out its attendant complication. The prevailing idea at the present time is quite erroneous in regard to the front eye being the pivotal point and that the axis of the worm shaft moves around that point. The rear half of the spring always corrects the movement and imparts a true parallel motion within certain limits of deflection.

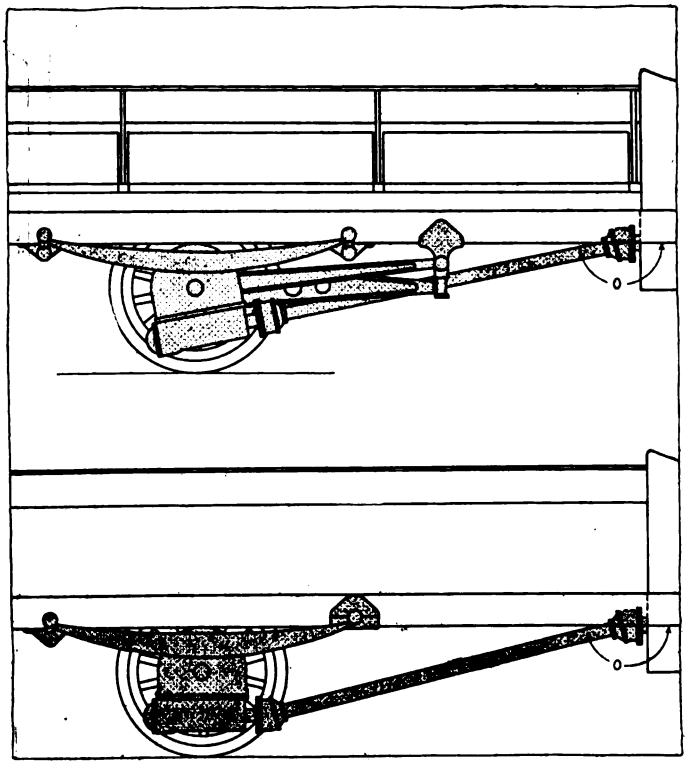
Springs Should Be Flat

In a good many designs abnormal cambers are used. This of course defeats the very object of driving through the springs, not only increasing the bending moment on the spring but upsetting the parallel motion to an alarming extent, particularly when the brakes are applied vigorously.

It is well also to note that in the Hotchkiss drive the spring seats attached to the axles are welded and not swiveled as in the radius rod and torsion member construction, which always gives more or less trouble particularly when operating in places exposed to mud and water, as it is most difficult to lubricate this bearing satisfactorily.

One of the greatest claims that Lanchester made for his parallel radius rod and cantilever suspension was the wear on tires. At that time, quite a few objections were raised in regard to the riding qualities of the Hotchkiss drive on account of the brake and torque reactions, but it is very interesting to note that this view is rapidly being changed. In the writer's opinion, the additional load put on from the brakes, and the torque reaction, assist very materially in dispensing with the use of the shock absorber, as the only time you need the shock absorber is when additional work is put on the spring, and this automatically increases the friction between the plates which naturally damps the effect of the spring.

Furthermore, by utilizing the Hotchkiss construction you have eliminated two spring seat bearings to take care of, two bearings on the torsion member, and four on the radius



Figs. 1 and 2—Diagram comparing torque arm with Hotchkiss layout

rod; and an additional two bearings on the springs, when the springs are suspended on links, together with the weight of all the parts named—a quite considerable item. Thus there seems everything in favor of driving through the springs on very heavy vehicles.

Analyzing Heat Flow

By E. H. Sherbondy

Consulting Engineer Clay & Sherbondy

EDITOR THE AUTOMOBILE:—Again reviewing the use of aluminum for automobile motor construction.

Mr. Leopold brought to light some interesting historical facts as to the use of aluminum for motor pistons and cylinders and to these I should like to add the following comments:

Interesting Historical Facts

In 1902 Alexander Winton of Cleveland built a racing car having a two-cylinder opposed crank motor in which he used aluminum cylinder heads and later in 1903 he used aluminum heads in the racing car "Bullet No. 2." During 1904 the German Daimler company built some large high-speed gasoline motors, after the designs of Loutski. These motors were six cylinders of 12-in. bore and 7½-in. stroke running at 900 r.p.m., developing about 1500 b.h.p. They were equipped with aluminum pistons and this is the earliest application within the writer's knowledge. These motors were designed for the use of submarines.

About 1905 Emile Mors brought out a design for a four-cylinder motor of 105 mm. and 150 mm., which comprised a number of novel features in design, among others, cast-iron sleeves pressed into aluminum jackets. The cylinders were T-head valve arrangement, cast in pairs, and the external appearance was very similar to that of the conventional iron cylinder design. I believe the St. Louis Car Co. produced a limited number of these motors under license. Prior to the general advocacy of aluminum pistons in America many French engineers had considered the subject.

In 1909 the Tony Huber Peugeot motors submitted to the A. C. F. were equipped with aluminum pistons.

A French engineer and writer, A. Contet, has given some comments on aluminum pistons, showing comparative power curves of the same motor using aluminum and iron pistons. These power curves indicated that there was a slight rise in mechanical efficiency as would be expected by reducing the inertia forces, however, his consideration of the subject at that time was superficial. I was told some time back that Chenard-Walcker and Doriot, Flandrian, Parant have been using aluminum pistons continuously since 1910 with good success in small motors (80-90 mm. bore).

Engineers Are Hasty

In the case of aluminum pistons which are now in vogue commercially I find the majority of engineers with whom I have talked on this subject have not carried out comparative tests in the same motor with iron and aluminum and plotted the resulting torque and horsepower curves, but have gone over to the aluminum piston in new designs on the strength of superficial considerations, aluminum being the fashion as is the case of many details of motor-car construction which are not settled on by reason of their engineering value but rather conforming with some powerful precedent which has been established primarily as a result of commercial consideration. Some of the older engineers in the industry, who have had the widest possible experience are not yet sold on the aluminum piston proposition for commercial product.

Peugeot, Talbot, Sunbeam, Mercedes and a great many other firms well known and established purely because of their engineering ability, have more than a passing knowledge of the materials of construction they employ. Peugeot was carrying on experiments with aluminum pistons in 1909. Chas. Faroux of *La Vie Automobile*, told the writer that the Peugeot practical results were within 2 per cent in all particulars of calculations on which the designs were based. Certainly these European firms have shown far more originality, initiative and independence of thought than has been exhibited on this side of the water—and the only logical deduction is that they are better students of engineering than we are over here. Certainly you will not find them buying American cars to cut to pieces and see how the trick is done. To make a long story short, we don't diagnose the disease before we take the cure but join the motley crew because it's the thing that is "being don."

It has been repeatedly asserted, by some of those interested in this field of work, that the increased conductivity of aluminum over iron was a factor of great importance in the dissipation of heat from motor cylinders and pistons and in my former communication, I perhaps did not bring forth my views on this point in as clear a manner as might be desirable. However, I believe the following may be stated axiomatically. "The dissipation of heat necessary and unavoidable in an internal combustion engine is controlled by the initial and final heat elements," *i.e.*, the temperature, coefficient of conduction, convexion and radiation of the gases of combustion at a higher level and the temperature coefficient of conduction, convexion and radiation of the cooling water or air, as the case may be, at a lower level. The coefficient of radiation in gases undergoing combustion is as yet an indeterminate factor having been a matter of experiment and consideration by Clerk, Callendar, Hopkinson and others. See the magazine *Engineering* (British). The coefficient and conduction of gases in general is very low, varying with the density of the gas employed (about 1/14,000 that of copper). The coefficient of convexion depends upon the internal agitation of the gases of combustion at one end and the rate of circulation of the cooling water at the other. It should be noted that liquids in general have a very small coefficient of conduction and that the transfer of heat through a liquid takes place almost altogether by convexion and is merely due to the agitation of the liquid molecules.

According to Dr. Watson of the Royal College of Science (London), who has done so much good work carrying out complete motor tests, the conductivity of aluminum is a little more than twice that of iron, namely, 0.344 cal./cm. sec. for aluminum and 0.167 cal./cm. sec. for iron. In the case of the aluminum cylinder where the wall proper is of this material, the heat passing from the gases of combustion by means of radiation and convexion to the cylinder wall is carried through by conduction at twice the rate of speed occurring in the iron cylinder. This heat must be carried away from the wall—to prevent an undue rise of temperature—by the cooling medium, and the rate at which this is done depends only the temperature of the cooling medium and its rate of circulation, so that we see in this case at least the conductivity of the metal employed has no effect upon the regulation of the working temperature in an internal combustion engine.

In the future development of automobile engines, aluminum cylinders may be an important factor in reducing the weight and it is very probable that satisfactory designs will be worked out, but the sole advantage will be weight reduction and not some startling thermo-dynamic change.

Due to its great affinity for oxygen when molten, aluminum, when cast, is usually porous, and if used in cylinders, there is likely to be a large percentage of bad castings because of water leaking through the jacket chamber to the bore. This may be overcome by designing the cylinders so that the inside of the jacket and the cylinder wall can be painted with litharge.

Favors Inserted Sleeve

Probably the best way of using aluminum to advantage in an automobile motor is to cast the cylinder jacket and crankcase integral, to insert cast-iron sleeves to form the cylinders proper in much the same fashion which is used in large gas engines so that the cooling water comes into actual contact with the sleeve. In general this construction would necessitate a loose head.

In reply to Mr. Leopold's comments on my earlier communication.

It is, of course clear to anyone informed on elementary physical processes, that the transfer of heat from one portion to another of a continuous metallic body takes place by the vis-viva or living force of the molecules of that substance, which cannot change their position relative to the aggregate in which they are found but only their amplitude of vibration. This phenomenon is called conduction.

In my former communication I pointed out that the heat of the piston was carried off "mainly by convexion to the lubricating oil film." It, of course, is apparent that the heat must flow from the piston head proper to the side walls and that sufficient material should be supplied in the design and construction of a piston to attain this end. Now, as pointed out in my earlier article, the only two exits of importance for the heat residing in the piston is by the way of the lubricating oil film, or the cylinder wall proper where the oil film breaks down—and the crankcase air. Some of the piston heat is given up to the gases of combustion but a technical analysis of the interchange of heat between the gases undergoing combustion and the cylinder walls, involves the use of mathematics and is too complicated to be presented in these brief comments.

The heat must be carried off to the crankcase air by convexion and radiation, and as the crankcase air is always heavily laden with oil in various states of disgregation from large liquid drops to vapor, we have an added agency of importance. The coefficient of radiation of cast aluminum is rather low, and the heat given up in this manner should be accounted negligible. There remains one method of carrying the heat from the piston—convexion—which depends on the rate of circulation of the cooling medium. The rate of air circulation on the inside of the piston is not rapid unless some special construction is used to obtain a flow of air into and out of the piston. To this end the writer applied for and obtained patents in connection with other motor improvements some years ago. The German Daimler Co.—I believe through Paul Daimler—also have issued patents on means for circulating air on the interior of pistons. This work was carried out in both instances with a view to enabling large engines to run at very high speed, without running up the inertia pressures to unreasonable values, which would have occurred with water-cooled pistons.

Factor of Crankcase Air

The importance of the nature of these considerations relative to other factors at play in internal combustion engines appears rather small. It would be somewhat difficult to determine just how much heat of the total amount received by the pistons passes to the crankcase air but it would be my guess that the percentage would be very much less than that passing by way of the cylinder oil to the cylinder walls. There is, of course, plenty of data available in the case of water-cooled pistons, such as are used in larger work than we are considering at present. In conclusion of these remarks on the importance of the coefficient of conduction of the material employed, I can only hold to the deductions which seem inevitable, in view of evidence presented by a consideration of the physical processes involved.

In relation to the consideration of inertia pressure, I think my position on this matter was clear enough.

In review: I hold that the inertia pressure occurring in the commercial product issuing from motor car factories today is not a matter for serious consideration and that cast iron is certainly as satisfactory and far cheaper than any other material which may be employed for pistons in touring car motors. As Mr. Lawrence Pomeroy (Vauxhall Motors) puts it "when a motor gets up to 3000 r.p.m. or so, the average customer gets so thoroughly frightened at the job that he is glad to take his foot from the accelerator," and this is the point worthy of consideration above all others. However, I shall make the high-speed engine a matter for consideration in another article.

In reference to Mr. Diamond's comments: Mr. Diamond's point, namely, "that the diffusion of heat through the aluminum pistons is more rapid than cast iron," goes of course, unquestioned, and in my former article I touched on only a few of the high spots of this subject, which came to my mind in the short period at my disposal, at that time. I must, however, refer to my answer to Mr. Leopold in answer to the points at issue and in conclusion admit that I have no axe to grind other than the advancement of automobile engineering.

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Twin-Six Balance

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By D. Fergusson
Mechanical Engineer, Pierce-Arrow Motor Car Co.

EDITOR THE AUTOMOBILE:—I am sorry I did not have an opportunity of seeing Mr. Vincent's letter before mine was published. It would have admitted of my altering my letter slightly and would have done away with much of Mr. Vincent's argument. Will you please insert in your next issue that I wish to add the following postscript to my letter published in your issue of Oct. 28, 1915?

"To the loads due to the inertia of the pistons and the reciprocating parts of their connecting-rods, must, of course, be added the centrifugal force due to the rotating parts of the connecting-rods. I assume that the same standards of engineering practice are used in both the six- and twelve-cylinder types."

The History of the American Automobile Industry

Second Installment of the Complete History of the Industry in America, the Opening Installment Appearing in Last Issue —Complete History To Be Published Later in Book Form

This Week the Conception and Early Development of the Steam Vehicle, the Pioneer in the Automobile Field

By David Beecroft

THE year 1769 is to the history of steam automobiles what the year 1492 is to America. In 1769 Nicholas Joseph Cugnot, a Frenchman, built the first steam locomotive, which was a three-wheel vehicle. The next year Cugnot built a more perfected type of vehicle by means of State funds appropriated for the purpose, and a model of this vehicle is still in Paris. True, it was a crude affair, scarcely possessing a single feature that could be compared with the vehicles of to-day, yet it incorporated many of the basic features of the present-day steam engine, even if they were in forms that can scarcely be recognized, and handled a boat of 2.5 tons at 3 miles per hour. Cugnot used a bowl-shaped boiler that hung out in front, ahead of the single-drive wheel, the boiler being over 4 ft. in diameter. A fire beneath it supplied the requisite heat; and the steam was alternately conducted to two cylinders by means of a four-way cock. The cylinders were placed vertically above the single drive wheel and power was conveyed to the wheel by means of two ratchet wheels in connection with a system of pawls and rods. Cugnot steered by the single driver and so was spared the difficulties of solving steering, differential gears and other later problems. The frame was a stout wood one, which rested at the rear on the back axle with its wheel on each end and in front it joined an iron frame carried in bronze bearings on the axle of the driving wheel. Such was the pioneer steam vehicle.

If the honor of building the first steam vehicle goes to Cugnot and France the honor of making a steam vehicle possible must go to James Watt and Scotland. James Watt was a prominent engineer, who had been watching the crude steam engines that were used for pumping water in mines, these cumbrous affairs dating back to 1698, when they were first made practical by Thomas Savery, a Briton, to whom belongs the honor of being the first man to harness the power of steam to any useful practical device, as previous to that time steam was centuries old, but it had only been used in toys and for a few minor tasks.

The Savery engine had been improved by Thomas Newcomen, a Scotchman, in 1705, whose engines were the recognized designs from that time until 1763, when Watt made his great improvement on them. Watt saw that the Newcomen engine, explained later, was exceedingly wasteful of fuel and impossible of general adaptation. To improve its economy he conceived the separate condenser for the steam, and by this one invention gave us the condensing steam engine as we have it to-day and made it possible for steam to be adapted to vehicles and a myriad of other uses. Thus Watt, by this master stroke of genius, gave practical birth to the steam engine just as in 1876 practical birth was given to the gasoline engine of to-day by introducing the compression of the explosive mixture, which made it a reality.

It was by virtue of Watt's patent granted in 1769 and which expired in 1800 that Cugnot was able to make his first steam locomotive. But Watt did immeasurably more, in a few years he had invented the centrifugal governor, which is continued until to-day. He established the law in steam that the cylinders must be kept as hot as the steam entering them; he conceived the employment of the expansive power of steam in the cylinder; previous to his day water had been used to make the pistons steam tight, but Watt invented the packing as we have it to-day.

Although on Watt's shoulders rests the mantle of Father of the Steam Engine, we must not imagine his engine similar to ours of to-day. At that time the crankshaft as we know it to-day was unknown, and it was not until 1780 that the crankshaft was first used in an engine by Pickard. Previously various rod-and-ratchet devices were used.

After Cugnot's steam vehicle was running, activity in developing steam road locomotives, as they were then called, was rife in France and England, but no radical improvements were made until 1802, when Richard Trevithick, in England, built the first practical steam vehicle in that it incorporated so many of the features that time has proved are necessary in the steam vehicle as we know it. Trevithick built a steam engine with a crankshaft, as we know it to-day, in gasoline vehicles as well as steam automobiles. This crankshaft carried a flywheel; and Trevithick went further by connecting the crankshaft by gearing with the driving

road wheels. This Trevithick automobile made many journeys at speeds of 10 miles per hour, an amazing performance for 113 years ago. It was sold after being in use for 3 years to a hop rolling mill, where it furnished the motive power for many years. Trevithick must receive the honor of being the first inventor to transmit power from the motor to the drive wheels through a chain of gears, as well as being the builder of the first practical steam automobile.

The third big forward step in developing steam automobiles came in 1821 when the first steam vehicle that afforded comfortable accommodation for passengers was built. Cugnot gave us, in 1769, the first steam vehicle; Trevithick in 1802 gave us the first practical steam automobile and the honor of the first steam vehicle designed with the object of giving some comfort to the passengers it carried goes to Julius Griffiths of England. The body resembled that of a stage coach and was hung on springs and the boiler and motor were mounted on a special frame in rear of the coach body. A chain of gears connected the two-cylinder vertical motor to the driving wheels on the rear axle. The driver sat separately over the front axle, which was used in steering. Griffiths used an engine that condensed the used steam in a set of thin tubes and returned the water to the boiler for repeated use.

In this History of the Automobile Industry in America it is imperative to trace the evolution of steam and the steam vehicle from its inception in those countries where it was developed. Turning next to America, before completing the stage of progress abroad, it must be remembered that carriages and workmen were not plentiful in this new country at the time of the War of Independence.

The first steam engine in America was set up in a copper mine near Belleville, N. J., in 1753, at which time steam-engine construction could not have been very familiar to American inventors because of the large territory and the imperfect means of communication. In spite of these things Oliver Evans (1755-1819), a celebrated American engineer and millwright, turned his attention to the propulsion of road vehicles about 1772. In 1786 he petitioned the legislature of Pennsylvania for the sole right to use his steam engine in that State and was thought insane, an unjust accusation too often extended to many of his successors. Maryland, however, although probably thinking the same, granted him a patent for 14 years, dating from 1787. Another American inventor, Nathan Read, took up the steam automobile problem in 1788, 1789, and in 1790 applied for a patent for his invention.

Just which of these two inventors actually did the first work seems not to be known. Read obtained a patent for a multi-tubular boiler in 1791 and must therefore be given much credit by those who followed after him because of the greatly increased heating surface obtained by this construction with consequent faster steam generation and very greatly reduced size and weight. Whether or not this invention had much bearing on later work is not known. It may be that it was too early to be appreciated and so remained in obscurity until nearly a century had passed. Read proposed to use two double-acting engines, one driving each wheel so that in turning, each engine would respond to the slower or faster movement of the wheel. He also proposed to exhaust the steam rearwardly and thus take advantage of the reaction to assist in propelling the carriage. It seems not to have been then understood that in order to secure any satisfactory advantage from the reaction of an escaping jet of steam or other fluid, the moving part must be traveling very nearly half as fast as the motion of the escaping fluid. The reaction from a jet of escaping steam is very slight in its effect on a slow moving vehicle. He also applied his device to boats.

An Amphibious Vehicle

To Evans is usually given the credit of priority at this period for not only did he apply for patents in Pennsylvania and Maryland, but during his life he constructed a number of steam engines and made many attempts to secure capital for his steam carriage projects. Finally in 1804, while fitting up a steam harbor dredge for the City of Philadelphia he decided to make it self-propelling, and says, "This was a fine opportunity to show the public that my engine could propel both land and water carriages, and I resolved to do it. When the work was finished I put wheels under it; and though it was equal in weight to 200 barrels of flour, (about 20 tons) and the wheels were fixed on wooden axle trees for this temporary purpose, and in a very rough manner, and attended with great friction, of course, yet with this small engine, I transported my great burthen to the Schuylkill with ease; and, when it was launched into the water I fixed a paddle-wheel at the stern and drove it down the Schuylkill to the Delaware and up the Delaware to the city, leaving all the vessels going up behind me at least half way, the wind being ahead."

From the above account it would seem that this was his only self-propelled experience. The load was exceptionally heavy. The distance, however, was but 1½ miles, the streets probably good and the speed unquestionably slow. It was, however, a very creditable showing both on land and on water and compares very favorably with the work of others at or near that time.

It must be kept in mind that there was very little vehicle traffic at that time. American stage coaches began running in 1786 and then only between the more important centers. The rivers were the principal means of communication outside of private conveyances. Practically everyone was compelled to depend upon his or her own conveyance, although as far back as 1697 John Clapp at the Bowery, New York, kept a hackney coach for the convenience of patrons. It is an interesting comment on the tendency of the people to hold back progress by restrictive laws that in 1699 a law was passed in New York against fast driving of "slees" (sleighs). Words would probably not express the horror of those ancient law makers if they have been transported into modern with its never ending streams of rapid

Stating the Case for the Eight

Comparing Eights with Twelves Shows Many Advantages for Simpler Type—Comparative Figures for Balance and Efficiency

By Charles S. Crawford*
Chief Engineer Cole Motor Car Co.

THE required range of ability, *which in substance means the capacity of the engine to do the ordinary thing and to answer everyday requirements*, is that which can be utilized in practice, and a speed range that will give a car from 2 to 60 m.p.h. in high gear, is, as we all know, ample.

The desirable torque must be maintained throughout the useful speed range, and this the eight-cylinder engine does.

This range of capacity depends upon the ability to run the engine to reasonably high speed without detrimental vibration and to arrange the gear ratio in relation to the highest speed that can be developed with a maintenance of torque.

To illustrate this: If an engine running at 2600 r.p.m. can, with a given gear ratio, make a car go 60 m.p.h., then the necessary size or displacement of the engine can be determined by the torque necessary to reach this speed in a given time, or with a given acceleration, say, of from 10 to 50 m.p.h. in a certain number of seconds.

This will then utilize to advantage all the power the engine can develop at its highest useful speed, which is limited by the volumetric efficiency at the said speed, or the ability to maintain a proportional torque. To attain this result is simply a matter of design and the proper development of the power plant.

Fundamentally, the torque developed is dependent on the displacement and the mean effective pressure on the pistons. Given a full charge in the cylinders by volume, this pressure is proportional to the energy of the mixture.

To illustrate this point more clearly: There is a certain mixture of gasoline and air which, with normal quality of gasoline, is about one to fourteen. This is the most efficient from the point of perfect combustion, which means that the energy which we derive from it on its combustion is a maximum consistent with the heat energy in the fuel.

It is possible to increase the explosive pressure by an increase in the strength of the mixture, that is, an increase in the heat energy of the mixture, and this can only be accomplished by having the maximum weight of gasoline and air.

We might have the best of volumetric efficiency from a valve-timing viewpoint and yet the heat energy of the charge would not be a maximum if it were of too high a temperature or partially expanded before entering the cylinder.

Excess compression of the charge in the cylinders does not add to the pressure. We still have the same quantity of heat units in the mixture and by excessive compression we do not increase these. More work is done on the compression stroke, and though the initial pressure is higher there is no net gain in work on the crankshaft.

Thus it follows that the chief advantage of increasing the compression is to obtain rapidity of ignition at high speed and not to increase the torque at low speed. With an eight-cylinder engine, properly designed, we secure every advantage necessary for practical purposes, therefore, without incurring the danger of trouble by going beyond that point. *The torque developed in an eight should be and is greater than that of a twin-six with the same displacement, for there is a greater heat loss with an increased number of cylinders.*

The area of cylinder wall exposed is proportionately greater, the displacement being the same, and when it is considered that approximately 60 per cent of the heat energy of the fuel is lost through the cooling water and radiation, the fallacy of too great a number of cylinders with a consequent decrease in individual cylinder displacement becomes evident, while the presumption that, by reason of the small bore and increased compression it is possible to increase the available torque, also, is shown to be fallacious.

Engines with small bore and necessarily high compression, while being advantageous at the very high speeds, invariably give unsatisfactory operation at lower speeds, and it is always necessary to retard the spark in order to prevent knocking. It follows, necessarily, therefore, that the eight, with its larger bore and consequently lower compression, is bound to possess advantages in this respect and *must of necessity give a smoother operation at the lower speeds.*

Acceleration and Torque

As we have defined the desirable range, we can assume that with the engine running at 2565 r.p.m., in order to get a road speed of 60 m.p.h. with 35-in. wheels, eliminating slippage, a gear ratio of 4 5/11 to 1 is required. From this basis, establishing a definite acceleration, the necessary displacement of the engine to get the torque essential, can be determined.

In the light of the performance of powerful multiple-cylinder cars, the acceleration of from 10 to 50 m.p.h. should be accomplished in from 20 to 25 sec.

Cole eight stock jobs well run in, carrying three passengers and with windshield and top up, will give an acceleration of from 10 to 50 m.p.h. in from 22 to 24 sec. The motor has a piston displacement of 346 cu. in., giving a maximum torque of 187½ ft.-lb.

The horsepower and torque curve of this engine is shown in Fig. 1, while in Fig. 2 is shown the torque developed per cubic inch of piston displacement. Incidentally, the torque developed per cubic inch of piston displacement of a twin-six engine is also shown in Fig. 2.

In this figure *A* represents the curve of the eight-cylinder engine, while *B* designates that of the twin-six under similar conditions.

The torque in the eight is conventional, inasmuch as the most efficient speed is in the neighborhood of 1000 r.p.m., which corresponds to 750 ft. per minute piston speed. This is only what could be expected, for at this speed the gas velocity is at a maximum, consistent with the manifold friction, while the volumetric efficiency is a maximum, by reason of the relation of this velocity and the time element of the valve openings. The temperature at this speed is consistent with good thermal efficiency, and the relative curves show, also, where the cooling theory has its effect on the thermal efficiency.

At the lowest speeds it is virtually impossible to have a greater torque than at any other speed if a normal torque is developed at the usual speed of maximum torque, because the

*From a paper read Oct. 29 before Indiana Section S. A. E.

gaseous inertia, on which we rely to a great extent to fill the cylinders, has not reached a point where it can overcome the skin friction of the manifold, the port and the valve openings, and still maintain a reasonable velocity.

These statements and those which immediately follow will correct the assumption left with us on a previous occasion that, by reason of multiple cylinders, it is possible to get the maximum torque at the lowest speeds of revolution.

Since the torque is proportional to the horsepower and speed, and therefore can be deduced from a factor which is constant, it is difficult to see how it would be possible to obtain from horsepower curves which are similar in characteristics torque curves which are so widely different at the lower speeds. Yet this is precisely what is inferred from the characteristic curves of single-six and twin-six engines of approximately equal capacity, brought previously to our attention.

The torque frequency has no influence on the magnitude of the torque developed at lower speeds. However, the ability to attain increased volumetric efficiency and better distribution of the charge is responsible for the actual increase that does occur.

Where the eight scores in generating increased torque at lower speeds is in its undoubted ability to distribute the mixture to better advantage. In support of this contention a layout of the manifolds to scale is shown in Fig. 3, which presents clearly the equidistant port locations and the comparatively short distance of each from the carbureter.

The importance of limiting the manifold lengths to obtain good volumetric efficiency and likewise torque at the lower speeds being obvious, the ability of the eight's construction to give this condition stands out prominently, and is thus seen to be more pronounced than in any other type of multiple-cylinder engine.

The efficiency of the carbureter, by reason of constant jet suction, is logical in the eight, while the suction strokes if closer together, as in the twin-six, produce an excessive lap which creates at some point almost double suction in the manifold.

In regard to frequency of impulse it is asserted that the frequency is proportional to the number of cylinders. The actual frequency at the road wheels is the *determining* factor, however, and this is dependent on the gear ratio.

Unbalance and Vibration

Smoothness *from the point of engine balance* is the next point that requires study. In the conventional fours there are, from their inherent design and construction, unbalanced forces due to inertia, which increase with the square of the speed. This unbalanced force is fundamental in the four but not necessarily in the eight, as is commonly supposed.

While the forces do occur as calculations show, there must be a fair amount of discrimination in discussing the relative balance of mechanisms that have respectively unbalance and perfect balance, viewed theoretically.

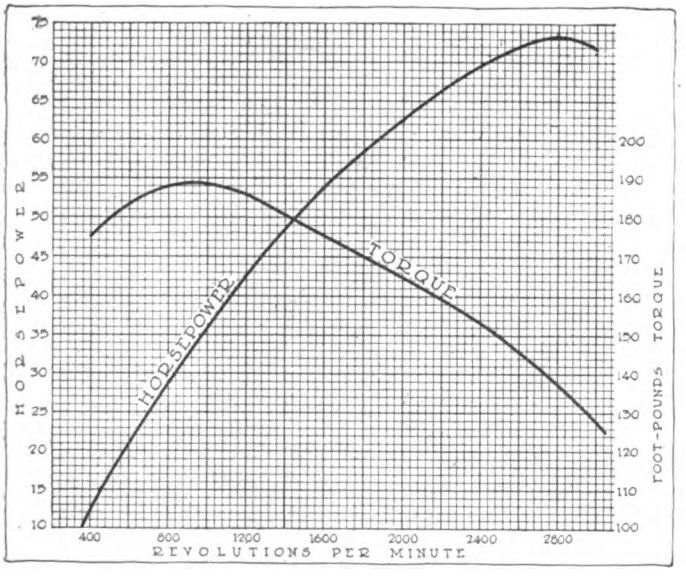


Fig. 1—Power and torque curves of Cole eight

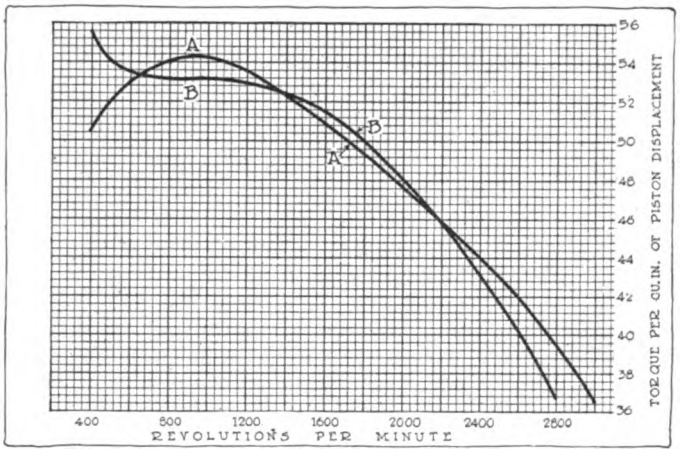
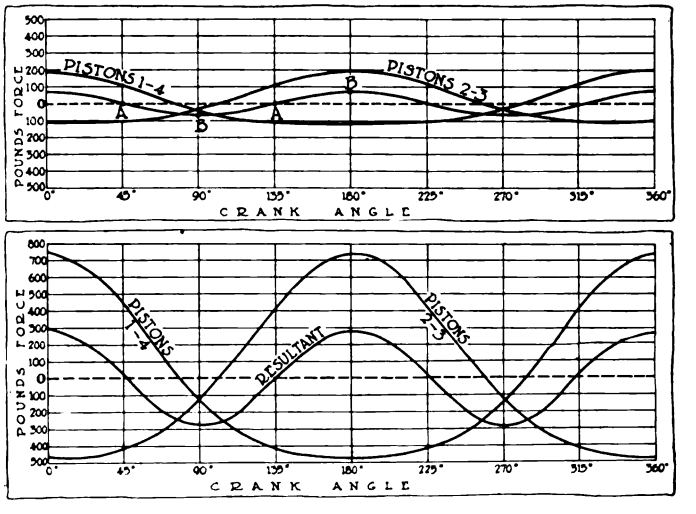


Fig. 2—Torque per cubic inch piston displacement for Cole eight and also a twelve-cylinder engine. A is the curve for the eight and B that of the twelve



Figs. 4 and 5—Unbalanced force fluctuations in an eight-cylinder engine. Upper—at 1000 r.p.m. Lower—at 2000 r.p.m.

There are two fundamentally distinct problems in connection with vibration and balance. There are the vibrations that arise from unbalanced systems, considering all the parts as rigid within themselves, and vibrations or sources of vibration due to the elastic yielding or springing of the parts of the system—such as the crankshaft, which is subject to bending and torsion; the connecting-rod, which acts as a strut and obeys the law as such in connection with rigidity, and sustaining members, such as the engine crankcase.

The vibrations arising from lack of rigidity in the crankcase can be attributed to the influence of the forces on either side of the plane of symmetry.

Supposing the engine were articulated at the middle, or plane of symmetry. We can see that each half would rock against the other in a symmetrical manner, influenced by the couples exerted by the centrifugal and inertia forces on the crankshaft.

The stress of the crankcase section at its middle point, therefore, resists this tendency, the magnitude of which increases with the length of the crankshaft and crankcase,

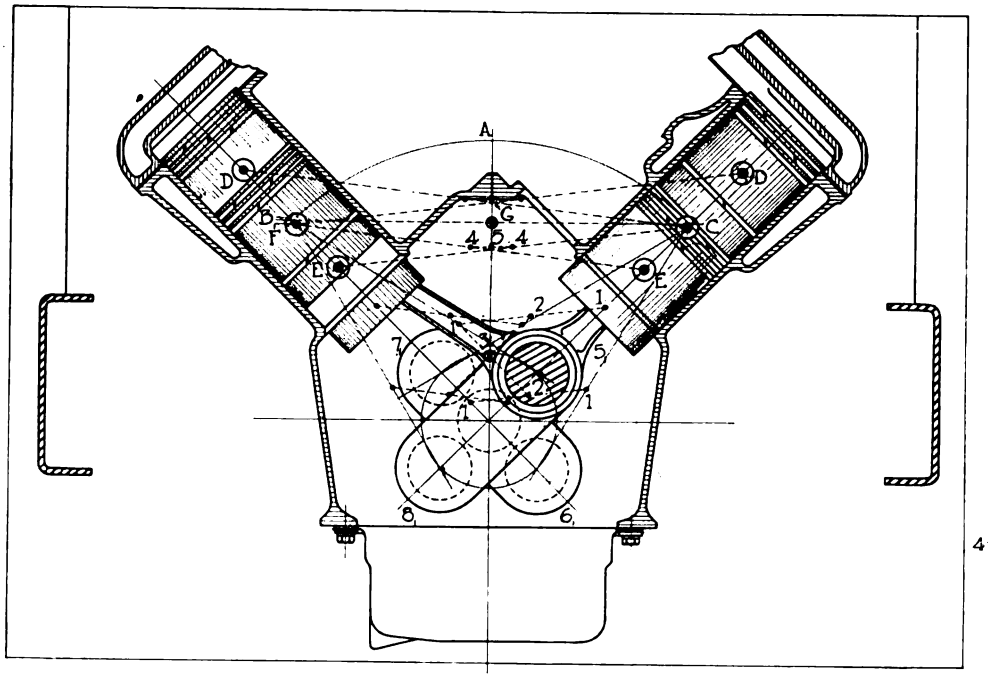


Fig. 8—Relative piston positions and mass center movement in eight with 90 degree crankshaft

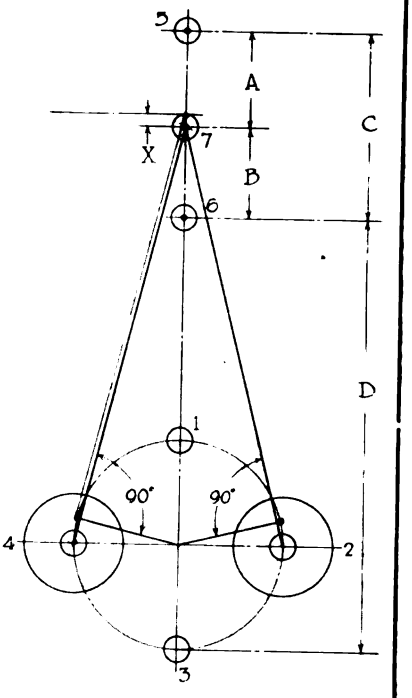


Fig. 6—Diagram of piston mass center movement in single cylinder

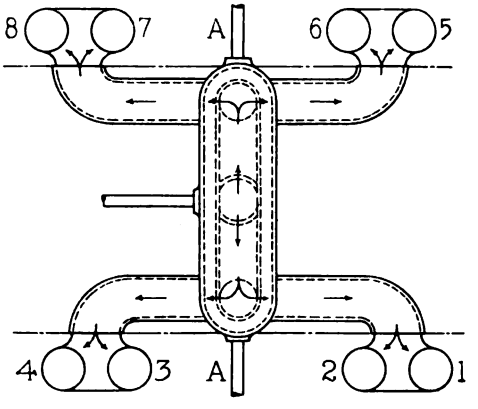


Fig. 3—Intake manifold layout of eight

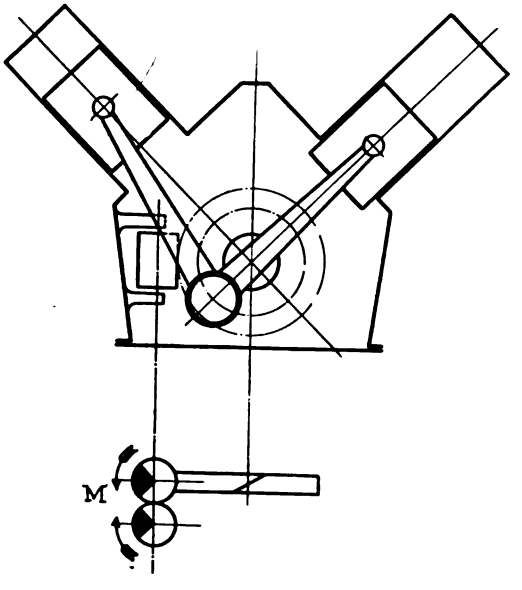


Fig. 12—Lanchester anti-vibrator for neutralizing horizontal unbalanced force

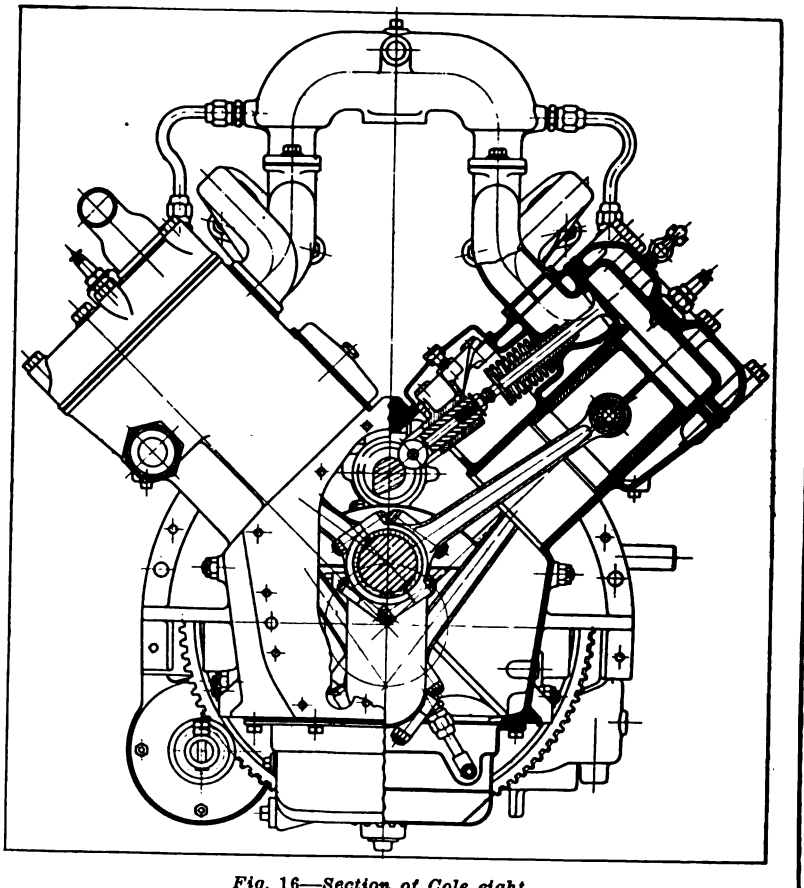


Fig. 16—Section of Cole eight

and an absence of rigidity, therefore, would result in a vibratory bending of the engine itself. The shortness of the crankshaft and crankcase and consequent rigidity of the eight, therefore, is distinctly favorable.

Likewise, the counterbalancing of the crankshaft eliminates to a marked degree the couple due to centrifugal forces and therefore the vibratory tendency is practically expelled. So far as the inertia unbalance of the eight is concerned, it is advisable to consider this, to some extent, to show that this is not objectionable. At the outset it would be wise to remark that while the horizontal vibratory force does exist, one is usually surprised at not being able to notice it when riding in an eight-cylinder car.

In order to show the actual magnitude of this vibration tendency at different speeds, curves labeled Fig. 4 and Fig. 5 are shown. Fig. 4 represents the magnitude of the unbalanced forces of the pistons in each block at 1000 r.p.m., and, as will be noticed, they are very small. Since this is the normal running speed, it explains the reason why vibration in the eight is not perceptible.

That this is true is more evident when you consider the effect of a force of this order acting upon the mass of the engine and the chassis. Imagine, for instance, applying a force of 70 lb. on a mass weighing 3500 lb., suspended on springs, by starting with zero and gradually increasing the force to the maximum in a time space corresponding to the periodicity of the revolutions. You could not feel it and this is exactly the condition that exists in the curve shown. At point *A* there is no force, but it is applied almost uniformly up to the maximum of 70 lb. at point *B*.

At 2000 r.p.m., which is a high rate of speed, and one not used for long periods, the forces increase as shown in Fig. 5. The forces plotted are the actual magnitudes as calculated for a 3½-bore motor with aluminum pistons.

It has previously been shown why this unbalanced condition exists, but in order to give a better idea and to elucidate more logically the points to which reference is made later in the paper, I have added diagram, Fig. 6. The four positions of the crankshaft are shown respectively, at 1, 2, 3 and 4, while 5 and 6 are the top and bottom of the piston stroke, respectively, point 7 being at the position of mid-piston travel. If the connecting-rods were of infinite length all four pistons would reach mid-stroke position at the same instant and at all other points, pistons 1 and 2 would have the same motion as pistons 3 and 4. With the connecting-rod of finite length, however, the positions of mid-stroke and mid-crankpin travel do not coincide, the error being as shown at *X*.

Now the inertia of the piston masses, or the energy stored in them, tending to keep the pistons in their state of motion, is dependent on the velocity or acceleration and the mass. As will be observed from the diagram, owing to the angularity of the connecting-rod and the position of the pistons at mid-crankpin travel, piston No. 4, traveling upward, will have farther to go than half-stroke by the amount *X* or a total *A*, while the piston going down will have less than half-stroke by the amount *X* or the distance *B*, to travel in the same time, which is in 90 deg. of crankpin travel. Therefore, the speed on the up-stroke of the piston will be greater than on the down-stroke, which explains the difference in the inertia of the piston up and down respectively. This is the magnitude of the inertia unbalance and has the effect of an external force equal to the difference of inertia of the pistons up and down.

The longer the connecting-rod the less will be the variation *X*, but the amount that this variation can be reduced is very slight unless the connecting-rod is impracticably long. The limit of length is determined by the rigidity sought. The longer we make the connecting-rod, the more substantial it must be to give the same rigidity as a connecting-rod of shorter length, and then weight becomes a factor to be considered.

So far as the influence of inertia on bearing wear is concerned, this will be the same whether it is a four, six, eight or twin-six engine, if the masses are equal, as the influence of inertia, or the accelerating force of the pistons on the crankpin, is independent of the balance of the masses as a whole.

The main bearing loads set up by the centrifugal effect of the crankpins and connecting-rod bearings are quite appreciable. In order to reduce these to an absolute minimum a counter-balanced crankshaft is used in all of our engines.

The counter-balances as shown in Plate 13 are effective because they counteract the effect of the centrifugal forces, and incidentally the balancing of the revolving masses as nearly as possible in the planes of rotation also has a remarkable steadying effect on the shaft as a whole, and eliminates to a marked degree local distortion of the shaft, thus preventing the periodic tremors that often exist as a result of this local deformation.

As a means of comparison of the bearing pressures due to the influence of inertia and explosion forces, refer to Table 7. It will be seen that actually in the eight-cylinder engine we have relatively less pressure on the connecting-rod and main bearing.

The relative balance of the six and eight has been illustrated in a previous paper before this section, and though it was asserted that the eight-cylinder engine is not a balanced system, I should not say that this statement was fundamentally in accord with the most recent scientific conclusions along this line.

In the course of our experiments made as a means of determining the influence of the theoretical unbalance of the conventional eight, we have experimented with various types of crankshafts designed to eliminate it and make a "system of bodies," or a theoretically balanced system, the same as we find in the six and twin-six.

Fig. 8 shows an end view of one of the shafts in question, the crankpins being at 90 deg. to each other. This demonstrates graphically the balance of the piston masses and the reciprocating portion of the connecting-rods. The angular location of the pins with respect to each other in the longitudinal plane and the effects thereof are shown later.

This illustration is made primarily to prove that an eight-cylinder V-type engine is not necessarily an unbalanced system. In the drawing it will be seen that the shaft is in dead center position. It will be observed that one piston is up and one down respectively, while two are in the position of mid-crankpin travel.

The same is true of each block and therefore the center of gravity will coincide in each block at any instant, the arc *A* struck from the center shaft passing through the center of gravity *B* and *C* as shown. The center of gravity of the pistons is indicated by the black spots in the line of piston travel. The positions *B* and *C* are midway between the center of gravity or mid-position of the pistons *D* and *E* and the center of gravity *F* of the other piston. Likewise, the center of gravity of the connecting-rods is indicated by the small dots on the center line of the connecting-rods as shown at 1-1.

The points 2-2 show the common center of gravity of the rods on the same crankpin, of which point 3 is the combined center of gravity of the whole and is common to all the connecting-rods and on the vertical center line of the motor.

The points 4-4 are the common centers of gravity of the piston masses on each crankpin, being midway between the center of gravity on each piston, the common center of gravity of each system being indicated at point 5, while *G* is the combined center of gravity of the whole system and coincides with the center of gravity of the pistons in both blocks as arrived at by the combination of the centers of gravity *B* and *C*. This, therefore, is an analogous condition to that of the six-cylinder engine.

As a further illustration and as a comparison with a conventional shaft, the existing inertia and accelerating forces are again plotted as shown in curves in Fig. 9 and Fig. 10. The inertia curves being superimposed at crank periods of 90 deg., the resultant is zero, as indicated at 0-0. This is arrived at by subtracting all the negative ordinates, or those beneath the zero line, from the positive ordinates above the zero line.

Figuratively we can arrive at the same conclusion by resolving the forces of inertia and acceleration of each piston into horizontal and vertical components. It will be seen in Fig. 8 that the piston masses 6(1) and 7(1) each have their resultant downward as the piston 6(1), having passed the position of maximum velocity, the energy of the piston will be doing work on the crankshaft while the piston 7(1), not yet having reached the point of maximum velocity, is still being accelerated by the crankshaft, its reaction being, therefore, downward. Adding up the forces we get zero as a resultant, showing that there is positively no resultant unbalanced force.

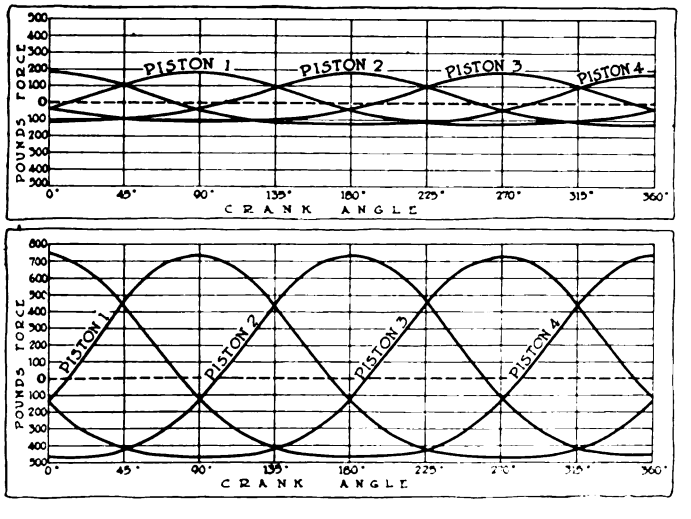
Special Crankshafts

The arrangement of the crankpins is shown in Fig. 14 and Fig. 15 and each exhibits different characteristics. There is not what we could term "looking-glass symmetry" in the same sense that it is found in the conventional shaft with the crankpins at 180 deg. in the same plane. In other words, while the shafts are identical in each half, about an axis in the center, so far as their structure is concerned, one-half, if placed before a mirror, would not show a true reflection of the other half. There will be, therefore, a rocking moment about a plane of symmetry at right angles to the crank axis.

In the first shaft in Fig. 14 a longitudinal couple of large magnitude does exist, due to the centrifugal effect of the crankpins and also the accelerating forces on the pistons. This would tend to rock the shaft about the center 0-0 as shown, and the magnitude is such that it can not be balanced practicably.

In the shaft in Fig. 15, however, while there exists a small rocking moment due to the accelerating forces of the piston masses, and also a rocking moment in a plane at right angles due to the centrifugal effect of the crankpins, the magnitudes of these rocking moments are very small in comparison with those in the first shaft, as can be seen from the sketch. In Fig. 15 the effects of the forces on adjacent crankpins tend to rock the shaft in opposite directions, the resultant being the difference of these moments. In the first case, on the other hand, they augment each other.

Therefore, it is entirely practicable and feasible completely



Figs. 9 and 10—Unbalanced force curves for eight with crankpins at 90 degrees as in motor.

Fig. 8—Upper—at 1000 r.p.m. Lower—at 2000 r.p.m.

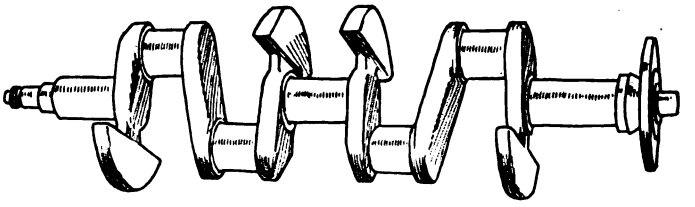
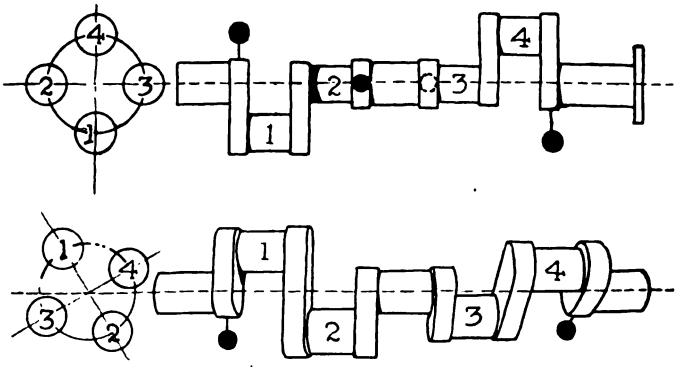


Fig. 13—Ordinary balanced crankshaft



Figs. 14 and 15—Balanced crankshaft with pins at 90 degrees. The lower of the two is the better design

to balance the centrifugal moment by the addition of balance weights on the end crank arms, and also to eliminate the inertia moment to such an extent that its presence would not be observed under any ordinary conditions.

The firing order for the latter shaft would be 1-5, 2-6, 8-3, 7-4 or 1-3, 7-4, 8-5, 2-6 and with crankpins 3 and 4 rotated 180 deg., the firing orders would be 1-5, 2-3, 7-4, 8-6 or 1-4, 8-3, 7-5, 2-6, which, with proper manifold design, are equally as good as the firing order of 1-8, 3-6, 4-5, 2-7, as used in the conventional shaft with the crankpins at 180 deg. The foregoing is sufficient to show the general characteristics of these experimental shafts as we have found them. And our experiments demonstrated that the equality of cylinder performance was of prime importance since we found that, with the unbalanced inertia forces eliminated, we could actually produce vibrations by erratic firing order when different camshafts are used and by purposely creating a condition of unequal cylinder performance.

The general conclusions drawn from these tests are that the theoretically unbalanced forces do not offer such objectionable vibrations as those which may be produced from other sources. This led us to assume that the vibration of the kind arising from the elastic yielding of the parts of the engine are far more serious.

If the vibrations due to the theoretical unbalance of the eight with the conventional crankshaft were perceivable or objectionable to the same extent as the critical vibrations of the six and twin-six, corresponding means could be employed to correct them.

Fig. 12 shows the "Lanchester anti-vibrator," as it can be applied to the eight-cylinder engine, which in effect supplies a countervailing movement of a mass of the same periodicity and opposite in direction to the unbalanced force in the engine. The masses M, revolving in opposite directions, neutralize each other in all but the horizontal plane where the combined centrifugal forces equal the vibratory force in the horizontal plane.

It will be observed that with a greater number of cylinders it would be harder to obtain equality of cylinder performance. Particularly is this true where the individual cylinder displacement is very small, because the little variations which occur either from the differences in valve timing or tappet clearances and manifold designs will have a greater effect than with the same variations on a larger cylinder displacement.

In respect to rigidity the eight is most certainly superior to any other combination. The crankshaft is exceptionally stiff and although the explosive forces in the cylinder of 3½-in. bore exceed those in a 3-in. bore, the great reduction in length and lesser distance between the supports give greater rigidity and consequently less deflection than does a longer shaft even though the pressure imposed upon it be somewhat smaller.

In the eight-cylinder Cole-Northway V-type engine the shaft is 2⅛ in. in diameter and the length between center of supports 10⅝ in.

Periodic vibrations at critical speeds in a six-cylinder engine have been attributed to the synchronism of the torsional oscillations of the crankshaft, due to the impulses and the natural vibration period of the shaft itself.

This was treated in a previous paper before this section, but while it was pointed out that the decreased length of the shaft of the twin-six would be a factor tending to reduce this periodic vibration, it is logical that the critical period in the twin-six will be just as pronounced. By shortening the shaft the periodicity or natural period of the shaft will be higher. But the explosive impulses are also closer together. In other words, the torsional frequency is higher, and since both the natural period and the explosive impulses are higher, the time when the periods will coincide and give a critical vibration will be the same irrespective of the fact that with a light piston and small explosive pressure there will be a decreased twist on the shaft.

If the natural period were of a higher frequency and the torsional period due to impulse had remained as in the six, it is possible that the time of synchronism would not have been within the speed range of the engine. This is precisely the condition that an effort was made to attain in the six by using a big, heavy shaft. Therefore, the same difficulties and disadvantages can be argued against the twin-six as are characteristic of the six, since many of these peculiarities recur in the twin-six. *They are not characteristic, however, of the eight-cylinder engine.*

Minimum Noise

By the term "minimum noise" we mean the ability of the mechanism to *operate* without objectionable sound. Previously we have dealt with the vibration and the noise resulting therefrom, and under this heading we will consider the noise resulting from the parts of the mechanism which come together with metallic contact due to the clearances that must naturally exist.

Since in any engine the clearances are practically the same, the noise therefrom will be substantially the same per contact. *Thus, the multiplication of the parts in operation will increase the noise in the same proportion as such multiplication occurs.*

Let us for a moment consider push-rod clearance. It is necessary in any type of engine to have definite clearances to provide for expansion of the valves. While the weight of the push rods may vary slightly in the case of large and small bore engines, the impact caused by the acceleration of the push rods will be substantially the same and will depend upon the angle through which the camshaft moves in taking up the clearance—in other words, the back-lash angle.

If the minimum specified clearance is not maintained, the noise produced is increased to a marked degree. Under these conditions the total sound made by the conglomeration of the small noises is accentuated in proportion to the multiplicity of parts. These conclusions bring forcibly into prominence the relative merits of the eight and twin-six power plants interpreted in terms of their relative simplicity and proportionate quietness.

Because of the shortness of the cylinder block and the detachable head, which acts as a baffle, and the fact that the connecting passages are proportioned so as to give correct circulation, even temperature throughout the cylinder block is assured.

To the accessibility of the valve mechanism great importance is attached. Given a clear valve alley, as in the case of the eight-cylinder V-type engine in question, it is seen in Fig. 16 that the greater amount of free space with a 90-deg. construction enables more easy manipulation of tools than with the 60-deg. construction of the twin-six. Incidentally, the ease with which the push rods can be moved will be noticed in the cross-section.

In a recent criticism of the eight it was assumed that the accessories must, of necessity, be placed in a so-called conventional position and because the particular construction of the eight did not permit with advantage the placing of the accessories in that position, it was considered distinctly disadvantageous.

It will be observed on the Cole eight, though the position of the accessories is not what is purported to be the conventional one, *distinct advantages are to be gained from the positions in which these accessories are placed.* The position of the water-pump is ideal, for it simplifies to a considerable degree the water-piping in distributing the water to each block.

(*Discussion Appears on pages* 861 *and* 862)

TABLE 7.

BEARING PRESSURES DUE TO INERTIA AND EXPLOSIVE FORCES

Cylinders, 3½ bore = 9.62 sq. in.
Maximum explosion pressure = 2700 lb.
Inertia forces of piston at 1000 r.p.m. = 186 lb.
Inertia forces of piston at 2000 r.p.m. = 747 lb.
Area connecting-rod bearing = 4.54 sq. in.
Unit explosive pressure on bearing = 587 lb. per sq. in.
Unit inertia pressure at 1000 r.p.m. = 41 lb. per sq. in.
Unit inertia pressure at 2000 r.p.m. = 165 lb. per sq. in.

TWIN-SIX

Unit explosive force = 871 lb. per sq. in.
Unit inertia pressure at 2000 r.p.m. = 379 lb. per sq. in.

TABLE 11

3½-IN. BORE, 4½-IN. STROKE, CONNECTING ROD 2⅛ S.

Weights:

Piston	15½ ounces
Rings	4 ounces
Pin and bearing	9½ ounces
Reciprocating part of connecting-rod	9 ounces
Total	38 ounces = 2.375 lb.

Angle X	Crank Angle factor	I. at 1000 r.p.m.	I. at 2000 r.p.m.
0	1.235	186.2	747
10	1.206	182	729
20	1.12	169	677
30	.984	149.5	595
40	.807	122.8	512
50	.602	91.5	376
60	.382	48.1	193
70	.162	24.6	98.5
80	—.047	— 7.15	— 28.7
90	—.235	— 35.7	—143
100	—.395	— 60	—240
110	—.522	— 79.4	—318
120	—.618	— 94	—378
130	—.684	—104	—416
140	—.725	—110	—440
150	—.748	—113.7	—455
160	—.760	—115.5	—462
170	—.764	—116.2	—466
180	—.765	—116.3	—467

ventional shaft, the existing inertia and accelerating forces are again plotted as shown in curves in Fig. 9 and Fig. 10. The inertia curves being superimposed at crank periods of 90 deg., the resultant is zero, as indicated at 0-0. This is arrived at by subtracting all the negative ordinates, or those beneath the zero line, from the positive ordinates above the zero line.

Figuratively we can arrive at the same conclusion by resolving the forces of inertia and acceleration of each piston into horizontal and vertical components. It will be seen in Fig. 8 that the piston masses 6(1) and 7(1) each have their resultant downward as the piston 6(1), having passed the position of maximum velocity, the energy of the piston will be doing work on the crankshaft while the piston 7(1), not yet having reached the point of maximum velocity, is still being accelerated by the crankshaft, its reaction being, therefore, downward. Adding up the forces we get zero as a resultant, showing that there is positively no resultant unbalanced force.

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The arrangement of the crankpins is shown in Fig. 14 and Fig. 15 and each exhibits different characteristics. There is not what we could term "looking-glass symmetry" in the same sense that it is found in the conventional shaft with the crankpins at 180 deg. in the same plane. In other words, while the shafts are identical in each half, about an axis in the center, so far as their structure is concerned, one-half, if placed before a mirror, would not show a true reflection of the other half. There will be, therefore, a rocking moment about a plane of symmetry at right angles to the crank axis.

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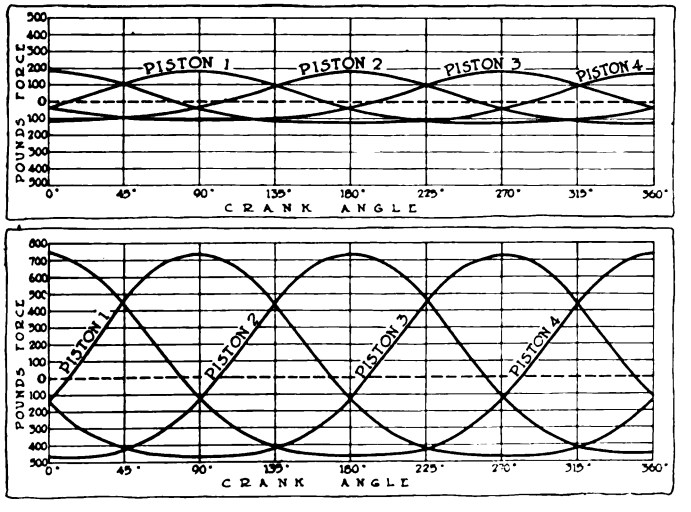
Therefore, it is entirely practicable and feasible completely



Figs. 9 and 10—Unbalanced force curves for eight with crankpins at 90 degrees as in motor.

Fig. 8—Upper—at 1000 r.p.m. Lower—at 2000 r.p.m.

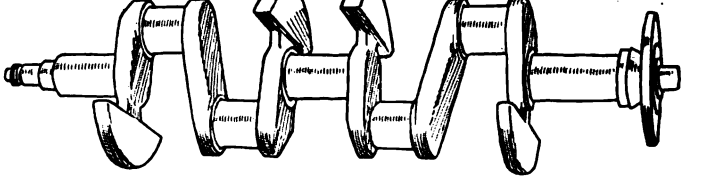
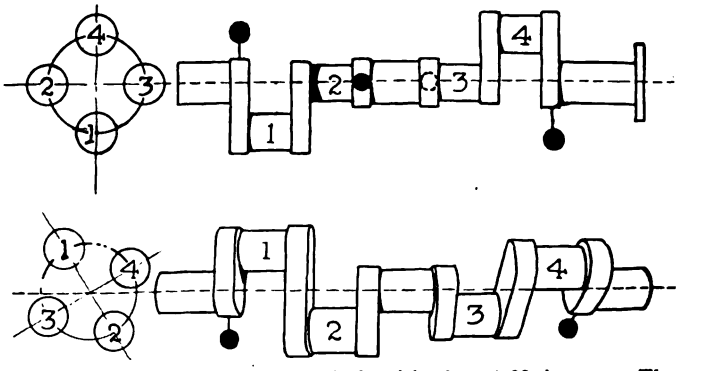


Fig. 13—Ordinary balanced crankshaft



Figs. 14 and 15—Balanced crankshaft with pins at 90 degrees. The lower of the two is the better design

to balance the centrifugal moment by the addition of balance weights on the end crank arms, and also to eliminate the inertia moment to such an extent that its presence would not be observed under any ordinary conditions.

The firing order for the latter shaft would be 1-5, 2-6, 8-7 7-4 or 1-3, 7-4, 8-5, 2-6 and with crankpins 3 and rotated 180 deg., the firing orders would be 1-5, 2-3, 7-4, or 1-4, 8-3, 7-5, 2-6, which, with proper manifold design, equally as good as the firing order of 1-8, 3-6, 4-5, 2- used in the conventional shaft with the crankpins a deg. The foregoing is sufficient to show the general acteristics of these experimental shafts as we have them. And our experiments demonstrated that the of cylinder performance was of prime importance found that, with the unbalanced inertia forces el we could actually produce vibrations by erratic fi when different camshafts are used and by purpo ing a condition of unequal cylinder performance.

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n in the foot brake lever. pin will engage with the us throwing out the high rakes. At one time, a num- is nature on the market, but d of any now for sale. The or this model is illustrated in

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J. W. A.

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Is Mean Effective Pressure

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J. A. J.

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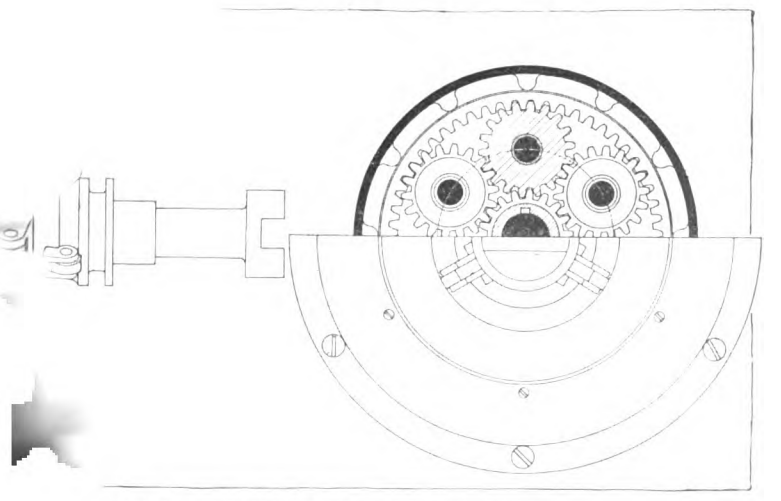


lick in part sectional side and end views

The Rostrum

The Correct Way to Grind Valves

EDITOR THE AUTOMOBILE:—Often we get into an argument about the correct way to grind valves. Some say turn them all the way around and keep on that way, occasionally putting on some more grinding compound, and others state that you must not turn the valves over one-quarter way around, thus rotating back and forth. Others claim about half way around and thus rotate them backward and forward.

Now, what is the correct way to grind valves?

Plentywood, Mont. J. S. K.

—When grinding valves the valve should not be turned to a complete rotation at any time, but should be worked backward and forward to one-quarter the circumference. After this has been done several times, the valve should be lifted free of the seat and turned a distance of about one-third revolution and then the same reciprocating action carried on.

Insufficient Gasoline Causes Back-firing

Editor THE AUTOMOBILE:—What are the indications when there is not enough gasoline in the charge?

2—In an automobile spark coil what name is given to the coil through which the battery current passes and the coil in which a flow of current is induced?

3—How are the cranks of a four-throw crankshaft for a four-cycle engine arranged and how many bearings may such a crankshaft have?

4—What are the names of the two systems of water cooling?

5—What is meant by three-point suspension, and of what advantage is it?

6—What is meant by an open circuit, a closed circuit, a divided circuit, and a grounded circuit?

7—What effects are produced by a weak battery or a broken or leaky spark plug, a wabbling timer or a loose electrical connection?

8—What is a master vibrator and of what good is it?

9—Why must one or more universal joints be fitted to the propeller shaft?

10—Can quick detachable and clincher tires be used interchangeably on the same rims, and can tire lugs for one size and make of tire be used with other sizes and makes?

11—What is the difference between a timer and a distributer?

12—How does the selective type of transmission differ from the progressive type?

13—What is a float feed spray carbureter, and what is a compensating carbureter?

14—How does the current generated by a dynamo differ from that produced by a magneto?

15—What system of ignition requires the use of an igniter?

16—How are the cranks arranged for a four-cylinder two-cycle engine and how many power impulses are received by the crankshaft in a revolution?

17—How does the low-tension type of magneto differ from the high-tension type and which is the better type to use?

18—Can you explain how the power developed by the engine and the speed at which the car runs are affected by the driver's manipulation of the spark and throttle levers?

Fort Warren, Mass. W. N. T.

—The main indication that there is not enough gasoline in the charge is back-firing on quick throttle opening and lack of power on hills.

2—They are called the primary coil and the secondary coil, respectively.

3—Doubtless you are referring to ordinary four-cylinder practice which is to have the cranks at 180 deg. With this arrangement there may be either two, three or five bearings for a four-cylinder motor.

4—Thermo-syphon and pump systems. The thermo-syphon is that in which the water is circulated due to the temperature setting up a flow through the manifolds and radiator. The pump system is that in which the water is positively circulated by pump.

5—Three-point suspension means the suspension of the power plant at three points making a triangular layout. The advantage is that racking of the frame or twisting of the side members has a minimum tendency to impose strains on the motor supports.

6—An open circuit in electricity is a circuit which is not complete and through which current would flow as soon as the gap or opening in the circuit was closed. A closed circuit is one which is complete and through which current is flowing. A divided circuit is one in which the current from the main leads is divided to sub-leads. A grounded circuit is one in which the return current is carried through the construction of the car instead of by wire. It is common practice to ground on the main frame or side member.

7—Irregular and misfiring of the charge.

8—A master vibrator is one which performs the vibrating work for a number of coils. It is used to assure a uniform spark in each cylinder since the same adjustment of the vibrator points is bound to occur for each plug.

9—In order to compensate for the different slopes of the propeller shaft due to spring action.

10—There are universal rims which allow the different types of tire to be used.

11—The timer times the spark by breaking the circuit at the right moment whereas a distributer leads the current to the proper spark plug.

12—The selective type of gearset permits the driver to go into any speed from any other speed without passing through intermediate gears. In the progressive gear it is necessary to go in the order of one, two, three, four or four, three, two, one.

13—A float feed spray carbureter is one in which the gasoline level is controlled by a float and float chamber. All carbureters are designed to be compensating, or in other words, to take care of variations in loads and speeds.

14—The current generated by a dynamo of the type used in automobile practice is direct whereas with a magneto it is alternating.

15—You probably refer to the low-tension make-and-break system in which the make-and-break apparatus was known as an igniter.

16—In a four-cylinder two-cycle motor the crankshaft re-

ceives four impulses per revolution. Since there are 360 deg. to a revolution the explosions will have to be 90 deg. apart and the crank throws arranged accordingly.

17—The high-tension magneto differs from the low tension in that it carries its transformer coil in a unit whereas the low tension has the transformer coil separate. Where magnetos are employed for automobile ignition either the high-tension or low-tension will give perfect satisfaction although the high tension is more compact.

18—The power developed by the engine must necessarily depend on the amount of explosive charge in the cylinder, hence if you open the throttle more there will be more gas in the cylinder and therefore more power. Advancing the spark permits the explosion to take place early in the stroke and by allowing the motor to take advantage of the expansion of the burning gases gives a higher mean effective pressure.

N. Y. License Good in Eastern States

Editor THE AUTOMOBILE:—Will you please let me know the automobile registration requirements for the Eastern States of the United States so far as interchangeability of license is concerned, such as purchasing a New York State license and wanting to take a trip to Birmingham, Ala.? Is it possible to travel through New Jersey, District of Columbia, Maryland, Virginia, North Carolina, South Carolina and Tennessee with a New York license?

Pedro Miguel, C. Z. L. DE LYON, V. V.

—The New York State license will carry you through all the States you mention, provided you do not stay in any longer than 10 days.

Interconnecting Buick Brake and Clutch

Editor THE AUTOMOBILE:—Referring to the model 10 Buick, what is the best way to interconnect the brake and clutch so that the latter will be disengaged before the former is applied?

I would like to make this change and feel that the necessary attachment should be preferably applied to the service brake. No doubt this point has been raised before and you have a ready solution of the problem. Perhaps you know of some device now manufactured for this purpose.

Kindly publish a sectional drawing of the clutch and transmission used in this car.

Hollis, L. I. R. M. DEV.

—In regard to interconnection of brake and clutch on the model 10 Buick this can be accomplished by welding or brazing a large washer on the front end of the rod which connects the high speed lever with the foot control shaft and by inserting a special large-headed pin in the foot brake lever. When the pedal is depressed, this pin will engage with the washer on the high-speed rod thus throwing out the high speed clutch when applying the brakes. At one time, a number of concerns had devices of this nature on the market, but THE AUTOMOBILE has no record of any now for sale. The gearset and clutch assembly for this model is illustrated in Fig. 1.

Information on Owen Magnetic

Editor THE AUTOMOBILE:—In the issue of July 15, page 102, there is a description of the Owen Magnetic drive car. Where, by whom and for what length of time has the Owen Magnetic been made? What is the highest speed?

2—What is the life of the magnetic transmission as compared with the ordinary and friction drive?

3—Could this transmission be put on another car?

4—What does the Owen Magnetic chassis sell for?

Kansas City, Mo. J. W. A.

—The Owen Magnetic cars are made in New York City, by R. M. Owen & Co., and have been on the market for about two years.

2—The magnetic transmission has not been on the market long enough to give any clue as to its ultimate life.

3—This transmission system can be put in another car, but this would be a wasteful operation and would not pay.

4—The price of the Owen Magnetic chassis alone is $3,150. For the complete car the price is $3,750.

M.E.P. Is Mean Effective Pressure

Editor THE AUTOMOBILE:—What is a T-head motor?

2—How can I secure the A. A. A. rules?

3—Is there a company prepared to fit front wheel brakes to a 1916 Chandler?

4—What does M.E.P. mean?

Cambridge, Mass. J. A. J.

—A T-head motor is one in which the exhaust and intake valves are on opposite sides of the cylinder. Two camshafts are generally employed with this arrangement.

2—The contest rules of the A. A. A. can be secured from the American Automobile Association, 437 Fifth Avenue, New York City.

3—THE AUTOMOBILE has no record of any concern prepared to fit front wheel brakes to a 1916 Chandler. This would be a very costly and complicated operation and it is doubtful if it would be possible to secure a practical job.

4—The initials M.E.P. stand for the mean effective pressure. It is secured by dividing the summation of the pressures at all points of the stroke by the length of the stroke.

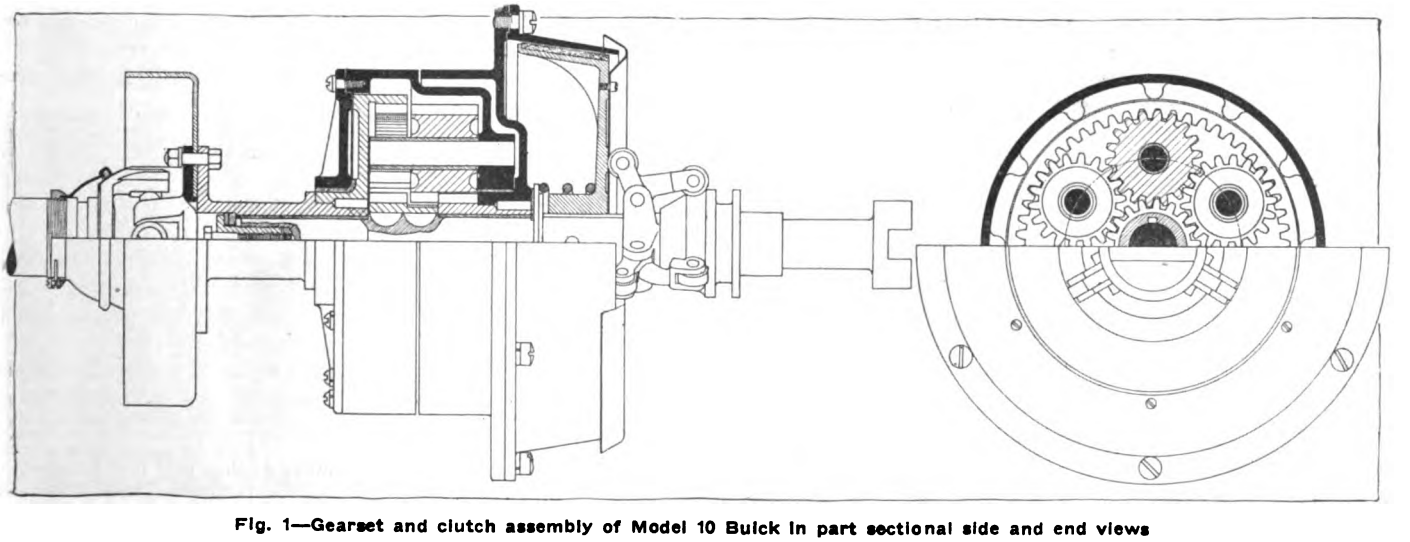
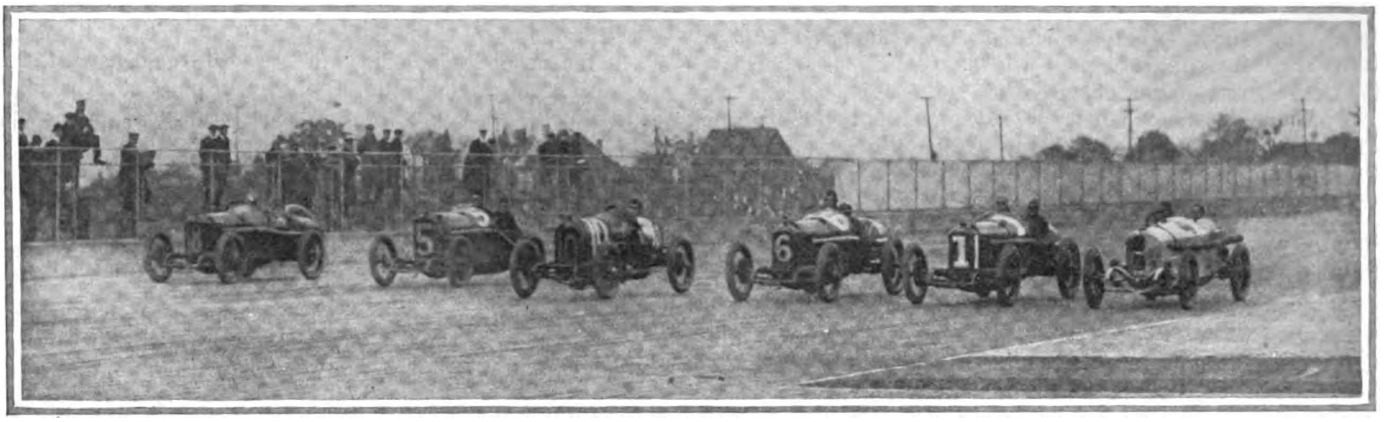


Fig. 1—Gearset and clutch assembly of Model 10 Buick in part sectional side and end views



The six cars coming into the stretch for the flying start of the 100-mile race for the Harkness gold challenge cup and $12,000 prizes. Left to right, they are: Mulford, Peugeot; Burman, Peugeot; Rickenbacher, Maxwell; Aitken, Peugeot; Resta, Peugeot; and De Palma Mercedes. As they swept up to the line the thousands of spectators in the stand burst into cheers

Resta Takes Harkness Cup Race at 105.39 M. P. H.

On Sheepshead Bay Track His Peugeot Comes Within 26 Sec. of Breaking 100-Mile World's Record Made at Brooklands

De Palma Wins Match Race with Burman in Two Heats, the First at 111.97 and the Second at 113.86 M. P. H.

Order of Finish in Harkness 100-Mile Gold Cup Race

Car	Driver	Time	M.P.H.
Peugeot	Resta	56:55.71	105.39
Peugeot	Burman	58:38.95	102.43
Maxwell	Rickenbacher	61:00.59	98.33

SHEEPSHEAD BAY SPEEDWAY, Nov. 2—Dario Resta to-day won the final speedway event of the year by winning in his Peugeot from a field of six of the picked drivers of the country in the 100-mile race for the Harkness gold challenge cup, on the 2-mile board speedway here. Besides the laurels of victory Resta, by going the distance in 56 min. 55.7 sec., without having to make a single stop, established a new American record for the century and came within 26 sec. of beating the world's record for the distance made on the Brooklands cement speedway in England some years ago. The Brooklands record is 56:29.93, or only 25.78 sec. faster than Resta's mark of to-day. Resta's average here to-day was 105.39 m.p.h.

Burman Second at 102.43

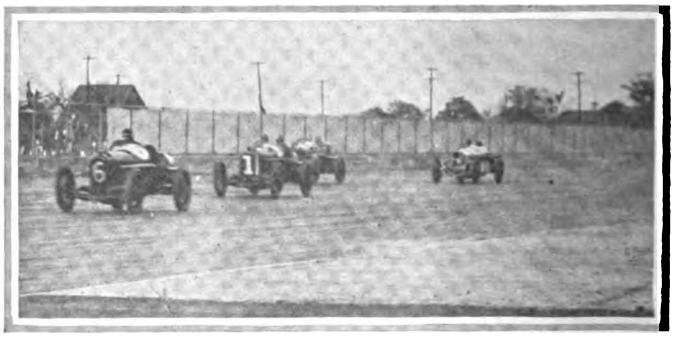
Second place was taken by Robert Burman in another Peugeot, Burman finishing a little over a lap behind the winner, but doing the distance in 58:38.95, an average of 102.43, and beating the mark that Resta made in the 100-mile match race on the Chicago speedway some months ago. Burman had to stop once for a right rear tire which lost him a lap.

Rickenbacher in Third Place

Third place went to Edward Rickenbacher in a Maxwell, who made a non-stop race but whose car was not fast enough for the company. Rickenbacher averaged 98.33 m.p.h., his time being 61:00.59.

Six racers started, the field being made up of four Peugeot cars, one Mercedes and a Maxwell. Resta, Burman, Mulford and Aitken drove Peugeots; De Palma handled the Mercedes and Rickenbacher the Maxwell. Aitken, after leading from the start, was forced out at 12 miles with a broken connecting-rod. De Palma was out at 40 miles, having made two stops for carburetion, his first stop coming at 24 miles. Ralph Mulford, who was the pace setter after Aitken was eliminated, was the hard luck tire driver of the race until at 92 miles when he went out with a broken connecting-rod. Mulford had the fastest car in the race but his speed cost him tires and he stopped regularly at 25-mile intervals to change his right rear. The first change was made in 21 sec. at the end of 28 miles; the second change was at 50 miles; and the third change at 76 miles was made in 23 sec. The fourth time he changed both rears in quick time. Each stop put him back more than a mile, due to time lost in slowing up. In the middle of the race he regained from Resta more than a mile of lost distance but in doing so he brought more tire changes for the right rear, the tire that gave him the most trouble.

While Mulford and Burman were wrestling with tire



The leaders closely bunched at 10 miles as they shot into the grandstand stretch. Left to right, Aitken, Peugeot; Resta, Peugeot; Burman, Peugeot, and De Palma, Mercedes

troubles Resta was going along at an amazingly steady pace of a little over 105 m.p.h., which he set from the start and did not vary at any one of the 10-mile points.

The start was a flying one with De Palma in the favored position at the pole and with the order outside of him Resta, Aitken, Rickenbacher, Burman and Mulford. In the first lap De Palma put his Mercedes in the lead in the first turn but Aitken took the lead in the backstretch and when they crossed the tape at the end of the initial lap the order was Aitken, Mulford, Resta, De Palma and Burman, with Rickenbacher trailing. Aitken at once established himself in the lead with Resta and De Palma close up, which order continued until 12 miles when Aitken was out and at this point Mulford had passed Resta and took the leadership, with Resta, Burman and De Palma all bunched 100 yd. back of him. Soon, Mulford had 200 yd. on this trio and a few laps later Mulford was more than the length of the homestretch in the lead. Mulford was making lap after lap at 108 m.p.h., when his first tire went and he was placed back nearly a lap, giving the leadership to Resta at 28 miles. Mulford's average at 20 miles was 105.18 m.p.h.

Tires the Determining Factors

With Resta slightly in the lead at this point due to Burman, Mulford and De Palma all stopping between 24 and 28 miles, the tense interest of the race ended and everybody sat back waiting for tires to become the deciding factors, as they did. Good judgment and fortune favored Resta as they did in the Chicago 100-mile event and he was an easy winner, finishing more than a lap ahead of Burman.

At the end of the first 10 miles Aitken's Peugeot led, having averaged 102.62 m.p.h. When 20 miles had been covered Mulford was ahead with a speed of 105.18. At 30 miles Resta had worked his way to the front, his average standing at 105.36. He held this position during the remainder of the race, his average speed in m.p.h. at each 10 miles being as follows: 40 miles, 105.88; 50 miles, 105.57; 60 miles, 105.31; 70 miles, 105.39; 80 miles, 105.53; 90 miles, 105.57; and 100 miles, 105.39.

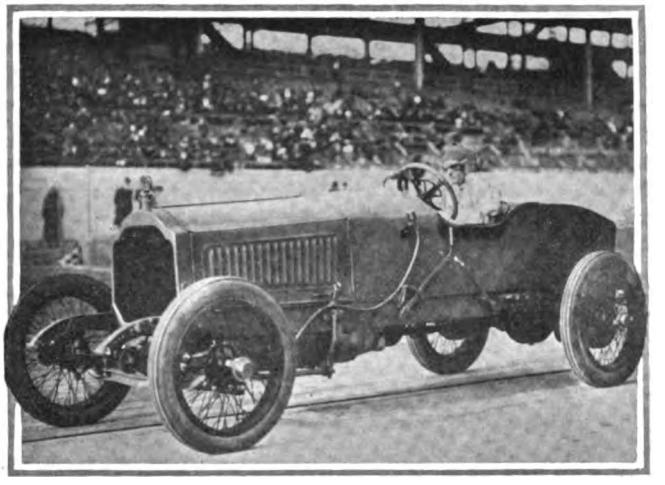
De Palma and Burman in Match Race

In addition to the 100-mile race there were two heats of 4 and 6 miles, respectively, between De Palma in the twelve-cylinder Sunbeam, which the Packard company purchased some months ago and Burman in the Blitzen Benz. These races were the most exciting of the afternoon, the finishes being so close that one car was alongside of the other. De Palma won both, taking the 4-mile heat in 2:08.61, an average of 111.97; and taking the 6-mile heat in 3:09.65, an average of 113.86 m.p.h. In these heats the cars were rarely more than a few lengths apart. On the turns De Palma, with the pole position, ran low, while Burman rode high, losing a length or so but coming into the stretches at terrific speed and going alongside and in a few instances passing De Palma, only to drop back a little on the turn. At the finish the front wheel of the Benz was alongside the rear wheel of the Sunbeam. The Sunbeam has cylinders 80 by 150 mm., giving a piston displacement of 549 cu. in. The car weighs 2800 lb., has 120-in. wheelbase and used 32 by 4½ tires. The cylinders are cast in groups of threes and arranged in conventional V groups.

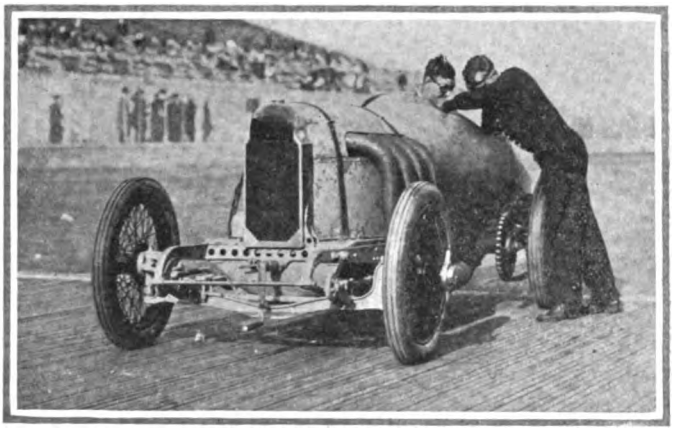
Burman's 2-Mile Trial

A third feature of the afternoon was a 2-mile exhibition by Burman in the Benz in which he was unofficially clocked at a speed of 116 m.p.h., which, if official, would establish a new American record for that distance.

Jesse G. Vincent, chief engineer and vice-president of the Packard company, drove a Packard twin-six with racing body a 2-mile lap in 1:10.52, a speed of 102.25 m.p.h. The car was standard except the timing was changed for higher speed; pistons were arched on top to give higher compression; a double Zenith carbureter was used and the rear axle gear ratio was to give 34 m.p.h. at a crankshaft speed of 900 r.p.m. Mr. Vincent says the crankshaft speed was 3000 r.p.m. on the backstretch.



The Packard twin six which J. G. Vincent, vice-president of engineering of the Packard company, drove around the 2-mile Sheepshead Bay speedway in 1:10.52, or at the rate of 102.25 m.p.h. This is a stock car except for the racing body and that the timing was changed for high speed work, the pistons were arched on top to give higher compression, a double Zenith carbureter was used and the rear axle was geared to give 34 m.p.h. at a crankshaft speed of 900 r.p.m.



Burman giving his Blitzen Benz a few preparatory touches just before the start of the match race with Ralph De Palma in the twelve-cylinder Sunbeam. De Palma won the first heat of 4 miles, two laps of the track, in 2:08.61, or at 111.97 m.p.h., and the second heat of three laps, 6 miles, in 3:09.65, or at the rate of 113.86 m.p.h.

In the 100-mile event Zenith carbureters were used on all six cars, as were Bosch magnetos and Silvertown cord tires. Wire wheels were used on all cars.

In the way of lubrication, Resta, Burman, Rickenbacher, Mulford and Aitken used Oilzum and De Palma used Monogram. Boyce Motometers were used by all the cars in the 100-mile race.

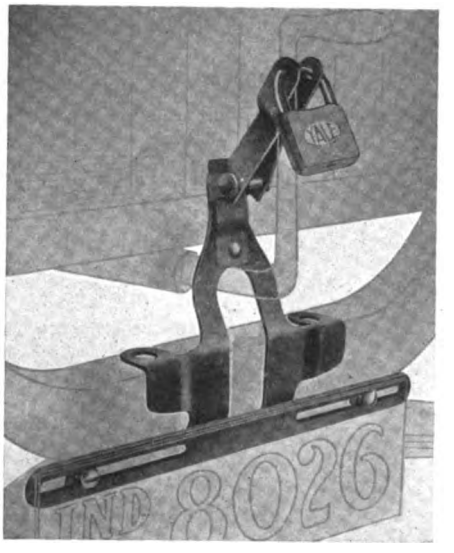
The piston displacement of the Peugeots driven by Resta, Mulford and Aitken is 274 cu. in., and that of Burman 296. The Maxwell is 298. The Blitzen Benz has four cylinders 7 5/16 by 8 in., and is one of the biggest racing motors of the day. The car weighs 2800 lb., is chain driven, uses a Benz carbureter, two Bosch magnetos, and carries 33 by 4 and 33 by 5 tires, front and rear. It is geared 1 to 1 between the motor and the rear axle.

The day was very windy and rather cold, increasingly so as the shadows began to lengthen toward the close of the 100-mile race but in spite of these conditions a crowd of over 25,000 thronged the stands and hundreds of cars were parked within the inclosure.

ACCESSORIES

Oakes Kranklock for Fords

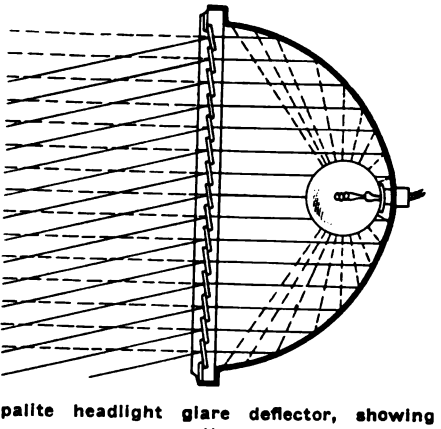
THE Kranklock is a combination starting crankholder and license plate bracket designed to fit on the center bolts of the Ford front spring, making its attachment simple and rigid. Its advantages are that it holds the starting crank upright and rigid as shown in the accompanying illustration, that it can be locked, thus making the car theft-proof and also that it holds the license number securely in a correct position.—The Oakes Co., Indianapolis, Ind.



Oakes Kranklock for Fords, illustrating mounting

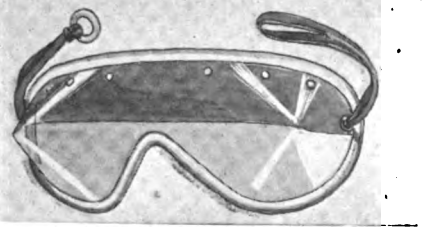
Opalite Glare Deflector

This device consists of a series of Parolin prisms which run diagonally across the headlight lens, each prism overlapping the top of the one below it, the prisms being arranged at such an angle that proper deflection and diffusion of the light rays result, thus overcoming all blinding glare. The manufacturers state that the device will not break, even if the headlight glass is shattered and emphasize that it kills the glare from the lamp but not the light, simply softening the beams without impairing the illumination of the road. Opalite is made to fit all makes of lamps, is permanent and positive in action and is adjusted in a few moments.—Price $2 per pair.—M. & K. Auto Sundries Co., New York City.


Opalite headlight glare deflector, showing action

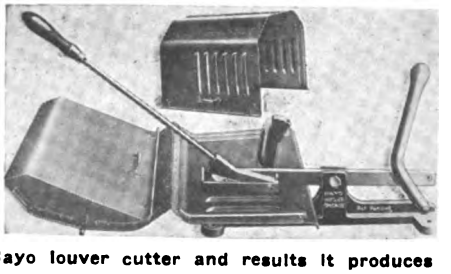
Micalite Fireproof Celluloid

A fireproof celluloid under the trade name of Micalite has been placed upon the market and is being manufactured in transparent sheets which are being used in the Micalite eye shield. Another interesting feature of the material is that although it has been generally understood that such a material as Micalite could not be stained it is being produced in colors suitable for use in goggles, namely, amber in a light shade or amber in two shades in one piece. This development has made possible the all-one Micalite eye shield which is now regularly marketed. The darker part is intended for the brightest lights and the lighter part for ordinary use.—Strauss & Buegeleisen, New York City.


Micalite eye shield of fireproof celluloid

Mayo Louver Cutter

A device for cutting louvers or ventilating openings in the bonnets of cars has been put out under the name of the Mayo louver cutting machine. It is intended for garage men who can solicit the work of cutting these louvres in the hoods of cars in their vicinity. The machine which is shown in the accompanying illustration is strongly constructed with hardened tool-steel cutters for left and right sides of the hood. The cutters can be removed and sharpened. The complete machine weighs 45 lb. and the dealers' price is $30 net.—Mayo Mfg. Co., Chicago, Ill.


Mayo louver cutter and results it produces

Arguto Wood Bushings

These oilless bushings are designed for shop work where oiling is objectionable or difficult, the wood being chemically treated so that lubrication is unnecessary, making it especially well adapted to loose pulley work, where centrifugal force throws oil out of the ordinary bearing. Arguto bushings are not recommended for heavy line shafting, because wood is not strong enough to withstand the stresses but for countershafts, light line shafting and similar work the wood gives excellent results, the makers citing instances where these bushings have been in satisfactory use for periods up to nine years. When using the Arguto bushings the shaft is lightly smeared with a lubricant, largely as a rust preventive in case the shaft is not immediately operated. For loose pulleys on grinding machinery these bushings have the advantage that they run perfectly dry and cannot gather abrasive dust. The coefficient of friction is about the same as that of ordinary metal line shaft bearings.

Cylindrical bushings are furnished from ¼-in. bore 1 in. long to 3-in. bore 16 in. long, the smallest size listing at 5 cents each and the largest at $4.50.—Arguto Oilless Bearing Co., Philadelphia, Pa.

Holdfast Nut

Holdfast nuts are made by a chemical welding process, the threads of standard size nuts being coated with a soft friction metal which grips the threads of the bolt and holds them tightly. A special tap is used to remove part of the soft metal from the bearing or load surface of the thread after the soft metal coating has been applied, leaving the metal on the clearance side. The nuts are applied in the ordinary way and can be used several times before wearing out the soft metal coating. Any size, style or grade can be furnished.—Holdfast Nut Co., Chicago, Ill.

Beamish Lunch Bag

The Beamish bag for cold lunch is of strong paper stock, the lower part being of heavy manila tag stock, the entire bag being paraffined to make it waterproof. The makers state that it will keep cold lunches clean and moist for a long time and that bottles packed in the bag with ice will keep cold for twelve hours. Each bag may be used several times. Price 10 cents each.—Beamish Glass Co., Kansas City, Mo.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, November 4, 1915 No. 19

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
T. B. Van Alstyne, Advertising Manager
231-241 West 39th Street, New York City

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Entered at New York N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October 1903, and the Automobile Magazine (monthly), July, 1907.

Cylinders Once More

IN automobile development it seems fated that there should always be cylinder factions. We began with one versus two, had an interval of two or three and then a long session of two or four. Then came a general acceptance of four, followed by more argument with the coming of the six. It was soon seen that both four and six had their legitimate spheres and the argument died away. Now, in one short year, we have both the eight and twelve providing a new three-cornered problem with the six for the other side of the triangle.

It is devoutly to be hoped that we shall not see engineers split up into groups over this new phase, because such grouping injures progress. The proper state for an engineer is that of the open mind; to assume the newest thing is good until it is proved instead of expecting failure until disproved. There is a great big difference between these two ways of looking at a thing, and one stands for progress while the other does not.

Marvelous Motor Progress

THAT 1915 has seen a more rapid development of the gasoline engine than any previous period of three times the length is undeniable. The high efficiency engine has been known for several years, though exploited but little in America; the eight and twelve-cylinder motors were practically not known anywhere. Now, in a single year our engineers have accepted and adopted high efficiency design and added to it the novel types of motor. Most remarkable of all, perhaps, is the fact that everyone from manufacturer to user is satisfied with the success of the engineers' work.

Not long ago engineering progress was undoubtedly retarded by the notion that rapid engineering development was uncommercial. The results of this year's business shows rather that engineering advance is one of the greatest assets of the industry. The automobile of 1916 is a far better car than the machine of two years ago, it is selling in far larger quantities, it is costing less to run and it is attracting more and more of the population to become automobile owners. Thus the first time for many years that the engineers have been given a free hand they have shown how great the part they play in stimulating sales directly.

Racing Car Making

THE recent editorial in THE AUTOMOBILE, Wanted! Racing Cars, has stimulated a good deal of correspondence which goes to show that the problem of supplying good cars to fill our speedways next year is being considered in many quarters. The general idea seems to be that the popularity of racing may create more small firms who will specialize solely on racing chassis and cater solely to the speedways, but the point first requiring to be settled is whether a sufficiently reliable market is assured.

There is obviously a very widespread feeling that the prize money needs to be distributed so that car builder and driver are no longer dependent upon winning or coming close to winning if they are to see any return for their work. The stars may draw their tens of thousands, but the chorus is also deserving of its hire.

With this view it is impossible to dissent, however hard it may be to devise a means for readjustment that will please everyone, and it is now the turn of the speedway organizations to offer a suggestion. Why not appoint a joint committee of the A. A. A., manufacturers, speedways, entrants and drivers and get something settled before the dawn of 1916?

Automobile Reserve Corps

THE ostensible purpose of the establishment of an Automobile Reserve Corps in this country is to provide a volunteer transport service, trained and ready at a moment's notice to mobilize or concentrate our small army. This should make our fighting force marvelously mobile, for we have many more automobiles available than all Europe could claim at the opening of the great war. Incidentally this Automobile Reserve Corps, with each recruit a unit in an active national patriotic organization, should raise the standards of citizenship. There are many motorists who do not feel competent to shoulder a gun. They feel no sense of duty other than at the polls.

Chandler Stock Now $10,000,000

New Régime To Increase Yearly Car Output from 9000 to 20,000

NEW YORK CITY, Nov. 1—A new régime in the Chandler Motor Car Co., Cleveland, Ohio, has been started by an increase in the stock of the company from $425,000 to $10,000,000, this increase being all common stock which is being put on the market by Hornblower & Weeks, 42 Broadway. This additional common stock is not all being sold, $3,000,000 being held for future sales. It is understood that Hornblower & Weeks have sold all the remainder already at 85. The stock will soon be listed on the exchange.

By this new financing scheme the capacity of the Chandler factory it is expected will be increased to 20,000 cars to be built in the next twelve months. There were 9000 cars built during the last year. Under the new financing the control and management of the company will remain with the old stockholders, and the majority of the board will be made up of the old Chandler organization, including F. C. Chandler, president; C. A. Emise, vice-president; W. S. Mead, vice-president; and Samuel Rogers, treasurer. The proceeds of the sale of new common stock will be used for increasing the factory capacity. During the last four months one factory addition has been under construction and is now nearing completion which will double the capacity of the factory.

Since its inception the rise of the Chandler factory has been one of the spectacular developments of the automobile industry, particularly in that field where price has been in the zone between $1,200 and $1,700. The Chandler six was announced in February, 1913, at the Chicago show. The feature of its announcement being the first six-cylinder car to be marketed in quantities at a price of $1,750. Two years later at the Chicago show, 1915, the motor car field was further electrified when the price was reduced to $1,295 which set a new low figure for a car of its class.

During the past year the stockholders of the Chandler company have received 100 per cent cash dividend on their common stock and the regular 7 per cent dividend on the preferred.

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Maxwell to Aid Dealers' Finances

DETROIT, MICH., Nov. 1—*Special Telegram*—The Maxwell Motor Co. has decided to use part of its surplus by making deposits in banks in different parts of the country where Maxwell dealers are located and enable the latter to get loans from the banks in order to be able to pay cash for cars ordered in December, January and February, during which months sales are almost always at a minimum. The arrangement between the banks and the Maxwell company is to be with the understanding that the dealer will be given credit equal to the company's deposit, the interest to be not more than 6 per cent. The dealer is to put up from his own resources about one-fourth of the purchase price while the balance will be made up from the loan, thus enabling cash payment on delivery of the cars. Certificates of deposit bearing 3 per cent interest will be accepted by the Maxwell company, the deposits being made for six months. The certificates will also be negotiable by special arrangement between the company and its banks. The dealers' notes will be collected by his bank.

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Studebaker To Retire All Serial Notes—$2,300,000

DETROIT, MICH., Oct. 30—The Studebaker Corp. has decided to retire all of its outstanding serial notes, amounting to $2,300,000, although the last of them are not due until 1922. For this purpose the 20,684 shares of common stock held in the corporation's treasury, will be offered to common stockholders of record at the close of business Nov. 20, at $110 a share, on the basis of 7 per cent of their holdings. In other words if a stockholder has 1000 shares of common on Nov. 20, he can buy seventy shares of the stock now in the treasury at $110 a share.

After the retirement of these notes the Studebaker Corp. will have no debts excepting current accounts and its working capital will be $22,050,000 of which $6,500,000 is cash. It is expected that the special surplus account used for amortization of preferred stock will soon total $2,500,000 which will then make it possible to declare more than 6 per cent dividends. The corporation's charter provides that only after the surplus has reached that amount can a dividend in excess of 6 per cent be paid.

—

Safford McQuay-Norris V. P.

ST. LOUIS, MO., Nov. 1—L. A. Safford, formerly Chicago manager of the Chilton Co., publishers, of Philadelphia, Pa. has been made second vice-president of the McQuay-Norris Manufacturing Co. of St. Louis.

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Cotton F. W. D. Advertising Manager

CLINTONVILLE, WIS., Oct. 29—J. D. Cotton has been appointed advertising manager of the Four Wheel Drive Co., Clintonville, Wis., and has already taken up the duties of the advertising and promotion department.

H. W. Ford Controls Saxon Co.

Buys Hugh Chalmers' Stock—$500,000 Involved—To Build 28,600 Cars

DETROIT, MICH., Oct. 30—Harry W. Ford, president of the Saxon Motor Co. has purchased all the stock which Hugh Chalmers, president of the Chalmers Motor Co. held in the Saxon company. The deal involves a cash transaction of half a million dollars and makes Mr. Ford the largest individual stockholder in the Saxon company, of which the original stockholders were, besides Mr. Chalmers and Mr. Ford, Lee Counselman, Percy Owen, Geo. W. Dunham, H. H. Pinney, C. A. Pfeffer, C. A. Woodruff and C. C. Hinckley, the latter four having disposed of their interests some time ago. The manufacturing schedule of the Saxon company for the present season calls for a production of 28,600 cars.

Harry W. Ford came to the Saxon company through Mr. Hugh Chalmers. He worked in the advertising department of the National Cash Register Co., Dayton, Ohio, while Mr. Chalmers was general manager of the company. When the latter organized the Chalmers Motor Co. he asked Mr. Ford to join him and put him in charge of the advertising department of the new company. When the Saxon Motor Co. was organized by Mr. Chalmers and other Chalmer's officials they chose Mr. Ford as president of the new concern.

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Overland Sales 100% over Oct., 1914

TOLEDO, OHIO, Oct. 28—President J. N. Willys in a statement at the annual meeting of the Willys-Overland on Oct. 26, stated:

"August and September shipments increased 400 per cent over the same months of a year ago. October sales increased 100 per cent over October a year ago. New buildings are now practically completed which will permit an increase in output to 1000 cars a day by March 1, which, from present indications, will be fully required to produce new models planned for 1916. The Willys-Knight deliveries are 40 per cent greater than we had planned."

—

Alter Price Remains Unchanged

PLYMOUTH, OHIO, Oct. 28—The Alter Motor Car Co. has brought out its 1916 model with few changes. The price of the car is $685, the same as last year. This includes starter, one-man top, electric lighting, horn, etc. The wheelbase has been lengthened to 108 in. and 32 by 3½ in. demountable rims are added.

Sept. Exports Are $10,711,133

Over $1,000,000 Better Than Aug.—Trucks Total 2227 and Cars 4299

	September, 1914		September, 1915	
	No.	Value	No.	Value
Cars ..	646	$597,904	4,299	$3,215,459
Trucks..	128	294.288	2,227	5,882,255
Parts ..	...	34,618	...	1,613,419
Total. ...		$926,910	...	$10,711,133

WASHINGTON, D. C., Oct. 31—Exports of automobiles, trucks and parts during September, 1915, showed a value of $10,711,133. This is quite an increase over the previous month's figures, which were $9,567,348 and over September, 1914, with only $926,910.

Trucks, numbering 2227 and valued at $5,882,255 and cars, numbering 4299 and valued at $3,215,459 with $1,613,419 in parts, were exported.

Both cars and trucks increased in number over August. One interesting point brought out in the above table is that though the number of cars shipped in September increased 460, the value only increased $93,265, showing the September shipment included cheaper-priced cars than those shipped in August. The number of trucks increased 613 and the value $1,495,062.

There was a drop in parts shipments, which amounted to $1,613,419 as compared with $2,038,321 in August.

Firestone and Miller Tire Companies Plan Additions

AKRON, OHIO, Oct. 30—The Firestone Tire & Rubber Co. and the Miller Rubber Co. will soon add to their plant outputs with new buildings. The new Firestone plant will be erected on the east side of Main Street, opposite the present plant. The Miller company is planning a new factory, the permit for which will be issued in a few days. This new building is the third to be started within the past six months.

A permit for the erection of the Firestone clubhouse has been issued. The new building will cost $85,000.

Paige Sales for October Show 600 Per Cent Increase

DETROIT, MICH., Oct. 31—During the first fifteen days of October, or thirteen actual working days, more Paige cars were shipped than in any other period in the history of the Paige-Detroit Motor Car Co. October sales show an increase of 600 per cent over October of last year.

500 Men Rush New National Plant to Completion

INDIANAPOLIS, IND., Oct. 30—More than 500 men are working overtime in order to complete the new plant of the National Motor Vehicle Co. Operations in the new building are expected to commence in about sixty days. The company is spending about $100,000 to enlarge its plant, and the new buildings are two stories high and 678 ft. in length. This means that the length of the additions is approximately two city blocks.

Chevrolet Cars To Be Assembled in McLaughlin Plant

FLINT, MICH., Oct. 30—The Mc-Laughlin Carriage Works, Oshawa, Canada, have completed an arrangement with the Chevrolet Motor Co. of Delaware, whereby their big carriage plant in Oshawa will be turned into an assembling plant for Chevrolet cars. At the same time the McLaughlin concern takes charge of the Chevrolet Motor Co. of Canada, recently formed to operate a plant in West Toronto. Thus the Crevrolet business in Canada will be controlled entirely by the McLaughlins.

Through the new arrangement it will now be possible to increase the production of Chevrolet cars in Canada from 5000 to 12,000 for the season of 1916. An output of 20,000 has been planned for 1917, it is said.

The McLaughlins have a controlling interest in the McLaughlin Motor Car Co., Ltd., which assembles and sells the Canadian Buick, the General Motors Co. having the balance of the stock.

King Has Improved Model

DETROIT, MICH., Nov. 1—The King Motor Car Co. has announced an improved model five-passenger, eight-cylinder King at $1,150, f. o. b. Detroit, $200 less than the King eight brought out a year ago.

The new car has a larger motor, 2⅞ in. by 5-in. stroke. Other modifications include a larger carbureter, refinements in lubrication, radiation and ignition. The main points in the design are unchanged. Color has been changed from blue to a salon green body and hood, with black fenders, running gear and wheels; with a fine gold stripe.

Kelly and Springer Return

NEW YORK CITY, Oct. 28—John H. Kelly, sales manager of the Republic Rubber Co., Youngstown, Ohio, accompanied by Frank V. Springer, export manager, returned on the Adriatic to-day from a two months' trip in Europe.

Porter Rubber Plant in Salem

SALEM, OHIO, Oct. 30—The Porter Rubber Co. has been organized with a capital of $125,000, and will erect a plant in Salem. The officers elected are as follows: President, J. C. Porter; vice-president, T. H. Boyd; treasurer, E. E. Boyd.

Peerless and General Veh. Co. Sold

New Corp. To Take Over Both —Trucks and Motors To Be Made

NEW YORK CITY, Nov. 3—The Peerless Truck & Motor Corp. has been formed in this city to-day to acquire the Peerless Motor Car Co., Cleveland, Ohio, and the General Vehicle Co., Long Island City. Nothing definite as to the capitalization or plans of the new corporation is at present known but it is understood the manufacture of commercial vehicles will be continued and that the manufacture of passenger cars at the Peerless factory is assured as an eight-cylinder car will be brought out in the near future. The General Vehicle Co., through its agreements with the Mercedes company in Germany has control of certain aviation features which it is expected will be developed and vigorously pushed in this country.

The exact personnel of the Peerless Truck & Motor Corp. is not known, but it is expected that it is closely allied with the electrical interests which secured control of the Peerless company over 3 years ago.

Gasoline Shortage in Paris Threatens to Stop Taxicabs

PARIS, Oct. 23—The shortage and high price of gasoline in Paris has become so serious that the taxicab service is threatened with a stoppage. The municipal authorities have taken the matter up, but have not yet arrived at any decision other than a statement that drivers are not allowed to change their rate of fares without giving official notice and changing the color of the taximeter flag to correspond with the scale they are using.

It was generally reported that the high cost of gasoline was due to the large requisitions made by the military authorities, but according to an official statement no extra requisitions have been made. This statement is not generally believed. One of the explanations given by the refiners is that they are unable to get the tank boats which normally bring gasoline up the Seine to Paris. The Roumanian and Russian supply of gasoline has been cut off, but this only represented 20 per cent of the whole, the remaining 80 per cent coming from America. It is known that there is no shortage of gasoline for military purposes; in certain cases soldiers report they are so well supplied they can wash their clothes in gas. As gasoline has now become a first necessity, all civilian users are asking if it is not possible to give them greater consideration without hampering the military.

Canadian Ford Profits $3,202,458.15

Annual Statement Shows Gain of $1,179,962.09 Over 1914 —Cash $2,609,997.65

FORD, ONT., Oct. 26—The annual financial statement of the Ford Motor Co. of Canada, Ltd., shows that during the fiscal year ending Sept. 30, 1915, the company made a net profit of $3,202,458.15 or an increase of $1,179,962.09 over the profit of 1914.

The assets totaled $9,182,408.30 as compared with $5,603,618.41 in 1914, an increase of $3,578,789.89 for the year just ended. Among the items enumerated the one showing the biggest increase is that of cash on hand or in the banks, which totaled $2,609,997.65 or nearly $1,400,000 more than in 1914. An increase of nearly $1,000,000 is also shown for the home plant's value, which is given at $2,743,112.07 as against $1,875,114.36 in 1914. For branch plants there is shown an increase of over 100 per cent. Accounts receivable which were marked down for $347,149.17 in the 1914 report now show a total of over $1,000,000 of which over half represents foreign accounts.

Among the liabilities all the items with the exception of one show big increases, this one exception being the dealers' contract deposits with which is also included miscellaneous credits. The total is $115,884.68 or about $1,000 less than the previous year.

Charges Fraud in Fender Test

CHICAGO, ILL., Nov. 2—Suggestions of bribery and fraud in the conduct of fender tests for the city of Chicago may result in throwing considerable light on the conduct of the so-called tests of safety fenders, which have been going on in Chicago. H. L. Eisenhauer, president of the Telescopic Fender Co., made charges before the judiciary committee of the city council yesterday, which involved Emanuel Freidlander, president of the Fender Manufacturers' Association. It is expected that these will result in an airing of the conditions in the fender tests, as information, it is understood, is to be placed in the hands of the State attorney.

Eisenhauer's attorney paved the way for the disclosures by making insinuations regarding the good faith of the committee which has been testing truck fenders under the direction of the deputy superintendent of police. The tests were made for the purpose of recommending to Chief Healey, which fender should be approved by the police department, as complying with the fender ordinance passed nearly a year ago. Eisenhauer said he paid $300 to Freidlander, the first $100 of which was to be paid over to the city to meet the cost of the test. In accordance with Freidlander's statement all the business is being done between the fender association and the testing committee. Eisenhauer said that Freidlander gave him a receipt and a written guarantee that he would get a certificate of approval of the fender or receive his money back. The second $100, according to Eisenhauer, was to assure the passage of the fender, and the third $100 was paid on the representation that the association needed the money and that "everything was fixed."

It seems that the telescopic fender has not been approved as yet, hence the disclosures. The deputy superintendent of police, in charge of the tests, claims that the Eisenhauer payment of the second $200 was for the purpose of bribing one of the committee but it was unsuccessful. The Standard Fender Co., a member of the association, is the only concern thus far which has received the approval of the committee. The chief of police, however, has not issued a certificate to the Standard company and the latter is complaining because the certificate is held up. The Standard Fender Co. is represented by attorney Frank L. Childs, who, by the way, is the attorney for the Chicago Motor Club. The chief of police has withheld the issuance of the certificate to avoid creating anything like a monopoly.

Ford Motor Co. of Canada, Ltd., Balance Sheet for Fiscal Year Ending Sept. 30, 1915

	1915	1914
ASSETS		
Cash on hand and in banks	$2,609,997.65	$1,257,032.35
Accounts receivable	1,027,573.17	347,149.17
Prepaid expenses	178,167.67	127,707.69
Inventories or stores accounts	1,649,078.40	1,513,695.17
Home plants, including buildings, machinery, equipment, etc.	2,743,112.07	1,875,114.36
Branch plants	974,479.34	482,919.67
Total	$9,182,408.30	$5,603,618.41
LIABILITIES		
Accounts payable	$874,848.33	$284,621.00
Accrued payroll and miscellaneous	133,088.53	64,207.00
Dealers' contract deposits and miscellaneous credits	115,884.68	116,679.00
Contract rebates	89,496.74	34,600.00
Reserves	439,289.51	276,166.00
Profit and loss	3,202,458.15	2,022,496.06
Surplus	3,327,342.36	1,804,846.35
Capital	1,000,000.00	1,000,000.00
Total	$9,182,408.30	$5,603,618.41

$3,000,000 Co. to Build Lozier

Property Bought by Assoc'd. Lozier Purchasers—New Interests Elect Officers

DETROIT, MICH., Oct. 29—With a capital stock of not less than $3,000,000 the Lozier Motor Co. will be re-organized and will continue to make Lozier cars as a going concern.

Two of the big stockholders, Maurice Rothschild and Charles Shongood, who were vice-presidents of the company, and who were among those who purchased the assets of the old concern, have withdrawn from the company and disposed of all their holdings to Theodore Friedeberg, Harry and Samuel Frank, who now control all the stock of the company.

The reason of the withdrawal of Mr. Rothschild is due to the fact that he is affiliated with the Harris Bros. Co., Chicago, which firm is commonly known as the Chicago Housewrecking Co. It caused people to believe that these firms were actually interested in the Lozier company and intended only to continue the business for liquidation purposes, which has not been the intention of the purchasers of the old concern.

As evidence that the business is to be continued, a deal was completed a few days ago between the present stockholders and the Detroit Trust Co., trustee in bankruptcy for the former bankrupt concern, whereby the real estate and plant here in Detroit, upon which the Associated Lozier Purchasers had an option, has been purchased by the latter, after the proposition had been submitted to the United States district court and approved by it.

The officials of the Lozier Motor Co. are, Theodore Friedeberg, president; Harry Frank, treasurer and Samuel Frank, secretary and general manager. U. G. Thomas is factory manager.

Steel Horse Farm Tractors

MILWAUKEE, WIS., Nov. 1—The Steel Horse Co. of Milwaukee plans to manufacture a general utility gas tractor. The company is capitalized for $25,000 and is backed by William B. Reith, Walter D. Mann and Adolph C. Graf. The tractor is designed especially for farm use and will haul a plow, cultivator, seeder, harrow or other light farm implements and can be used for light haulage of other kinds.

Ainsworth Mfg. Co. Organized

DETROIT, MICH., Oct. 30—The Ainsworth Mfg. Co. has been incorporated with a capital of $100,000 for the pur-

pose of manufacturing automobile accessories such as windshields, etc. The principal organizer of the company is Harrison Ainsworth, for many years with the Rands Mfg. Co. and with the Rover Motor Co., Coventry, England. He will be secretary-treasurer while Clarence H. Booth, formerly general manager of the Studebaker Corp., is the president. Others interested in the concerns are: George W. Golden, of Golden, Belknap & Swartz; L. D. Bolton, Detroit representative for the Brown-Lipe Co.; Alonzo P. Ewing, of the Detroit City Gas Co.; R. J. Purdy, mechanical engineer. For the present the plant will locate at Franklin and Dubois Streets, occupying 25,000 sq. ft. of floorspace in the old Ideal Mfg. Co. plant.

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Regulate Bay State Headlights

BOSTON, MASS., Nov. 1—Regulations for automobile headlights have been formulated by Massachusetts Highway Commission, making them effective Jan. 1, 1916. The regulation reads as follows:

Wherever there is not sufficient light, within the limits of the highway location, to make all vehicles, persons, or substantial objects clearly visible within said limits for a distance of at least 150 ft., the white lights which a motor vehicle is required to display by Section 7 of Chapter 534 of the Acts of 1909 shall, when said vehicle is in motion, throw sufficient light ahead to show any person, vehicle, or substantial object upon the roadway straight ahead of the motor vehicle for a distance of at least 150 ft. Any light thrown directly ahead or sidewise shall be so arranged that no dazzling rays from it or from any reflector shall be at any time more than 3½ ft. above the ground on a level road at a distance of 50 ft. or more ahead of said vehicle, and said light shall be sufficient to enable the operator of the motor vehicle to see any person, vehicle, or substantial object upon the roadway or side thereof, for 10 ft. on each side of the motor vehicle 10 ft. ahead of said vehicle.

The commission took the stand that a State regulation would prevent any cities or towns making rules that would puzzle automobilists. It also planned to word the regulations so that it would not be necessary to adopt any device unless the owner of a car wanted to do so.

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Annual Registration for D. C.?

WASHINGTON, D. C., Oct. 30—If the recommendations of Ben L. Price, tax collector, are adopted by Congress, Washington motorists will have to pay an annual registration fee instead of the perpetual license fee of $2 that is now exacted. In his annual report Price recommends that a license fee based on horsepower rating be charged and he suggests that the fees exacted by Maryland or Virginia be followed. If such a fee is charged it will take the place of the present personal tax fee that is charged in addition to a fee of $2 that must be paid to secure a license number, such number being good as long as the person who takes it out owns the car. If the car is sold at any time the license is void and a new one necessary.

15,485 Employees in N. Y. Plants

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Twenty-six Automobile and Parts Makers' Wages increased 10% in Sept.

NEW YORK CITY, Oct. 28—Evidence that the automobile and parts manufacturers in New York State have made a large increase in activity and an improvement in business, which has been manifest all summer, appears in returns received by the State Industrial Commission from representative manufacturers throughout the State. In its September returns it had reports in the automobile group for twenty-six firms with 15,485 employees in the State. All but five of these firms were engaged in the manufacture of automobiles or parts. All these five firms together had less than 1000 employees.

In July, 1915, 2.3 per cent more people were employed than in June; in August 1.5 per cent more than in June; and in September 14.4 per cent over June. Comparing returns for each month this year with the corresponding month last year a remarkable improvement since last year appears; June returns show 27.2 per cent more employees this year than last; July returns show 32.1 per cent more employees; the August returns 30 per cent more employees, and the September returns 47.4 more employees than last year.

A large increase in wages was made. Figures for that item show a progressive increase from June to September this year, 10 per cent more wages being paid in the middle week of September this year than in the middle week of June. For the middle week of each month this year as compared with last, in June 35.6 per cent; in July 33.1 per cent; in August 42.9 per cent; and September 46.5 per cent more wages were paid this year than last.

As indicating how the improvement in that industry compares with the improvement for manufacturing in general, the following figures show returns indicating 1 per cent fewer employees in July; 2 per cent fewer in August; but 4 per cent more for September of this year as compared with June of this year. In comparing this year with last there were 2.4 per cent fewer employees in June; in July 0.2 per cent more; in August 4.4 per cent more; and in September 5.4 per cent more employees this year than last.

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Western Tire Co. Now General Rubber Mfg. Co.

KANSAS CITY, MO., Oct. 27—The Western Tire & Rubber Co., this city, is building a three-story factory at Akron, Ohio, where it will move its plant Dec. 1. The company has been re-incorporated under Ohio laws, under the name of the General Rubber Mfg. Co. and the capital has been increased to $200,000.

The company will continue to make the K. C. line of tire accessories. In addition to this, it is adding equipment to make 400 tires a day. The new plant will be in full operation by Jan. 1. The personnel of the company will remain unchanged.

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Crowther Builds Model Cars

ROCHESTER, N. Y., Oct. 29—The Crowther Motor Co., whose factory is located at Ridgway and Woodrow Avenues, is making progress in construction work as reported in THE AUTOMOBILE for Oct. 28. The model cars are under construction and will be exhibited at the winter shows. The cars are expected to sell at $550, this including electric starter, lights, demountable rims and speedometer. The line will include a roadster touring car and a 1200-lb. delivery wagon. In these the transmission system of Charles E. Duryea, pioneer automobile manufacturer, will be used, in which the drive is direct into the rims of the two rear wheels, thus eliminating gearset, clutch and differential, as well as the live type of rear axle. It is expected to have a production of fifty to sixty cars per day after April 1.

—

Will Make Gas-Electric Truck

MILWAUKEE, WIS., Oct. 29—The National Brake & Electric Co., Milwaukee, Wis., is engaged in the development of a new heavy duty motor truck of the gas-electric type, said to be particularly adapted for use on the war front. The company is part of the Westinghouse group. No information relative to the new product will be given out until development work is completed. The National company manufactures compressors, gasoline locomotives, air brakes and electrical appliances and is the specialty plant of the Westinghouse company. Since July 1 the Milwaukee works force has been increased from 700 to 1000 men.

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Bosch Gets Nine Contracts

NEW YORK CITY, Nov. 1—The Bosch Magneto Co. has closed contracts with the following concerns to use Bosch magnetos for the coming season: Chandler Motor Car Co., Cleveland, Ohio; Crawford Automobile Co., Hagerstown, Md.; Continental Motor Mfg. Co., Detroit; Ohio Armleder Co., Cincinnati, Ohio; Palmer-Meyer Motor Car Co., St. Louis, Mo.; H. E. Wilcox Motor Co., Indianapolis, Ind.; U. S. Motor Truck Co., Cincinnati, Ohio; Hendrickson Motor Truck Co., Chicago, Ill.; Alamo Mfg. Co., Hillsdale, Mich.

Detailed Export Statistics for August and 8 Months Show Big Gains

United Kingdom Retains First Place with 2290 Cars Worth $3,530,831 in August—Increases in Shipments to West Indies, Asia, Oceania and Other Countries

WASHINGTON, D. C., Nov. 1—As indicated in a recent issue of THE AUTOMOBILE the exports of automobiles continue to grow so rapidly that even those in close touch with the industry are astonished. The gross figures for August and the eight months ended August, with figures for the corresponding periods of last year, have already been published.

The Department of Commerce to-day announced that September automobile exports were 2227 commercial vehicles, value, $5,882,255; pleasure cars, 4299, value, $3,215,459; parts, $1,613,419.

Detail figures show exports of commercial cars rose from sixty-six, valued at $124,016, in August, 1914, to 1614, valued at $4,387,193 in August last, while during the eight months' period they increased from 509, valued at $772,257, in 1914, to 15,042, valued at $41,886,961, in 1915. Exports of passenger cars likewise increased from 385, valued at $441,879, in August last year, to 3,839, valued at $3,121,834, in August last, and from 18,884, valued at $16,612,060, in 1914, to 26,736, valued at $23,576,188, in 1915.

United Kingdom Best Customer

Naturally, the United Kingdom retains first place in the volume of its imports of cars from this country, the figures showing that during August a year ago, twenty-seven machines, valued at $38,500 were exported to King George's domain, while during August last the number had increased to 2290 and the value to $3,530,831. During the eight months' period the number of cars exported increased from 4994, valued at $4,126,263, in 1914, to 16,784, valued at $25,528,943 in 1915.

There were no cars exported from this country to France in August, 1914, while in August last the number was 196 and the value $661,972. During the eight months' period the number rose from 1044, valued at $625,636, in 1914, to 4464, valued at $11,209,798 in 1915.

Germany failed to receive any cars from this country, and during the eight months' period the imports from this country fell from 1063 cars, valued at $799,552, in 1914, to four cars valued at $2,800, in 1915.

One car, valued at $1,000, was exported to Italy in August, 1914, while in August, 1915, the number had grown to thirteen and the value to $11,203. The eight months' period showed a decline from 229 cars, valued at $148,388, in 1914, to 121 cars, valued at $74,498, in 1915.

Other European Gains

Under the heading "Other European Countries," a big gain in exports is in-

Exports and Imports of Automobiles and Parts for August and Eight Preceding Months

	August 1914 Number	August 1914 Value	August 1915 Number	August 1915 Value	Eight months ending August 1914 Number	Eight months ending August 1914 Value	Eight months ending August 1915 Number	Eight months ending August 1915 Value
EXPORTS								
Commercial	66	$124,016	1,614	$4,387,193	509	$772,257	15,042	$41,886,961
Passenger	385	441,879	3,839	3,121,834	18,884	16,612,060	26,736	23,576,188
Total	451	$565,895	5,453	$7,509,027	19,393	$17,384,317	41,778	$65,463,149
EXPORTS BY COUNTRIES								
France	....	.....	196	$661,072	1,044	$625,636	4,464	$11,209,798
Germany	....	.....	....	.....	1,063	799,552	4	2,800
Italy	1	$1,000	13	11,203	229	148,388	121	74,498
United Kingdom	27	38,500	2,290	3,530,831	4,994	4,126,263	16,784	25,528,943
Other Europe	12	10,533	722	1,652,280	2,378	1,886,647	5,544	14,741,288
Canada	238	377,821	721	480,677	3,594	4,447,442	4,682	3,673,203
Mexico	6	4,400	8	9,100	60	70,374	69	65,406
West Indies and Bermuda	32	19,247	368	193,725	352	305,310	2,072	1,110,173
South America	19	13,288	274	149,319	891	722,527	1,486	793,037
British Oceania	79	60,562	391	322,689	2,666	2,294,033	2,760	2,368,736
Asia and other Oceania	14	19,404	330	393,771	1,193	1,129,405	2,508	4,703,181
Other countries	23	21,140	140	103,460	929	828,740	1,284	1,192,086
Parts of (not including engines and tires)	...	196,527	....	2,038,321	.....	4,107,545	.....	9,381,440
Total automobiles, etc.	....	$762,422	....	9,547,348	.....	21,491,862	.....	74,844,589
Tires								
For automobiles	....	$188,002	....	$1,211,804	.....	$2,290,094	.....	$5,509,787
Belgium	....	.....	....	.....	.....	301	.....	.....
Germany	....	.....	....	.....	.....	81,917	.....	.....
England	....	46,467	....	703,109	.....	936,260	.....	3,180,992
Canada	....	92,789	....	170,686	.....	742,553	.....	692,920
Mexico	....	9,684	....	5,936	.....	41,824	.....	71,387
Cuba	....	.....	....	22,028	.....	.....	.....	187,655
Australia	....	.....	....	91,124	.....	.....	.....	311,755
Philippine Islands	....	10,583	....	22,465	.....	77,689	.....	195,322
Other countries	....	28,479	....	196,456	.....	409,550	.....	869,756
IMPORTS								
Automobiles	No. dutiable 20	$19,809	No. dutiable 26	$28,912	No. dutiable 124	$198,440	No. dutiable 159	$248,738
IMPORTS BY COUNTRIES								
France	5	$3,008	6	$12,046	51	$91,717	45	$90,766
Germany	1	1,428	....	.....	10	16,556	.....	.....
Italy	8	9,086	....	.....	26	31,884	22	28,526
United Kingdom	2	2,517	....	.....	15	31,496	25	53,206
Other countries	4	3,770	20	16,866	22	26,787	67	76,240
Parts of (except tires) dut.	....	$31,222	.....	$35,776	.....	$634,051	.....	$423,573
SHIPMENTS TO NON-CONTIGUOUS TERRITORIES OF THE UNITED STATES								
Alaska								
Automobiles	6	$11,000	9	$9,444	51	$64,603	65	$77,137
Parts of (except engines and tires)	....	1,923	....	1,673	.....	7,324	.....	9,811
Hawaii								
Automobiles	20	30,667	145	146,011	545	572,306	682	741,331
Parts of (except engines and tires)	....	7,412	....	10,471	.....	64,027	.....	78,852
Porto Rico								
Automobiles	41	34,833	61	44,603	214	201,815	426	338,763
Parts of (except engines and tires)	....	5,950	....	1,611	.....	47,184	.....	66,057
Philippine Islands								
Automobiles	10	13,465	153	143,307	351	356,511	489	513,121
Parts of (except engines and tires)	....	847	....	4,184	.....	30,721	.....	33,161

dicated. In August a year ago the exports from this country amounted to twelve cars, valued at $10,533, while in August last the number was 722 and the value $1,652,280. The figures for the eight months' period were 2378 cars, valued at $1,886,647, in 1914, and 5544 cars, valued at $14,741,288, in 1915.

There were 238 cars, valued at $377,821, shipped to Canada in August a year ago, while in August last the number had increased to 721 and the value to $480,677 in August last. This increase, however, was not maintained during the eight months' period, the number of cars exported to our Northern neighbor in 1914 being 3594, valued at $4,447,442, while in 1915 the number was 4682 but the value was only $3,673,203.

War-ridden Mexico took eight cars, valued at $9100 from this country in August last, as against six cars, valued at $4,400 in August a year ago. During the eight months of this year the exports of cars to that country amounted to sixty-nine, valued at $65,406, while during the corresponding period of last year the number was sixty, and the value $70,374.

West Indies Buy More

The West Indies and Bermuda are beginning to appreciate American-built motor cars, the export figures showing an increase from thirty-two cars, valued at $19,247, in August, 1914, to 368 cars, valued at $193,725, in August last, and from 352 cars, valued at $305,310, in 1914, to 2072 cars, valued at $1,110,173, in 1915.

Increased exports to South American countries are also shown in the latest table of statistics. In August a year ago, nineteen cars, valued at $13,288, were shipped to various South American countries, while in August last, the number had increased to 274 and the value to $149,319. During the eight months' period the exports increased from 891 cars, valued at $722,527 in 1914, to 1486 cars, valued at $793,037, in 1915.

Increase for Oceania

British Oceania continues to be a good customer for American cars, the exports having increased from seventy-nine cars, valued at $60,562, in August, 1914, to 391 cars, valued at $322,689, in August last, while during the eight-month period the number of cars exported increased from 2666, valued at $2,294,033, in 1914, to 2760 cars, valued at $2,368,736 in 1915.

Fourteen cars, valued at $19,404, were exported to Asia and other Oceania in August a year ago, while in August last the number was 330 and the value $393,771. During the eight months' period the exports rose from 1193 cars, valued at $1,129,405, in 1914, to 2508 cars, valued at $4,703,181, in 1915.

S. A. E. Winter Meeting Program

Electrical Equipment of Cars To Receive Marked Attention on Jan. 5 and 6

NEW YORK CITY, Nov. 1—The 1916 Winter Meeting of the Society of Automobile Engineers will be held in the Engineering Societies Building, this city, Wednesday and Thursday, Jan. 5 and 6.

At the first session of the society meeting, to be held on Wednesday morning, business matters and reports of divisions of the standards committee will be submitted and discussed. For the sessions to be held on the morning and afternoon of the following day, Thursday, papers on current subjects of special significance are scheduled.

It is the purpose of the Council and the Meetings Committee that the coming meeting shall be shorter than the annual meetings of previous years, in order to afford the members an opportunity to concentrate their attendance on fewer sessions during the much occupied time of Show Week. It is believed that the papers to be presented will be of sufficient interest and merit to bring about a good attendance and valuable discussion.

A large portion of the meeting will be devoted to consideration of matters connected with the electrical equipment of gasoline cars.

Battery vs. Magneto Ignition

Comprehensive consideration will be given to the points involved in and the relative merits of magnetos and batteries as sources of ignition. Among those who will present statements in connection with this timely matter are Alexander Churchward; Frank Conrad; Dr. R. H. Cunningham, and E. Gassmann.

Electric Lighting and Starting

Joseph Bijur will present a paper entitled Electric Lighting and Starting for Automobiles, taking up among other topics the desirable characteristics and cranking speeds of starting motors.

Electric Bulbs

Henry Schroeder will present data on Electric Bulbs for Automobiles, indicating the various properties and efficiencies desired and to be expected. The paper should be of a great deal of benefit generally to automobile engineers engaged in the design and production of gasoline and electric vehicles, as well as in connection with the work of the Electrical Equipment Division.

Sulphur Content in Steel

Dr. J. S. Unger will read a paper on the Effect of Sulphur Content in Steel, giving the results of exhaustive tests. Discussion of this subject should result in the acquisition of fundamentally valuable information.

It is possible that a few more papers will be added to the program, but the principal idea of the committee is to have only subjects of unusual importance presented and that sufficient time shall be allowed for as thorough discussion of these as may be desired.

The annual dinner will be held at the Plaza Hotel on the evening of Thursday, Jan. 6. Tickets are $5 each.

Standards Committee Meeting

A meeting of the standards committee will be held at the rooms of the society in New York on Tuesday morning Jan. 4. All members of the society may attend this committee meeting.

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Detroit S. A. E. to Hear Diamond on Piston Design

DETROIT, MICH., Nov. 1—At the next meeting of the Detroit section of the Society of Automobile Engineers, to be held Nov. 12 in the convention hall of the Pontchartrain hotel, the feature will be a talk by J. E. Diamond of the Aluminum Castings Co. on the subject of Piston Design and Its Relation to the Cothias Process. Mr. Diamond's talk will cover piston design in general, as well as the aluminum alloy piston.

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Detroit Committee on S. A. E. Cruise

DETROIT, MICH., Nov. 1—Chairman George W. Dunham, of the Detroit Section of the Society of Automobile Engineers, has named W. A. Brush and Mason P. Rumney, to serve with him as the committee in charge of the next summer's annual cruise of the society. The committee is already at work.

Since the September list of contributors to the maintenance fund of the Detroit section of the society was published, two new concerns have been added to this list, the Electric Storage Battery Co. has pledged $100 and the Doehler Die Castings Co. $50. The total pledged to Oct. 15 being $2,850.

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Moline Plow to Continue Buggies

MOLINE, ILL., Nov. 3—The Moline Plow Co., whose entrance into the automobile field with a new passenger car was announced recently, wish it to be understood that in so doing they are not relinquishing the buggy business which will be continued as usual.

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Grant Adds an Acre

FINDLAY, OHIO, Nov. 1—The Grant Motor Co. is building three large additions to their North and South plants in this city. All are one-story and cover an acre of floorspace. The company is greatly hampered for space.

Gasoline Is Higher in West

Since March Average Increase Throughout Country Is 4 Cents per Gal.

NEW YORK CITY, Oct. 29—Gasoline prices continue to rise throughout the West, the latest advance being that in Cleveland where Standard Oil has raised its price per gallon 1½ cents to 14 cents to garages. The independents have met the increase by an advance of 1 cent a gallon to 14 cents. White Rose brand gasoline of the National Refining is now quoted at 16½ cents a gallon, an advance of 3 cents. The price of retail trade is 1 cent higher than these quotations. In March the garage price was 11 cents, and there was no change in price until Sept. 9.

The average increase throughout the country has been about 4 cents a gallon since March. In the past six weeks gasoline prices at the various cities have been advanced two or three times. This week there has been an increase in price from 1 to 3 cents a gallon in the principal cities of the country, including Portland, Los Angeles, Seattle, Minneapolis, San Francisco, Detroit, Kansas City, St. Louis, Chicago, Louisville, Denver and Cleveland. The oil experts attribute the advance to the increase in automobiles, the general increase in demand for gasoline and the fact that production has not been increased.

The Standard Oil Co. of Indiana last week, increased the price of gasoline in St. Louis 1 cent to 13 cents to automobile owners and 11.9 cents to tank owners. This follows the advance in Chicago of 1 cent to 12½ cents and 11½ cents respectively.

St. Louis jobbers estimate that the fight between the Standard Oil Co. of Indiana and the independents which commenced last May has netted the Standard Oil nearly $90,000,000. About half of this represents the increase in the price of crude oil, of which the company bought nearly 67,000,000 barrels, which oil is still in the company's tanks. The other half has been made by buying all gasoline from the independent refiners in the Cushing oil field.

Gasoline prices in Cincinnati have been advanced 3 cents a gallon to 15 cents, and further advance is looked for. This price is for tank wagons. To wholesalers the price is 14 cents, although on contracts to wholesalers deliveries are being made at lower prices. The price in March for tank wagons was 12 cents and the wholesale price was 11 cents.

The Continental Oil Co. and the Midwest Refining Co. in Denver have advanced the price 1 cent to 17 cents a gallon to tank wagons and 16 cents to garages.

Louisville gasoline now quotes at 13½ cents a gallon on tank wagons, compared with 11 cents at the end of last March.

The accompanying table gives the current price in cents per gallon on a tank wagon or garage basis in the larger cities in the United States. This is compared with the price on March 31 and the advance in cents per gallon. This price is several cents below what the consumer has to pay for his gasoline, that depending on the quality of the fuel, etc.:

	Current Price, Cents	March 31 Price, Cents	Advance, Cents
Atlanta	18	12.5	5.5
Baltimore	15	11	4
Boston	18	13	5
Charleston, S. C.	18	15	3
Cheyenne, Wyo.	16	15	1
Chicago	12.5	10.5	2
Cincinnati	15	12	3
Cleveland	14	11	3
Dallas	17	10	7
Denver	17	15	2
Detroit	13	10.5	2.5
Douglas, Ariz.	18	16	2
El Paso	18	11	7
Fort Worth, Tex.	17	10	7
Hartford	17	11	6
Houston	17	10	7
Kansas City	11.8	9.8	2
Louisville	13.5	11	2.5
Los Angeles	14	12	2
Memphis	16	10	6
Minneapolis	13.5	11.5	2
New York City	17	12	5
Newark	16	9	7
New Orleans	15	11	4
Norfolk	16	12	4
Oklahoma City	17	12	5
Pensacola	15	15	0
Philadelphia	14	11	3
Portland, Me.	18	13	5
Portland, Ore.	14	12	2
St. Louis	11.9	9.9	2
St. Paul	12.5	11.5	1
San Francisco	13.5	11.5	2
Santa Fe	20	17	3
Savannah	17	13	4
Seattle	14	12	2
Shreveport	15	10	5
Tucson, Ariz.	18.5	17	1.5
Vicksburg	15	13	2

Metal Prices Higher

NEW YORK CITY, Nov. 1—Market quotations last week were higher, especially in the metals. With the exception of antimony, all the metals showed substantial gains, with open-hearth steel the feature. This rose $2.00 per ton, closing on Saturday at $26.00. Bessemer steel closed on Saturday at $25.00 per ton; or 50 cents higher than the opening on Tuesday. Both electrolytic and Lake coppers rose ¼ cent a lb., both closing at 18. Lead saw a gradual rise throughout the week and closed at $4.90 or a gain of 15 cents per 100 lb. Tin fluctuated throughout the week, its highest mark being $34.75 and its lowest $33.75, quoted on Tuesday. It closed on Saturday at $34.75 at a gain of $1.00 per 100 lb.

In the oils and lubricants markets, two noticeable changes occurred, fish oil, Menhaden, rose to 45 cents at a gain of 3, and Pennsylvania petroleum rose 5 cents a barrel, closing at $1.80.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.53	.53	.53	.54	.54	...	+.01
Antimony	.34	.34	.34	.34	.34	...	...
Beams and Channels, 100 lb	1.62	1.62	1.67	1.67	1.67	...	+.05
Bessemer Steel, ton	24.50	24.50	25.00	25.00	25.00	...	+.50
Copper, Elec., lb.	.17¾	.17¾	.17¾	.18	.18	...	+.00¼
Copper, Lake, lb.	.17¾	.17¾	.17¾	.18	.18	...	+.00¼
Cottonseed Oil, bbl.	7.78	7.80	7.73	7.75	7.78	...	...
Cyanide Potash, lb.	.23	.23	.23	.23	.23	...	...
Fish Oil, Menhaden, Brown	.42	.42	.42	.45	.45	...	+.03
Gasoline, Auto, bbl.	.17	.17	.17	.17	.17	...	...
Lard Oil, prime	.85	.85	.85	.85	.85	...	...
Lead, 100 lbs.	4.75	4.75	4.75	4.90	4.90	...	+.15
Linseed Oil	.62	.62	.62	.62	.62	...	...
Open-Hearth Steel, ton	24.00	25.00	26.00	26.00	26.00	...	+2.00
Petroleum, bbl., Kans., crude	.80	.80	.80	.80	.80	...	...
Petroleum, bbl., Pa., crude	1.75	...	1.80	1.80	1.80	...	+.05
Rapeseed Oil, refined	.77	.77	.77	.77	.77	...	...
Rubber, Fine Up-River, Para	.57	.57	.57	.57	.57	...	...
Silk, raw, Ital.	4.30	...	...	4.30	...	...	...
Silk, raw, Japan	4.10	...	...	4.10	...	...	...
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	...	...
Tin, 100 lb.	33.75	34.75	34.25	34.75	34.75	...	+1.00
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	...	...

Federal Trade Commission to Investigate Gasoline Prices

WASHINGTON, D. C., Oct. 30—Request has been made of the federal trade commission to institute an investigation of charges that illegal practices prevail in the marketing of gasoline. Price fluctuations have been brought to the attention of the commission, which, it is declared, are not explained by the difference in freight rates between the cities where the varying prices exist. A thorough investigation of the matter is to be made by the commission.

Tire Sales Large—Manufacturers Increase Production

NEW YORK CITY, Oct. 29—Tire companies in this country are doing a large business. Heavy home sales of automobiles and the war's demands have brought about this prosperity. About 14,000 tires a day are being turned out by the B. F. Goodrich Co.; Goodyear is turning out about 10,000 and the U. S. Rubber is now making 8000 and this amount will shortly be increased to 10,000. The Kelly-Springfield company will be producing 1500 a day by Dec. 1. The company has purchased a new plant at Wooster to take care of its production.

At Akron operations are continued on a 24-hr. schedule and the company is so far behind its orders that capacity operations are certain on the same 24-hr. schedule throughout the remainder of the year.

It is said that the increase in the cost of fabric and crude rubber will possibly decrease the net earnings of the tire makers in the closing half of 1915, as compared with the first half. Fabric is now selling approximately 25 per cent above the price prevailing early in the year. Crude rubber is close to 10 per cent higher.

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Hess-Bright Issues Licenses

PHILADELPHIA, PA., Oct. 29—The Hess-Bright Mfg. Co., this city, has issued licenses covering the manufacture of ball bearings after the Conrad patent, to the Standard Roller Bearing Co., Philadelphia, Pa.; the New Departure Mfg. Co., Bristol, Conn.; the Gurney Ball Bearing Co., Jamestown, N. Y.; and the U. S. Ball Bearing Co., Chicago, Ill.

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Penberthy Gets Carbureter Rights

DETROIT, MICH., Nov. 1—The Penberthy Injector Co. has secured the right for the Ball & Ball carbureter in U. S. and Canada and is now manufacturing the device. F. H. Ball and his son F. O. Ball, formerly connected with the Ball Engine Co., Erie, Pa., have been retained as engineers.

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Dividends Declared

B. F. Goodrich Co., Akron, Ohio, regular quarterly of 1¾ on preferred, payable Jan. 1 to stock of record Dec. 21.

Tire Issues Feature Market

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Firestone Reaches 790 Mark—Kelly-Springfield Closes at 300 with 53 Point Gain

NEW YORK CITY, Nov. 1—The drop in Studebaker and the record rise in Firestone and Kelly-Springfield Tire common featured last week's security markets. A rally occurred at the close on Friday after a sharp decline, the crisis in the French cabinet occurring opportunely with a general strengthening of the market. There was heavy liquidation during the earlier hours on Friday, the rally setting in late in the afternoon. At one time the drop in Studebaker reached a total of 21½ points, striking terror in those who have been following the advance. However, the stock picked up and closed on Saturday at 172, just 16 points under last week's mark. Firestone common kept up its record rise and reached on Saturday the high mark of 790 with a 70-point rise for the week. Kelly-Springfield common reached the 300-point mark at the close on Saturday, a gain of 30 points for the week.

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General Motors Strong

General Motors was the strongest feature on Saturday, advancing 34½ points during the day to 390 on the probability of early inauguration of regular dividend payments. The week's rise was 20 points.

Paige-Detroit went up 20 points, closing at 460. Chevrolet closed at 130, a 5-point gain. Maxwell stocks showed substantial gains, the common rising 8¾ points, the first preferred 3¾ and the second preferred 7½.

The 550-point rise of Canadian Ford featured the inactive stocks in the Detroit Stock Exchange. This stock last week dropped 50 points. In the active Detroit stocks, the 25-point rise in Paige-Detroit common and the 20½ point drop in Studebaker common were the features. General Motors common dropped to 350, a loss of 16 points.

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Maxwell Meeting Postponed Until Nov. 10

NEW YORK CITY, Nov. 1—A special meeting of the holders of the stock trust certificates of the Maxwell Motor Co. has been postponed until Nov. 10. The meeting was called to ratify the plan recently submitted by the directors for the retirement of the accumulated 14¼ per cent back dividends on the first preferred stock by the issue of non-interest-paying warrants convertible into first preferred stock at par and to authorize the issue of $1,050,000 additional stock of the same class.

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Van Blerck Motor to Expand

MONROE, MICH., Nov. 1—Fifty per cent of the capital stock of the Van Blerck Motor Co., this city, has been secured by Eastern capital, and $150,000 additional stock will be issued. New land will be purchased, it is announced, and the factory enlarged to three times its present size. The present officers will remain until a reorganization is effected.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co., com			300	..	..
Ajax-Grieb Rubber Co., pfd			101	..	..
Aluminum Castings, pfd			102	..	..
J. I. Case, preferred			83	85	+4
Chalmers Motor Company, com			150	160	—5
Chalmers Motor Company, pfd			102	104	..
Chevrolet Motor Co			130	133	+5
Electric Storage Battery Co			71	73	..
Goodyear Tire & Rubber Co., com			790	810	+70
Firestone Tire & Rubber Co., pfd			112	..	..
General Motors Company, com			392	396	+20
General Motors Company, pfd			113	114	+1
B. F. Goodrich Company, com			76	77¼	—1½
B. F. Goodrich Company, pfd			113½	115½	+3½
Goodyear Tire & Rubber Co., com			334	340	+2
Goodyear Tire & Rubber Co., pfd			110	112	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co., com			39	41	—7½
International Motor Co., pfd			65	70	—3
Kelly-Springfield Tire, com			300	302	—53
Kelly-Springfield Tire, 1st pfd			95	96	—3½
Kelly-Springfield Tire, 2nd pfd			..	..	..
Maxwell Motor Company, com			82¼	83¼	+8¼
Maxwell Motor Company, 1st pfd			100¼	101¼	+3¼
Maxwell Motor Company, 2nd pfd			63½	64⅝	+7½
Miller Rubber Company, com			240	250	+5
Miller Rubber Company, pfd			109	110	..
New Departure Mfg. Co., com			..	..	..
New Departure Mfg. Co., pfd			..	..	..
Packard Motor Car Company, com			130	140	—5
Packard Motor Car Company, pfd			100	103	..
Paige Detroit Motor Car			460	..	+20
Peerless Motor Car Co., com			122	130	..
Peerless Motor Car Co., pfd			92	94	..
Portage Rubber Co., com			59½	60	+4½
Portage Rubber Co., pfd			94	95	+½
Regal Motor Co., pfd			14	20	+1
*Reo Motor Truck Company			19¼	20¼	—¼
*Reo Motor Car Company			38½	40	..
Splitdorf Electric Co., pfd			..	..	..
Stewart-Warner Speed. Corp., com			74½	75½	..
Stewart-Warner Speed. Corp., pfd			106	..	..
Studebaker Corporation, com			172	173¾	—16
Studebaker Corporation, pfd			115	117	+4
Swinehart Tire & Rubber Co			91	93	+1
Texas Company			170	171	+8
U. S. Rubber Co., com			55½	56¼	+1¼
U. S. Rubber Company, 1st pfd			105½	106¼	—½
Vacuum Oil Company			215	225	..
White Company, preferred			110	..	..
Willys-Overland Co., com			260	264	+2
Willys-Overland Co., pfd			109	110½	+1

No quotations available at this time on account of war.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co., com	..	97	..	160	—5
Chalmers Motor Co., pfd	..	94½	101	104	+1
†Continental Motor Co., com	155	180	200	250	..
Continental Motor Co., pfd	..	75	88	94	—2
General Motors Co., com	..	62½	350	374	—16
General Motors Co., pfd	..	82	112	114	..
Maxwell Motor Co., com	10½	11¼	83½	86½	+12
Maxwell Motor Co., 1st pfd	33	35¼	99½	102	+ 2¼
Maxwell Motor Co., 2nd pfd	14	16½	63½	66½	+10
Packard Motor Car Co., com	..	101	129	134	—5
Packard Motor Car Co., pfd	90	..	100	101¼	..
Paige-Detroit Motor Car Co	..	..	465	..	+25
*Reo Motor Car Co	21	..	39¼	40¼	+¼
*Reo Motor Truck Co	10½	11¼	20⅛	..	+¼
Studebaker Corp., com	..	..	170	174	—20½
Studebaker Corp., pfd	..	..	109	112	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2,000	..	+550
Kelsey Wheel Co	185	..	215	..	+10
*W. K. Prudden Co	18½	20	22	24	..
Regal Motor Car Co., pfd	..	30	..	..	..

*Par value $10.

†The quotation 200-250 for the Continental stock is for the new stock issued after a 100 per cent stock dividend had been paid. There is in reality a net change or increase of 80 points from the former quotation.

200,000 See Cars at Dallas Show

$1,000,000 Worth of Cars Displayed by 30 Exhibiting Dealers

DALLAS, TEX., Oct. 25—With $1,000,000 worth of automobiles on display, the third annual automobile show by the Dallas Automobile Dealers' Association is on. It opened with the Texas State Fair, Oct. 16, and will be concluded Sunday, Oct. 31. The show is significant for several reasons, first that this is the second showing of 1916 models in the United States, the first having been at Milwaukee; second, for the reason that during the first nine days of the show, more than 200,000 visitors, many of them farmers interested in the use of automobiles, passed through the automobile exhibit building. Of this great mass of visitors at least 50,000 stopped and asked questions regarding the merits of the various cars.

There were thirty exhibitors in the automobile exhibit building and every foot of space was occupied. Had the building been larger, the space could have been profitably used, as the Wichita Motor Co. and several others were compelled to seek space in adjacent buildings. The automobile building was erected three years ago. It cost $17,500 and is 149 by 264 ft., built of wood and concrete with concrete floors, large plate glass windows and several skylights.

Plans are to be made for an addition to the building before the next automobile show. The present affair cost the local dealers approximately $30,000. Of this expense, each dealer bore his share. No admission fee was charged this year, believing that without such there would be more visitors to the building.

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173 More Accessory Exhibitors for Chicago and New York

NEW YORK CITY, Oct. 27—One hundred and seventy-three additional accessory exhibitors have been granted space at the New York City and Chicago automobile shows, Dec. 31-Jan. 8 and Jan. 22-29. One hundred and three of these are in New York and seventy-four in Chicago. This makes the total list of accessory exhibitors for New York 196 and for Chicago 153.

Additional Accessory Exhibitors

Able Engine Co., Inc.....New York City
Ahlberg Bearing Co.....Chicago, Ill.
American Die & Tool Co.....Reading, Pa.
American Express Co.....New York City
American Taximeter Co.....New York City
Apex Elec. Mfg. Co.....Chicago, Ill
Armstrong Cork Co.....Pittsburgh, Pa.
Asch & Co.....New York City
Atlas Spec. Mfg. Co.....Chicago, Ill.
Auto Gear & Parts Co.....New York City
B. & L. Auto Lamp Co.....New York City
Bausch Machine Tool Co...Springfield, Mass.
Benjamin Elec. Mfg. Co.....Chicago, Ill.
Eug. Bournonville Weld'g Co.New York City
Buchanan Elec. Steel Co....Buchanan, Mich.
Celfor Tool Co.....Buchanan, Mich.
Chilton Co.....Philadelphia, Pa.
Class Journal Co.....New York City
Cochran Pipe Wrench Mfg. Co..Chicago, Ill.
Comfort Shock Absorber Co.Hempstead, L. I.
Curtis Pneumatic Mchy. Co...St. Louis, Mo.
Cutting-Armstrong & Smith Sales Co., Detroit, Mich.
Daly & Co.....Detroit, Mich.
Dann Spring Insert Co.....Chicago, Ill.
P. Dempsey .....New York City
Dunham Piston Ring Co.....New York City
E. Edelmann & Co.....Chicago, Ill.
Edison Storage Battery Co..W. Orange, N. J.
Electric Automatic Cigar Lighter Co., New York City
Essex Rubber Co.....Trenton, N. J.
Evans Engine Co., Inc.....New York City
Ever Tight Piston Ring Co....St. Louis, Mo.
J. H. Faw, Inc.....New York City
Fitzgerald Mfg. Co.....Torrington, Conn.
C. H. Foster Accessories Co.....Chicago, Ill.
Peter A. Frasse & Co., Inc...New York City
Fryer-Anster Co.....Providence, R. I.
Gates Mfg. Co.....Indianapolis, Ind.
Gordon Tire & Rubber Co.....Canton, Ohio
Emil Grossman Mfg. Co., Inc., Brooklyn, N. Y.
Guide Motor Lamp Mfg. Co..Cleveland, Ohio
Hess Spring & Axle Co.....Carthage, Ohio
Hill Mfg. Co.....New York City
Hill Pump Valve Co.....Chicago, Ill.
Holt-Welles Co., Inc.....New York City
Horseless Age Co.....New York City
Houpert Machine Co.....New York City
Humboldt Mach. & Stamping Co., Long Island City, N. Y.
Interstate Electric Co.....New Orleans, La.
K. T. Lever Spring Co., Inc..New York City
Kales-Haskel Co.....Detroit, Mich.
Kemco Elec. Mfg. Co.....Cleveland, Ohio
Laidlaw Co., Inc.....New York City
Lane Bros. & Co.....Poughkeepsie, N. Y.
L. Lawrence & Co.....Newark, N. J.
Leece-Neville Co.....Cleveland, Ohio
S. Leschziner.....Newark, N. J.
Lincoln Electric Co.....Cleveland, Ohio
Lipman Air Appliance Co.....Beloit, Wis.
McQuay-Norris Mfg. Co.....St. Louis, Mo.
Manzel Bros. Co.....Buffalo, N. Y.
S. W. Merritt Co.....New York City
Metal Specialties Mfg. Co...New York City
Metal Stamping Co..Long Island City, N. Y.
Charles E. Miller.....New York City
Morrison-Ricker Mfg. Co.....Grinnell, Iowa
Morse Chain Co.....Ithaca, N. Y.
Motor Magazine.....New York City
Motor Veh. Pub. Co.....New York City
L. J. Mutty Co.....Boston, Mass
A. Nelson Mfg. Co.....Chicago, Ill.
New Era Spring & Spec. Co...Detroit, Mich.
Newmastic Co.....New York City
N. Y. Coil Co.....New York City
Paul G. Niehoff & Co.....Chicago, Ill.
O'Bannon Corporation.....New York City
Peerless Motor Spec. Co., Inc.New York City
Perkins-Campbell Co.....Cincinnati, Ohio
Phila. Storage Battery Co..Philadelphia, Pa.
A. J. Picard & Co.....New York City
Pierce Speed Controller Co....Anderson, Ind.
Pittsburg Electric Spec. Co...New York City
Wm. E. Pratt Mfg. Co.....Chicago, Ill.
Prest-O-Lite Co.....Boston, Mass.
Pyrene Mfg. Co.....New York City
P. Rielly & Son.....Newark, N. J.
Rutherford Rubber Co.....Rutherford, N. J.
Sharp Spark Plug Co.....Cleveland, Ohio
Silvex Co. .....New York City
Spitler Puncture Plug Co., Inc., New York City
Standard Roller Bearing Co., Philadelphia, Pa.
Standard Woven Fabric Co., Framingham, Mass.
John P. Stanley Co., Inc.....New York City
Stevens & Co.....New York City
F. W. Stewart.....Chicago, Ill.
Story & Reed, Inc.....New York City
Sunderman Safety Carburetor Corp., Newburgh, N. Y.
Superior Lamp Mfg. Co.....New York City
Chas. O. Tingley & Co.....Rahway, N. J.
Tobey Furniture Co.....Chicago, Ill
Triple Action Spring Co.....New York City
Triple Action Spring Co.....Chicago, Ill.
Turner Brass Works.....Sycamore, Ill.
Tuthill Spring Co.....Chicago, Ill.
U. S. Air Compressor Co.....Cleveland, Ohio
U. S. Gauge Co.....New York City
Universal Rim Co.....Chicago, Ill.
Universal Shock Eliminator Co., New York City
Van Cleef Bros.....Chicago, Ill.
Victor Auto Parts Co.....Cincinnati, Ohio
Warm Hand Steering Wheel Corp., Poughkeepsie, N. Y.
Wasson Piston Ring Co.....Hoboken, N. J.
Weaver Mfg. Co.....Springfield, Ill.
Webber Mfg. Co.....Boston, Mass.
West Steel Casting Co.....Cleveland, Ohio
Western Tire & Rubber Co..Kansas City, Mo.
Whalen Engineering Co.....New York City
White & Bagley Co.....New York City
C. A. Willey Co.....Long Island City, N. Y.
Wood Mfg. Co.....Fairfield, Conn.

Ohio Garagemen Organize

85 Discuss Business Problems at Session—Many Papers Read

COLUMBUS, OHIO, Nov. 1—Garagemen of the State of Ohio organized the Garage Owners' Association of Ohio, at the organization meeting held here Oct. 26 and 27. All told, some eighty-five garage owners and dealers attended the meeting.

In addition to welding themselves together into a powerful working unit, the garagemen also placed themselves on record as favoring the passage of the Stevens Bill, which would permit price maintenance; they also urged, through resolutions, that the National Automobile Chamber of Commerce take up again the question of setting a uniform time for the anouncement of new car models.

The Columbus organization was assisted in the formation of the State association by E. J. McGuirk, organizer for the Associated Garages of America, who gave the benefit of his experience. Aiding him were J. C. Thorpe, president of the Champaign County Automobile Trade Association, of Urbana, Ill.; L. C. Steers, secretary of the Garage Owners' Association of Michigan, and Jud S. Joslyn, of the Motor Car Dealers' Association of Rockford, Ill.

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Buick To Build Foundry

FLINT, MICH., Oct. 30—The Buick Motor Co. has arranged for the construction of a new two-story foundry, 530 by 300 ft. to be made of concrete and steel. It will be one of the largest and best equipped foundry buildings in the world and is expected to have an output capacity of at least 200 tons of castings a day. Several hundred men will be added to the working force when the plant is completed, which is expected to be about May 1, 1916.

The old foundry may be taken over by the Weston-Mott Co.

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New Plant for Detroit Battery

DETROIT, MICH., Oct. 30—The Detroit Battery Co. now located at 607 Fort Street, West, will have a three-story plant at 104 High Street. Ground will be broken in a few days and the factory is to be ready for occupancy by Jan. 1. The structure will be 70 by 100 ft. About 150 men will be employed.

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L. P. C. Men Find Work

RACINE, WIS., Oct. 29—All of the 280 mechanics employed by the L. P. C. Motor Co., Racine, Wis., which recently made an assignment in favor of credi-

tors, have received their wages in full and obtained immediate employment in similar industries in Racine, Kenosha and neighboring cities where the demand for skilled help cannot be filled. Fifty of the best men went into the Thos. B. Jeffery Co. plant at Kenosha on the day following the cessation of operations in the L. P. C. works. It is stated on good authority that creditors are trying to arrange matters so that the plant and its valuable equipment will be kept intact and the manufacture of motor cars resumed at an early date. F. Lee Norton of Racine is in charge as assignee.

17,255 Cadillac Eights in Year

DETROIT, Oct. 30—Since the Cadillac Motor Car Co. shipped its first eight-cylinder, Oct. 10, 1914, the company has built and shipped 18,159 cars to Oct. 23, 1915. During the year, starting from the day the first eight was shipped to Oct. 9 of this year, the number shipped was 17,255. The re-equipment of the plant with new machinery, new tools, took much more time than had been anticipated and therefore production was greatly hampered during several months.

Carriage Factories, Ltd., Forms Canadian Briscoe Co.

MONTREAL, QUE., Oct. 30—Carriage Factories, Ltd., of Canada, has formed the Canadian Briscoe Co. as a subsidiary. The latter will assemble the parts in Canada from the American Briscoe company, the cars of which will be sold through the Carriage Factories company.

This company has acquired the carriage manufacturing end of the McLaughlin Motor Car Co.

Studebaker Adds 52,500 Sq. Ft.

DETROIT, MICH., Oct. 30—A three-story building, 50 by 350 ft. for tuning cars before they are shipped, will be erected by the Studebaker Corp., adjacent to its plant No. 3. It will cost about $75,000. Other new structures are planned. Several now in course of construction will soon be ready for occupancy. The corporation reports that several hundred dollars were paid as premium to advance delivery of the structural steel material.

Chalmers Workers Form Clubs

DETROIT, MICH., Oct. 29—After hearing Hugh Chalmers, president of the Chalmers Motor Co. talk to them about looking ahead to the future and what could be done in this respect by getting together, by organizing, the office and shop workers of the Chalmers Motor Co. organized two clubs, Young Men Chalmers Club and Young Women Chalmers Club, both of which will be directed or run by the office and shop workers.

Apperson to Add 12 Acres

Floorspace Will Total 1,000,000 Sq. Ft.—Production to Be 10,000 Cars

KOKOMO, IND., Oct. 29—The Apperson Bros. Automobile Co., this city, will add floorspace totaling 500,000 sq. ft. or approximately 12 acres. The production is to be 10,000 cars. This additional floorspace will increase the total number of square feet to a million.

Work is already under way on two new buildings, which are being constructed at location of plant No. 2. These buildings will afford an additional space of 150,000 sq. ft., and will cost $75,000. The company is laying plans for an expenditure of $200,000 in new equipment.

Springfield Body May Move

SPRINGFIELD, MASS., Nov. 1—Without giving their employers an opportunity to arbitrate, 350 employees of the Springfield Metal Body Co. went out on strike, demanding an 8-hr. day and recognition of the Union. For some time the removal of the plant to Detroit has been contemplated in view of the fact that a large part of the company's business is now with Detroit car manufacturers. Unless the strikers return to work, it will be necessary to remove the machinery at once so that the company can fill orders for quick delivery.

$1,000,000 Building for Touraine

PHILADELPHIA, PA., Oct. 31—Plans have been completed and the work of construction will begin immediately on a building which has been leased to the Touraine Motor Co.

The lease taken by the Touraine company is for a period of twenty years and the total rental will be $1,600,000.

The building will be six stories high, with a basement, of steel and reinforced concrete, with exterior walls of white glazed terra cotta and white brick, and with the ground, representing a total expenditure of $1,000,000. It will have a frontage of 400 ft. on Market Street, 250 ft. on Twenty-third Street, 400 ft. along the Pennsylvania Railroad and 155 ft. along the Baltimore & Ohio Railroad. Each floor will have 70,000 sq. ft. of space and there will be four elevators, each 22 by 10 ft.

Edwards Carbureter Tested on Buick Six

CHICAGO, ILL., Oct. 28—The Edward's carbureter was introduced to Chicago to-day by an economy, speed and acceleration test conducted by the Technical Committee of the Chicago Automobile Club under sanction of the American Automobile Association. An economy of 28.9 miles per gallon and a speed of 58 m.p.h. with the same carbureter setting was obtained on a Buick small six.

The economy run was made over Chicago's boulevard system with a route arranged so that the car went approximately an equal distance in all four directions. A measured gallon of Red Crown gasoline having a gravity of 59.1 deg. Baumé at 60 deg. Fahr. was poured into a special tank, and the run made at a speed of 20 m.p.h. until the fuel was exhausted at 28.9 miles.

In acceleration tests, the car was put from a standstill to 25 m.p.h. through the gears in 11 and 1-5 sec. On high gear, it accelerated from 5 to 25 m.p.h. in 11 and 4-5 sec.

The National Carbureter Co., manufacturer of the carbureter, made the test. The instrument was designed by W. A. Edwards, formerly connected with Rayfield and Stromberg factories.

Willard Opens Two Branches and Ten Service Stations

CLEVELAND, OHIO, Oct. 29—The Willard Storage Battery Co., this city, has opened branches in San Francisco, Cal. and Atlanta, Ga. The San Francisco branch at 1433 Bush Street, 15,000 sq. ft. of floorspace. The Atlanta quarters are located at 8-10 East Cain Street.

Ten new service stations have recently been established bringing the total to 544. The ten new stations are as follows: Wayne Electric Co., Wooster, Ohio; Citizens Garage, Laredo, Tex.; Continental Auto Parts Co., Franklin, Ind.; Shepard Garage, Jerseyville, Ill.; William L. Clark, Seymour, Ind.; J. E. Rogers, Ft. Morgan, Col.; Hartman Bros., Montrose, Cal.; Albany Storage Battery Co., Inc., Albany, N. Y.; F. A. Harrison, Ridgewood, N. J., and Battery & Elec. Serv. Station, Mason City, Ia.

Wilson Sells Studebaker Agency

PHILADELPHIA, PA., Oct. 30—O. S. Wilson, for the past two years Philadelphia agent for the Studebaker car, has sold out his interests to a new concern, taking effect Nov. 1. Mr. Wilson had been a Studebaker man for a number of years.

Simms Magneto Enlarges

EAST ORANGE, N. J., Oct. 30—The Simms Magneto Co., this city, will build two additions to its plant, one to cost $10,000 and the other $5,000. Work will be started in the near future.

Aluminum Goods Adds Again

MANITOWOC, WIS., Nov. 1—The Aluminum Goods Mfg. Co., Manitowoc, Wis., which made important improvements and additions to its plant some time ago, has broken ground for another large factory addition and when this is completed

will undertake the erection of a new warehouse and shipping room. The factory addition will be five stories high, 53 ft., 6 in. by 300 ft., of brick and steel with mill floors. The investment in the addition will be approximately $100,000.

To Sell Morgan-Marshall Plant

EAST LIVERPOOL, OHIO, Oct. 29—The manufacturing plant, together with all of the equipment of the Morgan-Marshall Co-operative Rubber Tire Co., in this city, will be offered at public sale by Sheriff Crawford at an early date. It has been appraised at $60,000, and will be sold on the premises.

Lima Crucible Steel Expands

LIMA, OHIO, Nov. 1—The Crucible Steel Co. of Lima will increase its capital from $50,000 to $100,000 and a new $30,000 addition will be built to the local plant at once. Seventy men will be added to the working force. The company turns out steed castings and parts for automobiles.

Overland to Increase Force

TOLEDO, OHIO, Oct. 29—Ten thousand additional men are to be employed by the Willys-Overland Co., just as soon as new additions now under construction, and others to be started at once are ready for occupancy. The output of automobiles is to be increased 1000 a week.

Mitchell-Lewis Takes Inventory

RACINE, WIS., Oct. 29—The Mitchell-Lewis Motor Co., Racine, Wis., is taking inventory this and next week (Nov. 1 to 13) and in order to keep production at the highest level possible, only part of the departments are closed down at one time.

A. Elliott Ranney Adds Daniels 8

NEW YORK CITY, Oct. 30—The Daniels eight will be handled in New York City by the A. Elliott Ranney Co., Fifty-second Street and Broadway.

Randall Opens Advertising Agency

DETROIT, MICH., Nov. 1—Fred M. Randall has resigned from The Taylor-Critchfield-Clague Advertising Agency, and has started his own agency, the Fred M. Randall Co., with headquarters at 605 Ford Building, this city.

Strike in Kundtz Body Plant

CLEVELAND, OHIO, Nov. 1—A strike by 3000 employees of the big woodworking plant of Theodore Kundtz, maker of automobile bodies and parts is said to endanger thousands of dollars' worth of orders for war trucks in Cleveland automobile factories.

Labor leaders declare the Kundtz plant makes bodies for practically every big automobile factory in Cleveland operating largely on war orders.

New Studebaker Policy

Will Hold Conferences of Branch Mgrs. and Dealers Where Branches Are

DETROIT, MICH., Oct. 28—The Studebaker Corp. has inaugurated a new policy with regard to branch managers and dealers getting together with the factory officials for general conference or convention purpose. Heretofore the dealers and branch managers came to the administration offices in South Bend, Ind., to confer with the officials. Much good resulted, but, at the same time, it was not realized sufficiently that the time thus spent by the dealer away from his place of business was possibly causing him a loss, as very often these meetings were held at the busiest time of the dealer's season.

Now the officials of the Studebaker Corp. have decided to try the other way and instead of having the dealers and branch managers come to them they are going to them. There will be conferences of the men in the cities where Studebaker has branches and where it will be easier to get the men of the district or territory together.

The first of these conference meetings was held in Chicago this week, when about fifty Studebaker dealers from Illinois, Wisconsin and Indiana met and discussed matters concerning advertising campaigns, selling methods, production and other matters of interest to them.

The officials of the corporation who attended the meeting included A. R. Erskine, president; L. J. Ollier and James G. Heaslet, vice-presidents; Henry T. Meyers, manager of the commercial car department. Others who traveled with the Studebaker party were: J. E. Grady, sales manager for Canada; R. H. Williams, manager of the Detroit branch; H. V. Blevins, distributor for the State of Ohio; L. Davis, of the Cleveland district headquarters; F. H. Peck, dealer in Grand Rapids, Mich.; H. A. Biggs, of the Frank Seaman, Inc., advertising agency.

The party is making the trip in a special Pullman and will stop for conference purposes in Minneapolis, Omaha, Kansas City, St. Louis. The branch manager and dealer in each city visited will be taken along to the next stopping place.

Randolph Builds Trailers

JONESVILLE, MICH., Oct. 28—The Randolph trailer is made by H. C. Randolph, successor to the Standard Auto Trailer Truck Co. It sells for $45 and upwards, according to load capacity, steel or rubber tires and the kind of axle.

There is only one model G, but it is made in four different sizes as far as loading capacity is concerned. The trailer with a 1000 lb. capacity has 1⅛ in. steel or rubber tires; the one with a capacity of 1300 lb. has 1¼ in. steel or rubber tires; with a load capacity of 1600 lb. the tires are 1⅜ in. steel or rubber, and they are 1½ in. rubber or steel, for the trailer carrying 2500 lb. There are two series, the first one having a D. C. axle and the second series a Timken.

85 Per Cent Dividend for Milwaukee Exhibitors

MILWAUKEE, WIS., Nov. 1—Results from the show held by the Milwaukee Automobile Dealers, Inc., at the State fair grounds are very encouraging and the undertaking was so successful as an attraction for the State fair that the agricultural commission has offered to set aside the same building for the show next year. The show was open five days and during that time the total attendance was 40,000, of which 27,000 was paid attendance, mostly farmers; between 400 and 500 dealers outside of Milwaukee attended. The payment to the State fair for the use of the building was $3,000 and the receipts from the sale of space and tickets were $6,021 and $2,700, respectively. In consequences, a dividend amounting to 85 per cent of the cost of space was returned to each exhibitor.

Larger Quarters for Quaker Show

PHILADELPHIA, PA., Oct. 30—Philadelphia's fifteenth annual automobile show, Jan. 8 to 15, will be held in Convention Hall, northeast corner of Broad Street and Allegheny Avenue, much further uptown than any previous event of its kind. However, there will be a floor-space of 60,000 sq. ft. as compared to 27,000 last year, when the show was held in the Metropolitan Building. No trucks will be shown.

Warner Trailer Enters Field

BELOIT, WIS., Oct. 29—A. P. Warner of Beloit, Wis., well known as one of the founders of the Warner Instrument Co., now the Beloit Works of the Stewart-Warner Speedometer Corporation, Chicago and Beloit, has developed a light trailer truck for automobiles and is about to engage in the manufacture of the appliance on a large scale.

Michigan Truck & Lumber Adds

HOLLY, MICH., Nov. 1—A one-story addition 70 by 176 ft. will be started at once at the plant of the Michigan Truck & Lumber Co. which, in addition to doing contract work for the Ford Motor Co. has recently closed contracts with the Buick, Hudson and Maxwell companies in Detroit and Chandler in Cleveland.

Vehement Discussion of Eight Paper

Crawford's Contentions Attacked By Indiana Engineers—Acceleration Tests on Speedway and Examination of Stripped Peugeot Provide Full Afternoon Program

INDIANAPOLIS, IND., Oct. 30—The eight-cylinder side of the eight versus twelve argument was presented last night to the members of the Indiana section of the Society of Automobile Engineers and the visiting engineers at the meeting of the section at the Claypool Hotel last night, Charles S. Crawford, chief engineer, Cole Motor Car Co., took up the cudgels in behalf of the eight-cylinder engine in reply to the arguments for the twin-six presented by Jesse G. Vincent, vice-president of engineering, Packard Motor Car Co., to the Detroit section Sept. 16, and to the Indiana section Sept. 24.

Representative Attendance

Prospects of an interesting and illuminating argument on multiple-cylinder engines together with the afternoon feature of acceleration and speed tests of eights and twelves on the speedway and a view of the Peugeot driven by Aitken at Sheepshead Bay, which was disassembled for the purpose, brought out a large and representative gathering. Every motor car manufacturing center was represented by engineers from some of the factories. Chairman Moskovics and Secretary Combs had done such good publicity work that there were in the neighborhood of 300 engineers in attendance.

Acceleration Studied

The afternoon session at the speedway proved an interesting one as twelves, eights and sixes were given tryouts for speed, acceleration and low-speed running. National twelves, Cole eights, Haynes, Marmon and Dorris sixes were put through their paces for the visiting engineers. After that they were taken to the Prest-O-Lite plant where the Peugeot racing car was torn down for their edification, as one of the best examples of motor car engineering.

Before taking up Crawford's paper, the suggestion was made by W. G. Wall of the National company that the section appoint a committee to develop a standard method for conducting acceleration tests. He stated that there were other factors than the actual time element required to increase speed from one definite point to another to be taken into consideration and cited that it was possible to cut down the flywheel weight and get very good acceleration, but the lower flywheel weight would give poor idling. He suggested that the section get up a formula which would take in such factors as wheel sizes, gear ratios, and so on, that what the owner wanted was low-speed ability as well as rapid acceleration.

In confirming this, Howard Marmon of Nordyke & Marmon stated that the owner availed himself most of the car's ability to get from one speed to another and there was needed a standard definite way to compare cars on that basis; the society should standardize the means for such comparison. He believed that the speedometer and stop watch while not giving precise results would give results sufficiently accurate for ordinary purposes.

Professor Veal of Purdue University, a member of the Research Division of the Standards committee of the S. A. E., stated that that division had been working on such a basis of comparison for some time. He said that such apparatus as the accelerometer and chronometer gave precise and satisfactory results but they were too elaborate for every-day use. He thought that the work of the section along this line would be of assistance to the Standards committee. The matter then was referred to the Research committee of the section for report next meeting.

The new section of the S. A. E., the Mid-West section, organized recently in Chicago was introduced to the Hoosier section by Darwin S. Hatch of *Motor Age*, who outlined the purposes of the new section and stated that it would not incroach upon the territory of the Indiana branch.

The Research committee of the Indiana section then presented a report of a test made that afternoon for acceleration and speed of a Cole eight. With an eight-cylinder motor, 3½ in. by 4½ in., a Cole eight car (stock model except for cord tires), the acceleration on the speedway on high gear from 10 to 50 m.p.h. was made in 23.7 seconds. This was the average of two readings, one taken in one direction and one in the other. The speed test conducted in the same manner gave 64 m.p.h. These tests were made with the windshield in operation and the top up.

With the top lowered and windshield open the Cole eight made an average of 21.5 sec. in accelerating from 10 to 50 m.p.h. The maximum speed in this instance was the same as that of the previous one. The car was geared 4 to 1, had 34-in. diameter wheels, used aluminum alloy pistons with a clearance of 0.005. These are all stock specifications. However, castor oil was used as a lubricant. With the same carbureter adjustments the car gave an average of 2½ m.p.h. on high in the low-speed test. This was done with one bad cylinder caused by a seized piston.

Crawford's paper was read by Haynan of the Cole Motor Car Co., and was entitled, "The Characteristics of the Eight-Cylinder Engine." It appears in part on page 838 to 843.

Warm Discussion Follows

In the discussion of the paper W. G. Wall of the National Co. referred to Crawford's statement, "Since in any engine, the clearances are practically the same, the noise therefrom would be substantially the same per contact; the multiplication of the parts in operation will increase the noise in the same proportion as such multiplication occurs." Mr. Wall stated that if we multiply the parts of the same size and shape this would be true, but if they are not the same size and weight, it would not be true. He illustrated this with the suggestion of a boiler shop in which a sledge was being operated slowly with a heavy blow—this representing the small number of parts, and compared it with very rapid blows from a tack hammer, leaving it to be inferred that the rapid blows from a tack hammer would be less objectionable than the less frequent and louder ones from the sledge.

In reference to Crawford's remark that while vibratory force does exist, one usually is surprised in not being able to notice it when riding an eight-cylinder car, Mr. Wall stated that he did not know whether the eight has horizontal vibration, but the eight-cylinder cars that he had noticed reminded him of a large dog coming out of a pond and shaking it-

self. He thought Crawford was right as to the heat loss being less in the eight than in the twelve on account of the area, but the loss in the single cylinder engine is still less and there are things which compensate for this loss in the greater number of cylinders. One is able to keep the pistons cooler and to use smaller clearances with the small-bore motor and higher compression with a higher mean effective pressure.

In an eight the distance from the carbureter to each cylinder is less than in the six or twelve, but Wall expressed some doubt as to how much advantage this might give for all-around use. For slow speed work it is advantageous to have a small intake pipe and mix the gases there, but the high speed engine requires a larger intake pipe and with a large pipe better mixture is essential in the carbureter.

Gas Distribution Uneven on Twelve

Replying to this, Mr. Crawford stated that on the noise comparison he was not referring to the noise per tappet, but held that the multiplication of noise was more objectionable in the twelve than in the eight. So far as even torque and vibration are concerned, there was no appreciable difference between the twelves and the eight. He remarked that it was almost out of the question on the twelve to get an equal distribution of gas, although perhaps it could be done by complicated piping which, however, might give difficulties on account of friction.

Mr. Dorris of the Dorris Motor Car Co., stated that it was his belief that the engineers in this discussion were overlooking the buyer of the car. He thought they ought to glance over their repair shop list; that there were other items besides cylinders that were giving trouble.

Loomis Attacks Efficiency Argument

A. Loomis of the Packard company, who to an extent represented J. G. Vincent, took exception to some of Crawford's calculations in the matter of balance and in the matter of evenness of torque stated that the question resolved itself into the number of impulses per unit of distance traveled, which would give Packard 1375 as against 1030 for Cole or one-third more impulses with the stock gear ratio. In regard to the complication of water piping, he stated that this was the same on the twin-six as on the old Packard six. In considering the variation in volumetric efficiency, he stated that the Packard used this argument many years ago when building "one-lungers," in prophesizing that the two-cylinder never would replace the single-cylinder. In regard to the difficulty in getting the parts equal in weight, and the increase in this difficulty with the increase of the number of cylinders, Loomis admitted that this is difficult, but Packard is doing it on a commercial scale. Referring to Fig. 15 showing Crawford's suggested counter weights he stated that anything that increased the weight of the reciprocating parts increased the vibration and the increase of the counter weight was analogous to an increase in weight of the pendulum in a clock, which would slow it down.

Three Miles Not Low Enough

It is possible to find a lower limit to the desirable speed on high gear and the 3 miles suggested by Crawford could not be considered such a limit. Also there is always a limit to the frequency of the noise, but that limit is when it goes beyond the musical range. The twin-six frequency of noise is not high enough to be objectionable.

As to the accessibility of the steering gear, he stated that the Packard frame width was much less than that of the Cole, and contended there must be more difficulty in placing a steering gear with a 90-deg. motor than with a 60-deg. one. In conclusion, he said that performance is more than structural economy and that after an owner had driven twin-sixes no smaller number of cylinders would be satisfactory.

In refutation, Crawford stated that the 3-mile speed limit was set because it was expected every owner would get that and that he has obtained 1½ m.p.h. on high. He did not feel that engineers of twelve-cylinder cars have had proper experience with the eight, that the latter had been in the hands of owners for a year, and that when the twelves have been in owner's hands that time, difficulties will crop up that are not known of at present. He expects considerable variation in valve clearance in the twelve as there has been some in the eight and the difficulties from this point should upset the twelve more than the eight.

Mathematics of Noise

Alanson P. Brush, consulting engineer gave it as his belief that the twelves and the eights were equally good if kept in the best range of their adaptability; that for any speed range there is a critical cylinder diameter which will give best results, and that this factor is the one that should determine the number of cylinders. He believes that this critical diameter ordinarily is less than the 3½ in. mentioned.

In discussing the noise question, he developed the fact that if an engine be multiplied, all of its parts, exactly in proportion, *its kinetic energy will increase as the fifth power of the line dimensions*, that tappet impact decreases as the number of cylinders is increased. He repeated the statement that *quietness is continuity of noise* and that the impact is lighter on a twelve as the tappets are lighter and the energy of the blow is very much less. For the same power the *smaller valve parts of the eight and still smaller ones of the twelve should make upkeep actually less than for motors of a smaller number of cylinders*, if equally well designed and made.

The Placing of Accessories

Professor Veal stated that in his opinion it was harder to place accessories on the eight than on the twelve without lengthening the hood.

Mr. Heinze of the Heinze Electric Co., and formerly designer of the Northway engines, corroborated Brush's statement that there was a certain size of bore and stroke which gave highest thermal efficiency, but disagreed with Brush when he said that he thought this was greatest in a cylinder 4¼ by 5¼. This fact, however, he did not consider the most important consideration for the buyer, who is buying for the smoother running qualities of the eight and twelve. The smaller number of cylinders would give fewer parts but durability is more to be desired. Though the thermal efficiency was decreased with the increase in the number of cylinders, the public wanted even torque and less noise and that objectionable noise is heavy impact, so that *the more cylinders the less noise*. He said that engineers, whether they knew it or not, throughout the entire industry were striving toward the gas turbine. He thinks the limit is not reached in the twelve-cylinder.

Turbine Should Be Simple

Mr. Bull of the Cole engineering staff stated that it was not only the continuous torque of the gas turbine that made it desirable, it was its simplicity, consequently too many cylinders decreased simplicity. On frame width, he said the Cole size was the S. A. E. standard width and there should be no objection to a width already standardized.

Four Never Fully Developed

Mr. Crawford, in closing, stated that the four never had been developed in this country, that before it was brought to its highest point it was ditched for the six; that the two best motors for thermal efficiency and all-around efficiency ever built were the Sunbeam and Vauxhall, four-cylinder motors which, though they have different bore-stroke ratios have shown better efficiency than any others regardless of the number of cylinders.

Factory Miscellany

Weston-Mott Adds—Alterations which will cost at least $5,000 will be made at the plant of the Weston-Mott Co., Flint, Mich.

Work on Continental Plant Started—Work has been started in the new drop forge steel plant for the Continental Motor Mfg. Co., Muskegon, Mich. The structure will be 180 by 60 ft.

Gryphon Tire Buys Land—The Gryphon Rubber & Tire Corp., New York City, has acquired title to a plot of land, 250 by 103 ft., in the west side of Bailey Avenue, just north of 192d Street. The property also fronts on the tracks of the New York & Putnam Railroad.

Brewers to Make Tanks—American Brewers & Bottlers Specialty Co., Fourth and Windlake Avenues, Milwaukee, Wis., has entered the automobile field, and is specializing on gasoline tanks, its equipment being especially adapted to handle this class of work.

To Make Valve Grinder—The Just Specialty Co., Syracuse, was dissolved Oct. 15 and a new company styled Universal Equipment & Supply Co. formed to take its place. The new concern will manufacture and distribute a number of accessories including the Simplicity valve grinder formerly produced by the Just company.

Davis Co. Moves—Davis Manufacturing Co., Milwaukee, Wis., has abandoned its old plant at Fifteenth and Park Avenues and removed its entire equipment to its new plant at Fifty-seventh Avenue and Mitchell Street. The Davis company specializes on large motors for tractor purposes, although building to some extent motors for the automobile trade.

Crown Fender Plant in Ypsilanti—The city council has voted to turn over the Gaudy property to the Crown Fender Co., which has been negotiating with the Industrial Association for some time to locate here. It is provided that if no factory building is erected on the site within two years the Industrial Association is to reimburse the city or return the deed.

Federal Bridge Tests Tractors—The Federal Bridge Co., Waukesha, Wis., is now building tractors for several different companies, and each day the plant is the scene of a novel test. Two tractors with steering gears set run for hours continuously, without the attention of a driver. In this way the tractors are given a practical road test and are examined at intervals only to see that they are working satisfactorily.

To Make Springs—The Jenkins Vulcan Spring Co., St. Louis, Mo., has incorporated for $40,000, to make and deal in automobile leaf springs and accessories. The company has taken over the stock of the Jenkins Manufacturing Co., St. Louis, maker of the Vulcan spring. The officers of the new company are T. B. Jenkins, president; J. F. Jenkins, vice-president and secretary, and R. G. Zetrouer, treasurer and manager.

Dort Acquires Land—Land valued at $40,000, located west of the Dort Motor Car Co., Flint, Mich., has been acquired by J. Dallas Dort, president of the company, to provide for future expansion. The property comprises about 75,000 sq. ft. of ground. No buildings will be erected for the present time on the land, but it is expected that with the growing business the Dort company will start some building work early next year.

Ford Addition in St. Louis—The Ford Motor Co. will add a $300,000 building to its St. Louis branch, which will be ready by April 1. This building will duplicate the original building erected two years ago at Forest Park Boulevard and Sarah Street. The new building, fronting on Forest Park Boulevard, will cover a lot of 150 sq. ft. and will adjoin the site of the original building. It is to be fireproof, of brick and reinforced concrete construction.

Reo Truck Buys Bldg.—The Reo Motor Truck Co., Lansing, Mich., has purchased the large structure known as the Lyon Tabernacle, which has been used by Dr. Lyon. The truck business has been so exceptionally large that additional room had to be provided at once, although additions to the truck plant are under way. However, conditions have been such that much work has been going on on the grounds outside the plant and where neither the workmen nor the material and trucks were under shelter. It was principally to overcome this that the tabernacle building has been purchased.

The Automobile Calendar

Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 18.....New York City, S. A. E. Met. Sec. Meeting.
Nov. 22-27.....Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 5.....Worcester, Mass., American Road Builders' Assn. Day.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

1916

Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 17-22.....Rochester, N. Y., Show, Exposition Park. C. A. Simmons, Mgr.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Fort Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Westlake Joins Philadelphia Ajax-Grieb—W. A. Westlake has joined the Ajax-Grieb Rubber Co., Philadelphia, Pa.

Turner N. Y. Saxon Mgr.—H. C. Turner has been appointed manager of the Saxon Motor Car Co., New York City.

Hurd Heads Portland White—R. S. Hurd is the newly-appointed head of the White factory branch in Portland, Ore.

Cowan Sommer Office Mgr.—Harry Cowan has been appointed office manager of the Sommer Motor Co., Bucyrus, Ohio.

Jackson Empire Sales Head—W. E. Jackson has been appointed manager of the Indiana Empire Sales Co., Indianapolis, Ind.

Swap Service Mgr.—Frank Swap has been appointed service manager of the More Automobile Co., St. Louis, distributor for the Marmon.

Payne with Gibson—J. H. Payne has been appointed manager of the automobile department of the Gibson Automobile Co., Indianapolis, Ind.

Riley Heads K. C. Assn.—The Kansas City Motor Car Dealers Association has elected N. S. Riley, president; W. J. Brace, vice-president, and E. E. Peake, secretary and treasurer.

Marshall Buffalo Mgr.—G. J. Marshall is now manager of the Buffalo (N. Y.) office of the McGraw Tire & Rubber Co., East Palestine. He succeeds C. H. Connelly, who goes to Kansas City for the company.

Schwab and Beckler Leave Gemco—W. H. Schwab, formerly sales manager of the Gemco Mfg. Co., Milwaukee, and C. W. Beckler, formerly advertising manager of the same concern, have severed their connection with the Gemco company and become interested in the Auto Parts Mfg. Co., 528 Broadway, Milwaukee, Wis.

J. B. True, Jr., has been appointed director of sales of the Gemco Mfg. Co. Mr. True has had wide experience in merchandising and advertising and will handle the advertising as well as the sales department of the Gemco company.

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Dealer

St. Louis Chevrolet Makes Lease—The Chevrolet Motor Car Co. of Missouri, St. Louis, recently incorporated, has leased the new two-story building forming the western tip of the Lindell Locust Cutoff, which it will use for office headquarters of the company.

Motor Men in New Roles

Join Sun Co.—J. L. Larkin and H. A. Minturn have become actively connected with the Sun Motor Car Co., this city, and take up their work at once.

Horton Appointed Mgr.—G. A. Horton has become manager of the automobile painting department of the Great Western Motor Car Exchange, St. Louis, Mo.

Corn Detroiter District Mgr.—B. J. Corn has been appointed district sales manager of the Detroiter Motor Car Co., Detroit, Mich. His territory covers Indiana and Kentucky.

Greig Joins Dunlap-Ward—C. N. Greig has joined the Dunlap-Ward Advertising Co. of Chicago and Detroit. Mr. Greig will be a vice-president and his headquarters will be at the Chicago office.

Fuess Returns to St. Louis Co.—E. J. Fuess who until recently had been connected with the Frye Motor Car Co., St. Louis, has rejoined that company and will manage its used car department.

White a Purchasing Agent—J. F. White has been appointed purchasing agent of the Anderson Forge & Machine Co., Detroit, Mich. He was formerly in a similar capacity with the Metal Products Co.

Bartlow Makes Change—V. A. Bartlow, formerly in charge of the Bosch service station at San Francisco, will assume charge of the Spokane service station for the Inland Empire at the Child, Day & Churchill Co.

White Leaves Pierce-Arrow—H. C. White, formerly superintendent of the assembling departments of the Pierce-Arrow Motor Car Co., has accepted the position of production engineer with the Curtiss Aeroplane Co., Buffalo, N. Y.

Jossman Columbia Truck Mgr.—Henry Jossman has been appointed sales manager of the Columbia Truck & Trailer Co., Pontiac, Mich., which recently moved to this city from Kalamazoo. Mr. Jossman was formerly connected with the Oakland Motor Car Co.

Thompson Makes Change—B. D. Thompson has been appointed production manager of the Curtiss Motor Co., Hammondsport, N. Y. Mr. Thompson was until recently machine-shop foreman of the National Twist Drill and Tool Co., Detroit, Mich.

Viot Joins Continental Motor—H. R. Viot has become director of purchases of the Continental Motor Mfg. Co., Detroit, Mich., and will look after the purchases for both the local and Muskegon plants. Mr. Viot was formerly purchasing agent for the Oakland Motor Car Co., Pontiac.

Beatty Goes to Providence.—S. M. Beatty has been transferred by the Goodyear Tire and Rubber Co. from the managership of the branch at Providence, R. I., to a position at the factory in the sales promotion department. He is succeeded by E. J. Smith, who had been manager of the branch at Hartford, Conn.

Eastman Philadelphia Packard Mgr.—Lee J. Eastman, who was assistant to E. B. Jackson when the latter was head of the company in Philadelphia, Pa., has been appointed manager of the Packard Motor Car Co., Philadelphia. Mr. Eastman had been acting manager of the Packard company there since Mr. Jackson's removal to New York City as president of the New York company.

Houghton, Dodge Rep., Resigns.—A. E. Houghton, district representative for Dodge Brothers in the Mountain States territory, with headquarters at 1608 Broadway, Denver, who has for three months been in charge of both the Denver and Omaha districts, has been succeeded in the Denver office by his assistant, C. A. Biggs. From now on Mr. Houghton will make his headquarters in Omaha exclusively and concentrate his work upon the larger territory handled from that point.

Buick Managers Form Oakland Co.—Robert H. Martin, manager of the Buick branch in Washington, D. C., for three years, has resigned. With A. G. Southworth, Brooklyn, and A. H. Salver, Buick manager in Pittsburgh, he has formed the Southern Oakland Co., and will be wholesale distributor of Oakland cars in Georgia, Alabama, Florida, Mississippi, Tennessee, South Carolina and western North Carolina. The officers of the company are A. G. Southworth, president; A. H. Salver, vice-president, and R. H. Martin, secretary-treasurer and general manager. The company's headquarters will be in Atlanta.

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Dealer

Hartford Tire Pump to Add.—Plans for the factory and garage of the Hartford Auto Tire Pump Co., Hartford, Wis., have been revised to provide just double the space originally planned. The building will be of reinforced concrete and hollow tile, 55 by 88 ft., two-story and basement. Work is now under way.

VOL. XXXIII. NEW YORK—THURSDAY, NOVEMBER 11, 1915—CHICAGO NO. 20

The AUTOMOBILE

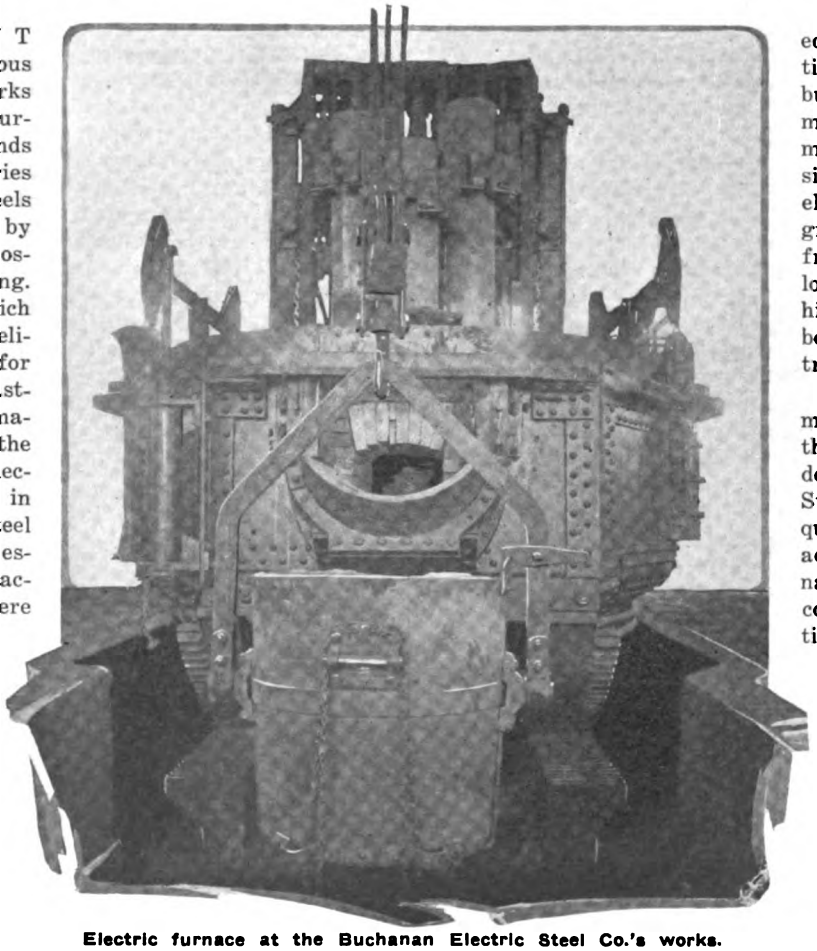
Electric Furnace Steels for Dynamic Stresses

Rapid Adoption of Improved Method Points to Coming General Use of Purer and Stronger Materials

By J. Edward Schipper

THROUGHOUT the country various iron and steel works are installing electric furnaces to meet the demands made in many industries for the high grade steels which can be produced by the super-refinement possible with electric heating. The demand for steel which must be the acme of reliability and the necessity for machined parts where wastage, due to impure material, shall be cut to the limit, has rendered the electric furnace a necessity in the manufacture of steel for many purposes, and especially, in the manufacture of automobiles where lightness and dynamic strength make the highest demand on materials.

Looking back ten years the development of the electric furnace and its application to steel refinement is marvelous. The few specimens of highly-refined steel then turned out in laboratories

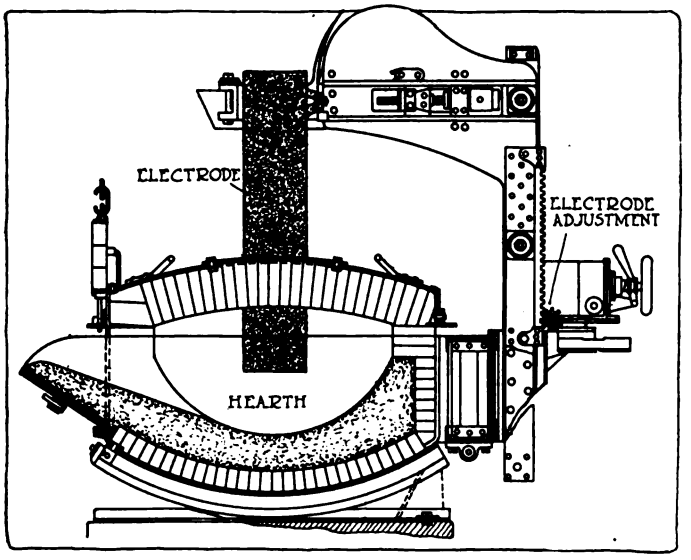


Electric furnace at the Buchanan Electric Steel Co.'s works. Note rack arrangement for tilting the furnace

equipped with this application of electric heat made but little impression on the minds of the practical steel men of the day. Gradually, since that time, the use of electric steels has been growing and now in cars from the highest to the lowest price are found high-duty parts which have been produced by the electric furnace method.

Although generally foremost in taking up and thoroughly utilizing a new development, the United States has not been as quick to avail itself of the advantages of electric furnace steel as have other countries. Authorities estimate that in the United States there are produced at present about 9000 tons per annum of electric alloy steels. In Germany there is produced per month as much as is turned out in the United States in a year.

At the beginning it must be understood that electric steels are more



Section through the Heroult furnace showing the construction of the hearth and mounting of the electrodes

expensive than those made by the open-hearth or other processes. Therefore, when electric steels are adopted, it must be because those who use them believe that the advantages offset the higher first cost of the material. While still a largely debated point it is undoubtedly true that most metallurgists are at the present time of the belief that not only is the electric steel worth the difference in price but that it results in a saving in many instances and furthermore a greater demand for its use would so reduce the price as to make the difference between it and open-hearth steel negligible.

Broadly speaking, the advantages of the electric furnace are largely centered about the facts that it is possible to confine the temperature variations within very narrow limits and that it is possible to carry out the high refining temperatures without exposing the molten metal to harmful gases. Metal made by this process, therefore, is nearer the complete state of refinement, containing a minimum amount of sulphur and phosphorus, being completely deoxidized and free from gases and nitrides.

The standard phosphorus and sulphur contents in open-hearth steel, unless special pig is used at an increased price, is 0.04 per cent. With special pig some mills will guarantee 0.035, the standard practice with the best manufacturers in electric steel is a guarantee of 0.02 sulphur and 0.015 phosphorus. The steel made by this process is, because of more absolute temperature control, more uniform. In the electric furnace the losses are confined to sulphur, oxides, gases and nitrides and all additions in the manufacture of alloy steel are made in the furnace and, as a result, these additions are more uniformly blended. In the open-hearth steel many of the alloys are added in the ladle or in the furnace only a few minutes before the heat is tapped. As a result the alloying substances do not have the same opportunity to become uniformly disposed through the material.

Five Great Advantages

In the electric furnace, on account of the closely maintained temperature, it is possible to cast the metal at nearer the desired temperature than is generally the case with the open-hearth. This gives greater uniformity in the ingots. To sum up it might be said that the direct advantages of electric furnace steel would be as follows:

Great uniformity, physically and chemically.

Higher degree of indestructibility in the thermal manipulation, *i.e.* forging or heat treatment after manufacture of the bars.

Due to freedom from oxides, gases, etc., the metal has a wider hardening range in heat treatment.

Owing to freedom from impurities it will have a longer life and be better qualified to resist dynamic stresses.

It will machine somewhat better than the average open-hearth and forge about the same, with the advantage of being more fool-proof in the heat manipulation.

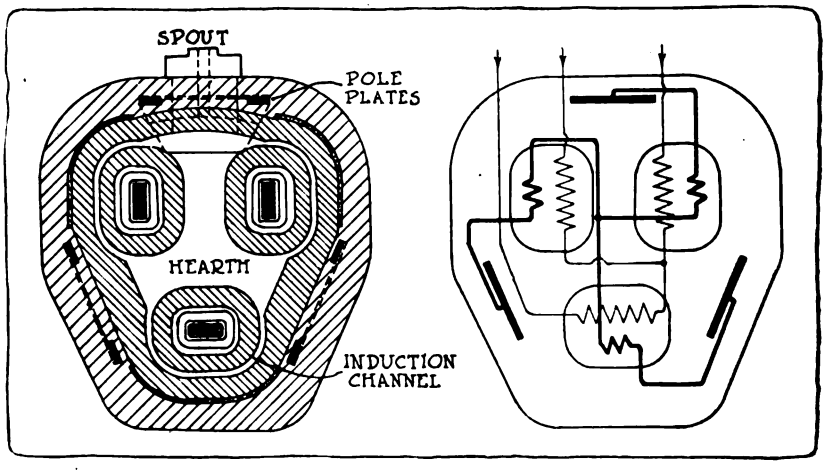
High Dynamic Strength

As to physical properties, an electric steel will be more uniform than in other processes because of the higher degree of purity. It is a fact, however, that these qualities will not greatly exceed those of the soundest part of an open-hearth ingot in which particular care has been paid to the process of manufacture. This of course refers to the static strength. But what is of extreme interest in automobile construction is dynamic strength, and it is for this reason that electric furnace steel should prove of great value to the automobile industry.

To offset the advantages many believe that under present conditions electric furnace steel will never reach the same quantity production as the open-hearth and therefore will always be more expensive. In the first place although steel is made in the electric furnace this alone is not a guarantee as to its quality; lack of widespread knowledge regarding the manufacture of electric steel is a handicap. Some engineers who have not closely followed progress in this work go so far as to state that the only good use to which electric furnace steel could be put by automobile manufacturers would be in case of faulty design where it would be necessary to replace a weak part by one of similar design but better material.

Weighing the advantages against the disadvantages it seems quite reasonable to expect that the use of electric furnace steel will grow rapidly in this country. The United States, with its population of 96,000,000 and a present production of electric steel of 9000 tons per annum, is not going to remain permanently at this stage in steel development while Germany, for instance, with its population of 56,000,000, has an annual output of electric steel of 108,000 tons. Although our output is small it is constantly growing, and in addition, America has been hitherto purchasing large quantities of imported alloy steels, but since the war has started these sources of supply have been interrupted and the result is that the electric furnace steel industry in this country is growing so rapidly that electric furnaces are continuously being added to the equipment of our steel manufacturers.

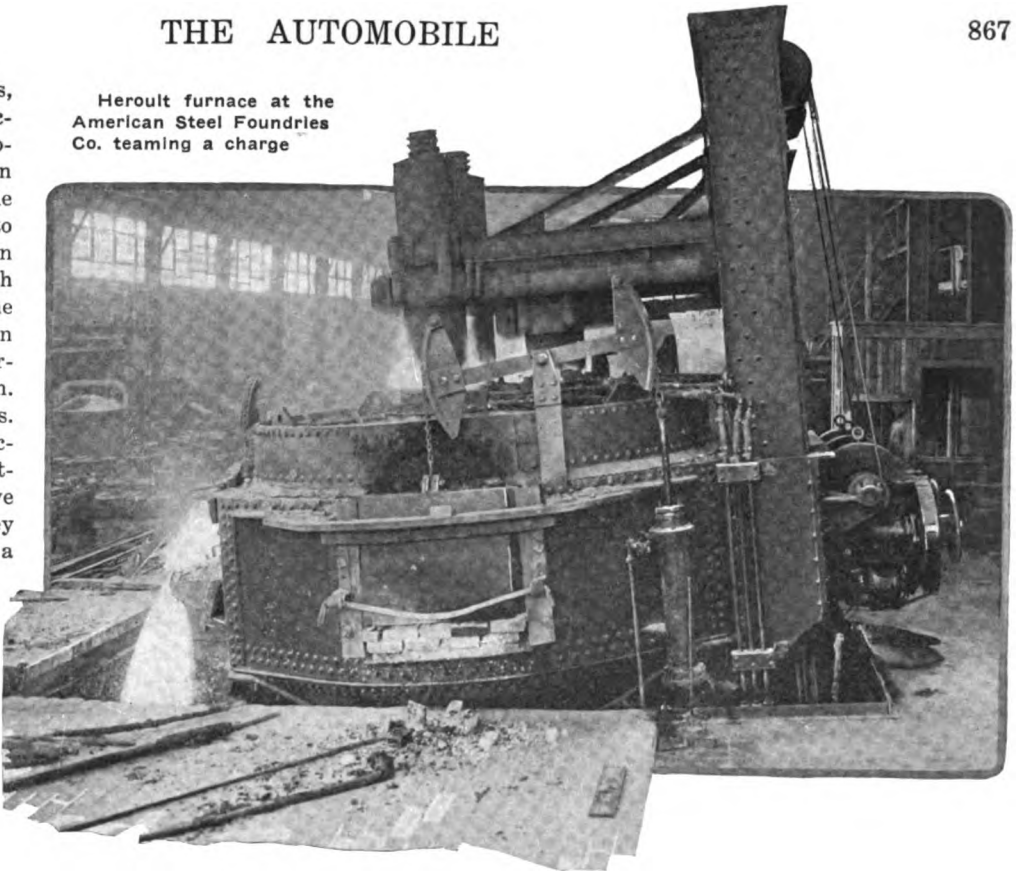
With the chief obstacle in the way of the use of large quantities of electric steel being the comparatively small produc-



Diagrammatic view of the Rochling-Rodenhauser furnace with layout of wiring connections

tion with resulting high prices, this turning toward America's factories for this kind of steel is going to have a beneficial effect on the entire industry and automobile manufacturers will not be slow to realize that there is oftentimes an actual saving in connection with electric steel. At the present time it costs approximately $45 per ton more to manufacture electric furnace steel than it does open-hearth.

This is due to several causes. The most successful types of electric furnaces are covered by patents and the steel companies have to pay a royalty for every ton they make. Again, electricity as a heating unit is more expensive than coal or gas which are employed in the open-hearth. The high cost of the electrodes burnt away in the manufacture of steel is another contributing cause and, finally, the smaller heats, because electric furnace steel is made in 6- to 20-ton furnaces whereas open-hearth alloy steels are made in 50- to 65-ton furnaces. Another point often brought up is that in order to keep down the carbon range, more expensive alloys have to be used than in the open-hearth, that is to say, alloying substances of the carbonless variety which, as a rule, cost considerably more.



Heroult furnace at the American Steel Foundries Co. teaming a charge

Due to the peculiar conditions which obtain in the working of alloy steels, better results are obained in some instances by charging cold material directly into the electric furnace. In other steels better results are obtained by melting in the open-hearth and then charging the hot metal into the electric furnace for ultimate refining and for adding the alloying substances.

For Automobile Work

In automobile work the majority of the materials used do not have to be of very close analysis to give desirable service, but there are a few parts which are of such great importance that the finest possible material is not too good for use. By using electric furnace steels on such parts a great amount of trouble is avoided because electric furnace steel, due to its high temperature of refinement and superior chemical composition is closer grained and has higher physical qualities than the average open-hearth steel.

Furthermore, the percentage of wasted parts where considerable machining is done is much reduced by its use and this reduction is such a potent factor where the ratio of machine cost to material cost is high that the initial difference in the price of the material is equalized.

In the use of ordinary alloy open-hearth steels a large number of highly-machined parts might often necessarily have to be thrown aside due to the encountering of a spot of impurity or some slight subcutaneous defect. The loss in time of the machine and the workman would be far more costly than the difference in price between the two steels and, at the same time, owing to the better physical qualities of the electric steel, a better part would have been made. Discarding finished pieces where expensive forges, dies, milling machines, drills, etc., have been employed in the various stages of the work together with high-priced machinists, is a serious wastage.

It is true that the mere fact that steel is made in the electric furnace is not a guarantee as to its quality, but with steel properly made in the electric furnace, using the same methods and care that are customary in the small mills, or in other words, quality work as contrasted with solely quantity work, electric furnace steel will be far superior to the ordinary open-hearth product because it will be made in small heats and small ingots which means a safeguard against segregration. Electric furnace steel is freer from sulphite of manganese and also slag, which is particularly harmful in case-hardened parts. The presence of slag is one of the principal reasons for the pitting and spoiling of case-hardened parts.

Another advantage of electric steels is that being handled in small units it will ordinarily receive much more careful inspection, so that surface defects and pipes will be detected.

An interesting fact concerning tungsten magnet steel used in the permanent magnets of magnetos is that when made in the electric furnace it has a higher retentivity than when made by any other method. Probably the close structure of the molecular arrangement is of influence.

History of Electric Furnace

The electric furnace is not a new development, although its practical application is one of the phases of modern industry. Probably the first electric heat machines were the mechanisms and apparatus employed by Davy, who in the year 1810 produced heat in the electrolysis of aluminum oxide. His apparatus consisted of a platinum plate connected with one pole of a thermopile of 1000 plates, the other pole being connected to an iron wire. The iron wire projected into a layer of clay carried by the platinum plate which was in connection with the other pole. When the current was switched on the iron wire became white hot and melted where it was in contact with the clay.

Five years later Pepys welded an iron wire by heating it with an electric furnace and in 1843 it was first suggested by A. Wall that electric current be used in treating pig iron in the converter. In 1853 there was a French patent granted to Pichon for the first electro-thermic furnace. This was the first direct commercial application of electric current to furnace work and made use of the electric arc.

A great forward impulse was given to the possibilities of electric furnace steels when William von Siemen patented his furnaces in the years 1878 and 1879. Siemen's furnaces varied in design. The first was a crucible surrounded by a metallic case through the bottom of which projected one pole of an electric circuit. On this was mounted a platinum electrode, the second electrode entered through the cover of the furnace and in order to preserve it and give it the longest possible life it was cooled by water, a practice which still obtains. There was a heat-protecting cover for the furnace and the crucible was insulated to prevent radiation. Another furnace used by Siemen was very similar to that of Pichon.

Siemen's Furnace a Pioneer

With the Siemen furnace it was possible to melt 22 lb. of steel an hour and with it he could even fuse metals of such high melting point as platinum, having succeeded in liquefying 8.8 lb. of the latter in 15 min. The only reason that the Siemen furnace was not an immediately commercial success was due to the high cost of electric current in those days. The present types of successful furnace such as those of Stassano, Heroult, Kjellin and Taussig appeared after 1890 and particularly between the years of 1898 and 1910. From that time it has been a matter of refinement of the constructions originated by these men, until to-day it seems as if we were on the verge of a rapid adoption of the electric furnace by steel makers generally.

One of the objections which some have urged against the electric furnace is that it requires the services of high-priced men to operate them. Some have claimed that the workmen in charge of detail labor on these machines must be electrical engineers but the growing tendency toward the use of automatic control is eliminating the necessity for men with a highly theoretical electrical education. The objection of one of the leading metallurgists in the automobile industry to the electric furnace is that the time and high degree of skill necessary to produce the improved qualities in material seems out of proportion to the advantages gained except for special cases. It is quite true that the open hearth furnace properly manipulated can keep the two impurities, oxygen and sulphur within such low limits that the material will perfectly satisfy the requirements for the great majority of constructions. Given the same amount of skill in both cases the electric furnace will doubtlessly remove more oxygen and sulphur from steel than can the open hearth.

Three Broad Classes of Furnace

It should not hold true that more expensive materials can enter into the construction of a high-priced car than a low priced one, as there need not be any relationship between the selling price of a car and the quality of the material which enters into it. The same relative proportions of very high grade steel to ordinary constructive material can hold true regardless of price, and hence the additional skill required in manipulating the furnace would not seem to limit the use of the steel to only high-priced cars.

Electric furnaces in general use can be classified under the broad heads of the arc furnace, the induction furnace and the shaft furnace. All three are based on well known electrical phenomena and in the fundamentals, are simple. In the arc furnace the entire theory and construction depend on the fact that if the ends of two current-carrying wires are brought together so as to complete the circuit and are then separated, the current will not be interrupted, but there will appear a small highly-luminous flame bridging the gap between the two ends of the wires. This separation of the electric current is what is known as drawing the arc. The theory of the arc is that at the instant of separation of the wires a great rise of resistance takes place at the point of separation and, since resistance causes heat, a quick rise in temperature also takes place. Under the influence of this heating the metal evaporates at the points of contact. If the separation should be increased the distance between the ends of the wires becomes filled with metallic gases which transfer the current across the gap. Since these gases are of high resistance a continuous glow is maintained.

The ends of the two wires correspond with the electrodes, and the gasification of these electrodes consumes them so that were the correct distance between them not continuously maintained the arc would be broken on account of the evaporation which would open the gap too far by the destruction of the electrodes. The ordinary arc lamp is a good illustration of the arc theory. The electrodes used in the arc lamp are usually ordinary pure carbon. The arcs in electric furnaces are made in a very similar way. The electrodes commonly employed are carbons, as a very high temperature is maintained with this sort of gap. The reason for this is that in carbon the greatest resistive conducting material is found and the gasification is at about 3500 deg. C. This is the arc temperature used with iron and steel when carbon electrodes are employed.

The different types of furnace made under the general head of the arc classification vary with the different manufacturers. Some of the principal furnaces made using the arc theory as the basis of their design are the Heroult, Stassano and Girod.

Induction Type Often Used

The next main classification of electric furnaces is the induction type. It is a known fact that when an electric current is passing through an insulated coil it is continually generating lines of force. If the current through the coil is alternating, the lines of force are also alternating and any electrical conductor in the path of these alternating lines of force will have a current induced in it. The strength of this current induced would be proportional to the number of lines of force cut by the conductor. In regulating the strength of this current there are two or three fundamental facts which

STEEL DIRECT FROM ORE	3,000 K.W. HOURS
PIG IRON DIRECT FROM ORE	2,000 K.W. HOURS
STEEL FROM COLD PIG IRON	1,500 K.W. HOURS
STEEL FROM FLUID PIG IRON	1,000-1,200 K.W. HOURS
STEEL FROM COLD PIG IRON AND COLD SCRAP	900-1,300 K.W. HOURS
STEEL FROM MOLTEN PIG IRON AND COLD SCRAP	600-1,000 K.W. HOURS
STEEL FROM COLD SCRAP	600-900 K.W. HOURS

Chart of kilowatt-hours estimated to carry out work by electric furnace methods

govern design. In the first place the voltage of the induced or secondary current is proportional to the number of turns of wire. Secondly, the strength of the current is inversely proportional to the voltage and inversely proportional to the number of turns.

This latter fact outlines the basic problem of induction furnaces which are really special transformer units. Every induction furnace has first its iron core and yoke surrounded by a primary winding and a secondary winding much in the same manner as a magneto except that in the case of the furnace this winding is composed either entirely of, or for the most part, of the bath itself. This allows of a subclassification of induction furnaces; those in which the high-tension or secondary winding is composed entirely of the bath, such as the simple induction furnaces; or where the bath forms part of the secondary winding with an additional winding made of copper to aid in the heating, as in the combination furnaces. The induction furnaces which are perhaps better known than any others in this country are the following: Kjellin, Rochling-Rodenhauser, and Snyder.

The electric shaft furnace is the resultant of the attempt to replace the fuel in the blast furnace by electric heat. In other words, it is merely a variation of the blast furnace with electric instead of flame heat.

Heroult Furnace Is Popular

While space does not permit to go into a detailed description of the various furnaces it might be interesting to mention the Heroult furnace as probably that in most common use. There are in this country at the present time about forty-two electric furnaces, nineteen of these are of the Heroult type, six of the Girod type, six induction furnaces, four Stassano, five Snyder and two miscellaneous. Of this number approximately 75 per cent are located in the Eastern States, and the capacities range from ¼ of a ton to 20 tons.

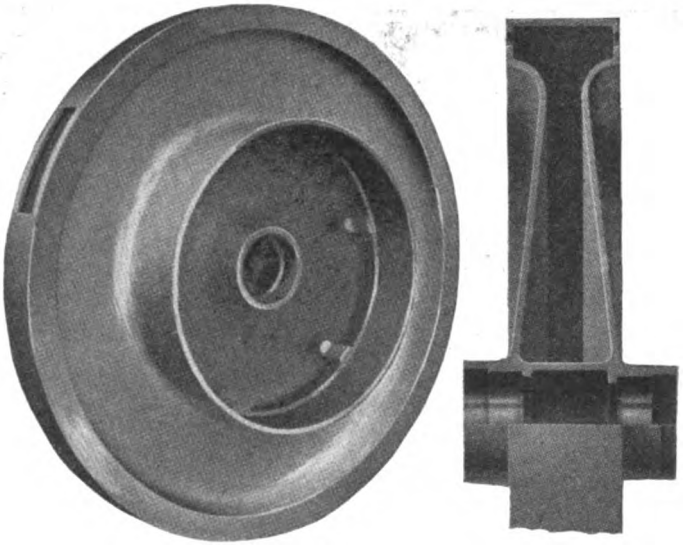
The accompanying illustrations show a furnace of the Heroult design which was recently installed in one of the plants of the American Steel Foundries. Referring to the illustrations at the tops of pages 866 and 867, this furnace, which is a 6-ton basic design, is shown in such a way that the three electrodes may be observed at the center. As stated, the Heroult furnace is of the arc type and this particular installation operates on a three-phase alternating current of 100 volts. The threaded projections at the ends of the electrodes are to allow new electrodes to be screwed on to the old ones thus eliminating any waste.

The electric current is stepped down from 11,000 volts to 100 volts in the transformer house and connections to the electrodes are made by heavy copper bars. Both the annular copper castings which hold the electrodes and the bushings where the electrodes pass through the roof of the furnace are water cooled. The path of the current is through the metal from one electrode to the other, the arc producing an intense heat which reduces the metal.

The electrodes are supported from the framework at the rear and each electrode is raised or lowered by an electric motor at the base of this framework. On the wall of the transformer house may be seen a delicate regulating mechanism which controls these motors and automatically keep the ends of the electrodes a short distance from the surface of the metal. Thus any surges of metal within the furnace will immediately react on the regulating mechanism and the electrodes will be kept at the proper distance from the molten metal.

Furnace Tilted by Rack

The furnace has a bowl-shaped bottom on which are two parallel curved castings with gear teeth, similar to a rack. By means of an electric motor, the furnace can be tilted or rolled on these plates to the angle required in drawing off heat. The tilting mechanism consists of a 40-hp. motor, driving direct on a large gear. A connecting-rod from the gear to the base of the furnace transmits the power for tilting and also makes the tilting mechanism "fool proof," for when the connecting-rod reaches its highest position, the gear in continuing its revolution will draw the furnace back to its normal position. The pit under the furnace is about 10 ft. deep and as the roller plates rest on pedestals, there is ample room for workmen to clean out slag, etc.



Single and double-disk wheels made from electric furnace castings

Movable Steel Heat Table

A very ingenious feature designed especially for this furnace by the plant engineering department of the American Steel Foundries, is the movable table in front of the tap hole. This table is covered with fire brick and is mounted on four wheels. When ready to take a heat from the furnace, this platform is rolled back on its track and the ladle is dropped into the put as usual. When the ladle is removed after drawing off the heat, the table is quickly pushed back so that the men can work on the tap hole with ease. In former furnace installations this has been a source of more or less trouble, as a few boards or a cover had to be placed over the hole, which was unsatisfactory and more or less dangerous. The new arrangement is very satisfactory.

The furnace has two charging doors, one on either side. These, together with the tap door, are operated by air. The furnace roof of course is of brick and it is inclosed in a steel ring in such a manner that the whole roof can be lifted off with a crane and a new one put in its place when necessary.

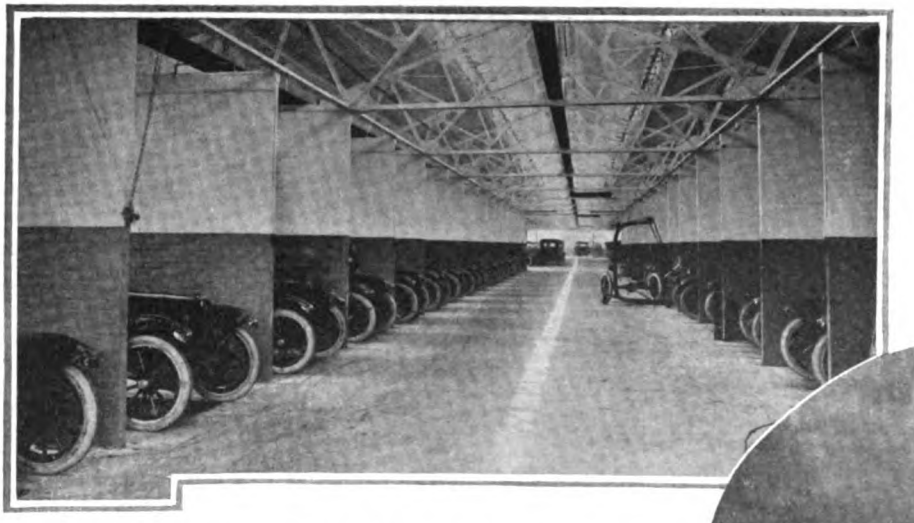
This furnace is typical of the very latest practice in electric furnace installations and is able to meet the most exacting demands in steel castings.

Physical Characteristics of Sample Electric Chrome-Nickel Steels

C%	E.L.	M.S.	Elon.	Red.	B.H.	Remarks **
.20	55,000	86,000	39.5	69.2	170	Annealed
	170,000	210,000	13.5	51	400	1525°-Oil - 400°F.
.40	60,000	90,000	29.5	66.9	175	Annealed
	230,000	280,000	9.5	35	490	1525°-Oil - 400°F.
	150,000	170,000	16.5	57.3	325	1525°-Oil-1000°F.
.50	62,000	97,000	25	54.6	180	Annealed
	215,000	216,000	8	37	446	1525°-Oil - 600°F.
	240,000	290,000	6	33	495	1525°-Oil - 400°F.

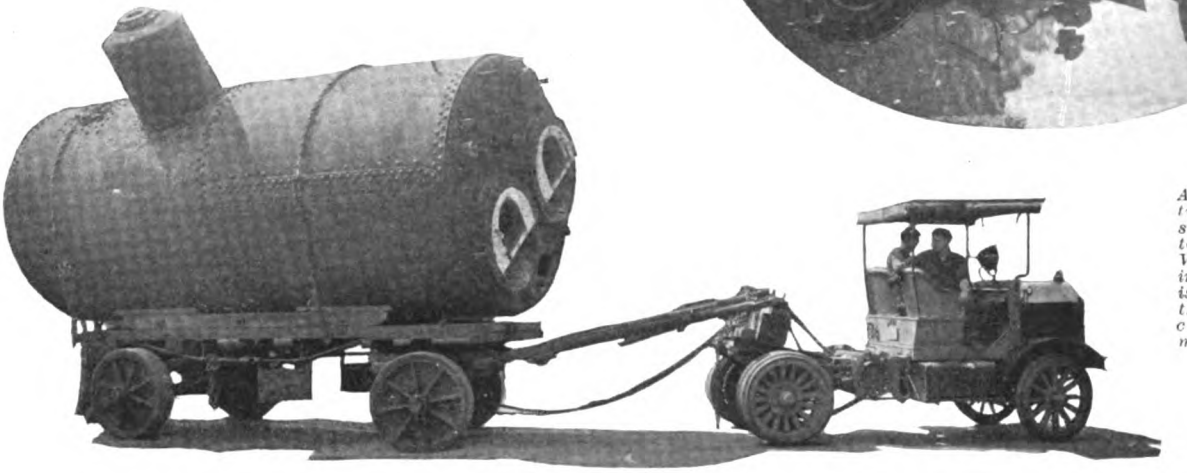
C% = Per cent carbon.
E.L. = Elastic limit.
Elon. = Elongation in 2 in.
Red = Reduction area, per cent.
B.H. = Brinnell hardness.

Feats and Features from Field and Factory

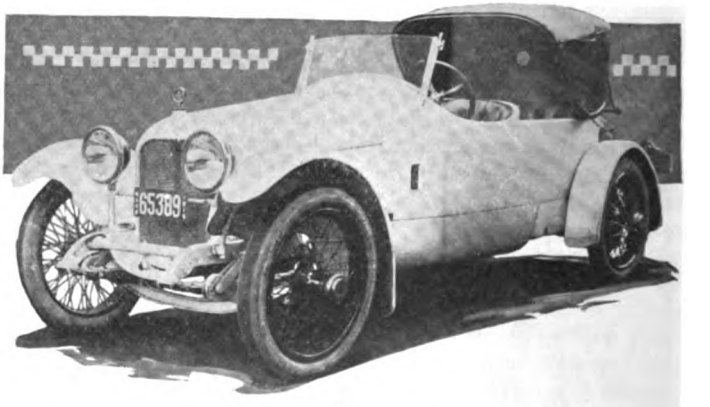


Above is illustrated a testing shed of the Dodge Bros. plant, Detroit, Mich. Solid brick partitions which are practically soundproof form a series of stalls on each side of the center aisle. After the car has been tested on the track it is run in one of these stalls and the tester is able to detect and remedy the faintest knock

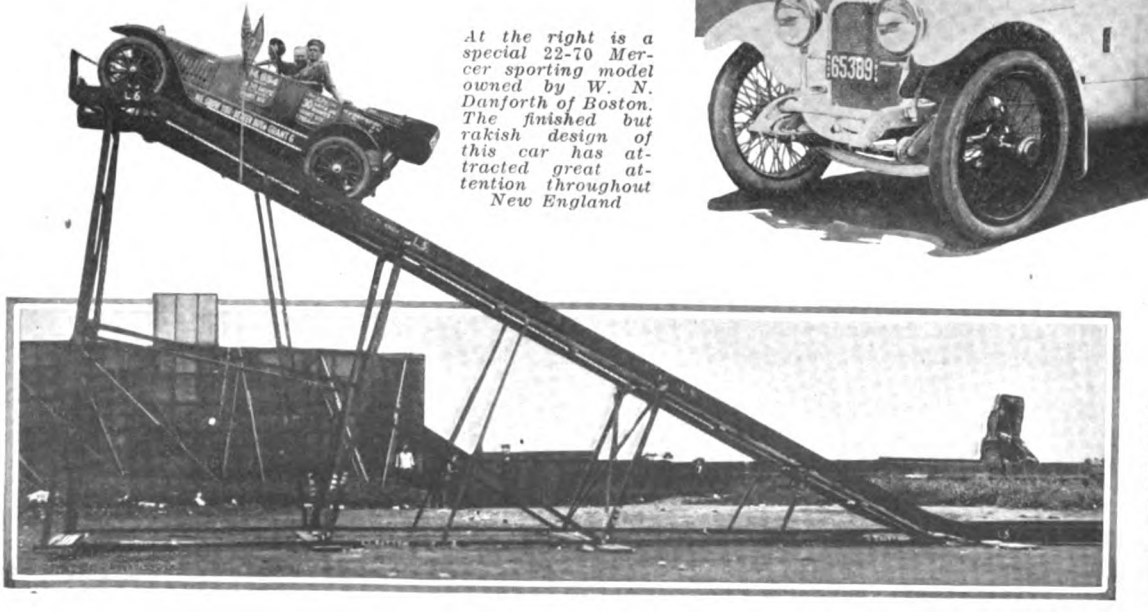
Above is a National twelve fording a stream on a field test at the base of Wild Cat Mountain in Tennessee. This is made possible by the high location of carbureter and magneto in the V of the motor



Above is illustrated a Knox tractor which recently moved a 33-ton boiler on an 8-ton wagon from a power plant at Holmsburg, Pa., to the Philadelphia city power plant at Fairmount Park. The total load hauled was 41 tons, although the tractor is rated at 5 to 15 tons capacity



At the right is a special 22-70 Mercer sporting model owned by W. N. Danforth of Boston. The finished but rakish design of this car has attracted great attention throughout New England



At the left is illustrated a test of a Grant six on a 50 per cent grade made at the Chicago sales rooms. The car starts on a runway 24 ft. from the bottom of the incline and then climbs 36 ft. on an 18-ft. standard

Piston Practice*

Present Day Design With Special Reference To Aluminum Alloy

By James E. Diamond

WHILE the aluminum alloy piston has been widely discussed, orally and otherwise, in recent months, rather more emphasis has been placed on the advantages of this type than on its design. The question of piston design in general offers profitable study and I believe its consideration at this time to be particularly appropriate for two reasons:

In the first place, not infrequently in recent months, the hope has been expressed that piston design might be standardized. Possibly, therefore, a setting forth of such differences of opinion relative to piston design as exist among engineers may offer a starting place for a movement looking toward the realization of this agreeable state of affairs. In the second place, such consideration is undoubtedly appropriate on account of the pre-eminence of the Lynite piston made by the Cothias process, a detail of which method involves the use of permanent molds, and to permit the utilization of which process, engineers must occasionally concede minor details of design. Further, it would seem the important position assumed by this new type of piston should warrant a consideration of certain limitations of the Cothias process should any move toward standardized design appear likely of success.

*A paper presented at the November meeting of the Detroit Section of the Society of Automobile Engineers.

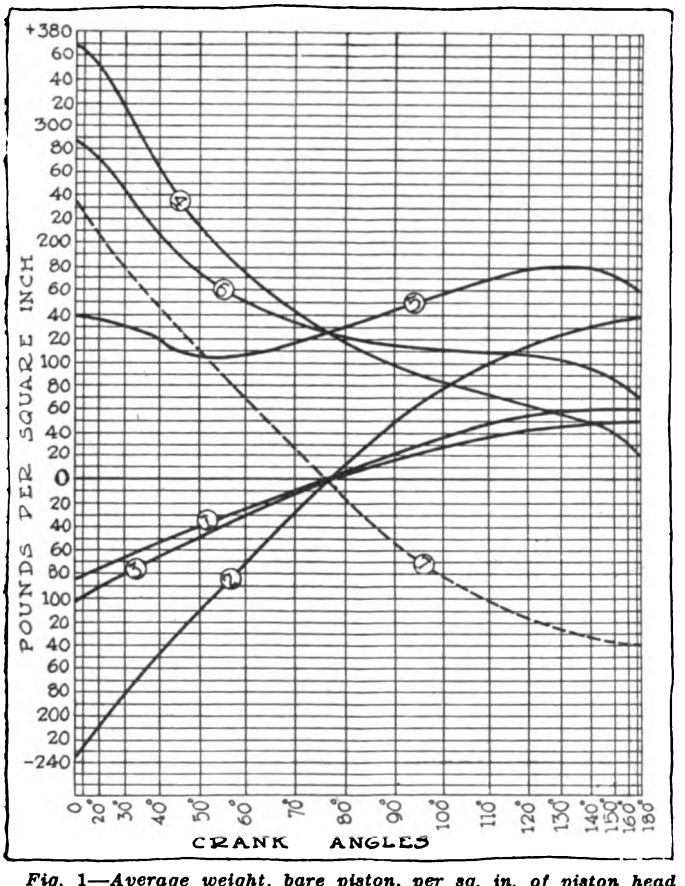


Fig. 1—Average weight, bare piston, per sq. in. of piston head area for Lynite Cothias Process Piston = .0875 lb.
Average weight, bare piston, per sq. in. of piston head area for ordinary cast iron piston = .240 lb.
Various inertia curves for motor with 6-in. stroke, at piston speeds of 1000 and 1500 ft. per minute. These curves for bare piston masses:
(1)—Inertia curve for Lynite piston at 3000 r.p.m.
(2)—Same for cast iron piston at same r.p.m.
(3)—Same for cast iron piston at 2000 r.p.m.
(4)—Assumed expansion gas pressure curve.
(5)—Curves numbers (2) and (4) combined, showing actual piston force.
(6)—Curves numbers (1) and (4) combined, showing actual piston force.
(7)—Combined inertia and exhaust gas pressure curves, iron piston, 3000 r.p.m.

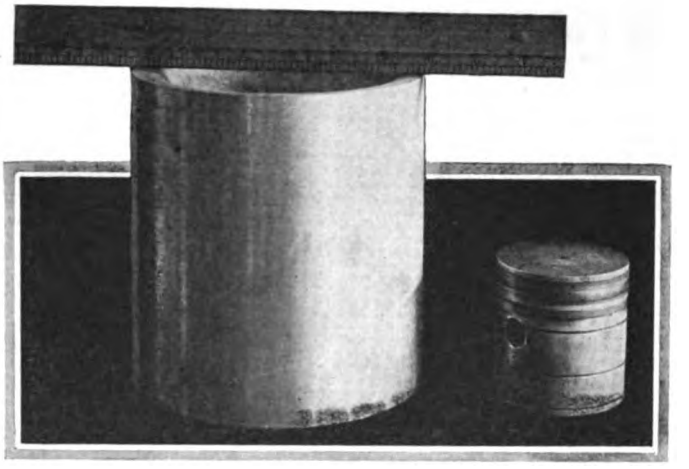


Fig. 2—By way of contrast

However, before entering into an extended consideration of design I venture to comment briefly on some points of superiority of the aluminum alloy piston, first, outlining its advantages generally, then, pointing out wherein the piston made by the process to which allusion has just been made is so much superior to the sand cast one.

Advantages of Alloy Piston

The weight of the aluminum alloy piston is, roughly speaking, but one-third that of a cast iron one of the same design. Therein, of course, lies its fundamental advantage. It naturally immediately follows that the inertia forces attributable to the purely reciprocating mass, by the use of the former, are reduced approximately 60 per cent since the force of inertia is a function of mass and acceleration. It will be recalled that the magnitude of these forces increases as the square of the piston speed, a fact which the advent of the high-speed, long-stroke motor has emphasized as it never before has been. Therefore, there is little need of dwelling on the significance of the reduction of the reciprocating mass, other than to note the marked reduction in the magnitude of the unbalanced forces, the fluctuation of which latter, is the major cause of motor vibration. It follows that the smaller these vibratory forces, the more likelihood that the motor will be able to absorb them within itself, no matter the direction in which acting. Possibly, too, in the past there has been a tendency to underestimate the effect of inertia forces on bearing pressures, but this seems now fully recognized. Quite conceivably, in motors of the type just mentioned, these inertia forces may produce bearing pressures quite comparable with those occasioned by the actual working forces in the motor. Bearing life is a decidedly practical consideration, and to say that decreased bearing pressure will result in increased bearing life is axiomatic.

The incidental advantages of this type of piston are several. The co-efficient of friction of the Lynite piston alloy is but half that of iron. This is significant in two or three ways. In the first place, there must be a gain, however slight, in mechanical efficiency in the motor, and it is these slight gains that the engineer to-day is seeking. Also, the piston side pressure may be increased without unfavorable results. This has a bearing on a type of piston, the design

of which will be later discussed, in which there is some reduction in the bearing area.

The much greater thermal conductivity of the aluminum piston alloy is likewise a factor of no little importance. This greater conductivity variously determined as from ten to fourteen times that of iron, reflects itself in a marked decrease in the amount of carbon deposited on the piston head. In fact under favorable lubricating conditions, there may be a total absence of carbon.

Advantage may be taken of this thermal property in increasing, if desired, in motors of the smaller bores, the compression beyond the point at which preignition would invariably occur with iron pistons. In fact, in one or two cases such advantage has been taken.

Characteristics of Cothias Piston

The piston made by the Cothias process, is superior to the sand cast one in every respect. The point of superiority in which its pre-eminence is most marked—and of the greatest practical worth—has to do with the quality, hardness. The Lynite piston alloy which has rather exceptional qualities even when cast in sand, acquires a hardness fully 25 per cent greater in this process. In fact, its hardness falls not far short of that of the average piston iron. At the same time, it is enough softer than the iron or semi-steel of the cylinder, that in the event of piston seizure, it is the cylinder, and not the piston that does the scoring.

Incidental to this process, additional strength is imparted to the metal, this increase ranging from 20 to 30 per cent. However, this gain in strength is quite secondary in importance to the gain in hardness just noted. I might add, however, that in one particular case, the difference between the sand cast and the piston made by this method, both pistons of identical design, was the difference between failure and success.

Quite aside from the engineering aspects of the matter, this Cothias process piston should, and does, commend itself to the manufacturer. Its advantages from the standpoint of production are quite obvious. As the pistons come from the mold practically exactly round, a finish of but 1/32 in. on a side is all that is required, not more than may be removed by two grinding operations, a rough and a finish. The wristpin holes are also cored, possibly saving one operation, or, if not, at least cutting the machining time in half. Considering now the sand casting this requires rather a liberal amount of excess stock for finish and the wristpin holes are but rarely cored. The foundry must be paid, and quite properly, for this excess metal, and in addition to this now unnecessary expense further expense must be incurred by the extra operations required to remove this same excess stock. As a basis of comparison, I have weighed rough sand castings and unfinished castings of the type being described of similar design, and find the former to weigh between 30 and 40 per cent more. To cite one specific case, the sand casting weighed 1¾ lb., the other but 1¼ lb., a saving of ½ lb. of metal per piston.

Regarding machining, a moment back, grinding was mentioned, such reference being made advisedly, since no difficulty is encountered in grinding the Lynite Cothias process piston, due to the acquired hardness of the metal. Kerosene seems to be the best grinding or cutting compound. As a matter of fact, however, I should judge that the majority of manufacturers prefer to machine their pistons on rapid lathes. With this procedure, fully as large production is being attained, and at less cost, it is stated. In a few instances, these pistons are being burnished, the alloy taking a high polish. This practice has much to commend it.

Difficulties with the Alloy Piston

A consideration of the difficulties experienced with the aluminum alloy piston should by no means be neglected. Fortunately, this consideration may be brief, since the troubles anticipated by most engineers a year ago on account of the relatively greater expansion of aluminum than iron, have not materialized. I would like to mention here that the co-efficient of expansion for iron is 0.0000119 and aluminum 0.000023 per deg. Fahrenheit, about one to two, but the difference is not as significant as might seem to be the case, since the greater thermal conductivity of the aluminum alloy is a factor which plays a part in the actual expansion of the piston.

It is not to be denied that trouble has been experienced in individual cases, but in practically every instance it has been possible to eliminate such trouble. The difficulties have, in the main, been two. Piston slap has been one of them, although as a matter of fact, very little has been said about slap in the last three or four months. The other has had to do with the pumping of oil in high-speed motors, while running at low speeds. This pumping naturally signifies, if nothing else, a larger consumption of oil with the incidental consequence of smoky exhaust and occasional sooty plugs, though these two do not necessarily follow. However, this trouble is by no means confined to the aluminum alloy piston, iron pistons under similar conditions having been known to pump oil; however, the condition is aggravated with the alloy piston, due to the fact that practically none of the clearance allowed for expansion when turning over at high speed has been taken up by the piston body, while on the other hand, with the motor throttled down, the vacuum created by the intake stroke, results in a greatly increased suction in the space between piston and cylinder. Various means of overcoming slap and oil pumping will be mentioned later in the paper.

Incidentally, brief scrutiny of the prints that it has been

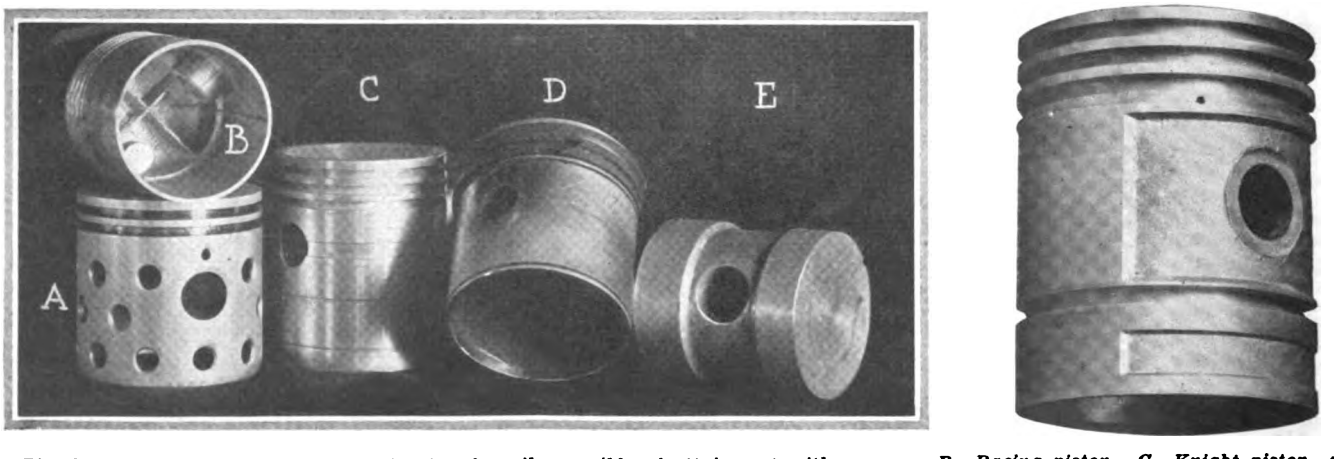


Fig. 3—A—Cothias process piston, showing fine ribs possible of attainment with process. B—Racing piston. C—Knight piston—note concave head. D—Piston, 490-hr. run, block test, at speed of 1200-1300 r.p.m., equivalent in mileage 17,000. Wear about 0.00025. E—English hourglass piston. On right—Northway piston.

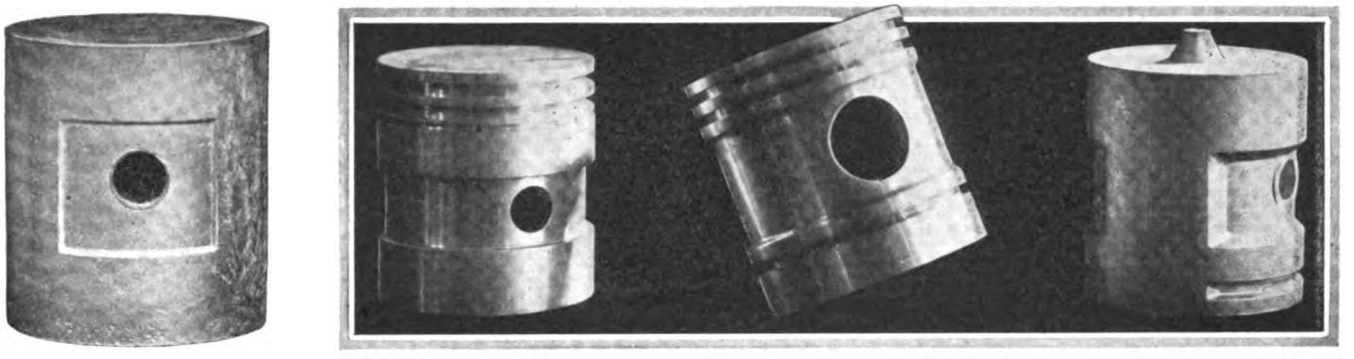


Fig. 4—Left and right—Northway piston. Center—King piston. Note wiping ring is employed

my pleasure to receive, would force home to designers generally the advantage of standardized design. Closer scrutiny would seem to show the possibility of reconciling these various designs. The prints submitted show pistons of fifteen or sixteen diameters, the latter ranging from 2½ to 5⅛ in. and while I feel entirely safe in saying that no two for the same bore motor are interchangeable, at the same time, in many cases, the differences are slight and might easily be compromised. Some of the variations noted will be mentioned. For instance, only one print showing a 2⅝ in. piston was submitted. The head of this piston showed a thickness of 5/32 in.; on the other hand, a piston 3¾ in. diameter calls for a head thickness of but ⅛ in. Similarly, another 3 in. piston calls for a head thickness of 3/16 in., the same as another 4¼ in. piston. There is the same diversity in the size of the wristpin. A small piston has a large one, and vice versa. Some designs make provision for oil drainage. In others there would seem to be none whatever. Another point of variation is in the width of ring used. As frequently as not, the smaller piston has a wider ring. However, tabulation has shown the ring with a width of 3/16 in. to be the most commonly used one for pistons with diameters between 3 and 4 in. In passing, possibly 90 per cent of the blue prints to which reference is being made, show pistons for motors with bores lying within these limits, and the most recently received prints show a decided trend toward the smaller bores. It is interesting to note that this independently made tabulation checks up exactly with the proposed S. A. E. standard for piston ring widths, and which will later be mentioned. The use of three rings seems to be the standard practice. In one or two instances, four rings are employed at the upper end of the piston; in three or four, but two rings. Several designs show the employment of a so-called wiping ring at the lower end of the piston, three rings being used at the upper end. In one case, provision is made for but two rings.

Piston Length Variation

Another point of great variation is that of piston length. A few, in my opinion, fortunately a very few, have a length no greater than the diameter. In one case, the length is less than the diameter. On the other hand, a few pistons have a length nearly one and one-half times the diameter. To mention the dimensions of a piston used in a recently announced model its diameter is 4⅝ in., its length 6 1/16 in., or the length in terms of the diameter is one and thirty-nine-one hundredths (1.39) the diameter. In general, the piston length has been found to vary from one and one-fifth (1.2) to one and three-tenths (1.3) the diameter.

Determination of Head Thickness

Let us consider from the standpoint of theory the conventionally designed piston. I characterize as the piston of conventional design the one employing rings, regardless of number, at the upper or head end only. This arrangement is quite the most common. Most treatises on design resort to the formula of Grashof in the determination of thickness of head, considering the piston head as a circular plate.

Grashof's formula is of the following form:

$$\text{Thickness } t = D\sqrt{\frac{P_m}{6S_p}}$$

Where D equals the diameter in inches, which may be taken as the bore, P_m equals the maximum pressure per square inch and S_p equals the allowable working stress in tension in the metal.

Merriman in his Mechanics of Materials derives a formula of the form:

$$\text{Thickness } t = \frac{3D}{4}\sqrt{\frac{P_m}{2S_p}}$$

For cast iron, S_p with both formulae is given as 3000 lb.

Formula Inapplicable

With one qualification, these formulae, assuming a maximum explosion pressure of 450 or even 400 lb. per square inch, give head thicknesses much greater than is current practice as shown by these prints. Of course it is possible, provided either of these formulæ has been used, that much higher allowable tensile stresses have been assumed than named as safe by the authors. I am inclined to think that most designers in calculating head thicknesses, have considered the problem as simply one in shear, and which I believe is an entirely safe procedure for pistons of diameters no larger than those of automobile engines.

With an assumed maximum explosion pressure of 450 lb. per square inch, and a figure that should provide for the exceptional condition, and an allowable unit tensile stress of 1500 lb.

F being the unsupported diameter of head

$$\text{Thickness } t = \frac{F}{13} \text{ approximately.}$$

Investigation has disclosed the unsupported diameter of head to range between eight-tenths (0.8) and eighty-five hundredths (0.85) the piston diameter, from which, taking the mean, it at once follows that

$$\text{Thickness } t = \frac{D}{16} \text{ approximately.}$$

I will anticipate the question that will possibly be raised, relative to the large factor of safety employed. As is well known, there is a tendency with all metals and alloys to lose a portion of their strength during actual subjection to continued high temperature. As a matter of fact certain aluminum alloys become very brittle under such conditions. The question of immutability under long continued high temperature is a most important one. While we believe we have developed an alloy of a nature peculiarly resistant in this respect, at the same time caution should be the keynote. It should be borne in mind that the melting points of aluminum alloys are much closer to the operating temperatures in motors than is the melting point of cast iron. The slight increase in head thickness given with the factor of safety used, will increase the weight of the piston only very slightly.

From the standpoint of thermal conductivity, a deep rib

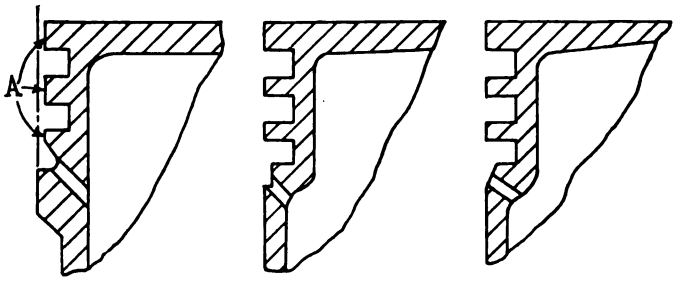


Fig. 5—Right and center—Provision for oil return. Two methods commonly employed shown. Left—Detail of King hourglass type piston showing ingenious oil drainage provision. Note bottom ring is backed by land of full depth, there being no sacrifice of support as in the case where the ordinary relief is employed. Also note all lands ground to same diameter.

or two, across the head, renders material assistance in keeping the piston head cool. The rib in the plane of the bosses may be dropped down to these, giving rigidity to the latter, as well as binding the ring-carrying portion of the piston securely to the lower half. The extension of this rib will permit a slight decrease in the thickness of metal back of the ring groove and it would seem that the pin boss might be of slightly less diameter when supported by a rib. In one or two cases, the objection has been raised that, due to the thermal property of the alloy, this rib carried heat to the one point it was not wanted. However, to my best knowledge, no trouble whatever has developed where this has been done. As an indication of the effect of ribbing, the case of a 5 in. piston is cited. The motor using this particular piston is a high compression one, developing in the vicinity of 175 hp. at about 1500 r.p.m. This piston is exceptionally well ribbed, the transverse rib extending down the side nearly to the bottom of the skirt, and but 0.008 in. clearance is allowed on the skirt. Before ribbing, the clearances necessary were some thousandths greater.

Piston Length

The calculation of the actual length of bearing a piston should have against the cylinder so that a safe working pressure should be exceeded at no time is too involved and would take too much time to warrant its determination here, other than to indicate the factors that enter into the problem. A mean pressure of from 25 to 30 lb. per square inch of projected bearing area is, I believe, not excessive for high speed motors.

Side-pressure is, of course, a tangential function and is expressed by an equation in the form

$$P_s = P \tan \alpha$$

P being the total force exerted by the piston and α the rod angle. The total force is not the gas pressure back of the piston but rather is the sum of such pressure and the inertia force. This latter opposes or is negative for approximately half of the stroke and is positive for the balance. Both, of course, vary with the piston position. It will be seen that the problem really depends upon the "cut and try" method for solution. The combined force must be determined for various crank positions, resolved into components perpendicular to the cylinder and the mean found. Investigation of several cases with the connecting-rod—stroke ratio two or higher has shown that if the actual bearing length is about the same as the piston diameter the mean side-pressure will not exceed the higher figure mentioned a moment since, that is, 30 lb. per square inch of projected area. However, the advantages of the long piston, especially in aluminum, are obvious and if it is possible to increase the bearing length, so much the better. If the length of the piston is always taken as one and three-tenths (1.3) to one and one-third (1.33) the diameter in the conventional three-ring one, the question of bearing length will almost certainly take care of itself.

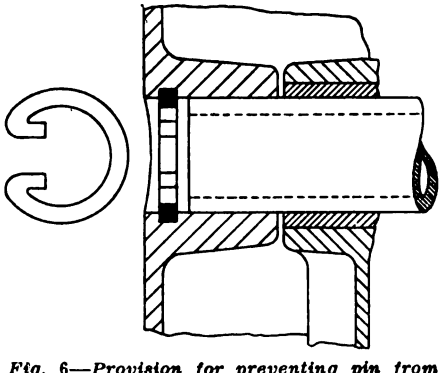


Fig. 6—Provision for preventing pin from scoring cylinder when free to rotate in either rod or piston

Wristpin Location

A detail of design meriting the fullest consideration is relative to the location of the wristpin. This point is approached with some little trepidation owing not to any great divergence of opinion as to its theoretically correct location, concerning which most engineers are, in the main, agreed, but rather because in advocating and urging that theory be put into practice, the question is going to be raised that motor cost will be increased. Undoubtedly, the conflict here between theory and practice is the chief stumbling block in the path leading toward standardized piston design.

In this connection the trend of design as shown by the prints in hand is worth a word of comment. If any conclusion is to be drawn from these prints, it is that many engineers in the last six months have approached this question from a new angle. Inspection of the drawings received prior to this time would seem to show that in the majority of cases the designer has had one or both of two things in mind. Possibly, in some cases an effort has been made to balance the piston about the wristpin. In other cases it would seem that the designer has endeavored to get the wristpin as near the head of the piston as possible, outside construction details apparently influencing him. The prints received showing that bearing considerations had had an influence on the wristpin location were exceedingly rare.

Recently, however, possibly as many as 25 per cent of the prints that have been submitted show that even distribution of side-pressure due to rod angularity has been the dominant consideration in the design of the piston.

Let us analyze the changes necessitated in a motor in changing the design of the piston in such way as to insure uniform distribution of side-pressure. As has just been stated the objection that is going to be raised to the conversion of theory into practice will be on the score of expense, due mainly to the fact that the over-all motor height must necessarily be increased to keep the operating conditions the same. This additional height represents a slight increase in weight, consequently, casting cost; also may increase very slightly the machining cost. There would seem to be no other reasonable objection except possibly in the eight in that it would increase the over-all width to an undesirable point. Especially might this be the case with eights with over-head valve construction. This objection I do not believe, can be raised in the case of the twelve nor in the case of the vertical motor.

As a matter of fact two manufacturers in this section have in their latest models increased the over-all height of their motors to permit the dropping of the wristpin which had formerly been nearer the head, to a point insuring this uniform distribution of side-pressure. The pistons (iron) in these motors were always a source of trouble in that they wore unequally and excessively and slapped badly until this change had been made.

In the consideration of the problem involving the determination of proper wristpin location the forces may be assumed to act in one plane. At first glance it might seem that if the wristpin axis were to lie in a transverse plane dividing the actual bearing portion of the piston cylinder into two equal parts the desired condition would be attained. However this is not quite correct since the friction between piston and cylinder introduces a turning moment about the

wristpin. Then if P represents the uniform mean pressure desired per inch of actual bearing length,

Total load $P = (L - l)\,p$

L being the total piston length and l the non-bearing length of piston. For reasons which are obvious, the rings do not enter into the problem at all. In taking turning moments about the wristpin, μ being the co-efficient of friction

$$p\,(x-l)\,\frac{(x-l)}{2} + \mu\,(L-l)\,p\,\frac{D}{2} = p\,(L-x)\,\frac{(L-x)}{2}$$

Simplifying

$$x = \frac{L+l}{2} - \frac{\mu D}{2}$$

D being the piston diameter.

The interpretation of this is that the proper location of the wristpin should be above the exact bearing center by a distance in inches equal to one-half the product of the coefficient of friction by the diameter. A similar method of reasoning may be used in the location of the wristpin in pistons utilizing a wiping ring. It will be seen the smaller the coefficient of friction, the nearer the center of actual bearing surface, the proper pin location.

Wristpin Bearing Length

Let us now briefly consider the relation of wristpin and piston. The method of locking the pin and rod together, rocking the pin in the piston seems to be gaining in favor and I should judge in approximately 50 per cent of the motors now being built this practice is being followed. It certainly has the advantage of being the cheaper construction and possibly a slightly longer bearing length may be had.

It may be assumed that the maximum load sustained by the wristpin is that caused by the explosion and which it really is when the motor is turning slowly. At high speeds on the power stroke it will not ordinarily be as great due to the inertia of the piston. In checking over a number of drawings this wristpin bearing pressure has been found to range between 2500 and 3000 lb. per square inch of projected area. In a few cases with the maximum explosion pressure figured as low as 400 lb. per square inch it has even been found that the wristpin bearing pressure will attain a pressure as high as 4500 lb. per square inch of projected area of the wristpin.

However, taking the low figure, assuming 2500 lb. per square inch of projected area to be the average figure, if l_w is the total length of bearing, d the pin diameter, D the piston diameter, and P the maximum explosion pressure per sq. in.

$$2500\,l_w\,d = \frac{\pi D^2 P}{4} \quad \text{or} \quad d = \frac{\pi D^2 P}{10{,}000 l_w}$$

l_w may be as high as seven-tenths with sand castings, but is usually limited to five-eighths (0.625) the piston diameter due to conditions surrounding the operation of the molds when the pistons are manufactured by the Cothias process. This has to do only with the case where the pin rocks in the piston.

Again assuming a maximum explosion pressure of 450 lb. per square inch,

$$\text{When } l_w = 0.6D,\ d = \frac{\pi D}{13.3} = \frac{D}{4.25}$$

An empirical formula of the form

$$d = \frac{D}{4} - \frac{1 \text{ in.}}{16}$$

for the diameter in which we are interested checks up very well with the previous one, and is easily solved by inspection.

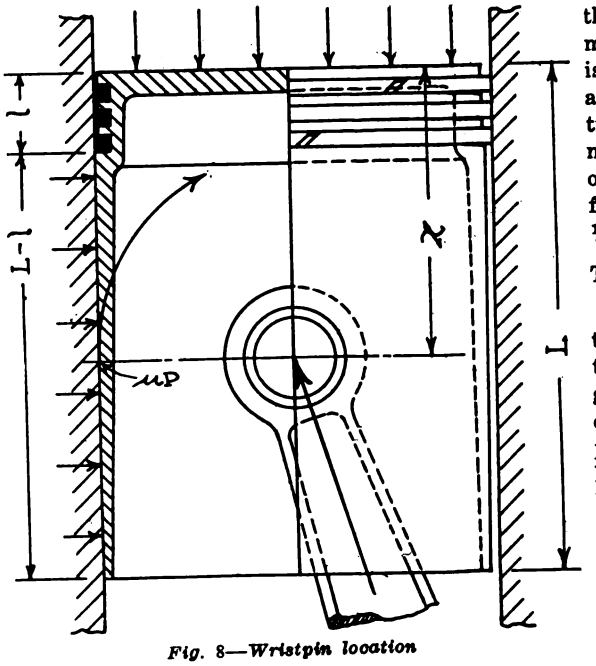


Fig. 8—Wristpin location

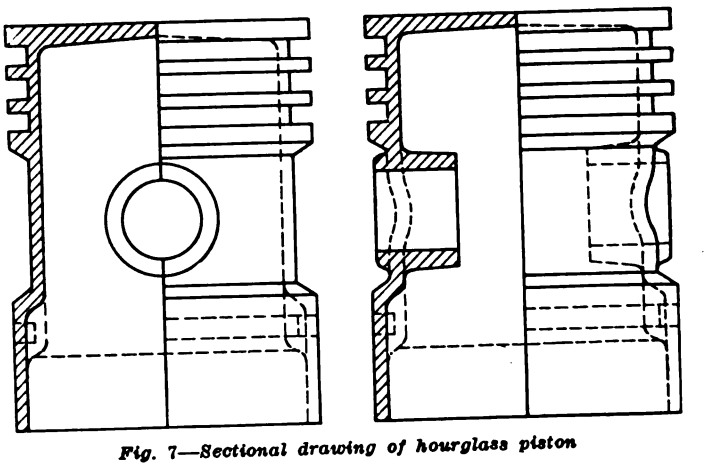


Fig. 7—Sectional drawing of hourglass piston

Occasionally it is possible to get a bearing length equal to sixty-five-hundredths (0.65) the diameter in this process when but one rib in the plane of the bosses is employed. On the other hand, if two ribs are desired a bearing length equal to six-tenths (0.6) the diameter is absolutely the maximum possible of attainment. More to the point, the distance between boss faces is represented by the complements of the percentages previously given; that is, the distance between faces will range from thirty-five-hundredths (0.35) to four-tenths (0.4) the diameter.

Wristpin May Have Wide Bearing

It may be said that up to this time we have experienced no difficulty whatever in retaining the specified width between bosses in the type of piston in which the pin is locked in the piston, in the manufacture of pistons by this process. In some cases connecting-rod bearing length as high as seven-tenths (0.7) the diameter has been secured.

Limitation of the Cothias Process

The wall of the Cothias process piston from the bosses down should be somewhat thicker than that of the iron piston since this process as presently developed does not permit the production commercially of pistons with the internal flange incorporated for stiffness at the bottom of the skirt. In explanation may be pointed out the fact that this process in the present art requires that the diameters of the piston increase progressively from the diameter at the head end, that is, the internal diameter of the ring carrying portion, to permit the withdrawal of the core. It is also necessary that slight allowance for taper be made. Examination of the various pistons we have made shows that the wall thickness of the finished piston will average from 3/32 in. for a 3 in. piston to ⅛ in. for a 4 in. one.

The Oil-Pumping Problem

Relative to some of the minor details of design a large number of the piston drawings show an oil groove back of the last ring with drain holes into the interior of the piston. I believe that experience has shown these drain holes should be at least 3/32 in. diameter to function properly, this regardless of the size of the piston. This provision for oil drainage is most important in the aluminum alloy piston where the clearances are neces-

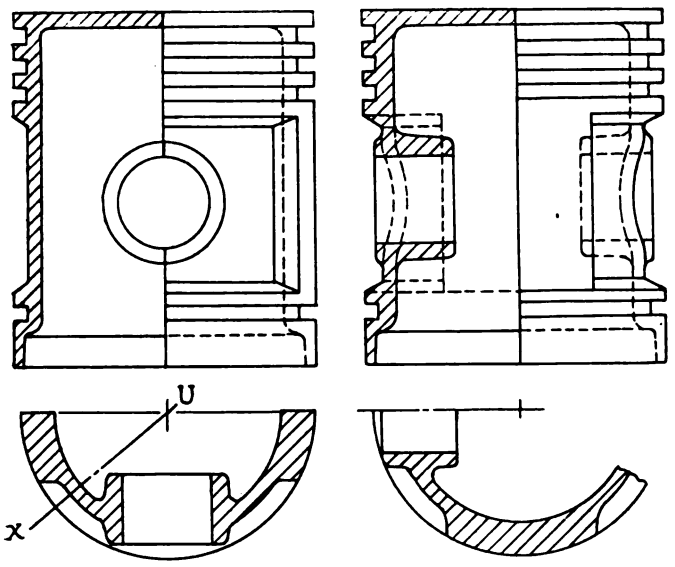


Fig. 9—Adaptation of hourglass type shown in section

sarily greater than with the iron one, the oil film being consequently heavier, since, this excess oil must either drain back into the crankcase or be pumped into the combustion chamber. Possibly the piston side-pressure causes a squirting action in addition.

In any event, as was mentioned some time back, in the case of several high speed motors where it has been found necessary to allow excessive clearance for the reasons given, it had been found most difficult to eliminate pumping of oil while running slowly, until this recess with drainage holes was incorporated in the piston.

Certain motors, however, due to the method of lubrication used, have required the employment of a wiping ring in the piston, to eliminate oil pumping. Incidentally, the use of a wiping ring, at least in all cases I have observed, has had a salutary effect on piston slap, even although in some cases the clearances have been unnecessarily great and slap should naturally have been expected. The "lag" of the piston due to friction in the ring groove, would seem to be the natural explanation for this agreeable condition.

The Hourglass Piston

In this connection since the results had with it have been quite remarkable insofar as the elimination of oil pumping is concerned, I would like to refer brefly to the hourglass type of piston. This type of piston was developed in Europe and its use has become more or less general on the Continent. At the present time pistons after this design are being employed on the Minerva, Clement and the Delage. As a matter of interest the pistons in the Mercedes 1914 Grand Prix winner were of this type. Two manufacturers in this country have recently completed a series of exhaustive tests with this type piston with such highly satisfactory results that it has been adopted as standard in their 1916 motors. In these two particular pistons, wiping rings are not employed, and the design has accommodated itself well to our process. This hourglass type of piston, in the main, is particularly well adapted to the Cothias process, and may very well include a wiping ring. It will be understood that for the same reasons that prevent the inclusion of an internal flange at the bottom of the piston, we are not able to include a flange to contain a wiping ring, at the same time maintaining an economic section. In other words, unless recourse is had to the hourglass type it is not possible for us to produce a piston with provision for wiping ring without sacrificing the fundamental advantage of the aluminum alloy piston, that is, lightness.

The general hourglass design may very easily include a wiping ring with a very slight, if any, increase in weight. The objection has been raised that bearing surface is being sacrificed. To provide additional bearing surface about the point where the side thrust is most direct, the Northway engineers have designed a piston in which the retraction is not carried the complete circumference, in effect bridging the gaps at the above locations. This Northway type has created much favorable criticism and several different pistons of this adaptation are now being produced.

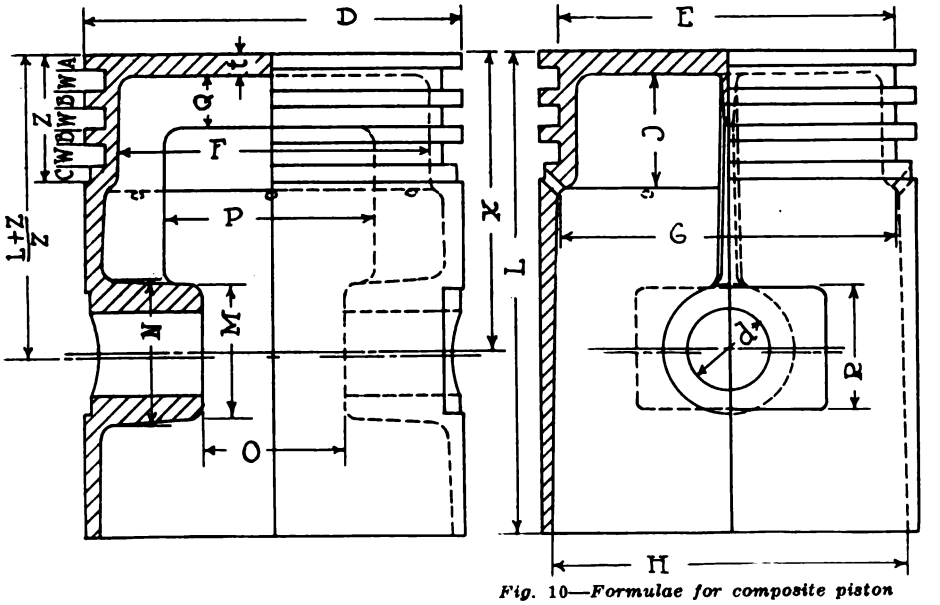
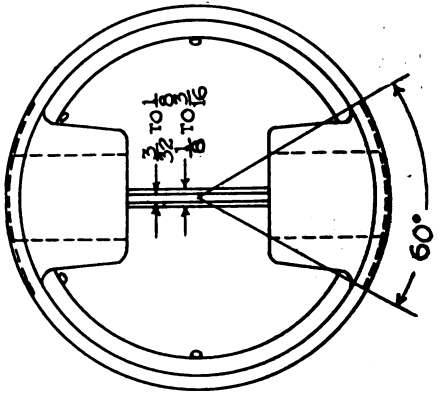


Fig. 10—Formulae for composite piston

Ring Widths

Nominal Diameter		*Width*
2"	—2½" inclusive	1/8"
2⅝"	—4" inclusive	3/16"
4⅛"	—5" inclusive	¼"
5⅛"	—6" inclusive	5/16"

Proposed S. A. E. standard for piston rings and grooves



Key

A	*Width of first land* = *D*/16 — 1/16"	*L*	*Piston length* = 1.3 *D*
W	*Ring width* = *See table*	*J*	*Depth inside of head of ring carrier* = *D*/8 + 3*W* — 3/32"
B	*Width of second and succeeding lands* = *D*/16 — 5/64"	*X*	*Distance from head to wristpin center line* = $\frac{L+1}{2}$ — $\mu D/2$
C	*Oil groove* = ⅛" wide × 1/32" deep	*O*	*Distance between boss faces* = 0.375*D* to 0.35*D*
D	*Piston diameter* =	*M*	*Diameter small end of boss* = ⅜*D* — 1/16"
E	*Diameter bottom of ring grooves* = *D* — 1.7 *W*	*N*	*Diameter large end of boss* = ⅜*D*
F	*Diameter of ring backing* = 7 *D*/8 + ⅛" — 1.7 *W*	*d*	*Diameter of wristpin* = *D*/4 — 1/16"
t	*Thickness of head* = *D*/16	*P*	*Opening of rib* = *O* + ½"
G	*Internal diameter top of skirt* = 15/16*D* — 1/16"	*Q*	*Depth of rib* = *D*/8
H	*Internal diameter bottom of skirt* = 15/16*D*	*R*	*Width of relief* = *D*/3
l	*Non-bearing piston length* =		

If the width of the pad is made one-half the diameter, it follows that one-half the projected area is at least retained, while at the same time weight is being saved on two-thirds of the diameter. In laying out various sizes of pistons of this adapted design, I have found the sacrifice of bearing area to approximate 30 per cent. It must be borne in mind that even with this decrease in bearing surface, the friction load is still going to be less than for an iron piston with 100 per cent bearing on account of the difference in coefficients of friction. The sacrifice in thermal conductivity is even less in proportion to that of the iron piston.

Another matter is relative to wristpin hole relief. I believe it is now universal practice to relieve the piston at this point to provide for boss distortion. Ordinarily, this relief may be cast in the Cothias process piston, saving an expensive machining operation.

The Design of a Composite Piston

It occurred to me in the preparation of this paper that the prints in hand offered much interesting data. Therefore, I have gone over these, compiling data relative to the various details of design and in connection with the questions of design previously discussed, have worked out what might be termed a composite piston, at the same time bearing in mind when designing this, the limitations of the process. However, after all, this has not affected the design of this composite piston very much. Since nine out of every ten piston points received show pistons between 3 and 4 in. in diameter only those prints showing such pistons have been considered. The compiled data have been disregarded in no respect in laying out this piston. However, the length has been laid out on the basis of one and three-tenths (1.3) the diameter rather than one and one-fifth (1.2) as shown by the compilation. I felt warranted in making this change since a great many of the prints submitted were for iron pistons and as has been previously pointed out the greater the length the better it is for the alloy one.

The proposed standards for ring widths have been included. I procured the desired information from the Standards Committee but understand that no formal proposal has yet been made to the members of the Society.

Unfortunately, there does not seem to be any general agreement relative to ring thickness and I have therefore inspected these prints and have tabulated the data relative to the groove depths for rings of the widths on which it is proposed to standardize. This tabulation shows the groove depth to range between eight-tenths (0.8) ring width and eighty-five one hundredths (0.85) ring width. I have taken the higher figure, since I have had no means of knowing whether the rings were eccentric or concentric, and apparently, if the groove depth is the higher percentage, ample provision is made for the eccentric ring.

Further Discussion of C. S. Crawford's Paper on Eight

By Allen Loomis
Research Engineer, Packard Motor Car Co.

EDITOR THE AUTOMOBILE:—As C. S. Crawford's interesting and able paper on Characteristics of the Eight-Cylinder Engine was not given out until the meeting, when the reading was necessarily rapid and time for consideration limited, divers mathematical errors in it escaped attention and are printed in THE AUTOMOBILE for Nov. 4. The following corrections are submitted:

The figure of 70 lb., given near the middle of the first column of page 841, as representing the maximum unbalanced force at 1000 r.p.m., was, at the meeting, changed by Mr. Crawford to 140 lb. I remarked at the time that this implied a reciprocating weight in each cylinder equal to only 1 lb., 9 oz.; but not until after the meeting was my attention called to the figure of 2.375 lb., given in Table II. A proper calculation based upon this would correct the figure originally printed in the paper by substantially trebling it instead of merely doubling it, as admitted at the meeting. I hereby submit the calculation in abridged form.

The distance X through which the combined center of gravity of reciprocating weights in one side of the motor moves, as indicated in Fig. 6 of Mr. Crawford's paper, is found by computation to be 0.274 in.

As has been pointed out previously in the deliberations of this society, the combined center of gravity of all pistons in a 90-deg. V-type, eight-cylinder motor moves in a horizontal path through a distance equal to the distance X multiplied by 0.70711. This motion is harmonic and the complete double vibration occurs twice during each revolution of the crankshaft.

The maximum accelerating force in harmonic motion is equivalent to the centrifugal force of the same weight revolving uniformly in a circle whose diameter equals the length of the harmonic motion, in the same period of time required for the complete double vibration.

The radius, R, of this circle $= \frac{0.274 \times 0.70711}{2 \times 12} = 0.008073$ ft.

At 1000 r.p.m. of the crankshaft, or 2000 r.p.m. of the point under consideration, the linear velocity, V, of the point equals:

$$2 \times 0.008073 \times 2000 = 101.45 \text{ ft. per min.}$$

or

$$1.6908 \text{ ft. per sec.}$$

The vibrating weight, W, equals

$$8 \times 2.375 = 19 \text{ lb.}$$

Substituting these quantities in the ordinary formula for centrifugal force, $\frac{W V^2}{g R}$, in which g equals approximately 32.2, we find that the horizontal vibrating force in the Cole eight motor, at 1000 r.p.m. amounts to 209 lb. At 2000 r.p.m., this force equals 836 lb.

These figures greatly modify the resultant curves given in Figs. 4 and 5 published with the paper. The vibrating effect cannot be ignored either when one considers theoretically but properly that this force acts upon only one end of only the unsprung weight of the car, or when one actually compares the impressions obtained by riding in the tonneau of an eight-cylinder car and in the tonneau of a well-built twin six.

Even up to the present I have not had time to check all the computations in the paper, but wish to call attention to the obvious error in the computation of unit inertia pressure per square inch of projected area of crankpin given by the author in Table 7. The author has apparently taken into consideration the inertia effect of only the reciprocating parts of only one cylinder. It is obvious that the total inertia forces acting upon each crankpin of the Cole eight motor are actually due to the reciprocating parts in two cylinders plus the revolving weights of the connecting-rod big ends. The weight of the connecting-rod big ends is not now at hand, but it is probable that when the forces alluded to are properly combined, the unit inertia pressures for the motor will be found to be approximately treble those given in Table 7 of Mr. Crawford's paper.

The FORVM

SAND CASTING ARGUED FROM A FRESH VIEWPOINT—WHY PHOSPHORUS AND SULPHUR CONTENT S. A. E. STEELS IS NOT CHANGED—HOW SHOULD THE GNOME ENGINE BE CLASSIFIED?

Phosphorus Sulphur Content of S. A. E. Steels

EDITOR THE AUTOMOBILE:—On behalf of the Standards Committee of the Society of Automobile Engineers may I ask that you present a correction of one point in your very excellent report of the Chicago meeting in your issue of Oct. 21? On page 736 the statement was made that the suggestion will be given to the society next winter of raising the limits for phosphorus and sulphur in steel to 0.045 and 0.054 per cent respectively. As a matter of fact, the phosphorus and sulphur contents of the carbon steel grades up to those containing 0.45 per cent carbon were raised to 0.045 and 0.050 per cent respectively in January, 1914, and no change in these elements is proposed either for the carbon or alloy steels at this time.

In continuing the work of the iron and steel division, it has been the desire to take recognition in some way of the higher grades of steel which are demanded by some manufacturers for certain particular parts and the division has considered the listing of a separate schedule for this purpose. Since, however, the grades listed at this time are, in the opinion of the division, thoroughly adequate for the production of the great majority of structural parts and since the introduction of a separate list with no variant except in phosphorus and sulphur would probably have the effect of complicating our list, the action proposed at this time, to cover the situation, is to introduce in the text of our specifications a statement equivalent to the following:

"The compositions listed below include practically all the steel materials necessary for the great majority of automobile parts. In cases where very special duty or exceptional quality is demanded, grades containing less phosphorus and sulphur are available, but these should be made the subject of special agreement between buyer and seller. By such arrangement, manganese may also be limited within a variation of 0.20 per cent inside the limits given."—K. W. ZIMMERSCHIED, Chairman, Standards Committee, S. A. E.

Advantages of Sand-Cast Pistons

By W. M. Levett

President Walker M. Levett Co.

EDITOR THE AUTOMOBILE:—The fact that all of the American cars entered at the Astor Cup race were equipped with Magnalite sand-cast pistons, seems to have aroused much comment and it may be of interest at this time to give you some further facts relative to sand-castings for piston requirements.

As piston discussions have proved a rather important part in your Forum on the increased use of aluminum and aluminum alloys for automobile construction, the types and designs of alloy pistons which have met with the greatest success should prove of interest to your readers, especially in view of the agitation now on as to the comparative merits of sand and die castings.

We do not concede that a die-casting made under the conditions necessitated by the die-casting process will show as close a grain or as much strength as a sand-casting. The conditions of manufacture to which the aluminum alloy is subjected in the die-casting process result in impairing the vitality of the metal because of reasons readily understood by the foundryman.

Comparative examination will prove that our sand-cast Magnalite metal has more density and strength than that of the die-cast piston as commercially manufactured. As a matter of fact, our experimental department has made an examination of some die-cast piston samples by comparative tests and we have found the metal in these to show really not so great tensile strength as in our sand-cast pistons.

No Piston Trouble in Astor Cup Race

Of the eight cars to finish at Sheepshead Bay, only one—the sixth—was not equipped with sand-cast pistons of our metal and this car we understand was equipped with steel pistons. Among the foreign cars, many of which, we understand, used pistons machined from the solid steel billet, the principal trouble which eliminated them seems to have occurred in the form of broken connecting-rods or crankshafts, a condition which would indicate that the reciprocating parts of these motors were not of sufficiently light weight construction to stand the terrific strains of the 102-mile pace which was established.

Of the American cars eliminated—all of them, as stated, were equipped with Magnalite sand-cast pistons—we were unable to learn of a single one going out of the race because of engine trouble in this form. The results at the Astor Cup race, as far as sand-cast aluminum alloy pistons are concerned, is simply a repetition of the showing that has been made throughout the racing season. It might almost be said that this season's racing offered competitive contrast solely between our pistons and those in the foreign cars machined from solid steel billets, as with only rare exceptions, have other pistons been used in races of importance. Out of thirty-nine cars equipped with our pistons, which participated in twenty-five races during the season, seventeen have taken first place, seventeen second place and five third place—a condition which would certainly prove beyond any question, the toughness and durability of this metal for racing cars.

The writer examined a steel piston and connecting-rod from a Peugeot which came to grief in the Astor Cup races and found a condition in which the piston wristpin and connecting-rod were battered and bent to an amazing degree ascribed by the driver to excessive heat. Such a condition has not arisen and would not arise with the use of Magnalite parts, owing to the high thermal conductivity of Magnalite.

As for the castings themselves, there can be no question but that by means of a properly made sand core, a much

more substantial and practical system of ribbing is permitted than with the die-cast pistons. The special form of ribbing under the dome of the piston which we have worked out for racing cars, would be impracticable in any type of die-casting now used, and yet experience has shown this ribbing system to be an essential where extremely high speed of the engine and increased strength in the dome of the piston are absolute necessities.

The die-caster has endeavored to compensate for the lack of sufficient ribbing in die-cast pistons by increasing the section of the wall and head, but is he not by so doing throwing away a part of the very advantage sought by the use of aluminum alloy pistons, *i.e.*, a light weight piston?

To sum up—where tough, durable piston metal, where the use of the most advantageous ribbing, where the lightest possible piston is desired, sand-cast pistons must be used.

What Is a Rotary Motor?

By Edward V. Hartford

President Hartford Suspension Co.

EDITOR THE AUTOMOBILE:—Heterophemy, the using of one word when we mean another, is really one of the commonest mistakes in this world of error. I am led up to this remark by a curious example of heterophemy that occurs on page 706 of your issue for Oct. 14, where Charles Vivier, in a very able article on pistons and connecting-rods, calls the Gnome motor, a "rotary motor." Now, the Gnome engine is certainly not a rotary engine, in the same sense that a steam turbine is a rotary engine. A steam turbine usually consists of two parts, stator and rotor. The first is stationary, and the latter in rotary motion. The Gnome type has also a stator and rotor; the crankshaft is the stator and the remainder of the engine is the rotor.

The Gnome engine, however, is also a reciprocating engine, for notwithstanding the fact that they rotate, they have within themselves, pistons which reciprocate in the cylinders. Every mechanic will readily perceive that unless these pistons reciprocate, such a construction called a rotary engine, would, therefore, not be a prime mover; for they would be locked in such a situation—hence, it is obvious that no engine, with reciprocating parts may be called a rotary engine. The Gnome engine has reciprocating parts, and therefore, it is not a rotary engine. Nevertheless, it is hardly fair to call it a reciprocating engine, because that term has been so well standardized, and I believe that the best phrase to use, as indicated by the Editor of *Power* and the Editor of the *Scientific American*, would be to call them rotative engines, in which "the reciprocating motion of the piston is transformed into a continuous rotary motion."

In conclusion, I wish to state that I simply write, because a technical journal should be careful of how it picks its technical terms and expressions, and if this phrase "rotary engine" is once applied to the Gnome motor, it will stick very hard indeed and make it very difficult to eradicate this false impression from the minds of not only the trained engineer, but of the layman as well.

—The only truly descriptive term that has been suggested is "stationary crankshaft engine" but this is too cumbersome for general use. "Rotary cylinder engine" is another suggestion but this offers opportunity for confusion also. Perhaps "fixed crank" would be a possible solution of the difficulty, but any other suggestions would be interesting.—[ED.]

Rhode Island's Registration Analyzed

AN analysis of the registrations of automobiles and motor trucks in the State of Rhode Island up to Oct. 1 shows a total of 14,017 vehicles in use. These are the products of 243 manufacturers, a large number of whom, of course, are no longer active in the car and truck-building field.

Owing to the fact that a number of vehicles are registered under their trade name where the manufacturer makes both passenger cars and trucks it is impossible to tell exactly the number of each. However, counting each of these manufacturers as passenger car producers only, there are 215 of these represented as compared with twenty-two truck builders and six makers of electric cars. On the same basis there are 13,888 passenger cars, seventy-one motor trucks and fifty-eight electric machines.

Going by the number of cars of each make registered Ford leads with 4413, Cadillac being second with 1070, Overland third with 817 and Buick fourth with 719. Then come Packard with 394, Studebaker 388, Maxwell 365, Reo 319, Chalmers 307, Hupmobile 303, Hudson 254 and Pierce-Arrow 249. There are twelve other manufacturers who have over 100 cars each registered, the other 219 varying from Peerless, with 99, down to a large array with but one vehicle.

Car	No.
Ford	4413
Cadillac	1070
Overland	817
Buick	719
Packard	394
Studebaker	388
Maxwell	365
Reo	319
Chalmers	307
Hupmobile	303
Hudson	254
Pierce-Arrow	249
Stevens-Duryea	176
Mitchell	161
Pope	158
Marion	143
Metz	133
Stanley	128
Franklin	122
Oldsmobile	122
Autocar	118
Regal	116
Stoddard-Dayton	110
Rambler	108
Peerless	99
Locomobile	97
Saxon	79
Fiat	77
Paige	75
Cole	69
Renault	68
Premier	65
Knox	61
Winton	58
Jackson	56
E. M. F.	55
Dodge	53
Oakland	52
Velie	43
White	43
R. C. H.	42
Stearns	42
Chevrolet	41
Mercer	41
American	37
Haynes	36
Alco	35
Corbin	35
Thomas	34
Mercedes	33
Stutz	32
Selden	31
Simplex	31
Special	31
Lozier	30
Elmore	29
Jeffery	28
Speedwell	28
Carnation	27
†Baker	26
Columbia	25
Flanders	25
International	25
Inter-State	25
Krit	25
Warren	25
Everitt	24
Lenox	24
Marmon	24
Scripps-Booth	24
Crow-Elkhart	23
†Waverley	23
National	21
Abbott	20
Kissel	20
S. G. V.	19
Briscoe	17
Delaunay	17
Empire	17
King	17
Chandler	16
Garford	16
Pullman	16
Cartercar	15
Herreshoff	15
Lexington	15
Case	14
*Chase	14
Imperial	13
Little	13
Palmer-Singer	13
Partin-Palmer	13
*Federal	12
Michigan	12
Pilot	12
Brush	10
Cutting	10
Northern	10
Crawford	9
Auburn	9
Grout	9
Royal	9
Mora	9
*Mais	9
Courier	8
Detroiter	8
Lancia	8
Moon	8
Nyberg	8
Apperson	7
Auburn	7
Lambert	7
Panhard	7
Pennsylvania	7
Rolls-Royce	7
Sears	7
Vim	7
Allen	6
Bailey	6
Bergdoll	6
Bollée	6
Rainier	6
Trumbull	6
Crown	5
Gaeth	5
Henderson	5
Herff-Brooks	5
Lyons-Knight	5
Westcott	5
Crane	4
DeDietrich	4
*Koehler	4
DeDion	4
Metallurgique	4
Marquette	4
Middleby	4
Marathon	4
Pathfinder	4
*Sampson	4
*Standard	4
Alpena	3
Amplex	3
†Anderson	3
Argo	3
Berliet	3
Brown	3
C. G. V.	3
Clement	3
*G. M. C.	3
Grant	3
*Kelly	3
Matheson	3
Nance	3
Ohio	3
Parry	3
†Rauch & Lang	3
*Republic	3
Welch	3
Zedal	3
Atlas	2
†Babcock	2
Bugatti	2
Cleveland	2
Croxton	2
Daimler	2
E. V. C.	2
Hotchkiss	2
Houpt-Rockwell	2
Isotta	2
Keeton	2
Monroe	2
*Morgan	2
Midland	2
Moline-Knight	2
Napier	2
Orson	2
Owen	2
Queen	2
Racine	2
S. P. A.	2
St. Louis	2
*Sternberg	2
Schneider	2
Vaughan	2
Acme	1
Arbenz	1
Argyll	1
*Available	1
*Bessemer	1
Brasier	1
Cameron	1
Chadwick	1
Charron	1
*Commerce	1
*Compound	1
Continental	1
Correja	1
Crest	1
*Decatur	1
DeTamble	1
Edwards-Knight	1
Enger	1
Flagler	1
Gt. Western	1
†Grinnell	1
Healey	1
Hollier	1
Holsman	1
Itala	1
Keystone-Drilly	1
*Lauth-Juergens	1
Kline	1
Lewis	1
Lion	1
*Mack	1
McIntyre	1
Minerva	1
*Modern	1
Mors	1
Orient	1
Paterson	1
*Piggins	1
Peugeot	1
Reading	1
Rochet-Schneider	1
Russell	1
Saginaw	1
Shaw	1
Shawmut	1
Service	1
Stuyvesant	1
Taft	1
Twombly	1
*Universal	1
*Veerac	1
Vera	1
Vauxhall	1
Vulcan	1
Weaver	1
Willys-Knight	1
Wayne	1
Westinghouse	1
Woods-Mobilette	1
Total	14,017

* Truck. † Electric.

The History of the American Automobile Industry

Third Installment of the Complete History of the Industry in America, Taking Into Account Its Antecedents in Europe —Complete History To Be Published Later in Book Form

This Week the Development of the Steam and Electric Vehicle and the Good Roads Movement

By David Beecroft

ANOTHER brilliant American inventor, John Fitch (1743-98), originally a prosperous jeweler and watchmaker at Camden, N. J., took up the manufacture of arms during the Revolutionary War at Bethlehem, Pa., and designed a steamboat in 1775-6. He built a model in 1785 and a full-sized boat in 1788, which was tested on the Delaware from Trenton to Burlington, making a speed of about 8 m.p.h. and doing as much as 80 miles in a single day. This boat was propelled by vertical paddles operated by a crankshaft, the upper end of the paddle being in a guide and the blade traveling an elongated elliptical path as it moved backward in the water and forward over it. That it was not continued in use and others made was no fault of the mechanism or of the maker, but solely because conditions were not satisfactory at that time.

Early Steamboat Construction

In 1804 William Stevens, of Hoboken, built a boat which was capable of traveling 8 m.p.h. and which was operated for a few weeks. This boat employed a boiler having copper tubes, although we do not know whether this was a distinct invention or whether he knew of the tubular boiler invented by Read a dozen years before. Many people believe that Fulton took advantage of Stevens' work and embodied it in his successful device of 1806, but although it is quite certain that Fulton knew of Stevens' efforts, it is also certain that Fulton was abroad while Stevens was doing his work and that Fulton had plans for a submarine in 1793 and that he tried to interest foreign nations then at war in them, that he published books or pamphlets describing them about 1796 and as late as 1801, and made experiments at Havre and Brest in 1803. Fulton's success must, therefore, be considered as due to finding the right condition rather than to any superior mechanical ability or to his making use of any rights belonging to others. Too often this has been the history of pioneers, and it is a disgrace to modern methods that even now we allow much talent to go unrecognized, seeking helplessly for the assistance and opportunity, that, properly aided and directed, could do much toward making the world better and richer.

With the passing of the year 1800 in America the seeds of motor transportation had been scattered and if the progress was slow from that date up to 1880, when the period of steam automobiles with which we are all familiar began, it was due to a variety of conditions. Population was sparse, roads did not exist in many places, and there were diversions of interest. The practical steamboat was demonstrated in 1804; railroads were started in America in 1809; the hot-air engine was receiving attention; in 1832 the first street car was operated in New York City by horses; in 1837 the electric boat was demonstrated, and in 1842 the first electric locomotive demonstrated what it could do.

Thus, beginning with 1800 began a period of diversity of energy in solving mechanical transportation. The field was not left open to steam, and what steam possessed was divided among the steamboat, railroad and the steam road vehicle.

From 1800 to 1880 the thread of steam development in America is a difficult one to follow, lapses of years passing without any definite record of progress. It will be necessary to introduce both boat and railroad progress in steam at times in order to get the proper perspective of the steam road vehicle through these years of evolution—years in which progress was materially retarded by the absence of roads and years in which the road vehicle was lost sight of by many, due to the faster development of steamboats and railroads.

The Use of Rails

The use of rails in lieu of good roads is much older than the locomotive on rails for it must have been very early apparent that wheels could be assisted over bad roads by laying down rails of some sort. On the other hand, this use could not have been very common because of the lack of suitable rail material. The first record of railways in America indicates that Thomas Leiper, near Ridley, Delaware County, Pa., laid about a mile of track in 1809 to move stone from a quarry. Part of this track was exhibited at some sort of gathering July 31 of that year.

Some claims were made that Silas Whitney had a similar short stretch of railway at Beacon Hill, near Boston, 2 years earlier. It must not be sup-

posed that these rails resembled present railway rails; they were most likely wooden logs hewed to furnish a flat surface, and mortised together at their ends. Because these wooden logs wore out unevenly and were short-lived at best, they were at a later date commonly covered with iron strips on which the wheels ran. These iron strips, at first cast but later of rolled material, resting on the soft wood, would bend more or less as the wheels rolled over them, and eventually break. Frequently their retaining spikes became loose and permitted the ends to rise and become entangled with the vehicle overhead. We therefore see in these inferior constructions another reason why conditions were so difficult for the inventor and progress so slow.

To establish a chronological comparison with railroading in England, the first locomotive was tried on rails in England in 1784 while in 1788 Symington, having abandoned his road carriage model, made a small model steamboat which he tested on a small English lake. In this same year Robert Fourness and James Ashworth obtained a patent on a traction engine for drawing other vehicles. It is not known whether this device was actually built or not, but it is interesting as showing a three-cylinder, vertical, non-condensing engine. Many others were undoubtedly working on the problem at this time and each contributing their small part toward the final success.

Development of American Roads

The reason for road locomotion in America dropping far behind that of Europe, particularly in England and Scotland, was because of the road movement being far behind in America. A brief comparison of road activities is necessary here.

The rapid development in European roads started a movement in America. Congress in March, 1806, appropriated $30,000 toward the surveying and construction of a road from the Potomac, near Cumberland, Md., to the Ohio at Steubenville, Ohio. The length first opened was 130 miles and cost $1,700,000. The first horse stage coach carrying United States mail from Cumberland to Wheeling passed over this road in August, 1818.

How to raise money for these expensive roads was a considerable problem not only in the United States, a country of large distances and little wealth, but even in England, and one of the solutions of this financial problem was the giving of franchises to private corporations which were permitted to construct roads and charge toll for their use. The toll system was probably at first a form of brigandage and is mentioned by the Historian Strabo as existing on roads leading from Babylon to Syria. Many present-day road users can testify that it has not lost its ancient character. In 1346 the toll system was adopted definitely as a means of raising revenue for road maintenance and repair in England, but not until the latter eighteenth and early nineteenth century period did the toll system for raising road revenue become really popular. It rapidly grew, until 1838 showed fully 1100 turnpike trusts existing in the Kingdom. The cost of collecting tolls, however, often nearly equalled the income, and the census of 1871 showed 5000 collectors in England and Scotland. In 1857 Ireland freed herself from toll gates and in 1878 Parliament abolished tolls in England, but this archaic system still exists in some of the older and less progressive parts of the United States.

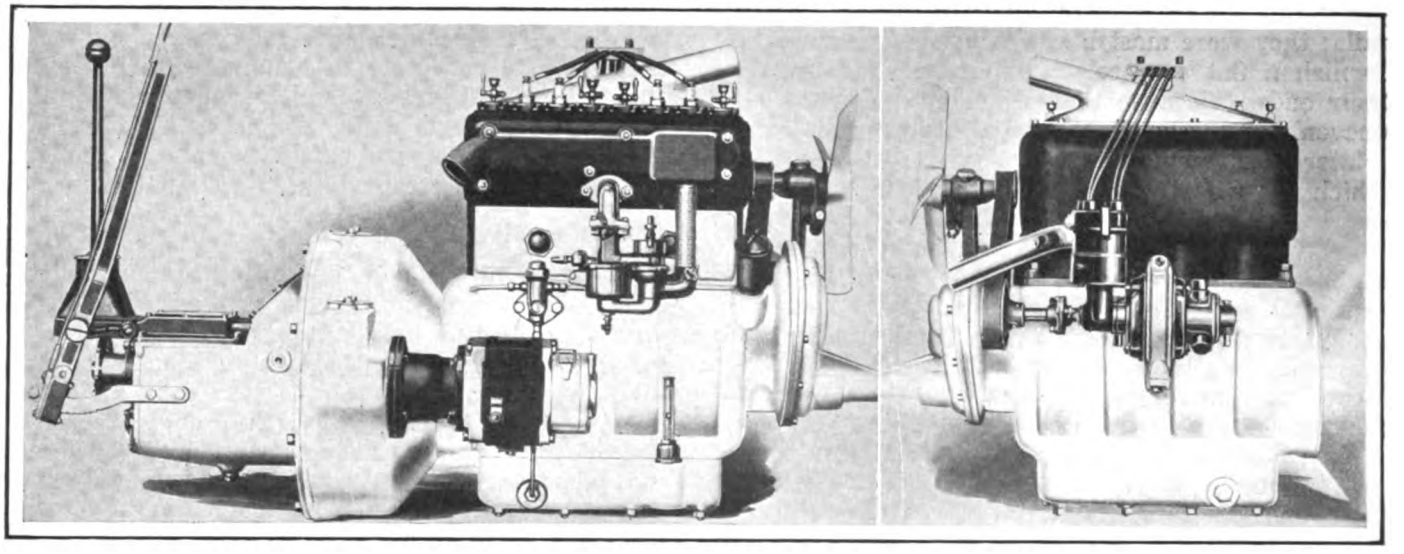
Lancaster Pike First Toll Road

The first toll road in the United States was the Lancaster pike, 62 miles long, authorized in 1792, and still collecting tolls; a monument to permanent private franchise. By 1811 more than 300 turnpikes had been chartered in New York and New England with a combined length of 4500 miles. In 1828 over 3100 miles of chartered turnpikes existed, of which over 2380 miles had been completed at a cost of nearly $8,500,000. The advent of the locomotive and transportation on rails soon after attracted the attention of the American public and the American road was left to itself. Even the great national highway, originally planned to reach St. Louis, vanished in a more or less incomplete end on the prairies of Illinois. This short account of the early roads accentuates the interdependence of the good road and the motor vehicle and partly explains why the second decade of the last century showed so little activity in the motor vehicle field.

Compared with America the road movement in Europe was immeasurably stronger. In fact, roads were the most potent influence in stimulating the development of the motor vehicle.

France was really the leader of the modern road movement, some 15,000 miles of hard road being built by enforced peasant labor under Colbert, who was appointed comptroller of finance in 1661. The present French system was really founded by Napoleon, who adopted very largely the innovations instituted by Tresaguet and perfected a splendid administrative system. P. M. Tresaguet, 1716-1796, was a great engineer and made many improvements for river navigation, but we know him only as a great road builder, and practically the father of modern road work. He recognized the need of constant maintenance and devised means for securing this. He improved the construction, reduced the cost, crowned the foundation so as to secure drainage, reduced the depth of broken stone used and, particularly, organized the caretakers who are the very backbone of the present French road system.

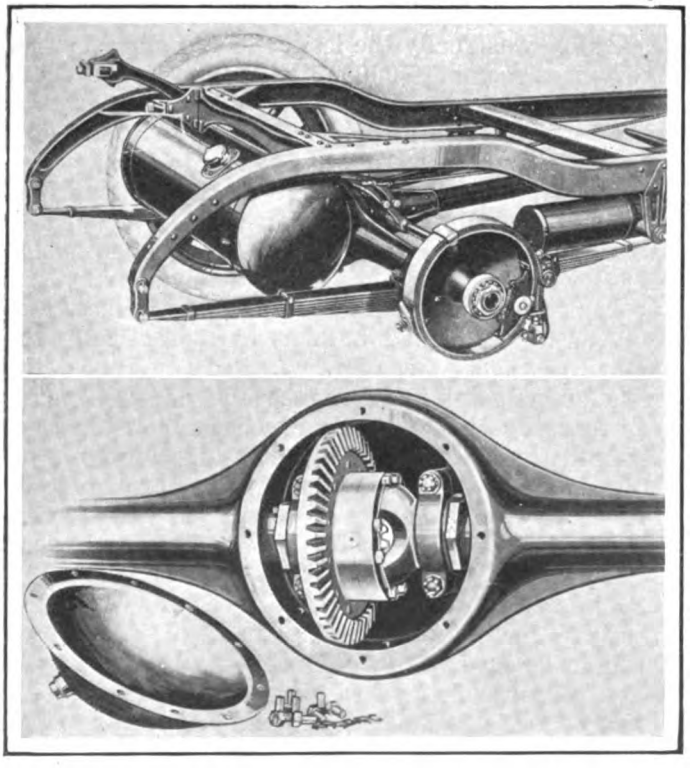
John L. MacAdam, England, 1756-1836, was not the inventor of the macadam road, for it was then used in several parts of Europe, but he seems to have been the first to fully grasp and explain the theory of the broken stone road without a paved foundation. As a youth he resided in this country, but returned to Scotland in 1783 and was soon appointed magistrate and trustee of roads. In 1816 as inspector for the Bristol turnpike trust, he supervised the reconstruction and repair of 178 miles of roads. In 1817 he built the first macadam roads in London, and the system which he advocated slowly spread throughout the Empire.



Left—Right side of Allen 1916 power plant, showing mounting of Westinghouse motor generator and also of control levers. Note oil level gage at bottom of crankcase. Right—Left side of Allen block motor, showing ignition unit and water pump

Allen Line Two Models on One Chassis

Bore ⅛ in. Larger—Wheelbase 2 in. Longer—Floating Rear Axle—Rounded Radiator, Built-in Windshield and Molded Line Bodies Improve Appearance—Other Refinements.



Upper—Rear construction of the Allen chassis for 1916, showing how the frame sweeps up and over the axle and joins to the underslung springs with a shackle at the end. Note also brake construction and fuel tank mounting. The floating rear axle is carried on Gurney bearings, the weight of the car resting on the pressed steel housing. Note cross rod equalizers for the brakes directly in front of the axle shaft

Lower—Allen floating rear axle with cover plate removed, showing mounting of bevel gear. This illustration gives an excellent idea of the accessibility of the assembly

TWO models on a single chassis will make up the line of the Allen Motor Co., Fostoria, Ohio, for the 1916 season. These are known as models 32 and 37 and are a roadster and a touring car, both selling for $795. Before this season the Allen company has been manufacturing five models and the decision to change to two models on one chassis is in line with the policy of concentration which is the tendency during the past few seasons.

Motor and Car Larger

This season the car is larger in practically every respect than it was a year ago. The motor has ⅛ in. more bore, the dimensions now being 3¾ by 5 and the wheelbase is longer by 2 in. than in last year's model, the length now being 112 in. This season the rear axle is a floating design and in exterior appearance there has been considerable alteration, due to the addition of a rounded radiator, a built-in windshield and a molded line body.

Doors 2 In. Wider

The doors are 2 in. wider with concealed hinges and the tonneau is roomier due to the increased wheelbase which has been entirely utilized in giving room to the passengers. The upholstery is easier sprung than last year, having better padding and higher grade material. A one-man top is now used, and on the instrument board has been added an electric light. Another improvement is the placing of the electric signal button at the top of the steering column. The front compartment is also roomier, providing leg room for the driver.

Block L-Head Motor

The motor is made in the plant of the Allen company and has its four cylinders cast in a single block. It is of conventional L-head design with the valves inclosed. It is cooled by the thermo-syphon system which operates in conjunction with a tubular radiator having a rounded shell. Lubrication is by a combination pressure and splash system and starting, light-

ing and ignition is supplied by a Westinghouse two-unit outfit. One of the innovations for this season is the introduction of Stewart vacuum feed.

Floating Rear Axle

A cone clutch faced with leather having a diameter of 13¾ in. and a face width of 2⅜ in. takes the drive from the motor and delivers through a three-speed selective gear to a floating rear axle of bevel type having a 4 to 1 ratio. The drive is through a single universal joint and the rear axle is carried on Gurney bearings, the weight of the car being taken on the pressed steel rear axle housing. The brakes are 12¼ by 1¾ in. service and 12 by 1¾ for the emergency, the service brake being contracting and the emergency expanding. The brake connections are fitted with equalizers.

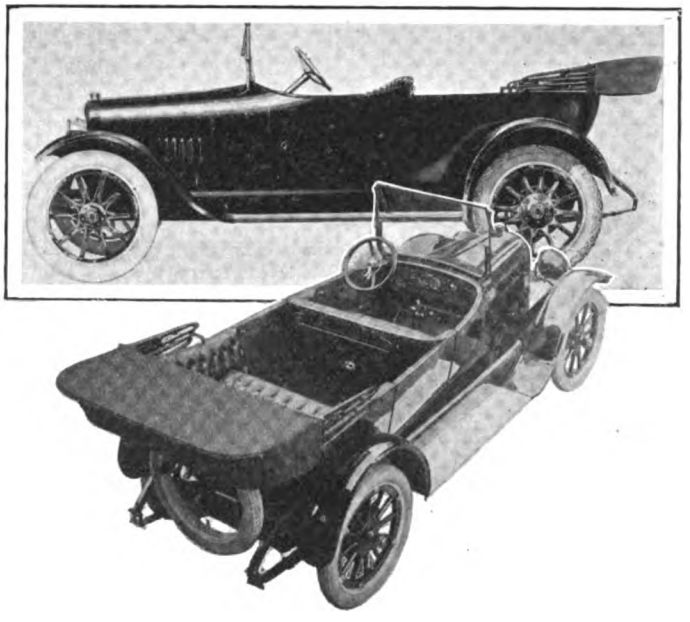
The front axle is a one-piece drop forging of carbon steel. It has an I-section. The frame is of channel section pressed steel and is braced by four cross members. High carbon steel springs are used, both front and rear being semi-elliptic, the length of the rear being 55 in. long and 2 in. wide. The wheels are 3 in. artillery type and carry Firestone demountable rims with 32 by 3½ straight side tires. The tread is standard 56 in., the road clearance 10½.

Body Features

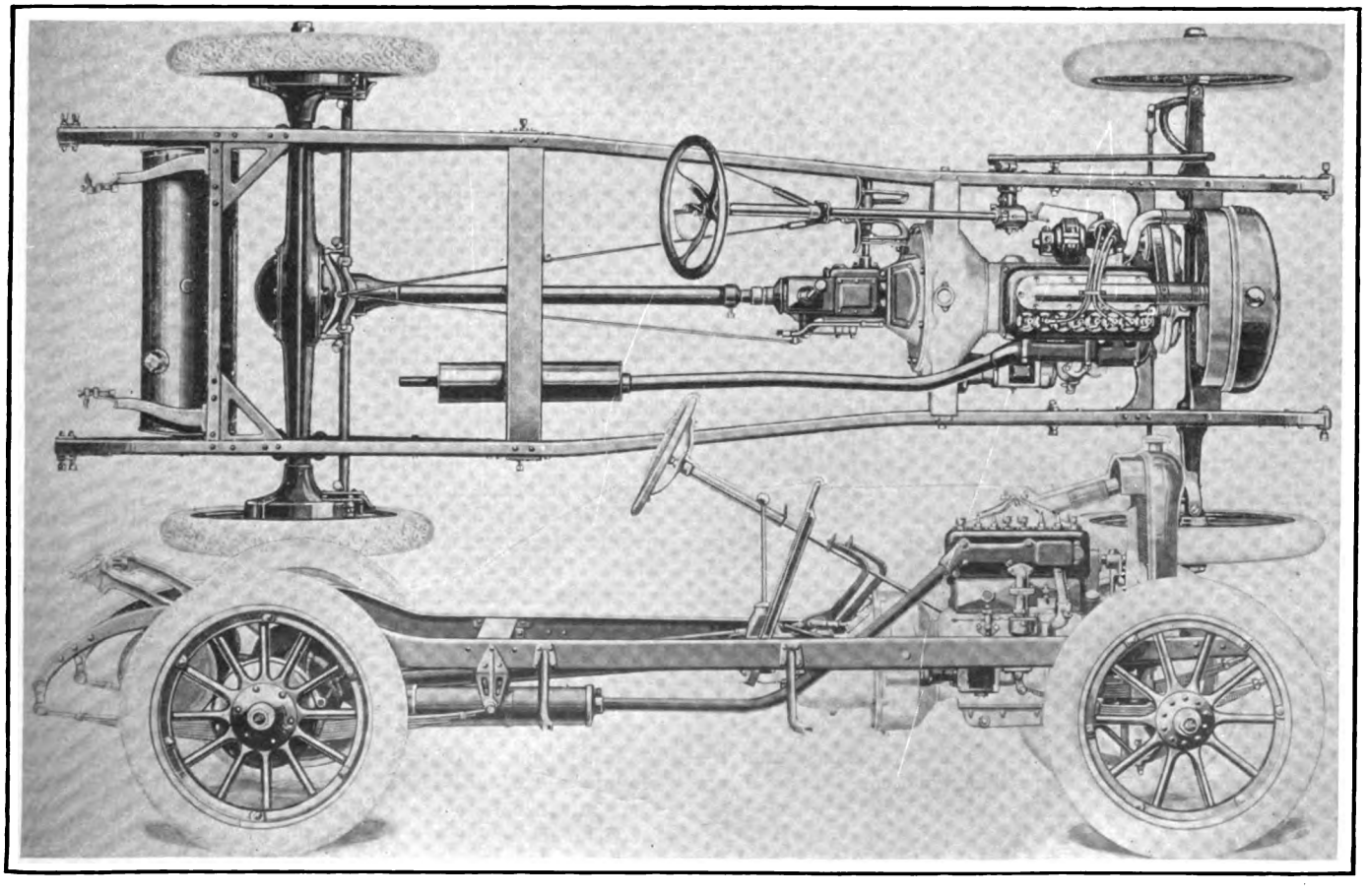
Features of the body, which is of five-passenger capacity, are the boat-like exterior and the wide doors with concealed hinges. Flush type upholstery is used and the floorboards are covered with linoleum with aluminum bindings. The instrument board contains a speedometer, lighting, starting and ignition switches, air control lever and an instrument board light. These are all flush mounted except the instrument light.

Equipment Is Complete

Black japanning is used on the fenders and radiators with the body, hood and wheels olive green. The trimmings are nickel and aluminum, and the equipment includes starting, lighting, combination tail light and license bracket, horns, speedometer, rear tire irons, extra demountable rims, rain vision windshield, one-man top with side curtains and slip cover, compound pump, tire repair kit and a complete tool kit and jack. The specifications of the roadster are the same as for the touring car except for the body, which is provided with a rear compartment accessible from either side and from the rear.



Two views of the 1916 Allen five-passenger touring car for 1916, the lower giving a good idea of the new body lines and the high narrow radiator



Plan and elevation of the four-cylinder chassis which constitutes the Allen line for 1916, showing mounting of power plant and fuel tank. Note strong cross members and also brake equalizer connections and rear tire carrier

Mobile Repair Shops Give War Service

With Tools and Equipment Mounted on Trailers These Shops Can Keep in Touch with Army Cars and Trucks for First Aid Work—Generally 25 Miles From the Front

By W. F. Bradley
Special Representative of THE AUTOMOBILE *with the Allied Armies in France*

PARIS, Oct. 23—The popular impression that automobiles are short-lived in war service is not borne out by facts. One of the French armies, located at a very active point of the battle front, has roughly 2000 trucks, touring cars and special automobiles in service. The three repair shops attached to this army, and established a short distance to the rear of the lines, handle on an average 300 cars per month. Obviously the number of cars going through the repair shops is a very variable quantity, running high when there are attacks and falling very low when the opposing armies are inactive. The average of 300 repair jobs per month for a fleet of 2000 cars is based on one year's operations and includes stationary trench warfare and a period of very fierce attacks. The automobiles comprise all French makes and five makes of American trucks, as follows: Packard, Pierce, Kelly, White and Jeffery.

Engineers Broaden Their Experience

According to one of the officers in charge of one of the three repair shops, the American trucks give just as good service, on an average, as those produced by French firms. This officer, it may be mentioned, is in civil life the chief engineer of a French automobile firm producing a high-grade car. This officer, together with others engaged on repair work at the front, is of the opinion that he is attending the finest school of experience in the world. He states that in twelve months' repair work at the front a practical engineer can acquire more data and more practical experience than in twelve years of peace conditions. It is thus a mistake to suppose that the engineers of warring nations are standing still while the war is in progress. They are able to examine and compare the working of all classes of automobiles—French, English, American, Belgian, Italian and German—under arduous conditions and in the hands of poor drivers. The reports which an observant engineer is able to send home to his factory are of an unusually valuable nature.

In this particular army, located in the Champagne district, with its repair shops only 25 miles to the rear of the front line trenches, it is found that the percentage of scrapped automobiles is very little higher than under peace conditions. There is more repair work to handle than in civil service, for conditions are more hazardous and drivers cannot be selected with the same care, but this does not imply a greater percentage of scrapped vehicles. It is surprising how difficult it is to put an automobile entirely out of business by shell fire. Bodies are very frequently destroyed by fire or by shells, but they are very readily replaced, and it requires a direct hit or very heavy shell fire to make a chassis unfit for further service. Even trucks which have come under direct fire and have had to be abandoned have been captured later, towed home and put into service again.

The diversity of the work undertaken by automobile trucks is not realized by the manufacturer abroad. In addition to carrying ammunition and food to the troops in the trenches, every truck is equipped for carrying men and also for hauling guns. An immense amount of trench-making material has to be hauled by automobiles, as well as men and material for making special roads. Under present conditions the big guns rarely remain in one position more than 24 hr., and when it is required to remove them the automobile trucks are called upon in preference to horses. This of course applies to the big guns, and not to the 75 mm. field pieces, which are light and quickly removable by means of horse teams.

Moving the Big Guns

The necessity for frequent and rapid removals of big guns had been foreseen prior to the war, with the result that four-wheel drive tractors had been put into service in fairly large numbers. These, however, are not sufficient for all needs and ordinary 3-ton trucks are called upon to tow heavy guns. After being in operation for a day the guns change position at night, with the object of keeping the enemy constantly guessing as to their exact position. As far as possible, gun positions are selected near roads. Where roads do not exist, they are made specially by the use of logs placed transversely on the track. Automobiles are invaluable for such work, for by their aid it is possible to build special tracks to gun positions in a night.

Mobile Repair Shops

The automobile repair shops at the rear of the lines are capable of undertaking any kind of work, and yet can be moved to any new position within an hour of the order being received. This method of working is not common to the whole of the forces in the field. Some branches of the army, and particularly the British army, have permanent repair shops from 50 to 150 miles to the rear of the battle line, the damaged vehicles being sent to these shops by train, and returning usually under their own power. In these cases ordinary factory conditions pertain, and most of the men working in these permanent repair shops have never seen any fighting or heard a gun fired.

In the repair departments immediately behind the armies mobility is secured by mounting each tool on a special trailer truck. Two or three of these trucks are fastened up behind an automobile and hauled away to whatever new position may have been selected. The equipment comprises lathes, drilling machines, grinding machines, a case-hardening plant, and all the smaller tools required for general repair work. Electricity is used for driving the machinery, a gasoline engine and dynamo carried on a trailer being provided for this purpose. While it is essential that these repair shops should be self-moving, and capable of keeping pace with every advance or retreat of the main army, it is not necessary for them to work absolutely in the open. They can operate most effectively at an average distance of 25 miles from the front, and at this range it is generally possible to find buildings which can be readily converted to repair shop work. An

abandoned factory, a street car depot, stables or a farm with a big courtyard all form convenient centers in which to establish the repair depots. Such widely different localities as a village school and an abattoir are selected as places suitable for working in, while a factory with electric power is looked upon as ideal.

Shackle Bolts Inadequate

The units which are picked out as giving most work to the repairman are shackles and shackle bolts and springs. According to one engineer-officer, there is not an automobile truck of any make or any nationality with really adequate shackle bolts. On war service these bolts are never lubricated by the driver; indeed they are generally in such a condition that it is impossible to lubricate them, and no provision is made for an automatic supply of oil or grease. The shackle bolts of a truck working over rough roads are subject to as much stress as the wristpins within the motor; yet these latter are absolutely protected from dirt and are perfectly lubricated, while the former have no protection and no lubrication. In a rather less degree than the bolts, springs also suffer from the lack of lubrication and attention, although the breakage of springs is not as frequent as the breakage of bolts.

War Conditions Affect Lubrication

War service has shown that mechanically operated forced feed lubrication to all motor parts is not as perfect as was generally supposed. One engineer-officer, who makes use of forced feed lubrication in his own motors, has taken careful records of all lubrication troubles on trucks and touring cars with the conclusion that circulating splash gives the least amount of trouble. It is found that on war service care is not taken to change oil at sufficiently frequent intervals, poor oil is sometimes used, dirt is often poured into the motor with the oil, and by reason of the high pressure maintained these impurities are forced into the bearings.

This objection cannot be brought against forced feed lubrication in civil life, for the driver or owner can be relied upon to exercise sufficient care to keep dirt out and change impure oil at sufficient intervals.

With the ordinary circulating system to the important bearings and constant level troughs for the connecting-rod ends, there is not sufficient pressure for dirt and particles of metal to be carried along and forced into the bearings. Under the rough conditions at the war the methods of oil filtering with forced feed lubrication systems are altogether inadequate. It would appear advisable to have an oil reservoir entirely independent of the base chamber with some method of filtering equivalent to the oil filters and economizers used in factories. The oil tank independent of the motor has already been adopted on some European racing cars, and also on the latest French aviation motors, but this has been done more with a view to keeping the temperature low than to freeing the oil of impurities. The war figures show that there are 20 per cent more bearing troubles where the forced feed system is employed than with the circulating systems. This conclusion is significant in view of the fact that it has been arrived at by an engineer who was the first in France to develop the long-stroke, high-speed motor and the first to lubricate with pure castor oil delivered to the bearings at high pressure.

Clutches and Poor Drivers

Although clutches do not come into the repair shops for a great amount of direct treatment, yet war has shown them up as somewhat unsatisfactory and responsible for a good deal of damage to various parts of the transmission. In the hands of a skilled driver, or even with a man who takes an interest in his car, almost any kind of clutch will appear satisfactory. But unskilled army drivers, operating pedals through thick soled boots or wood clogs stuffed with hay, very quickly find out the weak points of a clutch. Even the best leather faced cone clutches can only be described as moderately good under war conditions. Multiple-disk clutches running in oil are rather better, but require attention to keep them in first-class condition. The only type of clutch which is absolutely foolproof and with which an unskilled driver can be relied on to change gears in a satisfactory manner is the single plate dry clutch. The war has shown the necessity for making clutches absolutely foolproof.

Simplification to Result from War

There is nothing to indicate that the war will bring about radical changes in truck design, but it certainly will be responsible for numerous detail improvements and a large amount of simplification which will tend to the general betterment of commercial vehicles. There is not a single make but is open to improvement in some respect, and the war offers an excellent opportunity to wide-awake manufacturers to improve their product. French firms have better opportunities of profiting by the war than any others, for they all have some members of their engineering staffs with the convoys or in the repair shops at the front, and these men are sending back detailed technical reports on their own and every other make of automobile. It is obvious that these reports must be more valuable than those obtained by foreign firms which only send an occasional representative or inspector to the scene of operations.

Three-Tonner the Favorite

The type of truck which the war has shown to be most suitable is the 3-tonner. Above this weight trucks are too heavy and too big for general conditions; below that weight they are too small and are liable to be overloaded. The war has shown the necessity for uniform platform heights, so as to facilitate loading and unloading. It is quite likely that a standard height will be agreed upon in each country, so as to accord with the height of railroad trucks and loading platforms. Even now radiators are not given sufficient protection for war service. The substantial buffer uniting the ends of the frame members, as on the Packard truck, is considered insufficient by the French, and is supplemented by bars to the full height of the radiator. Bars attached to the radiator, as on some of the London buses, are also inadequate. It should be remembered that trucks are liable to collide with overhanging bodies, and that in such cases a protecting bar on the level of the frame members is of no use whatever.

—

Amalgamite Self-Lubricating Bearing

CHICAGO, ILL., Nov. 6—A new self-lubricating bearing, in which graphite is intimately mixed with the metal forming the bearing and in which bearing no other lubrication other than that afforded by the graphite is needed, has been brought out by the Dann Spring Insert Co., this city, which is furnishing the bearing for small bushing work such as spring eyes, universal joints, steering gear, and similar parts. This new self-lubricating metal, known as Amalgamite, is a compound in which the bearing metals are pulverized physically rather than melted by heat. In this pulverized condition the metal is mixed with air-floated flake graphite, the metal and the graphite being pressed into a steel shell which serves as a container for the bearing compound, many tons pressure being used in the work. Thus, instead of pouring the bushing it is pressed into formation. The graphite is not in layers, spotted, put in depressions in the metal or held in the metal by any adhesive but is mixed physically so that the cellular structure of the metals is intimately combined with the graphite, the theory being that it is a molecular mixture of the metal and graphite, so that graphite is a part of the warp and woof of the bearing.

The Rostrum

Water May Help Carbon Troubles

EDITOR THE AUTOMOBILE:—A copper tank, adjusted to the exhaust pipe, containing 2 qt. of water is connected by copper tube to intake manifold. The suction of the intake stroke takes the vapor with mixture to explosion chamber. Provided the small amount of water in the vapor gets to the chamber, will it cause more power, less carbon and tend toward economy?

Needham, Mass. F. T. R.

—There are many theories advanced for the action of water in the intake manifold and all of them are combated just as strongly as they are advanced. One of the theories held quite widely is that the water if entering in very minute quantities will be transformed into steam which on coming in contact with the blowing carbon will form carbon dioxide, thus cleaning the cylinders of carbon. It is generally accepted that no increase in power is given by the admission of water. There does not seem to be any reason why the economy should be better.

Hupmobile Oiling System Satisfactory

Editor THE AUTOMOBILE:—Can you tell me what lubricating system I could put on a Hupmobile model 20 other than the one which is now used by the Hupmobile company on this particular model?

Evansville, Ind. P. C. F.

—If desired a pressure feed could be put on the Hupmobile 20 but this would be altogether unnecessary as the gravity system now in place is an excellent one and works out well for any speeds of the car. The cam adjustment on the top of the oil box on the side of the motor provides a faster or slower proportional flow in coincidence with the throttle opening and gives all the oil necessary. To install the pressure feed it would mean an externally driven pump that could be taken by friction from the flywheel, which is at the front end of this motor. The oil leads will then have to be run into position and altogether it would make a job which would be more complicated than necessary.

Ammeter for Delco on 1914 Cole

Editor THE AUTOMOBILE:—Please advise how to connect up an ammeter to the electrical system, Delco, of a 1914 Cole 4-40.

Newark, N. J. E. C. McC.

—In installing the ammeter in the generator circuit of the 1914 Cole-Delco system, follow these directions:

On the top cover of the Delco motor-generator, rear end, are two terminal posts. The smallest one is the generator shunt field post and is connected to the bottom terminal of the voltage regulator tube. This generator post is not to be disturbed.

Remove the cable from the largest generator terminal post (which is the main generator positive post), cut off the brass terminal clip and pull this wire out of the metal conduit. Mount the meter at the desired location, and this loose, free wire, that has been removed from the metal conduit, connect to the negative post of the ammeter. Pull a new cable into the metal conduit, and connect one end to the positive post of the ammeter, the other end being connected to the main generator positive post, replacing the cable that is connected to the negative post of the ammeter. The brass terminal clip should be resoldered on the generator end of the cable that is newly installed. This arrangement places the ammeter in series in the main generating circuit.

An ammeter should be used that has its zero near the center of the scale, an 10-0-30 instrument being the type most commonly used for this work. When thus connected, the ammeter will indicate a discharge when operating as a shunt motor, as in starting, just prior to cranking the engine; indicating the charge rate, when the engine is running, and no ammeter reading will indicate trouble in the generating apparatus.

Possibly Oil in Commutator

Editor THE AUTOMOBILE:—I have a 1916 Maxwell car, and would kindly ask you to inform me just what may be wrong with the electric lighting and starting system on this car. The ammeter charges as long as I keep the car running above 10 or 12 m.p.h., but when I slow down to less than this number of miles for a little while and then speed up to even 25 m.p.h., the ammeter does not indicate charging, but remains at 0. Then, if I stop the engine, and start again, the ammeter continues to charge as before. I have used the car about six weeks, have run it 650 miles and the test of the specific gravity of the storage battery is 1250 or a little more. The mechanic at the service station in our city has not been able to locate the trouble, and does not think there is anything wrong. What do you say?

Hagerstown, Md. E. C. B.

—It is possible that all the connections are not tight and that they occasionally make poor contacts, decreasing the output due to the additional resistance. It is also found that oil in the commutator or brushes will cause trouble similar to that you describe. This is due to the fact that at low speeds the oil will sufficiently insulate the brushes from the commutator so that when the generator just commences to turn over and is producing only about 1 volt, the oil will prevent a circuit so that the output is zero. Of course, at times when running at high speed, the brushes may be able to touch the commutator, allowing the fields to become saturated and the output normal. It is also possible that the ammeter needle may be sticking and the vibration of the car at high speeds is sufficient to loosen it.

Compression Space for 85 Lb. Per Sq. In.

Editor THE AUTOMOBILE:—What are the cubical contents of the compression chamber for a 5-in. bore by 7-in. stroke motor above the piston when it is on top dead center, to get 85 lb. compression cold, assuming that the inlet closes 30 deg. past bottom dead center?

New York City. J. H.

—The displacement of one cylinder of a 5 by 7 motor is 137.5 cu. in. According to accepted tabulations in order to obtain 85 lb. compression the cylinder clearance should be about 23 per cent of the piston displacement figuring low.

With this percentage the volume of the compression space would be 31.625 cu. in.

The above clearance is taken as the minimum. Under maximum conditions of tightness, etc., to obtain 85 lb. per square inch compression the cylinder clearance can be 35 per cent of the piston displacement. All the pressures given above are in pounds per square inch absolute.

Shipping Weight of Packard Twin-Six

Editor THE AUTOMOBILE:—What is the shipping weight of the Packard twin six?

2—What is the fuel consumption of these cars at 20 m.p.h.? What compression do they use? What is the tire and fuel cost per mile?

3—How does the progressive gearshift lever engage its gears? How does the H quadrant lever select its gears?

4—Please show the mechanism which make its impossible to shift gears while the clutch is engaged?

5—What is the correct pronunciation of Renault, Goux, Boillot, Bleriot?

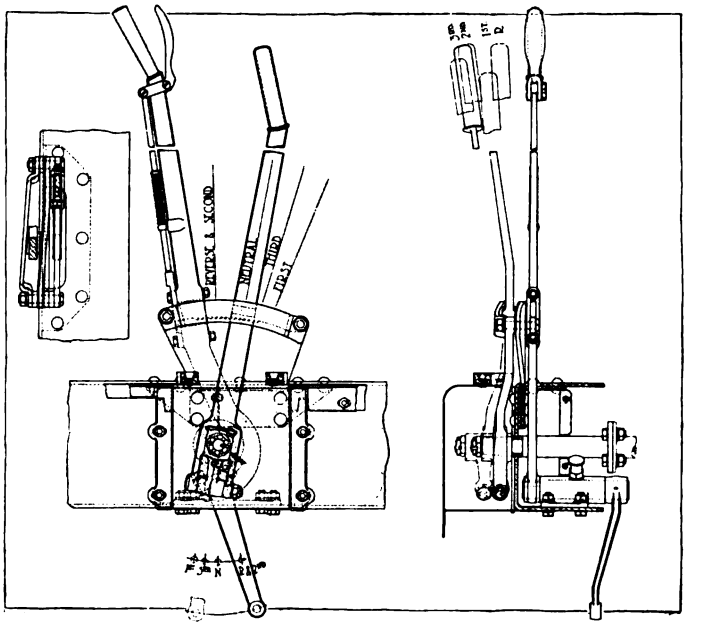
Mount Sterling, Ohio. C. W. S.

—The model 1-25 seven-passenger car complete with full liquid supplies and two spare tire rims weighs 4500 lb. The model 1-35 seven-passenger car with full liquid supplies and two extra tire rims weighs 4590 lb.

2—The fuel consumption at 20 m.p.h. is approximately 12 miles to 1 gal. The compression used is from 75 to 78 lb. The tire and fuel cost per mile will depend on the individual driver and the country.

3—Progressive gearshift levers engage their gears in the order 1, 2, 3, 4 or 4, 3, 2, 1 while with the H quadrant or selective gearsets the gear desired can be selected at will.

4—There is no such mechanism as this on the Packard twin six. The gearshifting arrangement employed in this car is shown in the accompanying illustration Fig. 3. In case you would be interested in the gearshifting lever system employed in the Packard twin six, THE AUTOMOBILE is showing Figs. 1 and 2, two assembly drawings of the mechanism. You will note that the gearshift lever is of the selective side rocking type. The shifter finger which engages the gearshift rods in the transmission case, is made with an auxiliary portion carrying a face cam which runs between two rollers mounted in a lateral sliding plunger in the transmission case beneath the gear shifter rods. This plunger has a slot in its upper side adapted to register with whichever of the gear shifter rods is engaged by the gearshifter lever. The other gearshifter rod is consequently positively locked against any movement, and it is also impossible to move both gearshifter rods at the same time.



Figs. 1 and 2—Two assembly views of gearshifting lever arrangement used in the Packard twin six

One of the rollers pressing on the face cam on the gearshifter lever is carried in a plunger backed up by a heavy, coiled spring. The face cam has a notch for neutral position and has a fairly steep cam action down each side which assists in shifting into any gear once the change speed lever is moved forward or back out of the neutral notch. In addition to this assistance to gearshifting given by the cam and spring controlled roller, the cam is also formed to produce a lock to hold any one of the gears when engaged in its normal running position.

The travel of the gearshifting rods fore and aft, is regulated by adjustable stops at the ends, and when any gear is engaged it is retained in position by the shifter rod being held against its stop through the shifter lever face cam and the spring-controlled roller.

5—The correct pronunciation of Renault is Ren'-olt; Goux, Goo'; Boillot, Bwah'-lo; Bleriot, Bler'-ee-oh.

Blown Fuse Due to Shorting

Editor THE AUTOMOBILE:—I have a Saxon six touring car equipped with a Gray & Davis starting motor. When running at a speed of 15 m.p.h., or over, the generator generates too much current. The automatic cutout does not work, and the 20-amp. fuse is burned out. Please advise why the

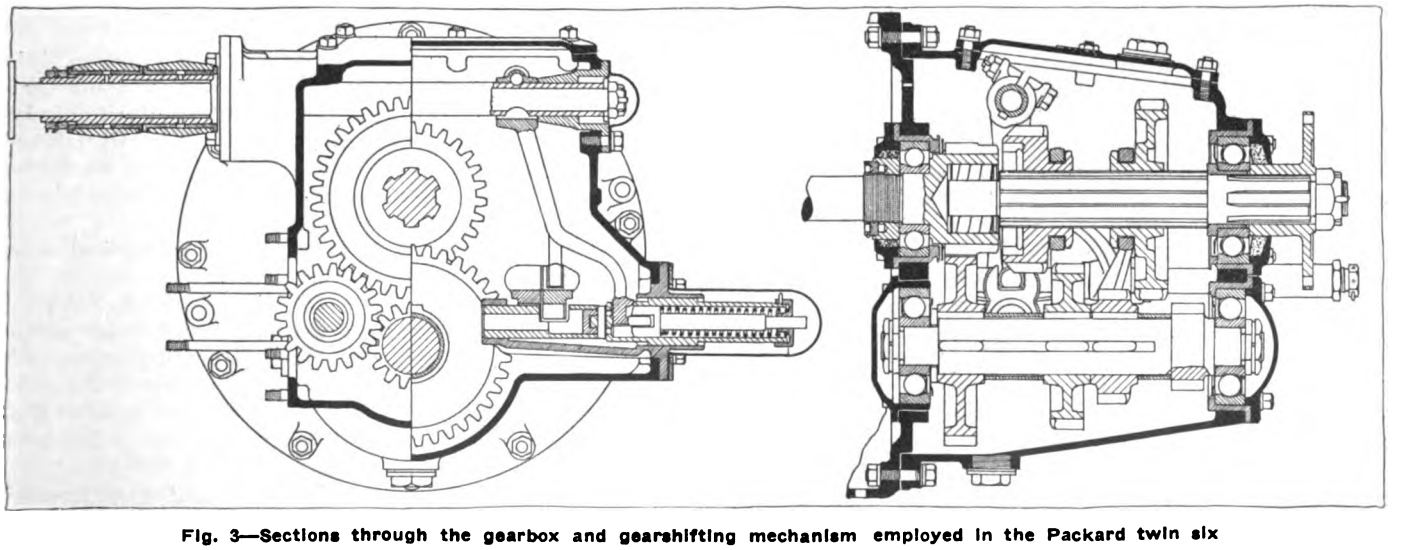


Fig. 3—Sections through the gearbox and gearshifting mechanism employed in the Packard twin six

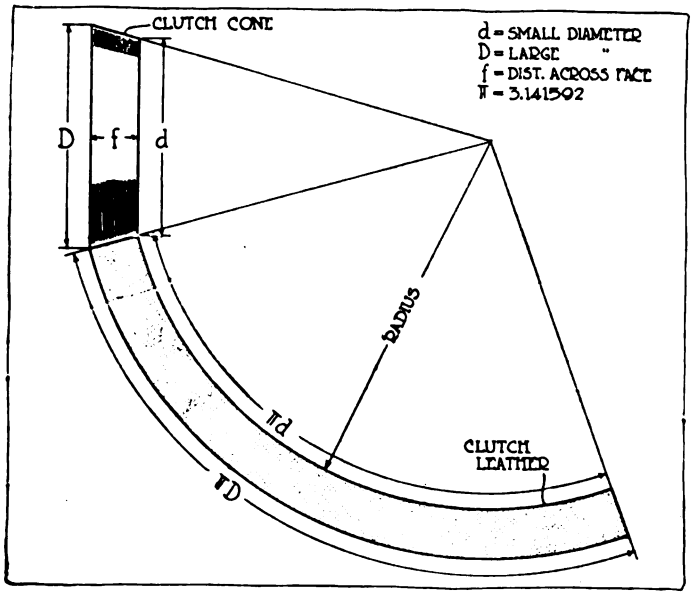


Fig. 2—Method for laying out leather for a clutch cone

generator generates too strongly and if the trouble in the cutout is in the adjustment.

2—Who manufactures the rear axle for this car?

3—What is the make of engine?

4—What makes a grinding sound when the engine is pulling hard? Is it the clutch slipping?

Weston, W. Va. C. J. L.

—The fuse on this car is rated at 30 amp. instead of 20 and is designed to carry 30 amp. and blow at about 50 amp. For this reason it is quite impossible that the generator could burn this fuse when running. The cause of this fuse blowing is either a short-circuit in the wiring or possibly the horn circuit or because the cutout has failed to open when the engine stopped. The cutouts are set properly and sealed before they leave the Gray & Davis factory and the guarantee in the instrument is revoked on the breaking of the seal by the customer. It is therefore recommended that this apparatus be taken to the nearest Gray & Davis service station or return it to the Gray & Davis factory in Boston, Mass.

2—The rear axle is manufactured by the Timken Detroit Axle Co., Detroit, Mich.

3—The motor is made by the Continental Motor Mfg. Co., Detroit, Mich.

4—The grinding noise you mention can probably be traced to the starter chain.

Laying Out Cone Clutch Leather

Editor THE AUTOMOBILE:—Please give me a diagram illustrating the most practical way to lay off a piece of leather for a cone clutch, knowing the largest diameter, the smallest diameter and the distance across the face of the cone.

2—In applying a new leather to the clutch, is it correct to soak the leather in oil and if so, before or after applying same to the cone?

3—What limits the distance apart the points of a spark plug may be set and the electrical reason for same?

4—What is the distance from edge of the float chamber to the surface of gasoline when same is at the correct level in a 1¼-in. carbureter.

5—The model 10, 1910 Buick comes regularly equipped with a 1½-in. carbureter, and in the event that a Holley carbureter was to be substituted, what would be the proper size to use?

6—Would increasing or decreasing the taper of the needle point in the jet of a carbureter, affect the mixture allowing that the same amount of gasoline passes in each case?

7—What means are used to take the back lash out of bevel gear in back axle of 1910 model 10 Buick?

Cheriton, Va. H. S. A.

—The diagram showing the method for laying out a piece of leather for a clutch cone is shown in Fig. 2. The largest diameter is signified by D, the smallest diameter by d and the distance across the space by f. The character π is equal to 22/7 or 3.14.

2—Before working the leather soak it in neat's-foot oil.

3—The distance between the points of the spark plug is set to secure the maximum efficiency. The current is capable of jumping a certain gap. At the extreme dimensions of this gap, the spark will be thin and weak, at the minimum dimensions the spark will be intense but short. A mean is adopted to provide a thick spark of reasonable length.

4—The level is such that the gasoline is 1/16 in. below the fuel nozzle.

5—A carbureter of the same size should be used.

6—The taper on the metering pin will affect the mixture as it governs the distribution of the section, a certain proportion of which falls on the gasoline jet and the remainder on the air intake.

7—No adjustment was provided on the rear axle in the model 10 Buick. The only method by which you can correct the mesh of the ring gear and pinion is to insert washers or shims behind the thrust bearings. This must be done while the axle is disassembled, and proper mesh is very largely a matter of trial and error.

Oxygen Flame Not Harmful

Editor THE AUTOMOBILE:—I shall be greatly obliged if you will advise me of your opinion as to the desirability of removing carbon by the oxygen flame method. It will be of interest to know whether, aside from the convenience of the method, it is even remotely harmful to the motor or likely to cause warping in the valves. I have followed your inquiry department, but have seen nothing bearing directly on this question in which I have no doubt, many motorists are interested.

Brooklyn, N. Y. P. S. CLARKE.

—No harm will result from removing the carbon by the oxygen flame method. When this is done the piston of the cylinder which is being operated upon should be at top dead center to be sure that the carbon is removed from the piston head. The temperatures within the cylinder are not near what they are in actual operation of the motor and although it is true that the water in the circulating system is not in motion, the temperature reached in burning out the carbon is not sufficient to do any harm.

Piston Displacement of 4 by 6 Four

Editor THE AUTOMOBILE:—Will you kindly explain through THE AUTOMOBILE what, and how obtained, the compression space will be for a 4 by 6-in. stroke four-cylinder motor with 90 lb. compression, cold. After stating the cubical contents of the compression chamber, will you also work this out so that I may study same carefully to familiarize myself with it?

2—Please explain what is meant by the mechanical compression ratio.

New York City. A. W. W.

—The piston displacement of a 4 by 6 four-cylinder motor is 301.6 cu. in. For one of the cylinders, the displacement is 75.4 cu. in. The relationship between the volume of the combustion chamber and 75.4 cu. in., therefore, must be such that when the piston is at the top stroke the pressure in the combustion chamber is 90 lb. per square inch absolute.

There are two methods by which a gas can be compressed and expanded. One is known as the adiabatic method in which no heat is either abstracted from or given the gas.

The other is the isothermal method in which the gas is kept at a constant temperature due to the use of water jacketing. The conditions in a gasoline engine cylinder are somewhat between adiabatic and isothermal. Therefore, these two conditions may be taken as extremes and the proper volume for the desired displacement will be somewhere between the two limits secured by calculation on adiabatic and isothermal bases.

Taking adiabatic first, the formula which air follows when compressed is

$$PV^{1.4} = P_1V_1^{1.4}$$

Let $P = 14.7$ lb. per square inch or atmospheric pressure.

$V = (75.4 + V_1)$ = Displacement plus compression volume.

V_1 = Combustion chamber volume, the unknown quantity.

P_1 = The compression pressure or 90 lb. per square inch absolute.

Then the equation becomes:

$$14.7\ (75.4 + V_1)^{1.4} = 90\ (V_1)^{1.4}$$

$$\frac{90}{14.7} = \left\{\frac{75.4 + V_1}{V_1}\right\}^{1.4}$$

Taking the 1.4 root of each side of the equation we have

$$\frac{75.4 + V_1}{V_1} = \sqrt[1.4]{\frac{90}{14.7}}$$

Solving, $V_1 = 29$ cu. in.

Taking the isothermal equation,

$P\,V = P_1\,V_1$ and substituting the equation becomes

$14.7\ (75.4 + V_1) = 90\ V_1$

solving $V_1 = 14.7$ cu. in.

The required combustion volume will therefore be somewhere between 15 and 29 cu. in., or perhaps 22 cu. in.

2—By mechanical compression ratio is meant the ratio of the cylinder volume to the combustion chamber volume.

Motor Made by Garford Co.

Editor THE AUTOMOBILE:—Some time ago I purchased a motor for installation in a boat and since I now desire to add an electric starting and lighting system, I find it necessary to have some data concerning the speed, gear ratios, etc.

The motor was taken from an old Studebaker roadster, and I understand it was made by the Garford Co. The cylinders are four in number, supposed to be 4¾ by 5, cast in pairs. Crankcase is of aluminum, with four supporting lugs, flywheel at after end, bored for cone clutch; fitted with Remy high-tension magneto and centrifugal water-circulating pump.

1—Can you tell me whether such a motor was made by the Garford company?

2—Has THE AUTOMOBILE published at any time the horsepower and torque curves of this type of motor?

3—Can you give the formula by which the horsepower of electric motors, necessary for cranking this motor, can be calculated?

4—Please show the wiring diagram for the Remy high tension magneto; the proper disposition of the cable containing three conductors, red, black and yellow. This is not understood.

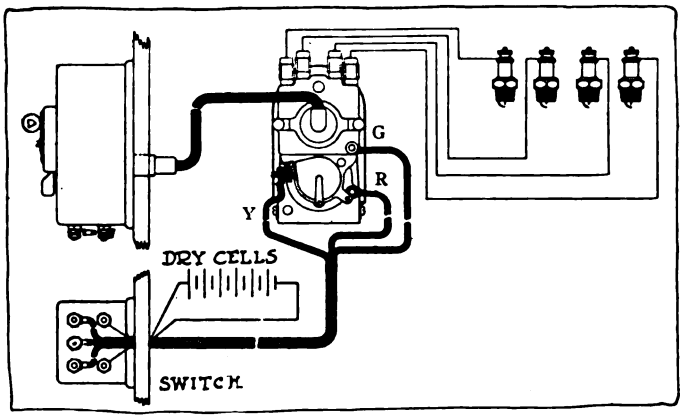
Brooklyn, N. Y. J. F. K.

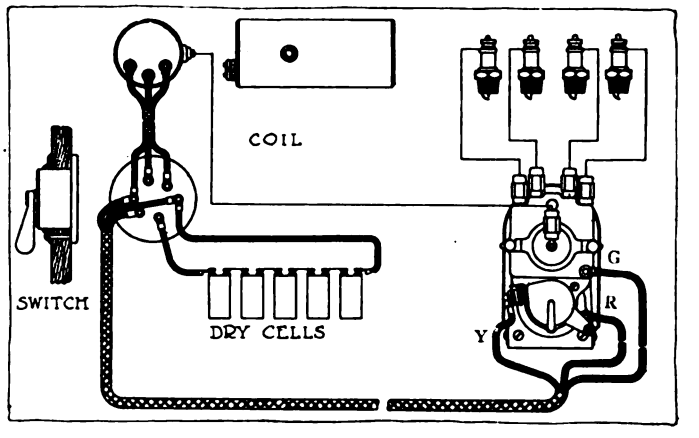
—The motor you describe was doubtless made by the Garford Co. as the bore corresponds to their motor, but the stroke is 5¼ and not 5 in. The Garford company fitted this with a Bosch low-tension magneto.

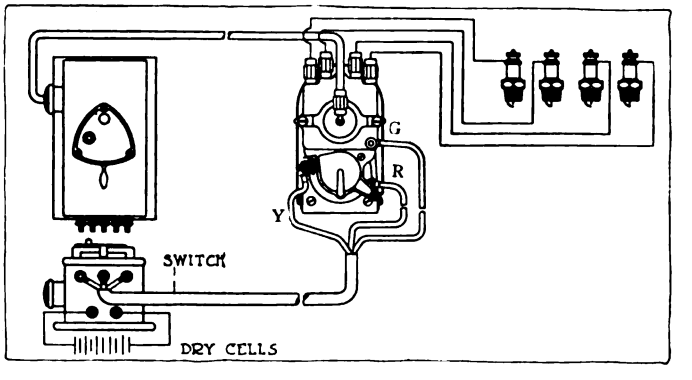
2—No.

3—This will depend on the speed at which you wish to crank it. If the pull, for instance, is 50 lb. to crank it at an arm length of 10 in. the energy necessary is 500 lb. in. or about 43 ft. lb. If it is necessary to exert this through a distance of any given amount it is easy to measure the power necessary in terms of foot pounds per minute. The number of foot pounds per minute divided by 33,000 will give you the horsepower of the motor required for cranking the engine.

4—The Remy Magneto Co. has been in business for about seventeen years and during that time has manufactured many different types of what are commonly known as high-tension magnetos. This concern, however, has never placed upon the market a strictly high-tension magneto, but has used the type in which the current is stepped up in a separate transformer coil. A few typical illustrations of Remy installations are given in Figs. 3 to 5 and you will note on practically all the coils the terminals are marked Y, R and G, standing for yellow, red and green, so that the person using them would know how to wire the coil. As a rule the connections on all the magnetos are the same, that is, the green wire is connected to the live terminal of the magneto, the yellow wire to the circuit breaker and the red wire to the ground terminal.







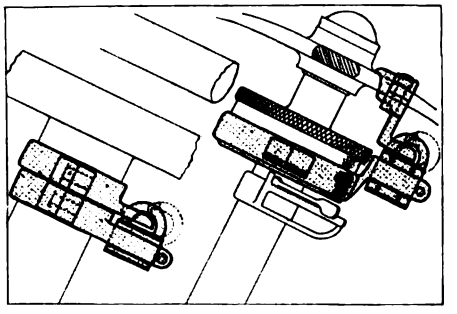
Figs. 3, 4 and 5—Typical Remy high-tension magneto wiring diagrams

ACCESSORIES

Deitz Steering Wheel Lock

THIS is a simple device for locking the steering wheel. A special design being made for Fords, and a different model for other cars. The general model consists of two metal clamps for the steering post, with a small padlock firmly bracketed in the lower clamp and three attaching rings as a part of the upper clamp. This arrangement provides for locking the steering post whether the car is standing with the wheels set straight ahead or whether it is left in such a position that the steering wheel is turned to the right or left. This makes the device easy to use if the car is driven up to the curb and left hurriedly without squaring the position of the wheels. The Ford model is similar in working principle, but here the upper clamp is fastened directly to an arm of the steering wheel. For locking in different positions, this model must depend upon three lock brackets on the lower clamp.

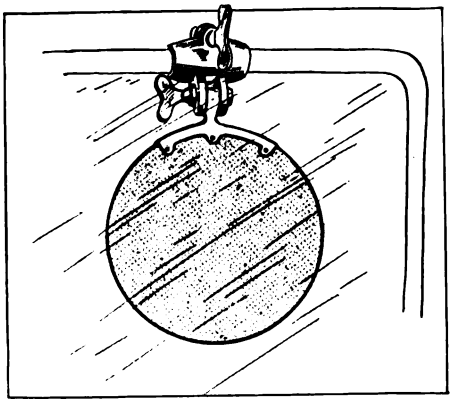
These clamps can be made of either forged steel or hard bronze, and are fastened by a patent device which will prevent removing them with a screwdriver or any ordinary tool. A small spring holds the bar of the padlock in the clear when open, thus guarding against its being jarred shut and catching the clamp which turns with the steering wheel. The device sells for $2.50.—Henry Deitz, Denver, Col.



Deitz steering wheel lock in two models

Staude Glare Stopper

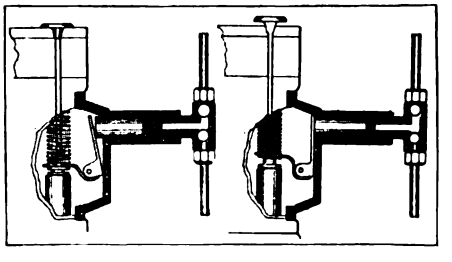
A disk of heavy glass, of an amber color, is clipped to the edge of the windshield in such a position that the driver of the car can look through it by moving his head a little to one side, when facing the headlights of an approaching car. The clip incorporates a joint which permits the glare stopper to be kept vertical even when the windshield is inclined. If the glass is broken it may be replaced for $1.25.—The glare stopper sells for $2.50. —E. G. Staude Mfg. Co., St. Paul, Minn.



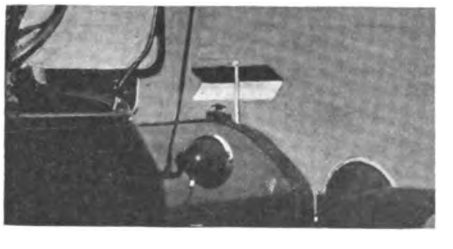
Staude glare stopper on windshield

Strong Oil Pump for Fords

A plate carrying the Strong oil pump fits over the valve stem compartment of the Ford motor, in place of the regular cover plate. The pump is of the plunger type and is actuated by a rocker arm, one end of which is in contact with one of the valve lifters; the lifter raises the arm and pushes the plunger outward, discharging the oil in the barrel, and on the return stroke the plunger is brought back by a spring and sucks in a fresh charge. The oil is pumped from the bottom of the flywheel housing through a sight feed on the dash and forward to the timing gear housing from which it goes into the crankcase under the connecting-rods and is splashed. The makers state that the pump can be installed in 20 min. It sells for $5.—Perkins Mfg. Co., Des Moines, Ia.



Strong plunger oil pump for Ford cars



Kruse direction signal on car

Kruse Signal

The Kruse mechanical signal indicates both in front and behind the car which direction a motor car intends to take at a street intersection. It consists of two signal arrows, in regulation red and green, mounted upon nickeled steel rods, which are turned by a cable passing around a pulley at the base of each rod and controlled by a lever attached to the steering post. This lever runs down alongside the post to a universal joint at the floor of the car, where it connects with the cable. The front signal stands above and in front of the radiator cap, while the rear one is fitted to a bracket midway between the springs and near the tail light.

The device is simple in construction, easy to operate, made to fit any style of machine, and can be adjusted to prevent rattling or getting out of order. Being operated mechanically, there is no upkeep expense for batteries or lights.

The position of the two signal arrows is such that the front one is well lighted at night by the side lights on the car equipped with the device, while the rear arrow is made clear either by the tail light or by the headlights of any car following at all closely. The signal sells for $10.—National Auto Signal & Mfg. Co., Denver, Col.

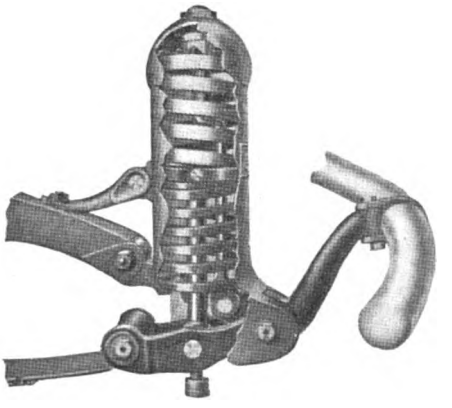
Answer Spark Plug

A spark plug which the owners claim will not break, leak, soot or oil soak has been brought out under the name of the Answer. It is made in every size including ½-in. standard, ½-in. extension, ⅞ S. A. E., ⅞ extension, metric and Ford. There is also a metric motorcycle size. The plug is shown in section herewith and, as will be noted, there is a steel spindle which acts as the core of the plug. Surrounding this is mica insulation 3/32 in. thick. The shell is made in all sizes and the terminal is a combination design suitable for screw cap connection or snap-ons. The price of the plug is $1.—Hill Mfg. Co., New York City.

U. S. E. Shock Eliminator

The U. S. E. shock eliminator and bumper combined is a mechanical device which is attached between the frame of the car and the springs. It consists of a metal casing in which are assembled spiral springs having between them a reciprocating trunnion ring attached to

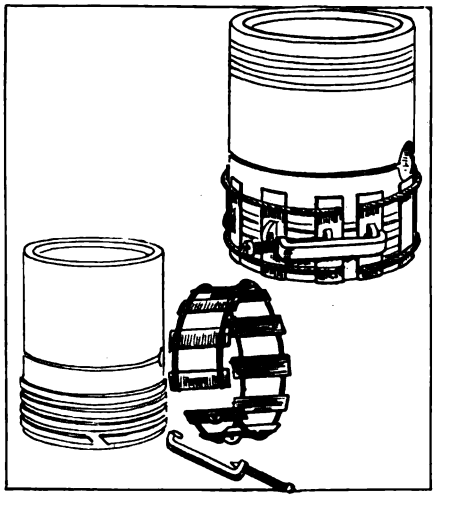
the main connecting-rod. This connecting-rod, being joined to the lever which is pivoted at one end of the shock absorber and at the other end to the car spring, receives the force of the shock from the car spring and transmits it to the spiral springs of the shock eliminator where it is absorbed by their reciprocating action. The bumper, which is a part of the front U. S. E. shock eliminator, is connected with the internal spring so that any blow received by the bumper is absorbed by their action. The prices are: Front pair, including bumper, $60; rear pair, $50; rear pair, underslung, $40; small car equipment, $80, and for attaching complete, $10.—Universal Shock Eliminator, Inc., New York City.



U. S. E. combined shock eliminator and bumper

Morgan Piston Ring Tool

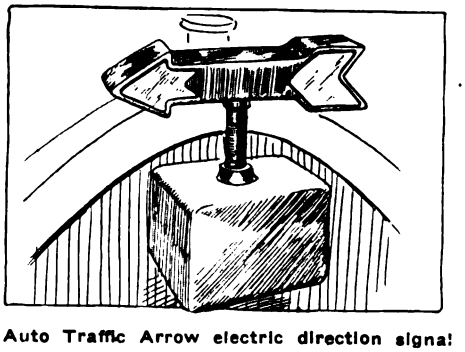
In this tool a series of flat steel bars are connected together by two flexible steel cables, the last bar on one end and several of the bars on the opposite end being fitted with lugs. The device is wrapped around the rings of a piston and a small clamp, which is furnished with the tool, is placed on the two lugs which are the right distance apart and screwed up until the rings are well down. When the piston is inserted in the cylinder the device is pushed off the rings as they enter the cylinder in succession. This tool sells for: 2 to 4-in. pistons, 50 cents; 3 to 5-in. size, 75 cents, and 4 to 6-in., $1.—Morgan Mfg. Co., Newport, R. I.



Morgan's piston ring compressing tool

Auto Traffic Arrow Signal

To indicate by day or night to other vehicles, pedestrians or traffic officers the direction to be taken or the intention of stopping, a traffic signal under the name of the Auto Traffic Arrow is marketed. The outfit consists of two metal motor boxes, one secured to the top of the radiator and the other at the rear. From the mechanism in each box an inclosed shaft extends upward and upon this is mounted an arrow finished in highly polished nickel. Within these arrows are powerful miniature electric lamps which illuminate them at night, indicating plainly by night or day the direction which is to be taken.



Auto Traffic Arrow electric direction signal

The action of both front and rear arrows is controlled by a set of three buttons clamped to the steering wheel or post or anywhere desired. A touch of the button is sufficient for the operation of the arrow and it is not necessary to hold the button down as the arrows remain locked in position until one of the buttons is again pressed.

Both arrows turn simultaneously when the corresponding button is depressed for right or left. In addition to the arrow in the rear of the car there is also a disk which is illuminated at night and when the driver presses down upon his brake to bring the car to a stop the disk makes a half turn showing the word, Stop. When the brake is released the disk turns back to its original position.—The Auto Arrow Signal Co., St. Louis, Mo.

Benn Power Tire Pump

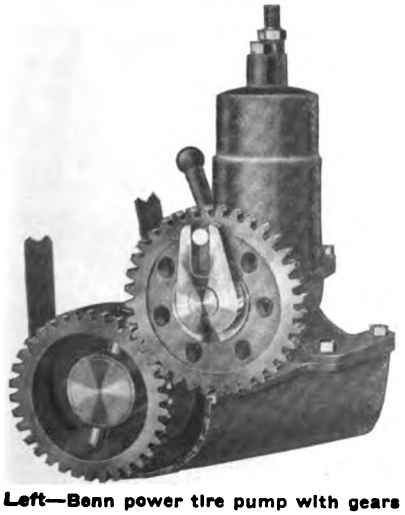
This is an all-metal pump with steel crankshaft in one long bearing. The connecting-rod is of bronze and cylinder and piston of gray iron. The pump is permanently attached, brackets and driving gears being provided to suit various motors. The makers state that the pump for Fords will put from 45 to 60 lb. pressure into a tire in 1 min. The construction is exceedingly simple and compact. There is an asbestos oil separator which will last a year or two before requiring renewal. Standard type $8, Ford type $7.—Benn Pump Works, Boston, Mass.

Kumpy Jitney Bus Sign

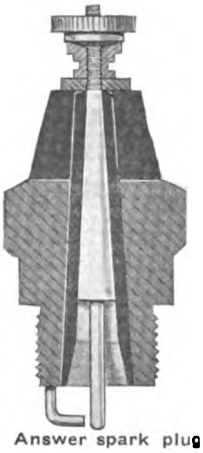
An illuminated sign giving the destination of the jitney buses is one of the early accessories to appear in connection with the movement toward the low-priced transportation medium. They are similar to the direction signs on street cars, having a roll of canvas or duck on which are painted the destinations of the jitney. The roll is inclosed in a box with a glass front, through which the destination is visible. The sign is equipped with two 12-volt lights, which are supplied with current from the battery on the car. The required destination can be placed in front of the glass by simply turning a crank, and the sign itself can be mounted on the windshield if desired. The signs sell for $5.—Walter Odell, Kansas City, Mo.

Shanhouse Motor Suit

The Shanhouse is a one-piece slip-over suit of olive khaki, designed to protect the clothing when working about the car. It can be donned quickly and easily and covers the clothing completely and has no flapping ends or corners. The suits sell for $2.50 each.—W. Shanhouse & Sons, Rockford, Ill.

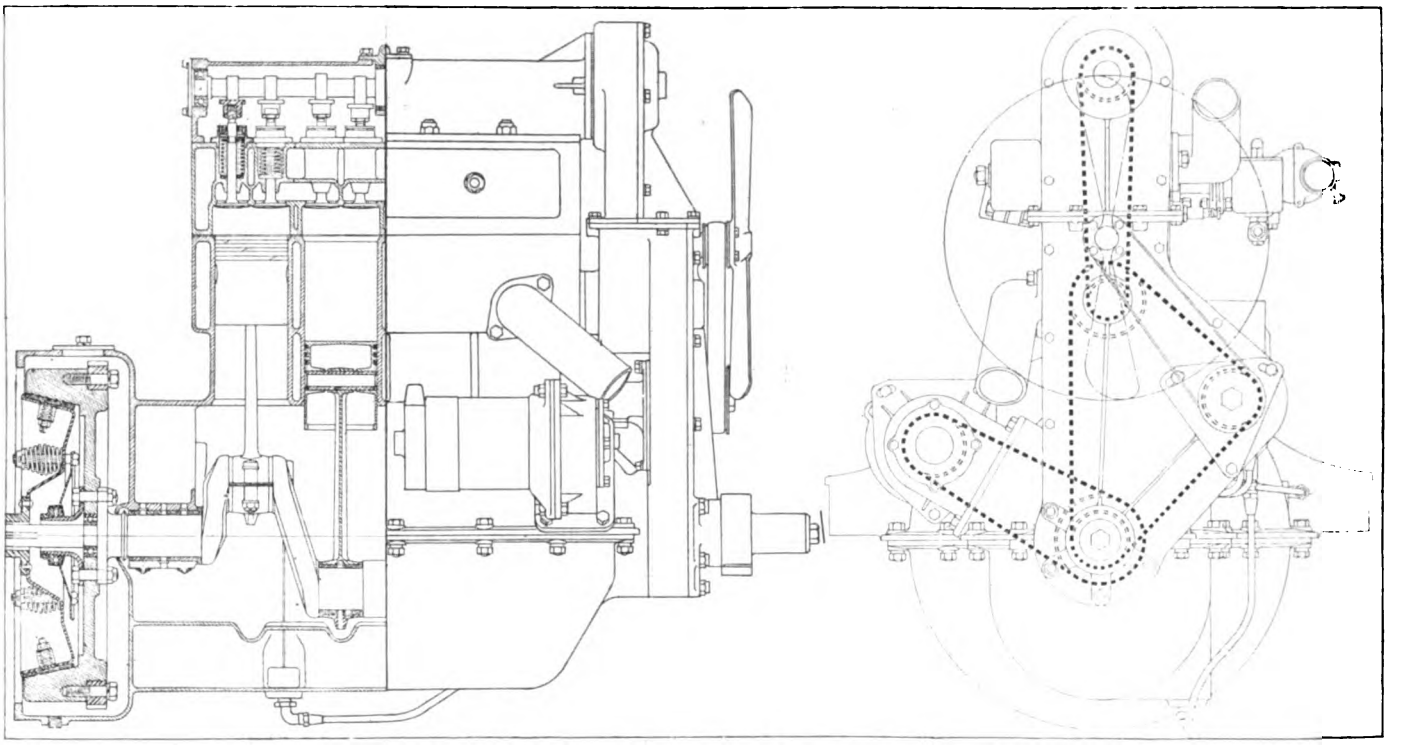


Left—Benn power tire pump with gears and clutch. Right—Section



Answer spark plug

Overhead Valves in Farmack Four



Left—Four-cylinder block motor used in Farmack car. Right—End view showing chain layout for overhead camshaft drive

THE Farmack car is made by the Farmack Motor Car Corp., Chicago, Ill. This is a new concern headed by A. J. Farmack, formerly of Detroit, who is president and general manager. The car appears in three body styles on a single chassis, a roadster and a five-passenger touring car at $855 and a cabriolet at $1,155.

The car has a wheelbase of 112 in., a four-cylinder block 3½ by 5 in. motor, 33 by 4 in. tires.

The feature of the Farmack car is the overhead valve, overhead camshaft motor. As will be seen from the illustration of the motor, the valves are directly in the head of the cylinder and are operated by a camshaft above them and whose cams push directly on the valve stems or extensions of the valve stems. The camshaft is operated by a chain drive which is a two-stage drive, the first stage being a triangular chain around sprockets on the crankshaft, magneto and an idler. A secondary chain from the idler to the camshaft sprocket carries the drive to the latter.

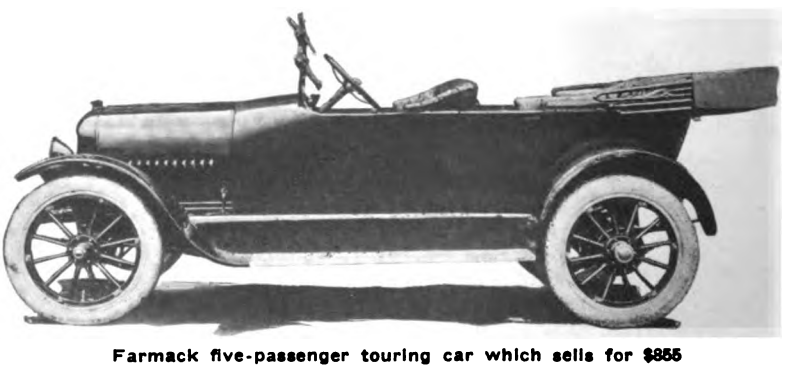
Accurate adjustment of the timing of the camshaft drive is provided by an arrangement at the sprocket end of the camshaft by which the camshaft is driven from its sprocket through a tooth clutch which permits the adjustment to be varied to as close limits as one-tenth of the width of a gear tooth instead of the smallest adjustment being the width of a gear tooth as would be the case without this subdivision. The valve stems are provided with an adjustment for wear and the contact points of the cams are of the mushroom type, both of which features are designed with the idea of eliminating noise. The tungsten steel valves are 1 3/16 in. diameter with a lift of ¼ in. The motor can be divided into four parts, first the crankcase which is split horizontally; second, the cylinder block; above this the cylinder head carrying the valves; and above this the camshaft with its cover. The crankshaft has two bearings, 2 by 2¾ in front and 2 by 3½ at the rear, bronze backed and babbitt lined.

The lubrication system combines a splash system with the level maintained by a plunger pump. This pump supplies oil directly to the camshaft chamber and to the camshaft bearings, the entire chamber being flooded with oil. An overflow from the top of the motor carries oil down to the splash troughs into which the connecting-rods dip.

Cooling is by thermo-syphon and the electric system is Bijur two-unit with Willard battery and battery ignition.

From the engine power is transmitted through a cone clutch with spring inserts and this has an arrangement for adjustment. The three-speed gearset is made by the Grant-Lees company and uses New Departure bearings throughout. From this the drive is taken through an inclosed propeller shaft with a universal joint immediately back of the gearset. This is supported on the yoke, the drive being carried through three-quarter elliptic springs. The rear axle is floating.

The braking system includes internal and external brakes on 1¾ by 12-in. brake drums, tires are 33 by 4 in. and non-skid in the rear on demountable rims.



Farmack five-passenger touring car which sells for $855

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, November 11, 1915 No. 20

THE CLASS JOURNAL COMPANY
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Entered at New York N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October 1903, and the Automobile Magazine (monthly), July, 1907.

Standardizing Pistons

THE suggestion to adopt a standard formula for piston design, or to set up a range of standard pistons covering practically all automobile requirements, needs rather more consideration than have most of the existing S. A. E. standards. A standard to be a good, useful and efficient thing must benefit everyone. The piston standard would certainly cheapen pistons, because it would convert them into a specialized product instead of being an individual one, as they now are. Standard ring sizes would help a business that is already highly specialized and, most of all perhaps, the dealer would feel the benefit because his stock of spare pistons and rings could be reduced enormously. The owner, coming last in the chain, would obtain indirect benefit.

But, and now comes the big question, is it possible to standardize pistons while they are in a state of evolution?

This year piston design has been entirely changed by the coming of aluminum alloys which will withstand the conditions, and the case is further complicated by the many patterns of special rings which are now in competitive, experimental use. Thus, it appears that any standard will have to be experimental also. To make the attempt is good, but it should be made with due caution, for the case is so different that past experience of the benefits of simple standards is not fully informative.

Gas-Electric Progress

AN event of 1915 which should not be allowed to pass without due recognition is the successful marketing of a gas-electric passenger automobile. Despite many attempts in the past, it has been left to America in the present year to manufacture in a standard form a passenger car without gear connection between the engine and the road wheels.

Of course, this particular machine is being manufactured on a small scale only, but it has sold in a quantity sufficient to prove the existence of a market, and it is more than probable that the demonstration of ability thus provided will lead to the production of gas-electric passenger cars on a far larger scale.

There are as many types of electric and semi-electric transmissions as there are kinds of gasoline motors, so the possibilities for development are vast, but just as quantity output has made the ordinary automobile what it is to-day, so will quantity have to exercise its influence before the gas-electric car settles into a standard form.

It is inconceivable that the success of the first *commercial* essay with a vehicle of this type will not be followed by larger scale manufacture, and early experiments in this connection are to be anticipated.

Electric Steel

IN spite of the contrary opinion of many it cannot be doubted that the majority of metallurgists in this country welcome the growth in the use of electric furnace steels. With the constant wish to be always seeking something better in the way of materials, it is but natural that a process which increases the good qualities of steel should be welcomed. True, in the present state of development steel made by this process costs more; but it can hardly be doubted that the general adoption of the product for parts which are subjected to puzzling stresses of a dynamic nature would greatly lower the price.

In buying any grade of material first cost alone should never be considered, and even while the price of the electric furnace steels remains above that of the open hearth products, it would be well for the manufacturer who is obliged to scrap a high percentage of parts upon which high machining costs are placed, to consider the advantages of the more expensive but more uniform and purer product.

In this great industrial country it has been estimated that we use approximately the same quantity of electric furnace steel in one year that Germany does in a month.

The war also has had its influence. While we imported thousands of tons of electric furnace steel before the conflict started, the supply has now been shut off with the result that the steel is being made here. This increased production is the very factor needed to reduce prices, and there are many who believe that increased production, combined with the lower wastage factor, will rapidly bring to the front the purer and more uniform product.

$15,000,000 Overland New Pref'd

7% Stock Convertible into Common at $300 Per Share—$50,000,000 Common

NEW YORK CITY, Nov. 10—The Willys-Overland Co. yesterday announced an issue of $15,000,000 new convertible 7 per cent preferred stock which will be offered to holders of the common stock of the company at 102½, with adjustment of accrued dividends. Common stockholders of record Dec. 21 and also preferred stockholders will have the privilege of subscribing to the new stock to the extent of 71½ per cent of their respective holdings. The new preferred stock, of which the authorized issue is $25,000,000, is convertible from Jan. 1, 1917, up to Jan. 1, 1922, into common stock at $300 a share. The present issue of preferred, of which there is $4,483,700 outstanding, will be called for redemption at 110 and accrued dividend on or about Jan. 13 next. President Willys, being desirous that the holders of the present preferred shall have an opportunity to continue their interest in the company, has agreed to waive part of his subscription rights as holder of common stock, those rights to go to the holders of present preferred who may subscribe on the same basis as the holders of common stock.

The new preferred issue has been underwritten. A special meeting of stockholders will be called on or about Jan. 14 to authorize the new stock. The authorized amount of common stock will be increased from $25,000,000 to $50,000,000 of which a par amount sufficient for the conversion of the $15,000,000 new preferred will be reserved for effecting the conversion thereof. The present amount of common stock outstanding is $21,000,000 and $1,500,000 additional common is to be set aside for sale to employees.

Redeemable at 110

The new preferred stock is redeemable at 110. It is provided that the remaining $10,000,000 of the $25,000,000 authorized may be issued from time to time, but not before Jan. 1, 1917, for cash, provided the net quick assets of the company immediately upon the issue of this stock shall be equal to 110 per cent of the amount of preferred stock outstanding. The remaining preferred may be issued in series and the stock of different series may be at dividends at the same or a lower rate, may be redeemable at a lower price, and may be nonconvertible or convertible at higher prices for the common than those provided for the $15,000,000 issued at this time.

Subscription to the new preferred stock will be made as follows: Jan. 21, $40; Feb. 10, $30; March 1, $33.23. These payments include adjustments of accrued dividends. Subscriptions may be paid in full on Jan. 21, in which case the amount payable will be $102,889 per share, including adjustment of accrued dividends.

To Retire Present Issue

Out of the proceeds of the $15,000,000 new preferred, the present issue of $4,783,000 preferred will be retired and the balance, about $10,500,000, will be applied to the general funds of the company.

Applications will be made to list the new preferred stock and the subscription receipts on the New York Stock Exchange.

In connection with the proposed new issue a circular has been sent to stockholders showing that the company's earnings for the nine months ended Sept. 30, 1915, were over $8,500,000 of which approximately $3,500,000 was earned in the three months ended Sept. 30, 1915. These earnings compare with $5,231,274 for the year ended June 30, 1914, and $3,019,098 for the six months ended Dec. 31, 1914. The net current assets at the present time plus the net amount to be realized from the new financing are approximately one and one-half times the amount of the proposed $15,000,000 preferred stock issue and the total net assets exclusive of good will, etc., on the same basis about two and one-quarter times the proposed issue.

—

Will Keep Lozier Property

DETROIT, MICH., Nov. 9—The Associated Lozier Purchasers who took over the assets of the old Lozier Motor Co. for $1,000,000 and who had the privilege of re-selling the property, consisting of the plant and land in Detroit, have notified the Detroit Trust Co., trustee, that they will keep the property. An agreement has been made whereby the price of the plant property or $225,000 will be paid in four yearly installments of $50,000 and one of $25,000 beginning Feb. 15, 1916, and on the same date of the following years, while the payment of $125,000 for the vacant land property is to be made in five annual installments of $25,000 on the same dates.

The Associated Lozier Purchasers have paid up to Oct. 15, 1915, $449,906.15 of the total purchase price of $1,000,000. The trust company has thus far paid two dividends of 5 per cent to the creditors, on allowed claims.

—

National Tube Advances Prices

PITTSBURGH, PA., Nov. 5—The National Tube Co. has advanced prices for tubing, casing and drive pipe about $2 a ton.

Plath Maxwell Sales Manager

Stebbins in Charge of Executive Sales Work in Detroit —Other Promotions

DETROIT, MICH., Nov. 4—Some important promotions have been made in the sales organization of the Maxwell Motor Co., John J. Plath, who was supervisor of sales zone No. 1, with headquarters in New York, has been appointed sales manager of the Maxwell company. Mr. Plath has been with the company for over one year, being previously connected with the Colwell Lead Co., New York and Windsor, Ont.

C. E. Stebbins, who was superintendent of sales and assistant sales manager, has been promoted to have full charge of all executive sales work at the Detroit headquarters of the company.

C. R. Newby, L. K. Cooper and T. J. Toner, zone supervisors, have been attached to the general national sales staff.

The staff of zone supervisors is now as follows: L. F. Smith, Boston; E. W. Clarke, New York; H. H. Howe, Pittsburgh; J. P. Headley, Atlanta; E. M. Lubeck, Chicago; C. S. Riedel, Minneapolis; E. F. McConaha, Indianapolis; W. C. F. Morris, Memphis; G. E. Clarke, Kansas City; L. A. Smith, Dallas, Tex.; W. J. LaCasse, Portland, Ore.; E. E. Thompson, San Francisco.

—

Acceptance Corp. Will Buy Notes Taken by Truck Dealers

NEW YORK CITY, Nov. 6—A new credit department has been opened by the Acceptance Corp., 55 Liberty Street, this city. Under the new plan a dealer can now accept notes in part payment for a truck which the corporation agrees to purchase from him. This enables the dealer to pay the truck maker cash for his product and permits the dealer to get the concessions, discounts and freight allowances usually made to cash customers. It will also relieve him of the bother of collecting the notes from the customer or financing any part of the transaction.

This corporation started business in 1909 and includes in its board of directors R. M. Owen, R. A. Rainey, R. H. Montgomery, E. D. Bird and D. B. Mills.

—

Lakey Leaves Foundry Co.

MUSKEGON, MICH., Nov. 5—Vice-president and general manager William B. Lakey, of the Lakey Foundry & Machine Co. has resigned to give all his attention to the Pressed Steel Co. which he organized recently. This concern occupies the building formerly used by the Muskegon Pattern Works.

To Investigate Export Trade

Federal Trade Commission To Send Out Letters of Inquiry for Referendum

WASHINGTON, D. C., Nov. 6—In the near future the Federal Trade Commission will send out to the automobile and supply manufacturers a letter of inquiry, followed up by a brief schedule, as a part of the investigation of conditions that affect American foreign trade. Congress has empowered the commission to make an investigation and to report the facts with such recommendations as it deems advisable.

It is pointed out that the war in Europe has so affected the trade of the world that American enterprise has a peculiar opportunity to supply the wants of foreign markets and to secure a greatly enlarged share of their trade. The commission, therefore, deems it to be its duty to complete with all possible dispatch an investigation which may assist Congress in determining what action may be required in the public interest for the promotion of American foreign trade.

By public hearings throughout the country and by other means the commission has been gathering facts and information as a basis for its report to Congress. It now wishes to obtain information from a large number of men who were unable to appear at the hearings. For this purpose these letters and schedules will be sent out.

30,000 Letters to Go Out

About 20,000 letters will go to American manufacturers and producers and about 10,000 will be sent to other authorities on foreign trade conditions, such as export commission merchants, manufacturers' export agents, importers, domestic merchants, publicists, lawyers, economists, bankers and engineers.

A return post-card accompanying the letter is designed to give the commission a broad "yes" or "no" referendum on the advisability of export combinations and to put it in touch with those who are willing to assist the commission by furnishing further facts and suggestions. To those who state that they will co-operate with the commission in furnishing facts, etc., the schedule of inquiries will be sent, covering the topics on which the commission desires information.

The 20,000 names of manufacturers and producers include every important branch of American industrial enterprise and represent every shade of opinion in regard to the present problems of our foreign trade.

The 10,000 other persons to whom the letters of inquiry will be sent include even greater diversity of interest and thought. By obtaining facts and suggestions in this manner from a large number of persons with different experiences and points of view, the commission expects to secure a great deal of valuable information.

In its work the commission will also receive assistance from the Department of State and other government offices.

Argo Motor Co. Buys Standard Electric Plant

JACKSON, MICH., Nov. 6—A deal has been completed whereby the Argo Motor Co. has acquired the plant and land of the old Standard Electric Co. which it has been occupying. It is expected that arrangements will be made to enlarge the manufacturing facilities of the company, it being contemplated to build between 20,000 and 30,000 Argo cars for the season of 1916.

In connection with the contemplated expansion move it is announced that the Jackson Motor Parts Co. has been organized and incorporated. Its capital stock is $210,000. This concern will make principally parts for the Argo cars, but, it is said, will ultimately also make parts for the general trade. L. E. Latta, vice-president and general manager of the Argo company, has been appointed president and general manager of the new parts company. L. E. Wilson, Chicago, is now managing the Argo business and Stanley Whitwarth, Indianapolis, has become production manager.

Pettit and Gittings Case V-P.'s

RACINE, WIS., Nov. 6—Milton H. Pettit, formerly of Kenosha, Wis., was elected vice-president in charge of plants and production of the J. I. Case T. M. Co., this city, succeeding F. Lee Norton, who resigned as vice-president and general manager of the Case company several months ago. Ellis J. Gittings, whose appointment as manager of the sales department was announced a few days ago, has also been elected a vice-president, in charge of sales. Richard T. Robinson, for many years secretary of the company, also resigned recently, as noted, and is succeeded by W. F. Sawyer, formerly sales manager.

E. G. Norris McQuay-Norris Branch Mgr.

SEATTLE, WASH., Nov. 5—E. G. Norris has been appointed Northwest district branch manager of the McQuay-Norris Company, of St. Louis. He is a brother of W. K. Norris, president of the corporation which manufactures Leak-Proof piston rings. He will have supervision of Washington, Oregon, Idaho, Montana and British Columbia business, with headquarters in Seattle.

Ferro Brings Out a Twelve

On Same Lines as Ferro Eight—Overhead Valves with Detachable Cylinder Heads

CLEVELAND, OHIO, Nov. 10—It has for a long time been an open secret that the Ferro Machine & Foundry Co., this city, has been developing a twelve along the lines of the Ferro eight designed by Alanson P. Brush. It is understood that more than one experimental motor has been built and it is now announced that the size chosen for the standard product will be 2⅞ by 4½ in., giving 350.5 cu. in. displacement.

The features of the Ferro eight were commented upon and illustrated in the last issue of THE AUTOMOBILE, so there is no need to recapitulate them here, save to say that the new engine will have a twenty-four-cam camshaft and that the rocker mechanism will permit of easy adjustment of the tappets. The main features of the motor are as follows:

Weight—without starter or generator	730 lb.
Bore	2⅞
Stroke	4½
Formula hp.	39.7
Total piston displacement	350.5 cu. in.
Mean valve diameter	1¼
Valve lift	0.253
Firing order	R. 1-5-3-6-2-4 L. 1-5-3-6-2-4

Three crankshaft bearings.

Three camshaft bearings

	Dia.	Length	Dia.	Length
Front	1⅞	3 3/16	1⅛	1 15/16
Center	2	2¼	1¾	2
Rear	2⅛	2⅞	1	1 13/16

	Dia.	Length
Connecting-rod bearings side by side	2⅛	1 3/16

Starter gear ratio	10:1
Timing gear type	Morse chain
Valve type	Overhead inclosed
Lubrication	Pressure feed
Cooling	Pump

Myers Again Stutz Sales Manager

INDIANAPOLIS, IND., Nov. 6—W. D. Myers, who was sales manager of the Stutz Motor Car Co., this city, and resigned a little over a year ago, has returned to his old position with the Stutz company, that of sales manager. At the same time, announcement is made of the resignation of H. W. Anderson, sales manager of the Stutz company, effective on Nov. 1.

Mr. Myers resigned from the Stutz company to organize the Myers-Ebersole Motors Co., Kansas City, Mo., which controlled the agency for the Cole and Regal cars. This business will be continued under the management of J. H. Ebersole, though Mr. Myers will retain his interest.

Mr. Anderson, who has been identified with the automobile business for the past ten years, has not yet announced his plans for the future, but will make his headquarters at the Hotel Astor, New York City, for the present.

New Company Will Finance Time Payments On Overland Cars

Guaranty Securities Co. Formed in Toledo with Plan for Carrying Installment Paper—Three Kinds of Discount Facilities—Special Plan for Farmers

TOLEDO, OHIO, Nov. 8—Dealers selling Overland and Willys-Knight cars are now offered facilities for financing time payments on cars by a new securities company in this city, known as the Guaranty Securities Co. A guaranty plan has been worked out whereby the burden of carrying instalment paper is removed from the dealers' and distributors' shoulders and carried by the Guaranty Securities Co. Three distinct kinds of discount facilities are afforded the dealers by the new plan, namely, the discount of instalment notes on retail sales, the discount of farmers' notes on retail sales, and the discount of paper growing out of sales at wholesale by distributors to dealers, with particular reference to the winter stocking season.

In the working out of the plan, the Willys-Overland Co. has advised and suggested a course which would benefit Overland dealers, but the Willys-Overland Co. is not in any way connected with the Guaranty Securities Co.

Plan Good for Any Model

It is a method which will undoubtedly effect a great change in the selling of Overlands, for by its provisions, any dealer is in position to sell a man a machine of any model manufactured by Overland on a time basis. The buyer must, of course, be a responsible party whose notes will be good security.

Briefly, the guaranty plan consists in the securing of a down payment by the car buyer of a certain prescribed amount as given in the accompanying table, and the balance in eight monthly instalments, a note being given for each instalment. The notes secured by the dealer are then sent through the distributor to the Guaranty Securities Co., which concern discounts them, remitting all of the face value of the notes except an amount running from $100 to $200, depending upon the value of the car. This amount the dealer receives a deferred certificate for, and it is payable when and if the customer's notes are paid. But if a dealer does not want to wait for this portion of the profit, he can immediately cash the certificate at a discount of 5 per cent. This does not apply to deferred certificates on farmers' notes, which certificates are not discountable.

Going into the details of the plan, the car buyer is required to pay a small amount in excess of the list price of the car, this being for insurance and interest on the unpaid balance. The insurance covers fire, theft and transportation loss and is written under a blanket policy in the Automobile Insurance Co., Hartford, Conn., which is affiliated with the Aetna Life Insurance Co. Any scheme of reports or checking in order to make sure that insurance had been properly written on each car would be so cumbersome and costly as to be prohibitive. Therefore it was decided that the insurance should be covered by a blanket policy, it is pointed out, and that the charge for this insurance should be made in a lump sum and treated as a part of the time price of the car.

Books Sell for $1 Each

Forms have been provided on which to make the sales of cars under the guaranty plan in each of the different States so as to conform to the various laws. These forms are furnished to the dealers at $1 per book.

In making a sale under the plan, the first thing the dealer does is to make the necessary inquiries of the buyer so as to fill out the purchaser's statement intelligibly. This statement is one of the forms supplied. The mortgage and notes are then filled out, and the insurance requisition. From the moment this insurance blank is filled out and mailed by the dealer, the car is covered against fire and theft. A certificate of participation, showing the interest of the purchaser in the insurance, is issued in duplicate when the papers reach Toledo, one copy going to the customer and one accompanying the notes as collateral.

Having made the deal, the dealer indorses the notes, signs the assignment on the back of the mortgage, sending the papers on to the distributor. The latter also indorses the notes, signs and dates the mortgage or assignment and sends all the papers on to the Guaranty Securities Co. The latter then sends the money and deferred certificate to the distributor, from whom the Guaranty company actually buys the notes, but if the distributor receives them from a dealer, he at once indorses both check and certificate and sends them on to the dealer.

Dealer Must Handle Repossessions

The purpose of holding back the $100, $150 or $200 in the form of a deferred certificate is two-fold: First, the dealer's interest must be tied to the transaction until all the notes are paid, as the Guaranty Securities Co. is not in, and cannot enter, the automobile business, and in the event of a repossession of one car out of a hundred, it is necessary that the dealer handle the repossession. Therefore, it is thought only fair that he should wait for a part of his profit until his customer has paid out. The second reason is that the deferred certificate is necessary to provide the required borrowing margin for the Guaranty Securities Co. to finance the proposed purchases of this paper, which are likely to run into several million dollars. This money must come from banking centers, and in order to borrow it at the proper rate and in such unlimited quantities as to comply with the Guaranty Securities Co. arrangement with the Willys-Overland Co., it is stated that a margin of 25 per cent in the notes is necessary, so that they may deposit $1.25 worth of notes against every dollar borrowed. This margin is obtained by the deferred certificate. As already stated, these certificates are, however, cashable through the distributors at 5 per cent discount, and the distributors can in turn use them in lieu of cash in paying for cars or other merchandise bought of Overland, at a discount of 50 cents per month for the unexpired term of the customer's notes. If the certificates are for $150, the charge is 75 cents per month; $200, $1 per month.

Monthly Installment Sales Table

		Model 83		Model 84		Model 86,
		Touring	Roadster	Touring	Roadster	Touring
1	List—f.o.b. Toledo	$750.00	$725.00	$1,095.00	$1,060.00	$1,145.00
2	Interest and insurance charge	25.00	25.00	35.00	35.00	35.00
3	Time price	775.00	750.00	1,130.00	1,095.00	1,180.00
4	Cash down	275.00	250.00	530.00	495.00	580.00
5	Note one month	50.00	50.00	75.00	75.00	75.00
6	Note two months	60.00	60.00	75.00	75.00	75.00
7	Note three months	60.00	60.00	75.00	75.00	75.00
8	Note four months	60.00	60.00	75.00	75.00	75.00
9	Note five months	65.00	65.00	75.00	75.00	75.00
10	Note six months	65.00	65.00	75.00	75.00	75.00
11	Note seven months	75.00	75.00	75.00	75.00	75.00
12	Note eight months	75.00	75.00	75.00	75.00	75.00
13	Total notes	500.00	500.00	600.00	600.00	600.00
14	Deduct interest and insurance	25.00	25.00	35.00	35.00	35.00
15	Deduct discount	7.50	7.50	9.00	9.00	9.00
16	Proceeds	467.50	467.50	556.00	556.00	556.00
17	Cash	367.50	367.50	406.00	406.00	406.00
18	Deferred certificate	100.00	100.00	150.00	150.00	150.00
19	Cash from customer	275.00	250.00	530.00	495.00	580.00
20	Cash from G. S. Co	367.50	367.50	406.00	406.00	406.00
21	Total cash	642.50	617.50	936.00	901.00	986.00
22	Five car dealers cost	630.00	609.00	920.00	895.00	962.00

For farmers' accommodation, the plan is a little different. The farmer is accustomed to pay for his goods at harvest time, and in order to meet his requirements the Guaranty Securities Co. has modified its arrangement on installment paper so that a note or notes may be given for the deferred payment due at any time up to eight months. Further, the farmers' notes will be purchased direct from dealers as well as distributors, and will not be handled through the latter at all. The deferred certificate issued on farmers' notes cannot be discounted, but must be held by the dealer making the sale until the notes are paid.

The procedure in making the sale to a farmer under this plan is substantially the same as in the deferred payment method, except that the mortgage, contract of conditional sale, or lease will not be assigned to the distributor, but the bottom assignment printed on the back of the form, running directly to the Guaranty company, will be used by the dealer instead.

Third Plan—Sight Drafts

Due to the fact that dealers in very many cases are unable during the winter season to borrow suitable amounts with which to take their allotments in cars from the distributors, and because dealers often ask for assistance so that instead of having a large number of cars in warehouses and distributing points they would be more generally distributed through the country in the hands of dealers, where they can be seen by possible buyers, the third kind of discount facilities was fostered by the Guaranty company. The plan is for the distributor to draw his draft at 1 to 4 months sight on the dealer, with bill of lading attached. These drafts will bear interest from the date of their acceptance, and each draft will usually cover a carload of cars. Drafts may be paid in whole or in part at any time up to their maturity, and interest will cease on each car covered by the draft as paid for.

There is no cost to distributor involved in this plan, as the Guaranty Securities Co. will buy the acceptances from the distributor for their face value less only the cost of accommodation. In other words, the distributor will get his full dealer price for the cars out of the acceptance. The proceeds of the draft will be sent to the distributor in cash except that a deferred certificate for $150 per car will be issued, payable when and if, the acceptance is paid by the dealer.

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Allen Plant Is Busy

BUCYRUS, OHIO, Nov. 6—The Allen Motor Co., which recently finished an addition to its motor plant at Bucyrus, reports its shops working day and night for the past sixty days and is not yet caught up on its orders for the touring car.

Buffalo Engineers Talk Motors

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Many Automobile and Motor Engineers Among 350 at Eng. Society Meeting

BUFFALO, N. Y., Nov. 4—At a meeting of the Engineering Society of Buffalo held at the Statler hotel last night, the subject of multi-cylinder gasoline engines was discussed. There were 350 members of the society in attendance, many of whom are prominent in the automobile industry.

The subject was presented by O. E. Hunt of Detroit, engineer of the Packard Motor Car Co., and the discussion was carried on by David Fergusson, engineer of the passenger car department of the Pierce-Arrow Company; O. E. Spillman of the Herschell-Spillman Co., Tonawanda; Ernest Harris, assistant to Mr. Fergusson, and Otto Burkhardt, also of the Pierce plant.

Mr. Hunt's presentation included the letter which J. G. Vincent wrote the Packard company urging the concern, of which he is vice-president, to build a twin six motor. Mr. Hunt dwelt on the engineering considerations in designing a twelve-cylinder car in particular and a multi-cylinder type in general. Mr. Fergusson defended the six and sought to prove by scientifically worked-out diagrams that the characteristics of the six-cylinder motor with the cylinders arranged in a single row are as good as those of the twelve or twin six arrangement.

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Detroit Chassis Co. Formed

DETROIT, MICH., Nov. 5—The Detroit Chassis Co. has been organized temporarily capitalized at $10,000 and has leased the plant formerly occupied by the Vitralite Co., west Grand Boulevard and Hubbard Avenue, where manufacturing of a standard chassis has been started.

It is the object of the new company to cater especially to carriage and buggy makers and offer them a chassis at a reasonable price.

Before the new concern decided to organize those interested in it investigated the possibilities of the undertaking and came to the conclusion that the idea was a good one. In fact the company started with several large orders, one of which is for 600 chassis for Smith & Sons, London, Eng.

Instead of putting out a chassis with a specified line of parts or components such as carbureter, ignition system, starting and lighting system, this part of the equipment will be entirely optional with the party or concern placing an order, and the price will naturally be made according to the equipment required. The chassis itself will be only made in one size, 110 in. wheelbase. The motor will be a four-cylinder block, 3¼ by 5. The wheels will be of the artillery type, with 32 by 3½ tires.

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To Discuss Philadelphia S. A. E. Section

NEW YORK CITY, Nov. 9—A meeting of the S. A. E. members located in Philadelphia will be held in that city to-morrow for the purpose of discussing the advisability of forming a local organization to carry on activities in that vicinity. A dinner will start the program of the evening after which there will be addresses by members of the council of the society and by members of the governing committee of the Metropolitan section who have been invited to attend.

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Schipper Treasurer Metropolitan S. A. E.

NEW YORK CITY, Nov. 9—At a meeting of the Governing Committee of the Metropolitan Section of the Society of Automobile Engineers, J. Edward Schipper, technical editor of THE AUTOMOBILE, present secretary of the section, was appointed treasurer to succeed Prof. W. C. Marshall, who recently resigned. The governing committee of the section now consists of R. McA. Bloyd, chairman; J. Edward Schipper, secretary-treasurer; N. B. Pope and Joseph A. Anglada.

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Gray Is Haynes Advertising Manager

KOKOMO, IND., Nov. 8—R. T. Gray has been appointed advertising manager of the Haynes Automobile Co., this city, and has already taken up his duties.

Mr. Gray is a graduate of the Engineering Department of Purdue University, and is well versed in the technicalities of the automobile, as well as having had considerable experience in general advertising.

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Logan with McGraw Tire

EAST PALESTINE, OHIO, Nov. 4—W. V. Logan, recently manager of the manufacturers' department of the Goodyear Tire & Rubber Co., is now associated with the McGraw Tire & Rubber Co. in the capacity of assistant general sales manager. His efforts for the immediate future will be confined to the opening of new accounts with passenger and commercial car manufacturers.

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Germans Make Alcohol from Potatoes

LONDON, ENG., Nov. 5—A report from Germany states that that country is making great use of its potatoes, of which there is a great surplus. One of the results is wood alcohol, with which automobiles are now largely driven.

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Three Bodies for National Twelve

INDIANAPOLIS, IND., Nov. 6—The National Motor Vehicle Co., this city, will equip its new Highway Twelve w

three types of bodies for 1916, including a three-passenger roadster, a four-passenger coupé and a five-passenger sedan.

All three of these body types follow out the same general trend of National body construction that has been noted in previous models. The Highway coupé sells for $2,650; the five-passenger sedan has a center door on the right side and a forward door on the left, and sells for $3,200; the three-passenger roadster sells for $1,990.

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Goodyear Gross Business Totals $36,000,000

AKRON, OHIO., Oct. 5—Gross business of the Goodyear Tire & Rubber Co. for the fiscal year to Oct. 31 last reached a new record of over $36,000,000, an increase of $5,000,000, or 16 per cent over 1914, and $11,000,000 over 1912. The company turned out more than 2,000,000 tires during the year, but in the last three months has been making 12,000 to 13,000 a day, at an annual rate close to 4,000,000. In the year 1913-1914, 1,479,883 tires were sold.

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Chalmers Stock to Pay $12 a Share

NEW YORK CITY, Nov. 4—The Chalmers Motor Co., Detroit, which has been paying at the rate of $10 a share annually on its common stock for the past four years, will start the year 1916 with an increased rate. The new basis, it is understood, will be $12 a share annually, or at the rate of $3 quarterly. The increase will start in January and will be due to enlarged production and earnings, profits so far indicating a surplus for the current fiscal year equal to $30 a share on the common. The stock is $100 par value and is selling at 160.

In August, 1910, the company declared a stock dividend of $900 a share. In October, 1912, another stock dividend of 33 1-3 per cent was declared, followed in June, 1913, with another stock dividend of 25 per cent.

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Olds Sales Gain 133%

LANSING, MICH., Nov. 5—Sales of the Olds Motor Works during August, September and October, are reported to have been 133 per cent larger than during the same period last year. The increase would have been greater had it not been impossible to produce cars in sufficient number. Production is now being increased as much as possible and the manufacturing floor space has been increased for that purpose.

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House with Vacuum Oil

DETROIT, MICH., Nov. 5—C. M. House, who was engineer of the Briggs-Detroiter Co. is now with the engineering staff of the Vacuum Oil Co. at their headquarters in Detroit.

Earn 19% on New Peerless Stock

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Based on Actual Shipments of Combined Subsidiaries for Calendar Year

NEW YORK CITY, Nov. 9—The books and accounts of the Peerless Motor Car Co., Cleveland, Ohio, and the General Vehicle Co., Long Island City, which were merged to form the Peerless Truck & Motor Corp. last week, indicate, according to a preliminary examination by Touche, Niven & Co., chartered accountants, that the earnings from actual shipments of the combined companies for the current calendar year are at the rate of 19 per cent per year on the new $10,000,000 of capital stock of the new corporation. This is after deducting interest charges on the $5,000,000 of new notes and after setting aside liberal amounts covering depreciation, etc.

Aside from the notes mentioned, the corporation will have no bonded indebtedness, except a mortgage of $300,000 on the real estate and building which it owns at Fifty-seventh Street and Broadway, this city, which is used partly as a sales depot, the equity in which exceeds the amount of the mortgage, and returns a good income.

Assets are said to have been reduced to a conservative basis by writing off all bad debts and substantial amounts covering depreciation of buildings and equipment, though both the Cleveland and Long Island City plants are of recent construction, in good condition and in a high state of manufacturing efficiency. The consolidated net current working assets of the new corporation, exclusive of plants and equipment, will amount to $3,378,000 in excess of all liabilities, $2,370,000 of this being cash in banks.

The total capitalization of the new corporation, which is organized under the laws of Virginia, is $20,000,000, all common stock, of which $10,000,000 is to be issued now while the balance is to be reserved for the conversion of the new $5,000,000 ten-year 6 per cent notes convertible after one year into stock of the corporation at par, which is $50 per share.

Probable Board of Directors

While the composition of the board of directors of the new corporation has not yet been definitely determined, it is probable that it will include the following:

C. V. Rich, vice-president of the National City Bank and president of the National City Co.; E. R. Tinker, Jr., vice-president Chase National Bank; P. J. McIntosh, 26 Broadway, president of General Gas Appliance Co., director of Montreal Public Service Corporation, Halifax Electric Tramway Co., Imperial Trust Co., Montreal, United States Industrial Alcohol Co., etc.; B. G. Tremaine, F. S. Terry, identified with General Electric Lamp Works at Cleveland; P. D. Wagoner, president of General Vehicle Co., Long Island City; L. H. Kittredge, president of the Peerless Motor Car Co., Cleveland; Harrison Williams, identified with Cleveland Electric Illuminating Co. as chairman of the board, also with Republic Railway & Light Co., Federal Utilities, Inc., etc.

The management of the subsidiary companies comprise the following directors for the Peerless Motor Car Co.: L. H. Kittredge, president; T. W. Frech, vice-president; L. H. Treadway, president of Peck, Stow & Wilcox Co.; A. B. McNairy, director of Cleveland Trust Co.; C. E. Sullivan, vice-president Central National Bank, Cleveland; H. A. Tremaine, J. B. Crouse, associated with the National Lamp Works of the General Electric Co.; and G. B. Siddall, president of the Lorain & Southern Railway.

Directors of the General Vehicle Co. are: P. D. Wagoner, president; A. W. Burchard, vice-president of the General Electric Co.; M. F. Westover, secretary of the General Electric Co., and E. A. Carolan, A. K. Baylor, W. B. Potter and F. C. Pratt, all identified with the General Electric Co.

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Stewart-Warner Earnings Estimated at 16 Per Cent on Common

CHICAGO, ILL., Nov. 4—Stewart-Warner Speedometer earnings for nine months ending Sept. 30, exceed entire earnings of 1914 and this year's earnings are estimated at 16 per cent on common stock. The company retired out of earnings $246,000 preferred stock.

The profits of the corporation for the quarter ended Sept. 30, amount to about $447,000, a record for any three-month period. For the nine-month period the profits were $1,221,350, against $848,127 for this period last year.

Plans are being prepared for a factory, six stories, at Wolfram Street and Lincoln Avenue.

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Timken Roller Bearing Business 120 Per Cent Over 1914

DETROIT, MICH., Nov. 5—The business of the Timken Roller Bearing Co. shows an increase of 120 per cent for October over the same month's business in October, 1914, and an increase of 25 per cent over the business of September, 1915, according to Herman Ely, secretary of the company. This increase is not due to war orders but to the natural increase in car manufacturers' business.

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Musgrave with Pathfinder

INDIANAPOLIS, IND., Nov. 5—H. G. Musgrave has been appointed assistant director of sales of the Pathfinder Co.

Stevens-Duryea May Resume

Negotiations Under Way for Sale of Springfield Property —New Capital Interested

SPRINGFIELD, MASS., Nov. 6—There are persistent rumors that the Stevens-Duryea cars will be manufactured again. Negotiations are in progress for the sale of the Olmstead and Tuttle factory situated off Springfield Street that has a taxed value of $69,000. James L. Doherty, trustee of the estate, admitted that negotiations are under way for the sale of the property, but he refused to say who the prospective buyer was. Officials of the New England Westinghouse Co. which bought the Stevens-Duryea plant stated that they were not looking for any other factories at Springfield. So the talk about the Stevens-Duryea reorganization became current again. The company still has its plant for the making of parts to supply owners, but it is not large enough for manufacturing purposes. But the Olmstead and Tuttle factory would give it the needed facilities. According to the information gleaned a new charter will be applied for and work started on some cars again with new capital furnished by others not identified with the old company.

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Gunn U. S. Tire President

NEW YORK CITY, Nov. 4—J. N. Gunn has been chosen as the new president of the United States Tire Co. in full charge of manufacturing and selling. He has also been appointed assistant to the president of the United States Rubber Co., of which the tire company is a subsidiary. E. S. Williams resigns the presidency of the tire company in order to devote most of his attention to the mechanical rubber business of the United States Rubber Co.

Mr. Gunn has been assisting the tire and parent company since last June in important efficiency work. During this work Colonel S. P. Colt, president of the parent company, arranged to have Mr. Gunn become assistant to the president, and at the same time, because of the desire of Mr. Williams to be relieved to a great extent from the work of directing the tire company, the recommendation by Williams that Gunn be made president of the tire company, was also put into effect.

Mr. Gunn has been a prominent figure in the automobile field, having been for 1½ years general manager of the Studebaker Corp. He has been the head of Gunn, Richards & Co., New York City, business and efficiency engineers. For the purpose of systematizing and straightening out the plan of administration of the Studebaker Corp., following the merging of the Everitt-Metzger-Flanders Co., Detroit, and the Studebaker Bros. Mfg. Co., South Bend, Ind., in 1911, he took the general managership from December, 1911, until July, 1913, when his work was completed.

S. P. Colt, president of the United States Rubber Co., states that earnings this year will not be as large as in 1914. He states that it is costing that company considerably more to make tires now than it did in the early part of the year. The cost of fabric used by this company in the make-up of tires is probably 20 per cent higher than at the start of the year. Crude rubber is about 6 cents higher than then. Some other articles used in the manufacture of tires are no higher, but the materials used average in the neighborhood of 10 per cent more than a year ago.

The company is now turning out over 8000 tires a day. It is its intention to bring the tire capacity up to between 13,000 and 14,000 tires daily in the near future.

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Approve Plan for Paying Maxwell Back Dividends

NEW YORK CITY, Nov. 10—At a special meeting held here to-day the holders of the stock trust certificates of the Maxwell Motor Co. ratified the plan recently submitted by the directors for the retirement of the accumulated 14¼ per cent back dividends on the first preferred stock by the issue of non-interest-paying warrants convertible into first preferred stock at par. The issue of $1,050,000 additional first preferred stock was also authorized at the meeting.

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Studebaker Heads $1,000,000 Tire Co.

SOUTH BEND, IND., Nov. 5—Peter E. Studebaker, son of the late Henry Studebaker, one of the founders of the Studebaker Corp., has accepted the presidency of the International India Rubber Tire Co., a $1,000,000 corporation recently organized in South Bend. The concern will make automobile tires and sell direct to the dealers.

The officers of the company are: E. H. Schwab, Bethlehem, Pa., vice-president; G. W. Odell, Findlay, Ohio, secretary; J. R. Nobile, treasurer. These men, with William S. Moore, city engineer of Grand Rapids, Mich., form the board of directors. The plant will be in South Bend.

E. R. Erskine, president of the Studebaker Corp., in response to an inquiry, stated that the proposition is yet in embryonic state and that neither the Studebaker Corp. nor any of its officials are interested financially or commercially in the proposition.

Studebaker Earns $10,000,000?

Per Share Surplus of $30 as Compared with $15 in 1914

NEW YORK CITY, Nov. 4—Earnings of the Studebaker Corp. for 1915 will fall slightly short of reaching the $10,000,000 mark, compared with a surplus for 1914 of $3,752,916 after allowing a charge-off of $402,698 for "extraordinary expenses." On the $27,931,600 common stock now outstanding these profits work out a per share surplus this year of somewhat over $30, compared with just under $15 last year.

Mostly Domestic Business

The larger part of this earning power of between $9,000,000 and $10,000,000 is from domestic business entirely.

Last week was a record one with shipments of 1510 cars, and October was the record month, with shipments of 6009 cars. All these machines were for domestic consumption. The company is doing an excellent export business to South and Central America, Australia and the Far East. Its domestic demand, especially in the East, has been very heavy. The sales in Boston, Philadelphia, and New York in the past year have doubled.

The directors of the company yesterday declared a quarterly dividend of 1½ per cent on the common stock, and an extra dividend of 1 per cent. According to a statement issued by President A. R. Erskine, this places the junior shares on a regular 10 per cent annual basis. His statement reads:

Orders Running High

"It is the belief of the management that the 1 per cent extra dividend will be declared regularly hereafter, as the current business of the company, exclusive of any so-called war orders of which the company has been a recipient, is running at a rate which will fully justify a 10 per cent return to stockholders, and will leave ample surplus earnings for the extension of the business without any necessity for borrowing."

"The corporation is now entirely free from floating debt excepting $2,308,500 of serial notes, respecting which arrangements have been made to call which is the earliest possible date on which they can be paid in accordance with the indenture under which they were issued."

The Studebaker common dividend since May 4, 1915, has been on a 5 per cent basis, 1¼ per cent having been declared quarterly. Studebaker shareholders were recently offered the right to subscribe to 26,380 shares of treasury stock at $110 a share.

Monarch To Concentrate on Eight

Adopts Distinctive Silver-Aluminum Finish for Wheels —Price Is Unchanged

DETROIT, MICH., Nov. 8—The Monarch Motor Car Co., this city, will produce only one stock model for 1916, an eight-cylinder, seven-passenger touring car, which it has christened, "the car with the silver wheels." The price remains at $1,500. Mechanically the car is the same model as previously brought out, but a number of refinements have been made in the body and finish to bring the car up to the latest design.

3 by 5 High-Speed Motor

The motor is a 3 by 5 Herschell-Spillman with the cylinder blocks set at a 90-deg. angle. The cylinders are slightly staggered, allowing the connecting-rods to be placed side by side on separate bearings, thus avoiding the yoke-end construction. The motor is essentially of the light weight, high-speed type, and will develop upwards of 74 hp. at 2400 r.p.m., according to its manufacturer. Two mufflers are used.

The gearset on the new model is made by the Detroit Gear and Machine Co., and is in unit with the motor. Drive is by tubular shaft through a double universal of standard design. Axles are of Columbia make, the rear being floating with spiral bevel gears. Gemmer steering gear is used and the drive is from the left with center control, the gearshift lever operating on the power transmission direct.

The rear springs are three-quarter elliptic and take the driving stresses. The brake rod assembly has been altered somewhat to secure a thoroughly accessible and powerful construction, and both sets are on the rear wheels. The frame has been altered so as to have a slight kick-up in the rear.

Zenith Duplex Carbureter

The carbureter is a Zenith of the duplex, eight-cylinder model, and the ignition is by the Atwater Kent automatic advance system. Starting and lighting is Ward Leonard, especially adapted to the Monarch car with flywheel application through a Bendix driving pinion. The two-unit system is used, with the motor for starting separated from the generator for lighting. Fuel feed is by Stewart vacuum system. The gasoline tank is in the rear and has been increased in capacity.

Upholstery is flush type, and of genuine, long-grain leather, being cut away from the back of the front seats, giving the effect approaching that of the double cowl body. Fenders are crowned and rounded to the curve of the wheels, which are silver-aluminum finished, giving the car its name.

The wheelbase of the Monarch is 125 in. Tires are 33 by 4½, safety tread in the rear. Equipment is unusually complete.

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6-Tonner Completes Worm Line of Gramms

LIMA, OHIO, Nov. 6—Completing the line of worm-driven trucks produced by the Gramm-Bernstein Co., Lima, Ohio, a new model rated at 5 to 6 tons capacity has recently been added to the 1916 offering of B. A. Gramm trucks. The other trucks are 1, 1½, 2½ and 3½ tons size respectively, and all models are similar in general lay-out.

The new heavy-weight replaces the former 6-ton chain-driven B. A. Gramm, and like all of the more recent B. A. Gramm productions has its motor under a conventional hood instead of between the seats as in the first 2- and 3-ton models. Another departure to be found in this model is in the motor, which, instead of having six cylinders as previously, has but four, the new four, with cylinders 4½ by 6¾ in., has 375 cu. in. displacement, the respective horsepower ratings by the standard formula being 40.8 for the six and 32.4 for the four.

The present B. A. Gramm line consists of the following models, tabulated according to principal specifications:

Capacity, Tons	1	1½	2½	3½	5-6
Price ...	$1,500	$1.800	$2,600	$3,400	$4,300
Wheelbase	118	130	156	158	168
Tires, front	34x3	34x3½	36x4	36x5	36x6
Rear...	34x4	36x5	36x4d	40x5d	40x6d
Drive....	worm	worm	worm	worm	worm

Any of these models will be equipped with an electric lighting and starting system for $200 extra, or with the lighting system only for $100 extra.

Choice of Stromberg or Zenith carbureters is offered on chassis either for domestic or export purchase, fed by gravity from a tank beneath the seat. A Bosch magneto is used for ignition.

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De Tamble Equipment Sold for Taxes

ANDERSON, IND., Nov. 4— The equipment of the De Tamble Motors plant was recently sold for delinquent taxes to Elmer Eckhouse of Indianapolis. The property consists of all machinery, engines and boilers that go to make up the plant. The amount of delinquent tax due the county by the company was $1,150.

Negotiations, it is said, are being made for the resumption of operations at the De Tamble plant. An out-of-town concern has taken up the matter of re-opening the plant, which has been practically idle for two or three years.

Cummins-Monitor Adds a Six

3 by 5 In. L-Head Motor—Car Sells for $895—To Continue Four

COLUMBUS, OHIO, Nov. 6—For 1916 the Cummins-Monitor Co., this city, will add a six-cylinder to its line, to sell at $895, and continue the four-cylinder touring car and roadster models previously made, selling at $795. The motor used in the six-cylinder model is a 3 by 5-in. L-head, designed along the lines of accessibility and light weight.

The chassis is rigidly braced and reinforced to withstand the hardest usage, yet is free from complications. A simple system of brake equalization is used, which has proved very efficient in the test of the new six. The front springs are semi-elliptic and the rear, three-quarter elliptic, underslung, with a swinging saddle, designed to prevent the usual solid impact when passing over very rough roads.

Tires are 33 by 4 with non-skids in the rear. Wheels have large drums with internal expanding and external contracting brakes, the latter being leather-covered to protect the linings from dirt and grit. The rear axle ratio is 4 to 1.

The body, which is mounted on a 115-in. wheelbase, has been designed to give ample room, both in the front and rear compartments. Upholstering is in genuine leather, and the cushions are built with extra deep springs and with a gradual slope toward the back. The body is finished in Brewster green with dark blue as an option, with the rest of the car in back. Vacuum fuel feed is employed, the gasoline tank being in the rear.

Slight Changes in Fours

Very slight changes are to be noted in the four-cylinder models. The 4-30, which has a 108-in. wheelbase, is a streamline design. Fuel is carried in the rear of the roadster and under the cowl of the touring car. The motor used in the four is a Golden, Belknap and Swartz, 3¼ by 4¼. Cylinders are block-cast, with removable head. Lubrication is by force feed to the main bearings, but the splash system is used for the other parts.

Cooling is by thermo-syphon, and the clutch is a multiple disk, the gearset being three-speed selective.

The rear axle is a Russell floating type, with 1¼-in. shafts. Hyatt roller bearings are used in the axle and the driving shaft. Brakes are inclosed to prevent mud and dust from reaching the linings. The steering gear is of the irreversible type and has a 17-in. wheel.

Splitdorf ignition is used with a 12-volt Disco electric generator and motor for cranking and lighting. Tuthill semi-elliptic springs are found in the front of the four and three-quarter elliptic in the rear.

Speedometer, ignition switch, ammeter and lighting switch are carried in a unit case on the instrument board and are illuminated at night by a dash lamp. The windshield is rain-vision, ventilating. Tires are 32 by 3½, non-skid in the rear, with demountable rims and one extra rim goes with each car.

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Jeffery Sedan for $1,165

KENOSHA, WIS., Nov. 6—The Thomas B. Jeffery Co., this city, has brought out a sedan for its four-cylinder chassis to sell at $1,165. The sedan top is easily removed, converting the car into an open machine at the first approach of warm weather.

The entire car is built in the Jeffery factory, and looks like a permanent inclosed car.

The roof of the car is of laminated wood construction covered with a fine quality of top material. The rear section of the body of the top is metal, and the supports and sills are of a very substantial character. Yet with all this strength and appearance of permanence, the weight of the top is but approximately 200 lb. Taking into consideration the removal of the summer top, this makes a total added weight of a little over 100 lb.

The glass in the windows is of 3/16-in. crystal plate, ground and polished. In the broad forward windows and in the doors, the glass is arranged to drop half way. The rear window is extra large, providing more than ample light and vision. This window and the two rear side windows are provided with silk portiere curtains.

Because of the substantial construction of the top and careful padding between the top and main body of the car, there is said to be no rattle, even over the roughest roads. This careful padding also protects the top of the touring body—doing away with the need of refinishing when the top is taken off in the summer.

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U. S. Truck Prices Lower

NEW YORK CITY, Nov. 6—The United States Motor Truck Co., Cincinnati, Ohio, has reduced its prices on its models E, D, H, J and K, effective in 1916. The old and new prices are as follows:

Model	Old Price	New Price
E	$2,550	$1,900
D	3,200	2,400
H	2,700	2,200
J	3,400	2,800
K	4,200	3,600

Stegeman Trucks Six and Two Fours

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4-Ton Six Has 3¾ by 5¼ Motor of 50 H. P.—All Motors Continentals

MILWAUKEE, WIS., Nov. 6—The new line of worm-driven trucks announced by the Stegeman Motor Car Co., Milwaukee, Wis., employs the same style of motors as was used formerly in the chain-drive vehicles brought out by that concern—Continentals. In the 1½-ton and 2½-ton trucks, a 4⅛ by 5¼-in. four-cylinder motor, developing 35 hp. is used, while the 4½-ton machine is equipped with a 3¾ by 5¼ six-cylinder, 50-hp. motor. The makers declare that the six-cylinder motor will do away, largely, with the damaging internal vibration on the large machine.

Three-point suspension is employed and the motors all are equipped with sealed governors limiting the speed to 1100 r.p.m. The car speed of the 1½-ton is 18 m.p.h., the 2½-ton, 15 m.p.h. and the 3½-ton, 12 m.p.h. Lubrication is by a combination of the splash system and double plunger pump. Cooling is by centrifugal pump, gear driven, in connection with a large radiator. A Stromberg carbureter with a hot-air connection is used.

The frame is pressed steel, channel section. In the 3½-ton Stegeman, the frame is reinforced by nickel-steel truss rods. The standard wheelbase of the 1½-ton is 150 in.; of the 2½-ton, 144 in., but this model may be equipped with a special long wheelbase, which measures 162 in. The wheelbase of the 3½-ton is 156 in.

The standard tire equipment on the 1½-ton machine is 34 by 3½ solid front tires and 36 by 5 solid rear. On the 2½-ton, 34 by 4 solid in front and 36 by 4 dual solid in rear. The 3½-ton truck is equipped with 36 by 4 solid tires in front and 40 by 5 dual solid in rear. The standard tread of the 1½-ton is 56½ in.; the 2½-ton 58 in., and the 3½-ton, 65 in. However, a special country road 2½-ton is offered with a tread of 56½ in.

The chassis weights of the 1½, 2½ and 3½-ton models are 4200, 5000, and 6000 lb., respectively, and the prices in the same order, $1,900, $2,500 and $3,000. Any style of body will be supplied, to order.

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Koehler 1-Ton Truck at $895

NEWARK, N. J., Nov. 6—Specializing in one type of chassis for a four-cylinder, shaft-driven, 1-ton capacity truck, the H. J. Koehler S. G. Co., Newark, N. J., plans a minimum output of 2000 machines for the 1916 season. This concern's product, known as the model K, sells for $895, has a wheelbase of 129 in., is equipped with a complete, roomy, flare-board type of body, perfected for the purpose of meeting a general demand for a full-ton carrying capacity. Besides, the truck is designed for speed, assuring rapid transportation.

The power plant is of the unit type, combining the motor, clutch and gearset. Three-point suspension is used. The four-cylinder motor has a 3 1-2-in. bore and a 5-in. stroke, is of the valve-in-head type, and develops 30 hp. Cylinders are block-cast, the upper part of the crankcase being cast integral. A jacketed cylinder-head contains the entire valve arrangement for the four cylinders and is easily removed. An important feature of the motor is that the exhaust gases have a quick outlet to the manifold, separate from the cylinder head, thereby giving immediate expulsion of the exhaust heat from the cylinder head ports, allowing valves and adjacent parts to be cooler and taking a burden from the cooling system.

A cone type clutch is housed with the flywheel and the gearset. Three speeds forward and one reverse are offered. All gears are made from an alloy steel containing proper parts of nickel and the shafts are mounted between annular ball bearings.

A special feature of the spring suspension is the use of graded springs both in front and rear. These springs are built up of four different thicknesses of leaves.

The internal gear drive type of rear axle is employed, all working parts of which are mounted on heavy-duty roller bearings. Both front and rear wheels are 34 in. in diameter.

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Moreland Distillate Truck Lowers Prices

LOS ANGELES, CAL., Nov. 5—The Moreland Motor Truck Co., maker of Moreland distillate trucks, this city, has announced a sweeping reduction in prices for the coming year, as follows:

Capacity	Old Price	New Price
1-ton	$1,850	$1,150
1½-ton	2,200	1,850
2½-ton	2,800	2,400
4-ton	3,650	3,200

Continental four-cylinder motors are used in the full line except for the 4-ton model, which employs a special motor of Moreland construction. The 1-ton Continental motor is of 3¼ by 5, the 1½-ton model is 4⅛ by 5¼, while the 2½-ton is 4½ by 5½. The Moreland motor on the 4-ton is 4¾ by 6¾ in.

All of the motors are fitted with the Moreland gasifier, a fuel economizer produced by the Moreland company. Proceeding on the theory that No. 1 engine distillate, a clear, colorless liquid with a gravity test of 48, and selling at an average retail price of 6 cents a gallon, was the cheapest fuel to be had on

the Pacific Coast, the company developed the gasifier to take care of the heavier fuel. The action of the gasifier is simple. It is made of cast iron to give it heat-holding qualities and the exhaust and intake manifolds are cored through the outer shell, which completely envelops them. Fresh air is drawn through holes drilled in the top of this outer shell, directly upon the exhaust and intake manifolds, and this air, now heated, is drawn down into the air intake of the carbureter, heating the intake manifold at the same time. The fresh, warm air readily vaporizes the distillate in the carbureter, with the result that the mixture is carried through the warm intake manifold, and enters the cylinders as warm, dry gas which is readily ignited.

The wheelbases of the four models are 126, 150, 168 and 186 inches, respectively, for the 1, 1½, 2½ and 4-ton models.

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DETROIT BANKRUPTS PAY DIVIDENDS

DETROIT, MICH., Nov. 9—The Detroit Trust Co., trustee for the old Briggs-Detroiter Co. is sending out a first dividend of 10 per cent to creditors of proved claims. A large number of claims are still being investigated and will be taken care of after having been approved.

DETROIT, MICH., Nov. 9—A fourth dividend amounting to 3 per cent has been paid to creditors of the bankrupt American Voiturette Co. The preceding dividends consisted of two 10 per cent dividends and one of 4 per cent, making a total thus far of 27 per cent dividends paid, or approximately $90,000.

DETROIT, MICH., Nov. 9—The Union Trust Co. will shortly pay another dividend of 10 per cent to the creditors of the bankrupt Church-Field Motor Co., Sibley, Mich. Two dividends, one of 15 per cent and the other of 10 per cent, have been paid to the creditors previously.

The trust company has also paid a 10 per cent dividend to the creditors of the bankrupt Benham Mfg. Co.

DETROIT, MICH., Nov. 9—The creditors of the bankrupt Krit Motor Car Co. of which Frank W. Blair, of the Union Trust Co. is trustee, have been paid a first dividend of 4 per cent. The creditors of the Krit Sales Co., of which Henry Lansdale is trustee, have received thus far two dividends, one of 25 per cent and the other of 12½ per cent.

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Imperial Wheel Doubles Plant

FLINT, MICH., Nov. 4—The plant of the Imperial Wheel Works is being practically doubled in size. The present daily output is said to average between 1000 and 1200 wheels and it is to be considerably increased.

No Tire Shortage in England

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Manager of Goodyear Co. of Great Britain Says Business Is Tranquil

AKRON, OHIO, Nov. 6—"We have been getting big shipments of tires in England, but even these have not permitted us to fill all our orders," says P. D. Saylor, managing director of the Goodyear Tyre & Rubber Co. of Great Britain, who has just arrived from London and is spending a few days at the Akron headquarters in the interest of Goodyear's European trade.

"Business is tranquil in London, and, contrary to the general opinion, there is no shortage of tires. It is true that the government has taken and is receiving now great quantities of tires from the manufacturers, but they have equipped themselves to take care of the increased business, and are able to fill the government orders and at the same time supply the trade. The tire manufacturers are pleased to get the government business and seek it.

"The advent of so many women into the trades formerly occupied solely by men at first occasioned not a little apprehension on the part of the trade unions, but this was amicably dispelled by the granting of men's wages to the women. All of the rubber companies are making up the difference between their men's present pay as soldiers, and their former salaries, forwarding the money to the families left behind. Consequently there is little distress among the families of the men at the front.

"The 33 1/3 per cent duty placed on automobiles has apparently had very little effect on the flow of American cars to England, as there is a strong demand for the medium-priced cars, occasioned largely by the shortage of horses. Many thousands of horses have been requisitioned by the government. The 40 per cent income tax increase, however, has begun to be felt, as has also the 50 per cent tax on the profits of all business houses, over an average of the last two years' profits."

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Downey Heads Michigan Crank Shaft Co.

LANSING, MICH., Nov. 5—Charles P. Downey has been elected president of the Michigan Crank Shaft Co., while Oliver Meyer, formerly manager of the National Engineering Co., Saginaw, Mich., has become manager.

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Electromobile Co. Consolidated

ST. LOUIS, MO., Nov. 6—The Electromobile Co. of St. Louis, maker of an electric indoor truck, has consolidated with the Orenstein-Arthur-Koppel Co. of Koppel, Pa., according to an announcement made here to-day by S. J. Bernheimer, president of the local company. Hereafter the Koppel firm will manufacture the truck and the Electromobile company will market the product in the Southwest. The latter company will continue to make headquarters here.

The truck, which was first exhibited at the 1914 St. Louis show, is now in general use in industrial plants here and in neighboring cities. The operator stands by the control at the rear of the truck.

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Indorse Battery Standards

CHICAGO, ILL., Nov. 9—*Special Telegram*—At the weekly luncheon of the Chicago section of the Electric Vehicle Association, held at the Hotel Metropole to-day, W. F. Bauer, chairman of the local standardization committee, told of the work of his organization. The local committee's recommendations as regards battery standards coincide exactly with those of the parent body in specifying side-to-side assembly in trays and giving as the reason that in the end-to-end method jars are frequently broken due to the edges of the plates hitting the side of the jar whenever the vehicle is subjected to impact.

Wide latitude in assembly methods is left to the manufacturer by the committee as any number of cells to a tray between the limits of two and seven may be used.

The sub-committee on rubber jar sizes reported that it found twenty-eight different sizes prevailing, varying in dimensions from 1/16 to ⅛ in. This, Mr. Bauer declared, has forced manufacturers to keep large amounts of dead stock on hand to meet emergencies and is one of the factors responsible in keeping up the prices of lead batteries.

Regarding charging apparatus, it was suggested that a chart should be arranged to enlighten the garage man as to what he should do to eliminate losses through improper methods. Secretary McCall announced that the Commonwealth Edison Co. will give everyone who has charging apparatus a guarantee that current will not cost him more than 4 cents a kw-hr. if he charges batteries for others when asked.

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Soennichsen Forms Parts Co.

MILWAUKEE, WIS., Nov. 4—A. M. Soennichsen, one of the founders of the Auto Parts Mfg. Co., Milwaukee, has resigned as general manager to organize the A. M. S. Co., this city, manufacturer of automobiles parts and accessories. G. W. Browne and T. C. McMillan are associated with Mr. Soennichsen. A factory is being established in the Manufacturers' Home Bldg., foot of Mason Street.

227,467 Registration in N. Y.

57,296 More Owners and Dealers Than in 1914—77,675 Chauffeurs

NEW YORK CITY, Nov. 6—Up to Nov. 1, 1915, there were registered in New York State 227,467 automobile owners and dealers and 77,675 chauffeurs as compared with 167,755 owners and dealers in the same period in 1914 with 64,326 chauffeurs. The receipts in 1915 were $1,860,050.50 as compared with $1,506,933.86 in 1914.

In the whole year of 1914 only 170,171 owners and dealers were registered with 67,170 chauffeurs. Receipts for that year amounted to $1,533,367.86.

	Owners and Dealers	Chauffeurs	Receipts
Nov. 1, 1915..	227,467	77,675	$1,860,050.50
Nov. 1, 1914..	167,755	64,326	1,506,933.86
Total, 1914...	170,171	67,170	1,533,367.86

Olds Reduces Eight $100

LANSING, MICH., Nov. 10—*Special Telegram*—The Olds Motor Works, this city, has reduced the price of its type 44 eight-cylinder car from $1,295 to $1,195. This car, which was described in THE AUTOMOBILE for Oct. 21, has a V-type eight-cylinder Northway motor with cylinders 2⅞ by 4¾, a 120-in. wheelbase, leather-faced cone clutch, floating axle, three-quarter elliptic springs, open driveshaft with two universals and three-speed gearset.

Studebaker Amplifies Territorial Work

DETROIT, MICH., Nov. 5—The Studebaker Corp. has provided a western and an eastern division in the office of the territorial manager. T. E. McMeans, formerly of the claims division, has been promoted to territorial manager for the western division, while W. C. Shanafelt retains the eastern district. To their duties has also been added that of looking after the service system.

Reliance Takes Saeger Engine

LANSING, MICH., Nov. 4—The Reliance Engineering Co. has taken over the Saeger Engine Works, and expects to greatly increase its production capacity of automobile parts. The Reliance company has been supplying a large amount of parts for the Chevrolet Motor Co., and it is rumored, but not confirmed, that the control of the Reliance company is now in the hands of the same interests who control the Chevrolet company.

650 Grant Cars a Month

FINDLAY, OHIO, Nov. 6—The Grant Motor Co., this city, is running on a regular spring schedule, producing about 650 cars per month, and orders for actual shipment and for storage by its larger dealers and distributors will absorb every car it can make up to March 1. From then on until the end of the season, the production will be largely augmented.

The company recently erected two large buildings for stock storage purposes, one 60 by 225 ft., the other 50 by 200 ft., and is about starting work on an addition to its final assembly plant, of a building aggregating 20,000 sq. ft.

War Order for Gersix

PORTLAND, ORE., Nov. 4—The Gerlinger Motor Car Co., this city, maker of the Gersix truck, has received large orders for export. This is the only six-cylinder truck made on the Pacific Coast. One of the warring nations has placed an order for ten trucks a month, commencing the first of the year.

Kokomo Companies Increase Facilities

KOKOMO, IND., Nov. 8—A large brick addition is being built by the Kokomo Brass Co., and associated companies, Byrne Kingston & Co., and the Kokomo Electric Co. These concerns are now supplying some of the largest concerns in the automobile and tractor industries.

Maxwell to Add 130,000 Sq. Ft.

DETROIT, MICH., Nov. 8—The plant of the Maxwell Motor Co. on Oakland Avenue, where the assembling and shipping departments are located, will be greatly enlarged. An additional factory building, one-story high, 130 by 1000 ft. with sawtooth roof will be erected, thus adding 130,000 sq. ft. of floorspace to the plant.

Auto Body to Buy Acme Plant?

LANSING, MICH., Nov. 5—The Auto Body Co., which has been expanding very rapidly during the last year, is reported to be negotiating with the Acme Engine Co. for the purchase of the latter's plant, which is located opposite that of the Auto Body Co.

G. V. Strike Settled

LONG ISLAND CITY, Nov. 5—The two weeks' strike of 550 employees of the General Vehicle Co., this city, for an eight-hour day instead of nine, has been ended. The strike was called in sympathy for the machinists on strike at Schenectady.

Walpole Creditors Receive Dividend

BOSTON, MASS., Nov. 5—The receivers of the Walpole Tire & Rubber Co. have been authorized to pay another dividend of 5 per cent by Judge Dodge in the United States District Court. This makes 90 per cent paid on claims allowed. The receivers expect to pay another dividend later. They have $200,000 on hand now.

Fight Glare Rule in St. Louis

Accessory Dealers Claim Ordinance Hurts Business and Increases Accidents

ST. LOUIS, MO., Nov. 6—Automobile men, especially accessory and supply dealers, are making loud and bitter complaint against the St. Louis anti-glare headlight law which they say is responsible for a decrease in their business as well as for the unusual number of automobile accidents which have occurred in this city since the dimmer ordinance went into effect.

The wholesale arrests of motorists whose lights did not comply with the new law, the accessory men say, have so frightened the owners of cars that many, ignorant of the exact requirements of the law, are operating their machines with dim lights, dash lights and in many cases without any lights.

To this they attribute the fact that the total of deaths caused by automobiles during the current year has been brought up to fifty-five and the injured to approximately 300 during the last few weeks. Last month alone twelve persons were killed by automobiles here and nearly a hundred injured. Those favoring the ordinance point out that the number of cars has increased 100 per cent, while accidents have increased only 33 per cent.

Insurance men have joined hands with the accessory dealers in condemning the ordinance which prohibits the use of lights whose rays are more than 3 ft. above ground at a distance of 75 ft. in front of the automobile. Companies which have placed liability insurance on automobiles have been besieged during the last few weeks as never before with claims for injury to persons and machines alike.

The law defeats its own purpose, in the opinion of the insurance and accessory men. It was adopted in the belief that dazzling headlights bewilder pedestrians and motorists coming from opposite directions. On the contrary, opponents of the law argue, glaring headlights served to warn pedestrians.

Shorter Hours for Mercer Men

TRENTON, N. J., Nov. 6—The Mercer Automobile Co., this city, is the second largest concern in Trenton to voluntarily grant its men a shorter week. The company will hereafter count fifty hours a week, instead of fifty-four as at present, and the wages will remain the same. About 350 machinists are employed. Last week the John R. Roebling's Sons Co. also reduced the working week of [illegible] chinists without any reductio[illegible]

Gasoline Goes Up 1 Cent

Both Standard Oil and Independents Advance Prices—Trouble in Georgia

NEW YORK CITY, Nov. 4—Another advance of 1 cent occurred last week in the gasoline field. Garages in New York City are charging owners 22 cents a gal., an advance of 1 cent a gallon. During the summer the low price was 16 cents. The price of gasoline in northern New Jersey to the owner has been increased 1 cent to 19 cents by the gasoline delivery wagons.

Philadelphia gasoline has been advanced 1 cent, to 15 cents a gallon. Boston gasoline also received a 1 cent advance and is now quoting at 19 cents on the tank wagon basis. Standard Oil in that city has advanced the price 1 cent to 19 cents, tank wagon basis, meeting the earlier advance of the independents.

The Standard Oil of Nebraska has advanced the price of gasoline on tank wagon basis to 13 cents a gallon and has made corresponding advances throughout its entire territory. In Omaha, the price has been advanced ½ cent to 13 cents, tank wagon basis. The last thirty days has seen a rise from 10 cents, the low price this summer, and in fact the low price since March.

The S. O. of Kentucky has advanced gasoline prices 1 cent to 14½ cents, tank wagons and garage basis.

At Nashville S. O. now quotes at 16 cents a gallon to garages and 16 cents in lots of less than 100 gal. The Gulf Refining quotes the straight price of 17 cents. The price last March was 10 cents a gallon.

The independents have advanced their price 1 cent to 11.8 cents a gallon, tank wagon basis. This meets the price of the S. O. which has not been changed since the last previous advance.

The Atlantic Refining Co. in Pittsburgh, has advanced gasoline 1 cent a gallon to owners. Gasoline is now quoted at 17 cents a gallon, 68-70 deg., 19 cents, and 76 deg. at 12 cents. The prices on March 31 were 9 cents, 11 cents and 13 cents respectively.

In Detroit, gasoline is selling at 13 cents at practically all filling stations and garages, whether received from S. O. or some other company. This is an increase of 1 cent over the former price, which itself had been raised 1 cent, from 11 to 12 cents.

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Georgia to Prosecute Gasoline Dealers

ATLANTA, GA., Nov. 4—Between fifty and seventy-five retail and wholesale dealers in gasoline located in several Georgia cities are to be prosecuted by the state department of agriculture for violation of the State law which forbids the misbranding of gasoline as to the specific gravity of same.

This law requires that all retailers shall post signs, showing the specific gravity, and it is understood that some of the prosecutions will be for failure to brand at all.

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Higher Market Prices

NEW YORK CITY, Nov. 9—Prices in metals, lubricants and rubber last week were higher. The metals, after a substantial gain the previous week, made a new record when all the products listed under that head, made gains. Copper, aluminum, Bessemer and Open-Hearth steel and lead featured the market. Crude rubber was stronger with a 2-cent rise. This was due in the main to a stronger market in London and reports of a firmer situation in Brazil. The demand was more active, though manufacturers, as a rule, were disposed to restrict their purchases to moderate lots.

The oils and lubricants market was stronger last week. Gasoline prices in general are higher. Yesterday, New York gasoline went up to 18 cents a gallon in steel barrels. Pennsylvania crude petroleum saw a rise of 5 cents a barrel. Lard oil closed yesterday at 92 cents with a gain of 7 cents for the week.

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.54	.54	.55	.54	.56	.56	+.02
Antimony	.34	.34	.35	.34	.35	.35	+.01
Beams and Channels, 100 lb	1.67	1.67	1.67	1.67	1.77	1.77	+.10
Bessemer Steel, ton	25.00	24.50	25.00	25.00	25.50	25.50	+.50
Copper, Elec., lb	.18	.18	.18⅛	.18	.18¼	.18¼	+.00¼
Copper, Lake, lb	.18	.18¼	.18⅛	.18	.18¼	.18¼	+.00¼
Cottonseed Oil, bbl	7.65	7.50	7.65	7.75	7.50	7.58	—.07
Cyanide Potash, lb	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.45	.45	.45	.45	.45	.46	+.01
Gasoline, Auto, bbl	.17	.17	.17	.17	.17	.18	+.01
Lard Oil, prime	.85	.85	.85	.85	.85	.92	+.07
Lead, 100 lb	4.90	4.90	5.00	4.90	5.00	5.00	+.10
Linseed Oil	.62	.62	.62	.62	.62	.62	...
Open-Hearth Steel, ton	26.00	26.00	26.00	26.00	27.00	27.00	+1.00
Petroleum, bbl., Kan., crude	.80	.80	.80	.80	.80	.80	...
Petroleum, bbl., Pa., crude	1.80	1.80	1.80	1.80	1.85	1.85	+.05
Rapeseed Oil, refined	.77	.77	.77	.77	.77	.77	...
Rubber, Fine Up-River, Para	.57	.57	.57½	.57	.57½	.59	+.02
Silk, raw, Ital	4.40	...	4.45	...	...	4.60	+.20
Silk, raw, Japan	4.25	...	4.50	...	...	4.50	+.25
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb	36.00	36.25	36.63	34.75	36.00	36.25	+.25
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	...

Five More N. A. C. C. Members

NEW YORK CITY, Nov. 5—Five more companies have been admitted to membership in the National Automobile Chamber of Commerce, including the Milburn Wagon Co., Toledo, Ohio, maker of the Milburn Electric; Lewis Spring & Axle Co., Jackson, Mich., building the Hollier Eight; Argo Motor Co., Jackson, Mich., the Argo car; Empire Automobile Co., Indianapolis, Ind., Empire; and Consolidated Car Co., Detroit, Mich., Abbott.

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October Shipments 15,972 Carloads

NEW YORK CITY, Nov. 5—At the regular monthly meeting of the National Board of Directors of the National Automobile Chamber of Commerce, Inc., held at the headquarters of the Chamber here yesterday, the Traffic Committee reported that October shipments of automobiles amounted to 15,972 carloads as compared with 10,443 carloads shipped in October, 1914, or an increase of over 50 per cent. In September of this year shipments amounted to 17,190 carloads.

Automobile shipments for the past year for each month are as follows:

1914	
October	10,433
November	6,719
December	6,378
1915	
January	8,369
February	11,273
March	16,442
April	17,112
May	13,642
June	15,325
July	12,517
August	15,359
September	17,190
October	15,972

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Continental $416,000 Dividend

DETROIT, MICH., Nov. 4—Papers were filed with the County Clerk by the Continental Motor Mfg. Co. showing that in addition to the increase of its capital stock from $2,400,000 to $2,900,000, a stock dividend of $416,000 was declared which goes to present stockholders. Of the new capital stock of the company, $900,000 is preferred and it will be subject to redemption at par, Oct. 1, 1932. It may, however, also be redeemed before that date at $105 per share, plus accumulated dividends, after sixty days notice to holders.

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Chandler Stock Oversubscribed

NEW YORK CITY, Nov. 5—So eager have subscribers been for the increased issue of common stock of the Chandler Motor Car Co., which was listed at 85, that the total amount was oversubscribed a dozen times at the date of closing the subscriptions. This oversubscription was largely due to the fa-

vorable financial standing of the company, which for the nine months ending September, showed a profit of $950,000 earnings on stock, and it is estimated that the net earnings for the calendar year will be in excess of $1,000,000. F. C. Chandler, president of the company, states that the company has at present $690,000 in cash, which will be increased by the new money going into the concern to $1,786,000. The only liabilities are $125,000 current bills not due. President Chandler estimates the earnings for the coming year at approximately $2,000,000.

Gray-Dort Co. to Make Cars in Canada

CHATHAM, ONT., Nov. 6—Capitalized at $500,000 of which $300,000 is paid up, the Gray-Dort Automobile Co. has been organized here to make the Canadian Dort cars.

Robert Gray, of the Gray-Campbell Co. and J. D. Dort, who has been president of the Dort Motor Car Co., Flint, Mich., are the heads of the new company. F. Knight will be superintendent. Frank Averill has also come here from Flint to join the new organization.

Remsen Heads N. A. C. C. Committee

DETROIT, MICH., Nov. 2—The National Automobile Chamber of Commerce has named A. H. Remsen, assistant office manager of the Studebaker Corp. as chairman of the repair parts policy committee of the chamber.

Dividends Declared

Pratt & Whitney Co.; quarterly 1½ per cent on preferred, payable Nov. 15.

Maxwell Motor Co. quarterly, 1¾ per cent on preferred.

Security Prices Lower

War Stocks Drop — Reactionary Tendency Starts—Tire Issues Fairly Strong

NEW YORK CITY, Nov. 10—Motor stocks have suffered heavily in the last ten days, General Motors dropping 22 points; Maxwell 19; and Willys-Overland 45, the heavy losses being generally due to reactionary tendency that set in over two weeks ago. Practically all motor stocks have sold off while railroad stocks have shown perceptible gains.

These and other stocks which have been making phenomenal rises since July 29 are now suffering a few similar setbacks. Yesterday General Motors dropped 20 points; Studebaker 21; Maxwell 12, and Overland 21. The present price of these four leaders in the motor stock market is still high compared with Aug. 1, at which time General Motors was 203 and it is now 370. At that time Studebaker was 83¾ and is now 215. Maxwell was 36 and is 65½. Overland was 147 and is 215. There is nothing unusual in the declining prices in these stocks in the last few days, the drops being due to some of the holders trying to realize the heavy profits they have made in the last few weeks.

Most important in the motor stocks is the new issue of Willys-Overland consisting of $15,000,000 out of an authorized $25,000,000 of new convertible 7 per cent preferred stock to be offered to holders of common at 102½ to the extent of 71½ per cent of their holdings.

Portage Rubber and Peerless featured the market last week. The former stock closed on Saturday at 80 with a net gain of 20½ points. Its security rose to 98 with a gain of 4 points. Portage officials expect this fiscal year to duplicate the record of the preceding twelve months, when 15 per cent was made for common. The company has no war business; it is increasing capacity by a small addition, and when that is completed will be able to turn out 600 tires a day. It is reported that sales for 1916 are looming up 100 per cent greater than those for 1915. Peerless common went up 25¼ points, closing at 147¼.

Chalmers common went up 6 points. This stock, it is said, will be put on an annual dividend basis of $12 a share early next year. Profits the current fiscal year are said to be equal to about $30 a share on the common, which has been paying yearly dividends of $10 a share for four years.

Quotations in the Detroit markets were generally higher. Paige-Detroit kept up its rise, this week going up 15 points. General Motors, after dropping 16 points the previous week, rose 18 points, closing at 370.

700 Trucks Sold to France

NEW YORK CITY, Nov. 10—Sales of motor trucks last week to the French government totalled approximately 700 trucks. The companies from whom the purchases were made has not been announced. The trucks were of the conventional sizes that the government has been purchasing for the past year.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co., com			300	..	..
Ajax-Grieb Rubber Co., pfd			101	..	..
Aluminum Castings, pfd			102	..	..
J. I. Case, preferred			86	87½	+3
Chalmers Motor Company, com			156	160	+6
Chalmers Motor Company, pfd			102	104	..
Chevrolet Motor Co			123	126	—7
Electric Storage Battery Co			70	72	—1
Firestone Tire & Rubber Co., com			770	775	+20
Firestone Tire & Rubber Co., pfd			112	..	..
General Motors Company, com			369	371	—23
General Motors Company, pfd			113	114¼	..
B. F. Goodrich Company, com			71	73	—5
B. F. Goodrich Company, pfd			111	113	—2½
Goodyear Tire & Rubber Co., com			328	333	—6
Goodyear Tire & Rubber Co., pfd			110	112	..
Gray & Davis, Inc., pfd			..	..	..
International Motor Co., com			35	37	—4
International Motor Co., pfd			64	67	—1
†Kelly-Springfield Tire, com			76	77	..
†Kelly-Springfield Tire, 1st pfd			94	97	—1
†Kelly-Springfield Tire, 2d pfd			76	77	..
Maxwell Motor Co., com			67¾	68¼	—15
Maxwell Motor Co., 1st pfd			97	97¾	—3¼
Maxwell Motor Co., 2d pfd			57	59	—6½
Miller Rubber Co., com			249	252	+9
Miller Rubber Co., pfd			109½	110½	+ ½
New Departure Mfg. Co., com			..	..	..
New Departure Mfg. Co., pfd			..	..	..
Packard Motor Car Co., com			130	135	..
Packard Motor Car Co., pfd			100	102	..
Paige-Detroit Motor Car			465	..	+5
Peerless Motor Car Co., com			147¼	147⅜	+25¼
Peerless Motor Car Co., pfd			92	96	..
Portage Rubber Co., com			80	85	+20½
Portage Rubber Co., pfd			98	100	+4
Regal Motor Co., pfd			15	20	+1
*Reo Motor Truck Co			21	22	+1¼
*Reo Motor Car Co			40	..	+1½

No quotations available at this time on account of war.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Splitdorf Electric Co., pfd			..	..	..
Stewart-Warner Speed. Corp., com			75	76	+ ½
Stewart-Warner Speed. Corp., pfd			106	..	..
Studebaker Corp., com			162	163	—10
Studebaker Corp., pfd			113	115	—2
Swinehart Tire & Rubber Co			90	92	—1
Texas Co.			169	170	—1
U. S. Rubber Co., com			55	56	— ½
U. S. Rubber Co., 1st pfd			106¾	107¾	+1¼
Vacuum Oil Co			215	220	..
White Co., pfd			110	..	..
Willys-Overland Co., com			238	242	—22
Willys-Overland Co., pfd			109	111	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co., com	..	97	160	165	+5
Chalmers Motor Co., pfd	..	93½	101	103	—1
Continental Motor Co., com	155	180	230	260	+20
Continental Motor Co., pfd	..	75	89	94	+1
General Motors Co., com	59½	62	370	390	+18
General Motors Co., pfd	80½	82	113	114	+1
Maxwell Motor Co., com	10½	..	71	74	—12½
Maxwell Motor Co., 1st pfd	36	..	98½	101	—1
Maxwell Motor Co., 2d pfd	14	17	57	60	—6½
Packard Motor Car Co., com	..	100	130	135	+1
Packard Motor Car Co., pfd	88½	..	100	101	— ¼
Paige-Detroit Motor Car Co	..	..	480	..	+15
*Reo Motor Car Co	21¼	22	45	49½	+7½
*Reo Motor Truck Co	10⅞	11½	24	25	+3⅛
Studebaker Corp., com	..	..	162	166	—8
Studebaker Corp., pfd	..	..	109	112	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2000	2750	..
Kelsey Wheel Co	185	..	215	..	..
*W. K. Prudden Co	18½	..	22	24	..
Regal Motor Car Co. pfd	..	25	18	..	..

*Par value $10. †New stock when issued.

100,000 See Los Angeles Show

78,000 Paid Admissions at Dealers' Assn. Exhibit —Many Cars Sold

LOS ANGELES, CAL., Nov. 1—Credit for California's most successful automobile show must go to the Motor Car Dealers' Association of Los Angeles. A show has at last been staged on the Pacific Coast which ranks with the salons of the East.

The great Broadway Automobile and Flower Show, which came to a close at midnight last night, eclipses anything of the kind ever before attempted on the Pacific Slope. Not only was the Broadway Automobile and Flower Show a great success from the standpoint of the dealer selling at retail, but an overwhelming success from the standpoint of the distributor. There were 78,000 paid admissions. It is claimed that a quarter of these were prospects as only those interested in motor cars attended the show. Including passes 100,000 attended the salon.

Pleasure cars only were exhibited. Floorspace sold for fifty cents per square foot. Many firms were unable to secure space the last ten days before the opening of the show. The expenses of the show were heavy; but with several thousand dollars cleared for the association, another show under the same auspices is assured for next season.

The last week in October seems to be the best time for a show in Los Angeles. The orange growers who purchase cars annually in southern California to the amount of about $5,000,000 have their money in the banks for the last year's crops and are able to judge what the crops will be for the coming season. The walnut growers have just finished harvesting their crops. The beet and bean growers have their money and the motion picture people who buy cars in great numbers each year, have returned from their vacations and are looking for the latest models to spring at the holiday season.

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150 Studebaker Dealers Meet

BOSTON, MASS., Nov. 8—The annual convention of the New England Studebaker dealers was held last Friday at the Hotel Lenox at Boston, Mass. About 150 dealers were present and Manager George N. Jordan of the New England branch had charge of the affair. Addresses were made by Vice-president James G. Heazlett; Vice-president L. J. Ollier; Sales Manager R. T. Hodgkins; H. A. Biggs, Advertising Counsel; H. T. Myers, manager of the commercial department; F. P. Bump, manager of the New York branch; Lafayette Markle, Chicago distributor; A. L. Davis, Cleveland distributor; H. W. Blevins, Toledo distributor; Joseph Donovan, Boston distributor.

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Los Angeles to Have Permanent Used-Car Show

LOS ANGELES, CAL., Nov. 4—The largest tent in the world houses the latest novelty of the automobile industry established in Los Angeles. It is a used car show. The tent has a capacity of 5000 persons and 500 cars, the show being for the purpose of displaying for sale and exchange the largest supply of automobiles ever housed under one roof.

For many months, there has been a great used car business carried on within a short distance of the heart of the city on vacant lots. Realizing that this business will suffer from the winter rains and that there is a great deal of business to be done after dark, the Union Auto Bus Co., a California corporation with a capital of $75,000, has erected the great tent and will operate the used car show, auctions, sales and exchanges. Real estate is also exchanged for cars and cars for real estate.

A gasoline and oil station is operated on the grounds. In another side tent there is a restaurant. There is also a tent given over to a large accessory stock and another canvas top houses a garage and repair shop.

Inside the main tent there is a large circular track for demonstrating purposes. There is also an elevated runway in the center of the track for testing brakes, gears and motors. This elevated bridge will also be used at the weekly auction as the "block."

These auctions are to be held each Saturday. Cars are entered in the market place for the sum of $1.

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Connecticut Saxon Owners to Organize

NEW HAVEN, CONN., Nov. 6—Plans are under way to form the Connecticut Saxon Society comprising owners of that make of cars throughout the State. The idea is to have all Saxon owners who visit the New York show register there and be entertained by the factory officials, and next summer there is planned an entire day's outing at Savin Rock. One of the features also planned is to have some skilled factory mechanics on hand to give demonstrations to owners how they may repair their cars and get the best service from the machines.

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Studebaker Officials Reach New York

NEW YORK CITY, Nov. 9—A Studebaker business conference was held at Hotel Astor to-day where 150 dealers under the jurisdiction of the local branch met to listen to talks by the factory heads, who are making a tour of the branches throughout the country.

Develop Community Garage

Promoters to Sell One Share Only to Each Automobilist —To Provide Service

MILWAUKEE, WIS., Nov. 6—A community garage and supply system that is likely to furnish a model for other sparsely settled sections of the country is being worked out in Jackson County, Wis.

A number of business men of Black River Falls, have conceived the idea of organizing the 500 motorists of the county into a corporation for mutual benefit. The corporation is to build a garage and supply store which will also serve as clubhouse, and the wants and requirements of all members can thus be met in metropolitan fashion. The garage is to employ competent mechanical help and be prepared to repair, wash and overhaul cars of members at reasonable prices. Supplies will also be sold. It is also the intention of the corporation to act as selling agent for every automobile dealer who becomes a member of the association.

The corporation is to be incorporated with $15,000 capital, divided into 600 shares at $25 par value. A permanent organization is to be perfected on or about Dec. 15. R. P. Rainey and F. A. Parsons of Black River Falls are now canvassing all owners in the county for stock subscriptions, and it is the plan of the promoters to sell only one share to any one individual to make the corporation a true co-operative association.

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Miles Goes to Chicago

NEW YORK CITY, Nov. 6—Samuel A. Miles, general manager of the national automobile shows at New York and Chicago, has gone to the latter city to make the preliminary arrangements for holding the big exhibition Jan. 22-29.

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Try Semaphores in Chicago

CHICAGO, ILL., Nov. 5—A street semaphore for controlling Chicago traffic is being tried out at the intersection of two of the busiest thoroughfares of the city. This is of the conventional Stop-and-Go type and on the top is a combination red and green light similar to the type used for railroad switch signals. The red shows, for instance, north and south while the green shows east and west. Whether or not the semaphore will be definitely adopted on Chicago boulevards has not been determined as yet, but the trial is proving that this particular instrument undergoing test does not place the signal sufficiently high. It is only 8 ft. above the street and high limousines and cars with tops up obstruct the view

of the signal from those in following cars. It also is thought the letters are not large enough to be readily seen at sufficient distance. Another and temporary objection to the semaphore is the fact that Chicago motorists have become educated to listening to the whistle rather than looking for a visible signal and some of them the first day or two have failed to observe the signal at all.

St. Joseph to Have $2,000,000 Speedway

SAINT JOSEPH, MO., Nov. 4—Saint Joseph is to have a $2,000,000 2-mile speedway. Land for the building of a speedway at Lake Contrary, in the southern limits of the city, was donated by holders of concessions at that place.

Preliminary work will begin at once and the first races will be held early next spring.

Dealers Score in Separator Fight

NEW YORK CITY, Nov. 10—The Automobile Dealers Association of New York City, has won an important step in its fight with the fire department against the use of oil separators in garages. Recently the fire commissioner refused to grant a permit to a certain garage on the ground that it did not have an oil separator. On this action being taken the dealers asked for an order of mandamus requiring the fire commissioner to grant a permit. The Supreme Court, before which this action was brought, has ordered that the entire matter be heard before a jury, at which hearing the questions of fact with regard to the necessity of oil separators will be determined.

Another Ahlberg Bearing Branch

MINNEAPOLIS, MINN., Nov. 6—The Ahlberg Bearing Co., Chicago, Ill., has opened a branch office and exchange agency at 926 Marquette Avenue, this city, placing L. J. Bohan as branch manager. The company now has branches in New York, Boston, Cleveland, Detroit, St. Louis, and Los Angeles.

Vesuvius Plug Cheaper to Dealers

NEW YORK CITY, Nov. 8—The price to the dealer of the Vesuvius spark plug made by A. R. Mosler & Co., has been reduced from 75 to 55 cents; this is a 20-cent increase in profit, for the plug will still retail at $1. At the same time the price to the jobber has been reduced from 60 to 40 cents.

Rueschaw in New York

NEW YORK CITY, Nov. 10—R. C. Rueschaw, sales manager of the Reo Motor Car Co., arrived in this city yesterday on a swing around the country. He has been in the far West and on the Northwest coast recently. He states that demands for cars are unprecedented, especially in Canada.

Woman Wins Maxwell Efficiency

33.37 M. P. G. Not Highest Average, But She Did Not Take on Supplies

DETROIT, MICH., Nov. 8—By driving from Buffalo to Haverhill, Mass., a distance of 567 miles, without taking on extra gasoline or oil on the road and thus averaging 33.37 miles to the gallon, her consumption being 17 gal., Miss Eva Cunningham was declared the winner in the Maxwell Dealers' Efficiency Run, which started from Buffalo Sept. 28 and continued for several days after, or until the contestant had reached his home town.

The test or run was part of the convention of the Maxwell dealers of zone No. 1, which includes the New England States, New Jersey, New York, Maryland and eastern Pennsylvania, the dealers taking delivery of new Maxwell cars at the plant in Detroit and starting the home drive from Buffalo.

About 100 started, but owing to the bad roads in many parts of the country through which some had to drive they either gave up the contest or did not care to be considered as contestants. About thirty sent in their sworn affidavits showing exactly what they had done, and from the reports it was seen that the test was in many instances a most severe one.

Two contestants, F. J. Cunningham, Haverhill, Mass., and George D. Robinson, Springfield, Mass., averaged better than the winner, the former covering a distance of 516 miles on 14 gal., thus averaging 36.85 miles to the gallon while Robinson consumed 13 gal. of gasoline to cover 453.8 miles, or an average of 34.90 miles to the gallon. Both of these contestants, however, took on an extra supply of oil during the run while the winner did not take any extra supply and for this reason she was declared the winner.

Louis Nikrent with Chevrolet

LOS ANGELES, CAL., Nov. 5—Louis Nikrent, until recently a member of the Mercer racing team, has given up racing and is now in charge of the service department of the Los Angeles branch of the Chevrolet Motor Co. of California.

115 Studebakers on Four-Day Run

DETROIT, MICH., Nov. 8—To-day 115 Studebaker cars started in different parts of the country on a four-day reliability tour promoted by the Studebaker Corp., the contestants being principally dealers and distributors of Studebaker cars. The start was made as near as possible at 6 a. m., the day's run being over a course of about 250 miles. All cars used are either fours or sixes, standard stock, with full touring equipment, and carrying the number of passengers for which the car is designed. An observer in every car will keep track of happenings on the road. A record of the gasoline and oil consumption will be kept. The total distance of 1000 miles to be run in the four days is to be covered as nearly as possible in 48 hr. of actual running time. The tour has been arranged to get a gasoline and oil consumption record under ordinary touring conditions throughout the country.

Duffy Gets Standard in New York

NEW YORK CITY, Nov. 6—A Standard agency has been opened in New York by the Duffy Motors Corp., factory distributor in New York, New Jersey and Connecticut. The company has leased the property on the southwest corner of Broadway and Sixty-third Street for its show rooms and also has obtained adequate service facilities in the immediate neighborhood.

The Standard Steel Car Co., Pittsburgh, Pa., has been making automobiles for nearly three years.

Lavine Gear Not Reorganized

NEW YORK CITY, Nov. 5—In THE AUTOMOBILE for Oct. 28 it was stated that D. L. Robertson is secretary of the reorganized Lavine Gear Co., Racine, Wis., and that President Uihlein of the company is a member of the family owning the Schlitz Brewing Co. of Milwaukee. These statements were in error, Mr. Robertson being office manager and purchasing agent of the company, which has undergone no reorganization, while Mr. Uihlein has no connection whatever with the Schlitz brewery.

No Truck Show for Philadelphia

PHILADELPHIA, PA., Nov. 5—At a recent meeting of the board of governors of the Philadelphia Motor Truck Association it was decided not to hold a show the week after the annual show of the local automobile trade association. Several of the commercial vehicle agencies in Philadelphia will hold independent exhibitions in their establishments.

Traffic Law for Pedestrians

NEW YORK CITY, Nov. 6—The Street Traffic Society of the Safety First Society at a meeting recently decided that for the better safeguarding of pedestrians greater authority should be given to the traffic police to regulate and direct foot travel upon the public streets and that it should be unlawful for any person to cross a street in the middle of a block.

Factory Miscellany

To Make Automobile Spokes—Elrod & Co., Columbia, Ky., will establish a plant at Erwin, Tenn., to make automobile spokes and other stock. A building has been secured.

Toledo Light Co. Adds—The Electric Auto-Lite Co., Toledo, Ohio, will erect a concrete and steel addition, 103 by 385 ft., three stories. The company makes lamps, horns and other accessories.

Atlas Brass Adds—The Atlas Brass Co. plans a large addition to the plant, located on South Park Street, Columbus, Ohio. The company has found a large increase in business by the manufacture of automobile parts and accessories.

Bowser Adds—The foundation for a new three-story building to serve as vault has been laid by the Bowser company of Fort Wayne, Ind., and the building will be completed as soon as possible. It will be about 25 by 40 ft., and will be of absolutely fireproof construction, as all valuable papers of the company will be placed in it. Work on other buildings at the Bowser plant is progressing rapidly. The fireproof testing building is nearly completed.

Gisholt Machine in New Plant—The Gisholt Machine Co., Madison, Wis., turret lathes and other machine tools, has taken occupancy of the $40,000 addition erected because the rush of business crowded the former quarters to the utmost limit of capacity. The new building affords 25,000 sq. ft. of floor space. Approximately the same space has been added by the leasing of adjoining factory buildings recently vacated by the General Electric Co.

Clayton & Lambert Increase Force—The Clayton & Lambert Mfg. Co., Detroit, Mich., which makes automobile sheet metal parts and sheet metal stampings, will increase its working force from 500 to 1000 men or more. Additions to the plant are being completed and additional machinery and equipment is being installed. The business of the concern is said to have increased over 50 per cent during the last few months. More orders are on the books now than ever before.

Vulcanized Products' Addition Completed—The Vulcanized Products Co., Muskegon, Mich., new addition was completed a few days ago and the manufacturing of inner tubes has started. Within a fortnight the manufacturing of casings will also be started. When the plant will be in full operation it is expected that 200 complete tires will be made daily. Fifty more men are being added to the working force, it being the intention of the company to gradually expend and produce tires on a large scale. W. N. McDonald is factory manager.

Marathon Tire Warehouse in Omaha—The Marathon Tire & Rubber Co. is at present negotiating for the establishment of a warehouse in Omaha. This will in no way interfere with their present distributors or alter their sales plans. The establishment of the warehouse is to facilitate shipments to its distributors in that section of the country.

H. H. Replogle has been appointed manager of the middle west division with headquarters at Omaha.

No merchandise will be sold at retail from the warehouse. The local retail business will be handled by the Akron-Marathon Rubber Co. and its sub-agents.

Safety Engineers Meet at Philadelphia—Interesting and instructive addresses were given by safety engineers, in conjunction with numerous charts, photographs and devices, at the fourth annual congress of the National Safety Council, held Oct. 19, 20 and 21, at the Bellevue-Stratford Hotel, Philadelphia, Pa. Points on safety to workmen and methods of sanitation in industrial plants, whether woodworking, textile or automobile, were ably brought out by the various speakers, each versed in his particular line of work. The automobile industry is represented on the board of directors by J. M. Eaton of the Cadillac Motor Car Co., Detroit, and L. B. Robertson of the Ford Motor Co., Detroit.

The Automobile Calendar

Nov. 12-20.....Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18.....New York City, S. A. E. Met. Sec. Meeting.
Nov. 20.....Arizona 150-mile Grand Prix.
Nov. 22-27.....Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 5.....Worcester, Mass., American Road Builders' Assn. Day.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

1916

Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 17-22.....Rochester, N. Y., Show, Exposition Park. C. A. Simmons, Mgr.
Jan. 17-22.....Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Montreal, Que., Show, Automobile Trade Assn. Ltd.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Fort Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14..... ....Chicago Track Race.

The Week in the Industry

Robbins Chalmers Portland Representative—J. M. Robbins, formerly of Denver, has been appointed Chalmers representative in Portland, Ore., succeeding Marc Bunnell, at present in San Francisco.

Weidely Heads Los Angeles Pathfinder—W. A. Weidely, son of George A. Weidely, motor manufacturer, has been appointed manager of the Los Angeles Pathfinder branch, which serves the entire southern California and Arizona territory.

Gallagher Goes to Chicago—Jos. A. Gallagher, for many years with the Autocar company and the Swinehart Tire & Rubber Co., has been appointed branch manager for the American Taximeter Co., New York City, in Chicago.

Blanchard Makes Change—William Blanchard, who was prominent in the affairs of the Lenox Motor Car Co., Boston, Mass., acting as sales manager and treasurer, has resigned, and he is now sales manager of the Cunningham Motor Car Co. in that city.

Clemens Heads Detroiter Branch—The Detroiter Motor Car Co., Detroit, Mich., has opened branch sales rooms at 676 Woodward Avenue. The factory branch has been placed in charge of W. J. Clemens. Mr. Clemens disposed of the Clemens Motor Sales Co. in Buffalo, N. Y., in order to form his present connection with the Detroiter company.

Coburn Heads New Boston Maxwell—The Coburn-Draper Motor Co. was organized at Boston, Mass., last week to take over the retailing of the Maxwell in that city that the J. W. Bowman Co. gave up. The new company has leased one-half of the Peerless Building at 660 Beacon Street, where it will have sales and service station. Ralph Coburn, who has been identified with the Maxwell for eleven years, and was manager of the New England wholesale branch, is president and W. H. Draper of Providence, treasurer. S. W. Munroe has been sent on from the Detroit factory to take charge of the wholesale branch.

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Dealer

Handling Car Refinishing Paste—The Auto Lacker Sales Co., Denver, Col., has established a branch office at St. Louis, in the Wainwright Building. A. J. Short and C. A. Smith are in charge of the local office. The company's product is a paste which when mixed with water is used as a refinisher for automobiles.

Motor Men in New Roles

Tiffany Detroit McGraw Tire Manager—G. W. Tiffany has been appointed manager of the Detroit branch of McGraw Tire & Rubber Co., East Palestine, Ohio.

Chase Joins Anderson Electric—E. H. Chase, Jr., has become a traveling salesman for the Anderson Electric Car Co., Detroit, Mich. His headquarters will be in Philadelphia.

Frazier Goes to St. Louis—P. G. Frazier, formerly with the Philadelphia branch of the Kelly-Springfield Tire Co., has taken charge of the St. Louis, Mo., branch of the same company as manager succeeding H. L. Smith.

Connick Goes to Los Angeles—H. J. Connick, former Chevrolet dealer at Greenville, S. C., has been appointed supervisor of agencies for the southern California district, making his headquarters in Los Angeles, Cal.

Tucker Service Manager—C. H. Tucker, formerly service manager of the Cole Automobile Co. of Missouri, has been appointed service manager of the De Luxe Automobile Co., St. Louis distributor of Oldsmobile and Metz cars.

Sanborn Heads Detroit Branch—A branch has been established at Twelfth Street and the G. T. R. R., Detroit, Mich., by the Booth Felt Co., Brooklyn, N. Y., felt manufacturers. The branch is in charge of M. R. Sanborn.

Barrabee Forms Own Company—S. L. Barrabee, for some years a partner of the Brophy-Barrabee Co., one of the big accessory firms at Boston, Mass., has retired from the firm and gone into business for himself at 133 Columbus Avenue. His brother Frank has joined him.

Huyck Makes Change—Edgar Huyck, formerly with the Hendie tire factory at Torrance, Cal., has opened a tire and repair establishment at 772 East Third Street, San Bernardino, Cal., with Boyd Hocker, manager of the Pomona Valley Canning Co., Pomona, as a business associate.

Hill Cadillac Representative—F. J. Hill, formerly with the Hupp Motor Car Co., Detroit, Mich., has been appointed southwestern representative of the Cadillac Motor Car Co. His territory will include Georgia, Florida, Alabama, Mississippi, South Carolina, parts of Tennessee and Louisiana.

Holloway Heads Frisco Saxon—R. E. Hollaway, formerly with the H. O. Harrison Co., San Francisco, has been appointed general manager of the Saxon Sales Co., with headquarters in San Francisco. This company will distribute Saxon cars in the Northern California territory, taking over the Saxon agency from the Pearson-Saxon Co.

Apger in Garage Business—H. C. Apger, who until recently was with the Pacific Kissel Kar Branch at Los Angeles in the capacity of sales manager, has purchased the Corner Garage, located in Huntington Park, Cal., formerly owned and operated by the firm of Moore & Stringer. J. F. Smith, former service manager with the Kissel Kar branch in Los Angeles, is associated with Apger.

Tetzlaff Makes Change—Teddy Tetzlaff, formerly with the Lord Motor Car Co., in the capacity of supervisor of agencies throughout Arizona and southern California for the Maxwell, is now with the Harold L. Arnold organization, Dodge and Hudson distributors. The former speed king's new title is district booster salesman. He is to spend his time out with the sub-dealers as an efficiency man.

Ackerson Transferred—C. L. Ackerson, recently manager of the Winnipeg branch of the Maxwell Motor Co., Detroit, has been transferred to Windsor, Ont., where he will make his headquarters and take over the duties of general sales manager for Canada. F. W. Wilkins, recently manager for Saskatchewan, has been transferred to Winnipeg, and will have charge of sales in the western district.

Duffee Makes Change—E. L. Duffee, who has been manager of the New York branch of the Midgley Tire & Rubber Co., Lancaster, Ohio, since the opening of this office some months ago, has been recalled to the home office, where his services are required in another capacity.

E. S. Benson, recently with the Hartford Rubber Works, Hartford, Conn., is now manager of the New York branch of the above company.

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Dealer

Hartford Auto Parts Moves—The Hartford Auto Parts Co., Hartford, Conn., which was forced out of the Colt's west armory by the expansion of the latter concern, has taken a portion of the old Cheney silk mill on Morgan Street. Some time ago the company announced that it would remove to New Britain, where a satisfactory proposition was made by those interested in the company. For a time at least the company will remain in Hartford.

Trade News from Wash.—Lou Schabel, 1302-6 South E Street, Tacoma, Wash., has secured the agency for Swinehart tires.

The Thompson Lubricating Co., Tacoma, has secured the agency for Savage tires.

The Seven Seven Co., Spokane, Wash., and Inland Empire distributor of Dodge cars, has moved into its new garage, at First and Adams Streets.

New Willard Service Stations.—The Willard Storage Battery Co., Cleveland, has added the following service stations to its list: Edward E. North, Warren, Ohio; E. B. Vivian, Monroe, Mich.; The Sleeper Co., Fowler, Ind.; Oriental Auto Co., Chanute, Kan.; Meredith Battery Service Station, Springfield, Mo.; Iowa Battery Service Station, Hampton, Iowa; and Lebanon Storage Battery & Magneto Co., Lebanon, Pa.

Large U. S. Tire Deal—What is said to be one of the biggest tire deals ever closed was effected here this week between the United States Tire Co. and the Simmons Hardware Co., St. Louis. According to officials of the tire company the transaction involved a million dollars' worth of tires. Hereafter the Simmons company and its branch houses in Philadelphia, Toledo, Memphis, Wichita, Kan., and Sioux City, Iowa, will distribute United States tires.

Gas Engine Efficiency Reincorporates—The Gas Engine Efficiency Co., St. Louis, has reincorporated and hereafter will be known as the Efficiency Oil Corp. The incorporators are President Edward Sterns, O. L. Menzing and C. B. Hollister. A retail sales room has been opened at 3213 Locust Street with Hollister in charge. The company manufactures a product which is mixed with the gasoline so as to provide cylinder lubrication.

Late Texas Trade News.—C. H. Gray Rubber Co., Dallas, Tex., has added the Silver King and Blackstone tires.

The Herff-Brooks Automobile Co., Dallas, has been organized by W. C. Blanchard, Dallas, and J. A. Dinwiddle of Fort Worth. Temporary quarters are in the Linz Building.

The Ilseng Motor Car Co., Fort Worth, State distributor for the Monroe, has opened offices at 236 Commerce Street. H. Lester is in charge.

Trade Items from Missouri.—The Sears-Cross Spedindicator has opened a branch office in Kansas City at 205-7 East Eighteenth Street, Kansas City, Mo., under the management of Ed. S. Michelson. A complete branch and service station has been established.

The National Motor Car Co. is now operating a garage at 310 Boonville Street, Springfield, Mo., in a building extensively remodeled for the purpose. Lee A. Patterson is manager, being associated with Dixon Brothers in the operation of the garage.

The district branch and service station of the Hartford Suspension Co., Kansas City, Mo., has been moved to more convenient quarters, with better equipment, at 207 East Eighteenth Street. It formerly was at 1803 Grand Avenue.

Los Angeles Items.—The Kay & Burbank Co., Los Angeles, Cal., has opened a large Delco service station at 1101-3-5-7 South Figuroa Street. In addition to an extensive business as Delco specialists the concern is one of the largest Exide battery depots on the Pacific slope.

J. S. Bushby has opened a garage at 710 West Eleventh Street, making a specialty of Packard and Chalmers repair work.

H. G. Pendell, 1239-51 South Figuroa Street, has been appointed district distributor of Zenith carburetors. Pendell also handles the Commerce and Atterbury truck lines.

Milwaukee News.—The Storage Battery Service Co., organized recently in Milwaukee by C. F. Seifert and W. W. Zeige, has been appointed distributor of Exide batteries. Headquarters are at 137 Oneida Street.

The Philip Gross Hardware Co., 218-220 Third Street, has been appointed distributor of Eveready storage batteries, manufactured by the American Ever Ready Works of the National Carbon Co.

Lando L. Albert, for five years associated with the Hickman-Lauson-Diener Motor Car Co., then State agent for the Ford, has established a Ford repair shop at 187 Oneida Street and is making a specialty of repairs on this make.

An official service station for the Stewart-Warner Speedometer Corp. has been established at 182 Fifth Street, under the name of Speedometer Service & Supply Co.

The Dayton Rubber Sales Co., 415 Cedar Street, has taken the agency for the W. & C. shock absorber for Ford cars, manufactured by Phil. H. Webber & Co., Hoopeston, Ill.

Baltimore Trade Items—J. R. M. Adams, Franklin and Eutaw Streets, Baltimore, has entered the automobile business, as the representative of the Sphinx car. The firm for some time has been handling accessories.

The Baltimore Sewed Tire Co. has leased property at 522 North Eutaw Street, and expects to get into operation at once. C. E. Erdman, G. B. E. Erdman and L. D. Pritchard comprise the firm. In conjunction with the tire renewal business the new concern will handle automobile accessories and will be equipped to handle tire repairing and vulcanizing.

The Double Mileage Tire Co., Inc., 533 North Howard Street, is in charge of Earle E. Ramsdell, general manager. The headquarters of the firm is Buffalo, N. Y. The firm makes a new 4000-mile tire out of two old ones.

The Perfek Device Co., 535 West Baltimore Street, is placing a carbon remover and gasoline saver on the market.

Maurice L. Knight, 1025 West Mulberry Street, is manufacturing dimmers.

The Southern Engineering Corp., 223 West Saratoga Street, will handle a full line of supplies.

Oliver Garage & Machine Co., 1439 North Central Avenue, is now equipped for general repairing and the selling of accessories, as well as in a position to handle storing and hiring.

F. M. Schwalm, 329 Title Building, Baltimore, is the distributor for Maryland of Gaso-Tonic.

Recent Minneapolis Additions—Bohn E. Fawkes, representing the Oldsmobile in this territory, will erect at once a $40,000 brick, terra cotta and glass building at Hennepin Avenue and Harmon Place. The structure will be three stories. L. H. Fawkes of the Fawkes Auto Co. has bought an adjoining tract for $20,000 and will erect an automobile building.

The Ahlberg Bearings Co. of Chicago has opened a branch at 926 Marquette Avenue for sale of annular thrusts and double row and Rodax bearings.

Accessory House for Winnipeg—The Alfred Maw Motor Co. has opened in Winnipeg, Man., and will handle automobile accessories and will make arrangements to handle agencies for a low and medium-priced line of cars. The headquarters are at 417 Portage Avenue.

Electric Products Opens N. Y. Office—The Electric Products Co., Cleveland, Ohio, has opened its Eastern branch office at 30 East Forty-second Street, New York City, in charge of F. W. Eller and J. P. Lyons.

Louisville Agent Moves—The Motor Sales Co., Louisville agent for the Stearns and Saxon, has moved its office and salesroom from 728 South Fourth Street to 931 South Third Avenue.

M. & S. Gear in Canada—The Canadian Fairbanks-Morse Co., with branch houses in all of the important cities throughout the Dominion of Canada, has closed a contract with the M. & S. Gear Co., Detroit, to act as the Canadian distributor for the M. & S. differential.

Moon Agency in Central America—E. H. Serrano of Havana, Cuba, has made arrangements to handle the Moon car in Central America.

Will Repair Radiators—A radiator hospital and factory has been opened by W. C. Craig and F. L. Wilson of Tulsa, Okla., at 422 Bond Avenue, N. W., Grand Rapids, Mich. The men will make a specialty of repair work on radiators. At present they conduct a similar establishment in Tulsa.

Ford Service in Yonkers—The fiftieth sales and service branch of the Ford Motor Co., Detroit, Mich., has been opened by the company in Yonkers, N. Y. Several others are being planned, but arrangements have not progressed to the point where a definite announcement can be made at this time.

Trade News from Spokane—The Oldsmobile Co., Spokane, Wash., Inland Empire distributor for the Oldsmobile has closed a contract to handle in addition the Denby truck in the same territory, which includes all of Washington east of the Cascades, and practically all of Idaho, including the Boise territory. Frank Liddell will have charge of the truck department.

The Seven-Seven Co., Dodge distributor, has recently taken the agency for Kelly-Springfield tires, and has appointed sub-agents for the tires at all of the principal towns of the Inland Empire.

W. J. Ball Motors Co. has become the Inland Empire, distributor for Pierce-Arrow cars and truck.

Eclipse Spark Plugs in Detroit—The Cutting, Armstrong & Smith Sales Co., Detroit, Mich., has been appointed representative for the Eclipse Mfg. Co., Indianapolis, Ind., manufacturer of the Giant and Hercules spark plugs.

Takes Ideal Jack Agency—The Auto Device Sales Co., 139 Oneida Street, Milwaukee, has taken the agency for the Ideal automatic jack for the state of Wisconsin. The company is a large jobber and retailer of specialties, including the Adco shock absorber, manufactured by the Auto Device Mfg. Co. of Milwaukee.

Late Iowa News Items—Splinter & Holscher, garage proprietors at Earlville, Iowa, are installing a modern electric generating outfit for the charging of automobile storage batteries. They also are adding a large lathe to the equipment of their garage.

G. A. McLoney and J. E. Bigler of Moberly, Mo., have bought the Overland Garage at Keokuk, Iowa, and will continue it under the old name. Both are experienced men. Overland cars and fixtures are a specialty and expert machinists will handle an extensive repair business.

R. W. Phelps of Tipton, Iowa, has leased the Ross Building in that city and will establish an exclusive Ford garage, where Ford cars and accessories only will be carried. It will be known as the Phelps Motor Co.

John Hanson and John Hadley of the Waterloo Overland Co. have approved plans and specifications for a new four-story Overland garage and district headquarters at East Fourth and Franklin streets, Waterloo, Ia.

Philadelphia News Items—The Packard Motor Car Co., Philadelphia, has extended to its employees the privilege of acquiring military instruction at the recently organized Drexel-Biddle Military Instruction Camp. The leave of absence is accompanied by full pay and will not affect the regular vacation period allowed them.

The Studebaker agency at Broad and Callowhill Streets, Philadelphia, is receiving bids for remodeling the showroom, including extensive interior decorating.

The Stevens-Duryea Motor Parts and Service Station opened on Nov. 1 at 3001 Montgomery Avenue, Philadelphia, under the proprietorship of Archie Thompson. The garage has a capacity for 100 automobiles.

The Standard Supply and Equipment Co., 1710-12 Market Street, Philadelphia, will shortly move its accessory and general equipment business to new and larger quarters at Thirteenth and Cherry Streets.

The Keystone Repair and Service Co. is preparing to erect a garage and station at 5117-19 Frankford Avenue, Philadelphia. It will be of brick, one-story high, and will cost $2,000.

The Birch Motor College, Inc., to conduct schools in motoring and engine construction, was recently incorporated with a capital of $20,000 by H. M. Brown, M. E. Shakespeare and L. S. Dorsey of Wilmington, Del.

Wisconsin News Items—The Enger Motor Sales Co., recently incorporated at Milwaukee by R. D. Mitchell and E. D. Galt to represent the Enger in the Wisconsin territory, is establishing offices and service station in the new garage building on Eleventh Street, near Grand Avenue, adjoining the Auto Mart.

The Creek Motor Sales Co., 447 Jackson Street, Milwaukee, representing the Apperson and Inter-State in Wisconsin and upper Michigan, has disposed of its agency contracts, lease on its garage and salesrooms and stock of supplies, accessories, etc., to J. C. Fowler of La-Crosse, Wis., who has taken possession.

C. A. Kinney has sold the Colfax Garage at Colfax, Wis., to a new firm organized by Charles Paul and Edward B. Rosenberg of Colfax, and styled the Paul & Rosenberg Auto Co. The company takes over the agencies for the Buick and Overland. Talvin Bronken is retained as mechanical superintendent.

P. A. Peeters of Green Bay, Wis., has organized the Peeters Welding & Cutting Co., which is remodeling the Gehr Building at Pine and Jefferson Streets for its purposes. The concern will specialize in car work but will also conduct a general machinery repair business.

The Luther Grinder Mfg. Co., 285 South Water Street, Milwaukee, manufacturing an extensive line of tool grinders and similar appliances, is now operating double turn in most departments and at full capacity in others in order to cope with the demand from car and munition factories and jobbers and retailers in farm supplies. The company operates a large 6-story plant. Although this is generally a quiet season, the business this year is far and away beyond that of any previous year.

Andreas M. Soennichsen, inventor and designer of car parts and accessories, who recently retired from the Auto Parts Mfg. Co., Milwaukee, has organized the A. M. S. Co. of Milwaukee to engage in the manufacture of a line of newly patented articles for the car trade. A plant has been established in the Manufacturers' Home Building, foot of Mason Street, Milwaukee. The company is capitalized for $10,000 and in addition to Mr. Soennichsen the incorporators are G. W. Browne and T. C. McMillan of the Overland-Wisconsin Co. and G. W. Browne, Automobiles, Inc., Milwaukee. The products will include shock absorbers, windshields, bumpers and fenders, etc.

Illinois Trade Items—James Keller, formerly of the Portage Rubber Co., Chicago, purchased the Kenny Tire Shop at the corner of Fourth and Jackson Streets, Springfield, Ill. He will handle the Miller and Portage tires in Sangamon County.

The Irwin-Overland Automobile Co., Quincy, located at 300-310 Maine Street, has completed extensive improvements which include two additional offices, one for Leaton Irwin and the other for F. R. Lusk. Another story will be added to the building later, which will be utilized for accessories. The firm has decided to embark in the wholesale tire business and will utilize the concrete basement for storage purposes. A two-story building, 190 ft. in length at 217-321 Maine Street has been leased and will be utilized as a store room for cars. Starting with a 500-car contract per annum, the firm has increased this until the contract for next year calls for 1800 cars.

B. Pinkerton, president of the Pinkerton Motor Car Co., Peoria, has leased the old plow shop in Pekin, Ill. This structure contains three stories and will be utilized as a warehouse for the storage of Ford cars and accessories, and also as a branch office for Pekin and Tazewell county trade. A service station will also be established.

Noah Henline, for several years an automobile salesman in Bloomington, Ill., being employed by T. K. Hays and later by C. U. Williams, has resigned from the latter firm to enter the office of the Dodge Bros., at Memphis, Tenn., and will have charge of the southern distribution of cars for this firm.

Baltimore Co.'s Add—The Poehlmann Automobile Co., Chevrolet distributor, Cathedral and Chase Streets, Baltimore, will open a new department for automo-

bile supplies. J. R. Manuel will have charge of the new department.

The International Motor Co. will award contract for the building of a garage at 1006-1012 North Eutaw Street. The new building will be one story, 66 by 150 ft., of brick and reinforced concrete.

Denver Men Make Changes—W. A. Murphy, who recently secured the Colorado and Wyoming distributing agency for the Detroit Package Wagon, has now opened permanent quarters at 1608 Broadway, Denver.

W. S. Dawson, recently sales manager for the Charles F. Cole Motor Co., Pathfinder distributor, now has a similar position with J. M. Patrick, 1515 Cheyenne Place, Colorado and Wyoming distributor for the Lewis, Abbott-Detroit and Kissel.

Sam Stephens, for three years Pierce salesman for Tom Botterill, Denver, has been made assistant to C. A. Biggs, recently appointed Mountain States district representative Dodge Bros., with headquarters at 1608 Broadway.

York Dealer Builds—With the incorporation of the York Auto Exchange, R. P. Anderson, manager, this week, plans were started for the erection of a $20,000 fireproof garage and salesrooms on the southwest corner of East King and Queen Streets, where the company has purchased a plot of ground 90 ft. by 60 ft. The new firm, which will trade under the name of the Anderson Auto Sales Co., is capitalized at $30,000. It will hold the agency for the Cadillac, Studebaker and Reo cars and will maintain a repair station and handle a line of accessories. The business which the York Auto Exchange now maintains at the corner of North Duke Street and Clarke Alley will be discontinued when the new garage is ready for occupancy.

Fisk to Enlarge in Boston—The Fisk Rubber Co. has bought two large parcels of real estate at Boston, Mass., on Beacon Street, one adjoining the lot upon which the Peerless, Hudson, Autocar, King and Firestone Tire buildings are erected, and the other on Deerfield Street. The first piece of property comprises 17,000 sq. ft., taxed for $123,000, and the company will have a new building erected there for general offices and salesrooms. The other property comprises 14,000 sq. ft. taxed for $56,000, and a two-story service station will be erected there. It is said that the company paid in the vicinity of $200,000 for the land. The new location is at the big junction point of Commonwealth Avenue and Beacon Street.

Denver Fisk's New Building—The Fisk Rubber Co. is breaking ground for a new building at 1200 Broadway, Denver. It will be 50 by 125 ft., one story and full basement, and will cost $25,000 to $30,000. The main feature will be a service room large enough for ten or twelve cars, which will furnish a big improvement over the recent branch headquarters at 1635 Broadway. The new building is expected to be ready for occupancy by the first of the year.

Represents Kalamazoo Spring—The Cutting, Armstrong & Smith Sales Co., Detroit, is now representing the Kalamazoo Spring & Axle Co. of Kalamazoo, Mich.

New Master Carbureter Distributor—The Master Carbureter Corp., Detroit, has appointed the Lincoln Garage, South Bend, Ind., as its distributor for South Bend and vicinity.

Commercial Body Moves Offices—The Commercial Auto Body Co., St. Louis, Mo., has moved its offices and salesroom to its factory at Sixteenth and Pine Streets, St. Louis.

Spokane Items—O. J. Goeffinger and Albrecht Gross of New York City have opened the Washington Magneto Exchange at 1017½ Sprague Avenue. Mr. Goeffinger was formerly in the automobile business in New York, while Mr. Gross was associated with the Wisconsin Magneto Co. of Milwaukee. The new concern will be agent for the Rayfield carbureter and other accessories. It will handle and repair all kinds of electrical equipment and magnetos.

F. A. Williams has taken the agency for the Republic truck, the deal having been closed with H. W. English, representative of the Republic Motor Truck Co.

St. Louis Battery Co. Moves—The Moerschell Electric and Auto Supply Co., St. Louis, is making preparations to move into its new quarters at 2944-2946 Locust Street, a new building treble the size of the present quarters of the company. This firm is the exclusive agent for Willand batteries in St. Louis, and will have a charging capacity of 600 machines a day at the new plant.

Kansas City Department Store Tire Agent—The Jones Store Co., one of the largest department stores in Kansas City, is the first department store there to put in a tire department. The store has bought the equipment and business of the Pennsylvania Tire Co. agency known as the Tire Service Co.

Seattle Items—The Matthews Motor Car Co. is the name of the new distributors of Jeffery cars in Seattle and western Washington, located at 1409 Broadway. At the head of the company is J. G. Matthews, who for thirty-five years was in the banking business in Kentucky. Associated with Mr. Matthews are Dr. S. N. Colliver, vice-president; J. W. Bailey, secretary, and J. F. Scearce, treasurer.

Swinehart Tire Sales Co., Seattle, has secured the agency for Continental and Stanweld rims.

New Incorporations

Delaware

DOVER—Smith Form-a-Truck Co.; $100,000; maker. J. F. Curtin, S. B. Howard, S. A. Anderson.

WILMINGTON—E. I. du Pont de Nemours Powder Co.; 240,000. E. N. McCarney.

Indiana

AUBURN—Union Automobil Co.; $100,000; maker. C. M. Brown, John Zimmerman, W. H. Schaab.

CHURUBUSCO—Churubusco Auto Co.; $5,000. F. Fegel, W. E. Moudy, W. S. Moudy, A. M. Hire.

FORT WAYNE—Wayne Garage Co.; $2,500. C. V. Pion, C. E. Pfeffer, E. L. Pfeffer.

JEFFERSONVILLE—Bensinger Automobile Co.; $5,000 Archie Bensinger, A. B. Bensinger, Clifford Bensinger.

Illinois

CHICAGO—Chateau Garage; $2,500. P. S. Oberweise, H. W. Leybourne, F. N. Wood.

HUBBARD WOODS—Hubbard Woods Motor Car Co.; $5,000. F. J. Haarth, Pearson and W. N. Schnedder.

PEORIA—Fitch Auto Supply; $6,000. Robert Fitch, C. Lynch, M. M. Fitch.

Michigan

ST. JOHNS—Hayes Truck Wheel Co.; $100,000; maker. C. B. Hayes.

Missouri

ST. JOSEPH—Diamond Motor Co.; $2,500 to $5,000.

North Carolina

YADKINVILLE—Seagraves Ford Transportation Co.; $5,000. W. B. Seagraves, H. B. Seagraves, J. C. Wallace.

New York City

NEW YORK CITY—Twentieth Century Garage; $60,000. T. B. Hoy, M. L. Shav, B. J. Beck.

NEW YORK CITY—Voultry Tire Co.; $10,000. J. Coldmixon, A. S. Hoffheimer, F. S. Voultry.

NEW YORK CITY—Wheeler Motor Co.; $10,000. H. A. Strallhols, C. W. Williamson, L. V. Chew.

NEW YORK CITY—Winn Taxi Service Co.; $5,000. E. J. Winn, Jacob Levine, Herman Yachnin.

NEW YORK CITY—Keyless Auto Clock Co.; $125,000. O. A. Perry, F. Phinney, E. J. Hogerty.

NEW YORK CITY—Armstrong Rubber Co.; $200,000; tire maker. G. F. Armstrong, S. X. Newman, S. Mallach, 60 St. Nicholas Avenue.

New York

HUDSON—Hudson City Crescent Garage; $50,000. O. A. Coon, H. S. Williams, W. H. Beardsley.

LARRABEE—Deyo Motor Truck Co.; $80,000. H. C. Larrabee, A. C. Crossley, A. J. Parsons.

LONG ISLAND CITY—I. S. Automobile Radiator Co. to Long Island Automobile Radiator Co.

ROCHESTER—No-Bust Tire Co.; $100,000. A. G. Small, H. L. Barner, A. M. Ferguson.

New Jersey

PATERSON—Griffin Carbureter Co.; $25,000; maker.

Ohio

AKRON—General Rubber Mfg. Co.; $200,000. M. O'Neil and others.

CLEVELAND—R. C. Hull Supply Co. to R. C. Hull Electric Co.

COLUMBUS—Twenty-first Street Auto Laundry Co.; $1,000. J. Thirston, K. T. Churston, E. C.

ELYRIA—Overland-Elyria Co.; $10,000. A. L. Jackson, C. Jackson, L. B. Fauver, R. H. Rice.

MARION—Marion Tire and Rubber Co.; $300,000. A. J. Berry, W. T. Jones, J. L. Price, W. F. Meyer, R. T. Lewis, W. H. Holvertott, S. P. Lippincott.

Pennsylvania

PITTSBURGH—S. S. V. Motor Co.; $10,000. J. H. Weeks, J. R. Zinkman, C. B. Gearing, J. F. Tyrell.

Texas

PARIS—Lamar Motor Car Co.; $7,500. Ed. Hutson, H. H. McClanahan, T. A. Johnson.

Virginia

CLIFTON FORGE—Virginia Garage Co.; $30,000. B. H. Tatum, E. A. Snead, B. C. Goodman.

RICHMOND—King & Wright Co.; $15,000; buying and selling engines. H. D. Wright, H. R. Scott, A. G. Collins.

VOL. XXXIII. NEW YORK—THURSDAY, NOVEMBER 18, 1915—CHICAGO NO. 21

The AUTOMOBILE

Steering Gears Offer Many Problems

Actual Gear Superior to Layout—Lubrication the Great Trouble—Better Protection Desirable —Great Opportunity for Clever Detail Design

By A. Ludlow Clayden

STEERING gear as a matter of design has two sides, the mathematical and the mechanical. In THE AUTOMOBILE for Sept. 2, the former aspect of the subject was dealt with, it remains to review the other side and to study the detail of steering gears and connections. Steering is an automobile quality which is prone to deteriorate by the development of lost motion or slack between the hand wheel and the road wheel and this is due to two causes, the first being the number of bearings in the linkage, and the second the difficulty of properly lubricating those bearings.

Usually wear takes place first on the pin or yoke joints at either end of the tie rod, second on the universal joints of the drag link, third in the gear itself, and fourth in the axle swivels, though three and four may often be reversed in order. Wear in the actual steering gear is not so very troublesome, because there is frequently some means of taking up slack, also the opportunities for lubrication are ample so that undue wear in the gear generally means neglect on the part of the owner. All other parts, however, are difficult to deal with because the movement is so slight.

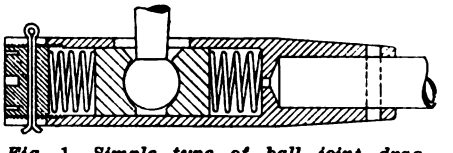


Fig. 1—Simple type of ball joint drag link connection for steering gear

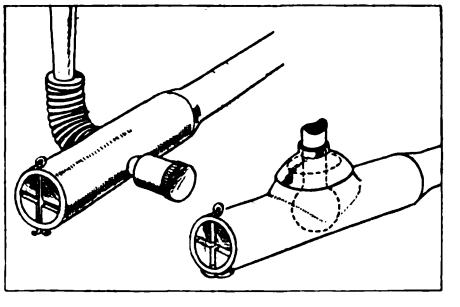


Fig. 2—Left—Suggested type of joint with a short piece of flexible metallic tubing for holding grease or oil

Fig. 3—Right—Suggested type of self-protecting, oil-retaining universal joint

For the great majority of steering movements the wheel is not deflected more than a very few degrees back and forth, and this slight motion is of little value in distributing lubricant. Where grease is used, the lubricant is forced in by hand in screwing down the cup, and it then squeezes out of the loaded part slowly, staying out till such time as a fresh supply is injected. Oil would be able to find its way around the whole surface, but is apt in most cases to escape altogether, leaving the joints even more dry than where grease is employed.

Greasing up two tie rod joints, two swivels, two drag link connections and one steering gear case is an operation taking time and much crawling about on the ground; while it is utterly impossible of accomplishment without donning overalls or ruining clothes. There used to be plenty of such dirty jobs on a chassis, but one by one they have been abolished, leaving only the steering gear practically in the same state as it was fifteen years ago.

The only way out of the difficulty that appears, is to make the joints self-lubricating so that they require attention at long intervals only. Also a great help would be to increase the size of the parts and so decrease the pressures. Yet another aid to durability, which is not exploited as much as it ought to be, is to use non-rusting metals wherever possible; to put in bronze bushings for the pins and to make joints which will be as nearly as possible waterproof. Leather boots or wrappings are a palliative only, however well made they may be, their life is fairly short and they are distinctly *not* engineering.

It is a wonderful thing, an amazing thing, that of all the automobile engineers in the world not twenty have produced cars that steer really well, and continue to do so month after month with little attention.

Taking the drag link connections first, these may be either ball joints or regular little universal joints. The former type is most used because it is cheaper and just as satisfac-

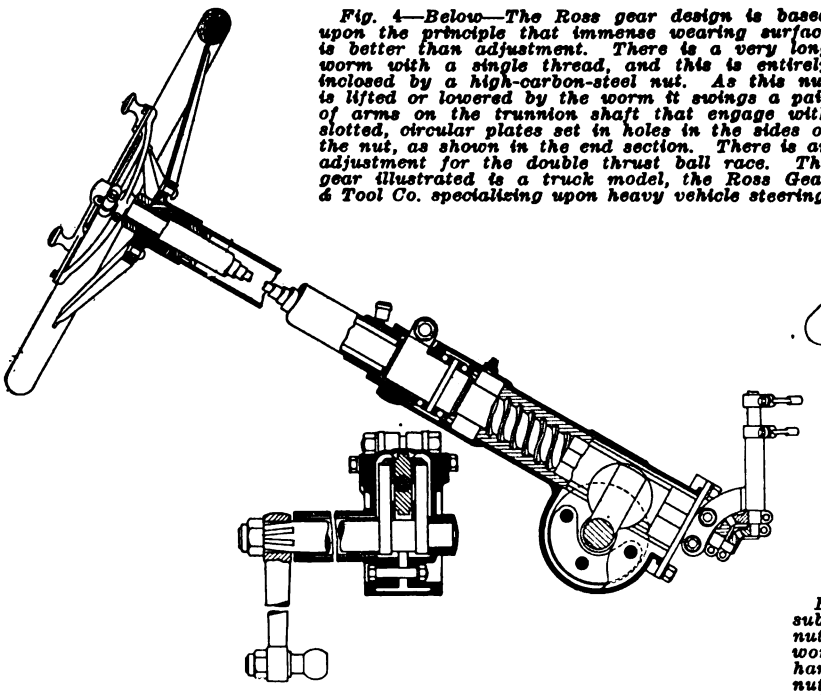


Fig. 4—Below—The Ross gear design is based upon the principle that immense wearing surface is better than adjustment. There is a very long worm with a single thread, and this is entirely inclosed by a high-carbon-steel nut. As this nut is lifted or lowered by the worm it swings a pair of arms on the trunnion shaft that engage with slotted, circular plates set in holes in the sides of the nut, as shown in the end section. There is an adjustment for the double thrust ball race. The gear illustrated is a truck model, the Ross Gear & Tool Co. specializing upon heavy vehicle steering

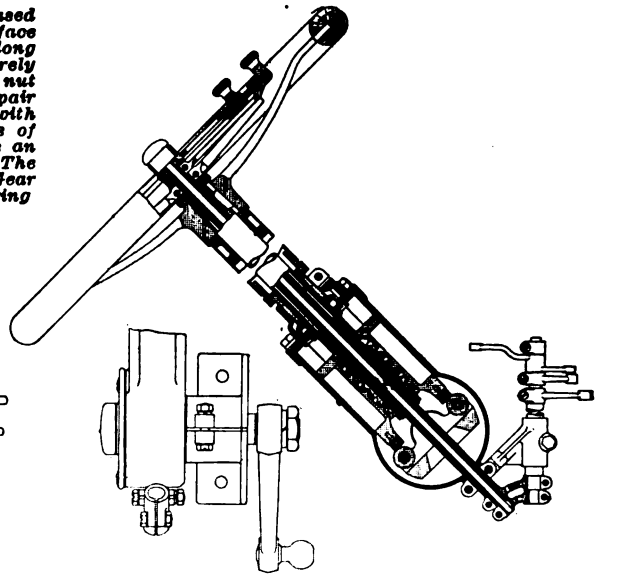


Fig. 5—Above—The Jacox steering gear has a substantial steel worm inclosed by a semi-steel nut, which is split lengthways into halves. The worm is double threaded, both right and left hand, so that turning the wheel causes one half nut to rise while the other falls. The ends of the nuts bear upon a rocking yoke which is connected to the external steering arm. One of the greatest virtues of this design is that a single adjustment of the nut that backs the ball thrust race takes up all wear. Owing to the very large thread surface wear is very slow. The maker is the Jackson-Church-Wilcox Co.

tory as the latter if made properly. There have been a good many accidents due to ball joints dropping off, and many ways for preventing this have been devised. One of the simplest is shown in Fig. 1. This is not any particular joint, but is the basic principle of several. The main idea is that the cups whch press against the ball are backed by strong springs that take up the wear automatically, and if one spring breaks the other drives the whole assembly along till the neck of the ball is caught by the edge of the hole in the outer case. The only drawback to this style of joint is the difficulty of renewing lubricant, for to get grease actually between the ball and the cup it will not suffice to plaster the outside. To make certain of it the joint needs to be taken apart and greased in that condition. Mud, and washing water from a hose also tend to remove the lubricant rapidly.

It is not easy to see how this type of joint could be entirely inclosed, but Figs. 2 and 3 show a couple of rather clumsy suggestions. The former uses a short piece of flexible metallic tube which would hold a soft grade of grease and possibly a heavy oil. The latter adapts the idea of the self-protecting universal joint and would be *oil* retaining. These devices should greatly outlast leather wrappings which are never completely waterproof and cannot hold oil.

Some Special Joints

A rather ingenious joint used by a few automobile makers is shown in Fig. 6; this is non-adjustable but it is to a great degree self-protecting. The grease being fed to the interior of the ball insures it reaching the working surface, and in exuding it drives all dirt before it. Such joints will wear for years if the greaser is given a turn every day, but their life depends upon this attention.

On the Peugeot racing cars there are no ball joints, the little universal shown in Fig. 9 being used instead. With this type grease can be supplied through hollow bolts as for a spring shackle bolt, and frequent attention to the grease cups will prevent wear. The universal type of connection is less easy to inclose, however, and when exposed is just as great a sufferer from neglect as the ball joint, which is simpler and cheaper.

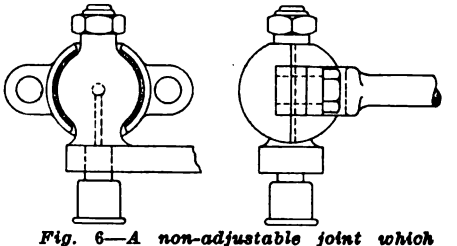


Fig. 6—A non-adjustable joint which is, however, to a great degree self-protecting

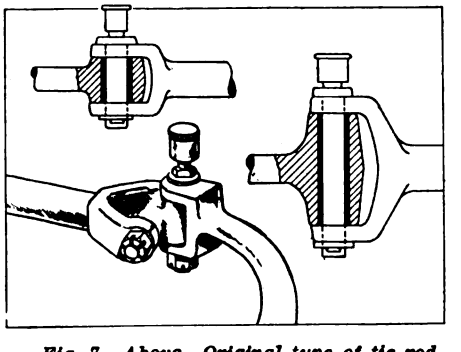


Fig. 7—Above—Original type of tie rod yoke. Fig. 8—Right—Illustrating how durability of this type has been increased by widening the jaws. Fig. 9—Small universal used instead of ball joints on Peugeot racing cars

Tie Rod Joints Get Longer

The original tie rod yoke was something like Fig. 7, and the durability of this bearing has been increased greatly by widening the jaws so as to give more surface to the pin as in Fig. 8. Wear on these joints is particularly annoying because it not only gives slack to the steering wheel, but it is liable to set up a continuous rattle of most irritating character. Here again lubrication is rendered difficult by reason of the extremely small angular movement and the only solution of the difficulty is frequent application of fresh oil or grease. The self-lubricating bushing of compressed graphite ought to find an application here and there is no reason save cost why the pins should not be bronze instead of steel.

Some manufacturers of expensive cars have used ball joints for the tie rod instead of ordinary yoke ends and where there are self-adjusting springs this prevents rattle. Probably the greater difficulty of protecting and lubricating the ball joint offsets the main advantage, however.

Schemes for Swivel Lubrication

There are two types of front axle, the most popular in America being that sketched in Fig. 13, and the one most used in Europe in Fig. 14. The difference is that in the American pattern the thrust bearing is located at the upper end of the swivel pin, while in the other variety it is at the bottom. Taking the most used type, the tendency is for the pin to wear at the ends, and for the

thrust washer to wear. From the viewpoint of freedom in steering it is an advantage to use a ball thrust bearing, but there are two drawbacks, first water, if it enters as it practically must do sooner or later, will destroy the balls and races immediately; second, the movement is normally so slight that the balls tend to make pits in the races due to repeated shocks. Thus the plain thrust is better if only it can be lubricated. Obviously, a plain thrust bearing with an area of 2 sq. in. or so and with a load of 1000 lb. on it is not easy to grease, and the grooves cut in the face of the washers do not help much as there is so little movement to distribute the grease.

It has often been an ideal with designers so to arrange the thrust bearing that it is permanently in a bath of lubricant. In Fig. 15 the Sunbeam design is shown and it may be noticed that the big brass cap at the top entirely protects the ball thrust washer from water, which could not reach it by any possibility. Also it is only necessary to remove the cap and fill it with grease about as frequently as it is necessary to do the same by hub caps, if indeed as often. This example is chosen as being one of the first attempts, but the same idea appears in various forms in a good many modern designs. Excellent steering swivels have been made with all ball bearings, both of journal type and cup and cone type. Also swivels have been made with taper roller bearings, but the plain bearing for the pin, combined with a properly lubricated thrust, also plain, gives just as good an effect as the expensive combinations.

Probably the reason that the detail of steering gear has had so little attention is that the cheapest forms will operate fairly well if they get a complete overhaul every 10,000 miles or so. For a really cheap car this is good enough, but the buyer of an expensive machine is quite capable of appreciating a design which would reduce the trouble of greasing and enable the steering to be maintained in its original state of efficiency for the life of the car without rebushing joints. For the manufacturer who wants a novel talking point that of safe, easy and durable steering offers a hitherto neglected opportunity.

Steering Gears of Many Patterns

For the passenger car an absolutely irreversible steering mechanism is not desirable, for it destroys the "feel" which is essential to quick steering and is obtained by a gear that is just a little short of being quite irreversible. It is necessary to strike the happy mean.

In the main, steering gears divide into two types, those with a short worm and worm wheel, or part of a wheel, and those with a screw and nut. The former is the simpler, but it is less easy to adjust for wear and it does not give so large a wearing surface. In early attempts with the screw and

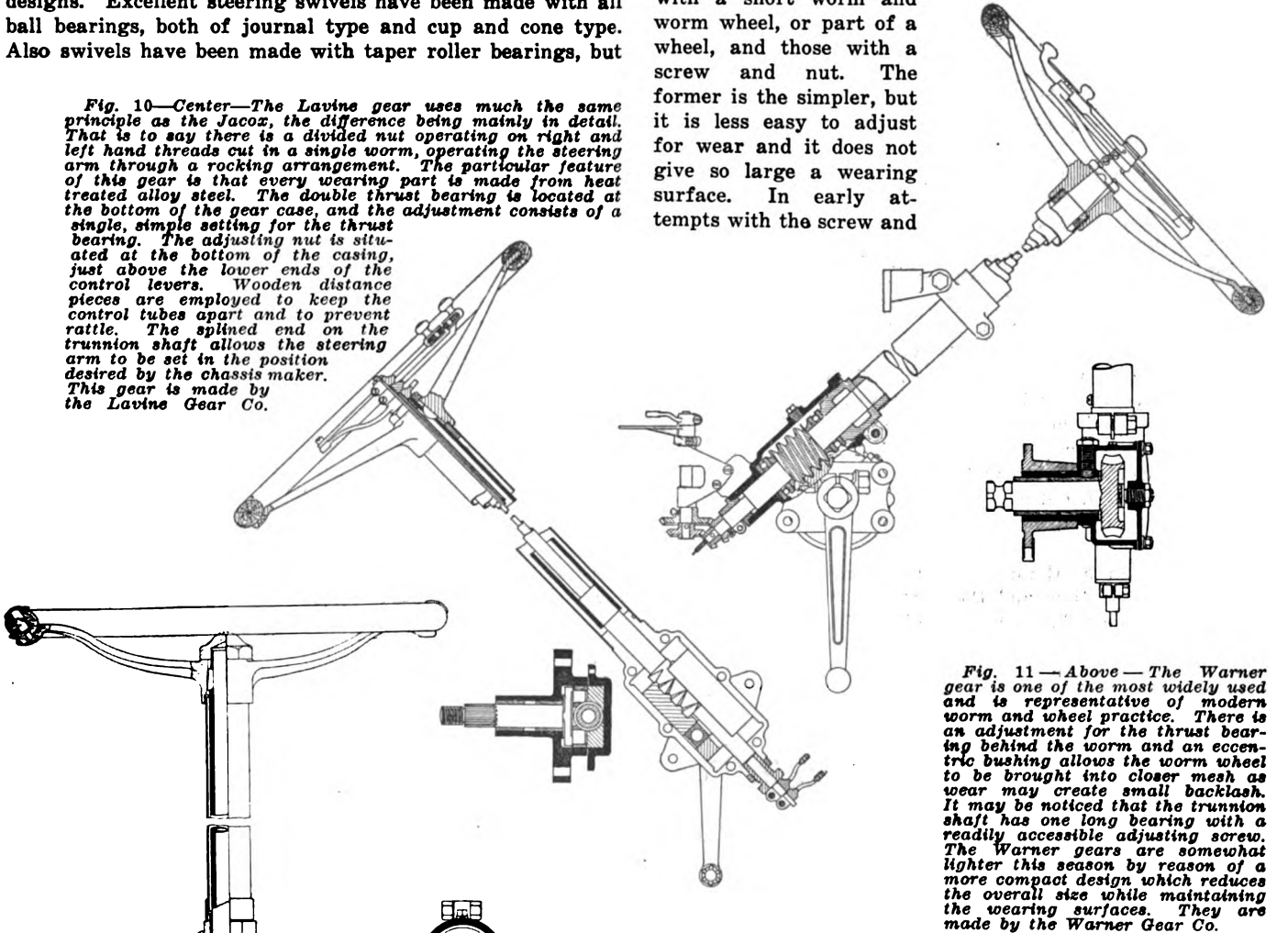


Fig. 10—Center—The Lavine gear uses much the same principle as the Jacox, the difference being mainly in detail. That is to say there is a divided nut operating on right and left hand threads cut in a single worm, operating the steering arm through a rocking arrangement. The particular feature of this gear is that every wearing part is made from heat treated alloy steel. The double thrust bearing is located at the bottom of the gear case, and the adjustment consists of a single, simple setting for the thrust bearing. The adjusting nut is situated at the bottom of the casing, just above the lower ends of the control levers. Wooden distance pieces are employed to keep the control tubes apart and to prevent rattle. The splined end on the trunnion shaft allows the steering arm to be set in the position desired by the chassis maker. This gear is made by the Lavine Gear Co.

Fig. 11 — Above — The Warner gear is one of the most widely used and is representative of modern worm and wheel practice. There is an adjustment for the thrust bearing behind the worm and an eccentric bushing allows the worm wheel to be brought into closer mesh as wear may create small backlash. It may be noticed that the trunnion shaft has one long bearing with a readily accessible adjusting screw. The Warner gears are somewhat lighter this season by reason of a more compact design which reduces the overall size while maintaining the wearing surfaces. They are made by the Warner Gear Co.

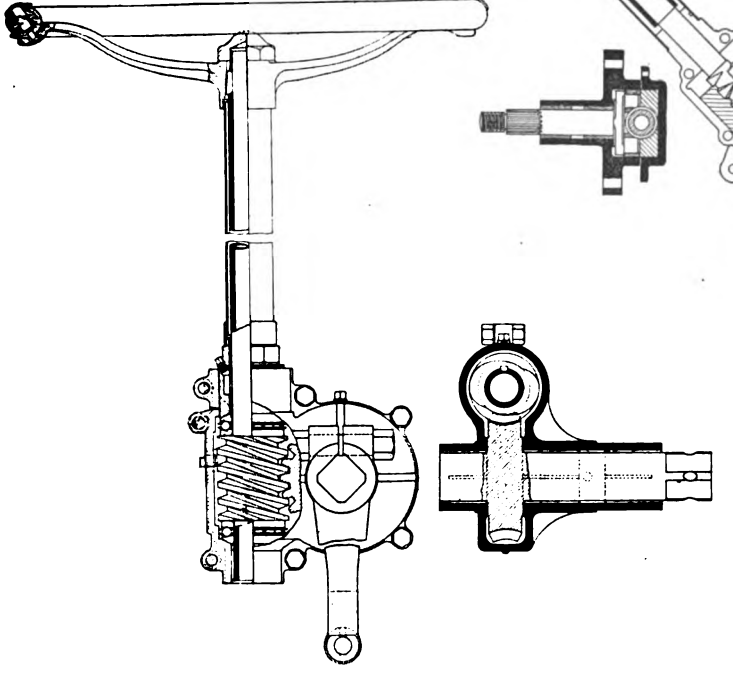
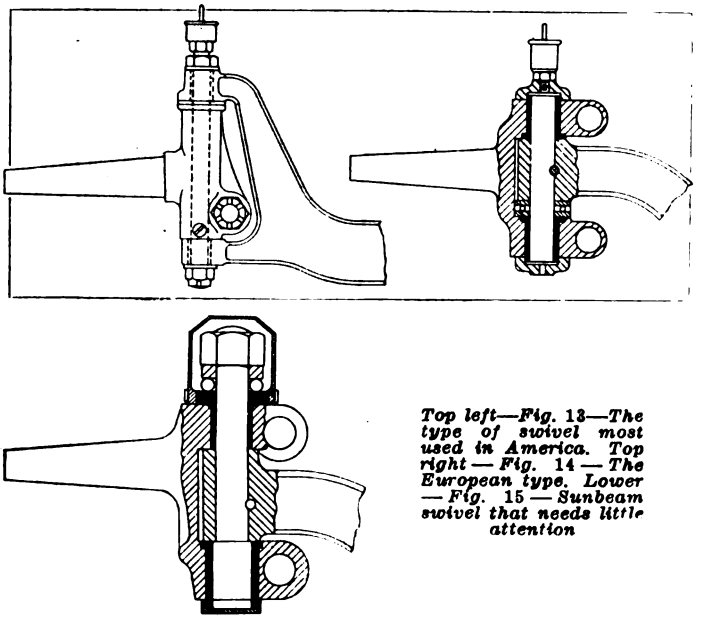


Fig. 12—Left—The Barnes gear is a worm and wheel pattern having two adjustments, one back of the thrust bearing and the other on the trunnion shaft bearings, the shaft being held in eccentric bushings. The use of a full worm wheel and a square end shaft allows the four quarters of the worm wheel to be used in turn, thus providing yet another increase of durability. This gear is made by the Barnes Gear Co.



Top left—Fig. 13—The type of swivel most used in America. Top right — Fig. 14 — The European type. Lower — Fig. 15 — Sunbeam swivel that needs little attention

nut type the advantage of big contact on the thread was often lost by the use of some sort of rocking joint which had a very small surface, but this has been corrected, and to-day there are plenty of nut gears possessing remarkable durability.

Simplicity favors the worm and wheel type, and if this is well made with a good size of thread its durability is excellent. Practically the only adjustment possible is to mount the worm wheel on eccentric bushings, so that it can be brought into closer contact with the worm as it wears, but this adjustment is imperfect, because wear is never even, since it nearly all occurs at the center position corresponding to a few degrees of steering movement only. The idea of using a complete worm wheel instead of a segment is that when one quarter of it has worn, the wheel can be removed from its shaft, given a quarter turn, and replaced with a fresh, unused surface to the worm. If the worm is the harder member of the gear this practically quadruples the life of the gear. A nut gear can be adjusted in several ways, and needs an adjustment for the rocker bearing as well as for the nut.

In the design of these gears there has been only detail change for some time and they are mostly of a quality of service that precludes the probability of alteration. Here and there weight has been reduced by simplification of design and by the use of materials with a greater strength.

In general, the aim of the maker of the gear is to provide the largest bearing surfaces possible with reasonable weight and size so that adjustment shall be necessary only at very long intervals. There are, of course, very many different patterns of steering gears, but in selecting the few which are illustrated in section it has been attempted to cover the main princples in common use.

Adjustable Rake

A feature of steering gear construction which is obtaining greater attention is the inclusion of some device whereby the rake of the column or post can be altered. Ability to so set the angle is very useful to the automobile manufacturer who usually is well cared for by the steering gear specialist. It is to be regretted that the automobile maker so rarely constructs the body and the clamping arrangements for the gear that the user is able to swing the gear an inch or two forward or back to suit his stature.

In mounting the different parts of the gear, ball bearings are almost always employed for taking the thrust of the worm or screw, except in gears which are subjected to very violent shocks, as are heavy truck steerings. For journal bearings there is a marked trend toward the ingenious self-lubricating bronze bushings with graphite inserts. With such equipment only an extremely small quantity of oil has to be inserted to keep the worm thread in good condition; the bearings look after themselves.

Another point which has caused trouble in the past, but has now been overcome is that of rattle between the several tubes inside the post, which connect with the control levers above the steering wheel. Where there are three or four drawn steel tubes of this section one inside the other, vibration can readily set up a chatter that is particularly irritating. All gear makers almost have settled upon one way to prevent this chatter, that of giving the tubes bearings on each other at sufficiently short spacing. Sometimes this is done by knurling the tubes or raising collars on them, sometimes by the insertion of bronze bushings and sometimes by wooden spacers. All seem equally effective in service.

Materials Are Factors

Materials used in construction do not vary very much, the important wearing parts such as the worm and guides or rocker pinions being a high quality steel. For the outer case malleable cast iron is most popular, and the tubing is commonly cold drawn steel. Choosing steel for steering parts is a somewhat delicate operation, because surface hardness to give durability is needed combined with great toughness to resist the continual shocks to which a gear is subject, hence steels of the nickel chrome variety and alloy steels deriving their qualities from careful heat treatment are used frequently.

Packard Uses Special Vehicle for Moving Machinery

Building operations at the plant of the Packard Motor Car Co., Detroit, Mich., are going forward at such a rapid rate that it has been found necessary to construct a special vehicle for the transportation of machinery between the old and new factory units. As shown in the accompanying illustration, where a special crankcase milling machine weighing over 21 tons is being moved by a Packard 4-ton truck, the special vehicle is constructed of extra large motor truck wheels, mounted on special axles and carrying a platform made of 12-in. channel steel frame and special oak flooring. At the forward end of this float is anchored a winch by which the machinery is loaded onto its truck

Gearsets Are Smaller and Lighter

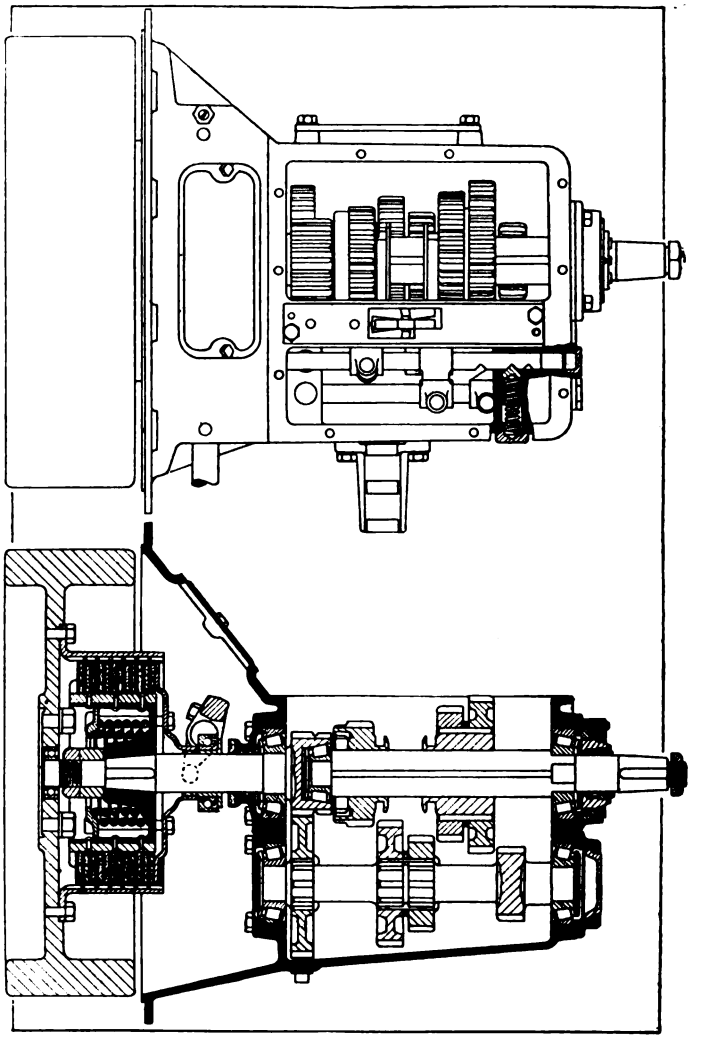
Roller Bearings Increasing in Favor—Popularity of Iron Case Due to Noise Problem—Ease of Gearshifting Obtained by Clutch Design

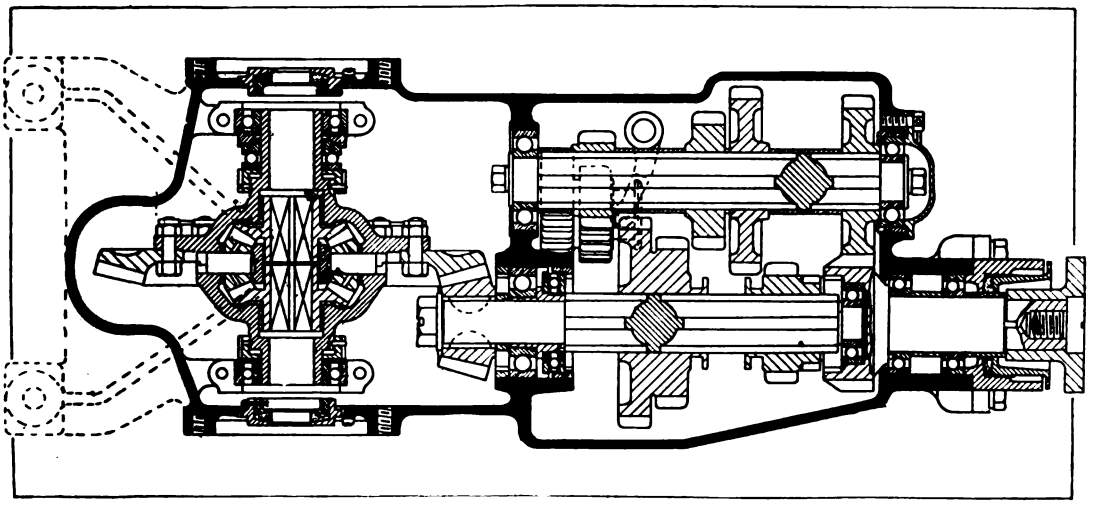
AS with steering gears, so with gearsets, change has been slow and development by easy stages. There has been only one great change in automobile gearboxes since they first were used, this being the introduction of the direct drive, which came more or less simultaneously with the live axle transmission. From this point onward development has been directed toward simplification of detail, elimination of noise and reduction of size and weight.

Lately the main development has been the great simplification rendered possible by the coming of center control, and changes in the form of bearings most popular with manufacturers can also be observed. Steady abandonment of the rear axle situation for the gearset and the growth in favor of the unit power plant has made noise in the gearing far more difficult to eliminate, or rather, more noise is permissible in the old type than can be allowed for the new. Of course, in these days of everywhere on high, the noise made by second speed and low gears is of little importance, that which counts is the hum of the constant mesh pinions. It is the opinion of several prominent engineers that the most potent influence in reducing this sound is continuity of engine torque, eights and twelves proving easier to cope with than sixes or fours, but apart from this the bearings used seem to have the greatest influence. That the quietest gearset is obtained by the use of all plain bearings seems to be agreed by everyone, but the difficulty of satisfactory lubrication is such that ball or roller bearings are used almost always for both portions of the main shaft.

For the countershaft plain bearings are used fairly often, because the latter can be so situated that it is in a permanent bath of oil or grease. Roller bearings especially certain types, seem to give quietness results nearly as good as plain bushings, so it is not surprising to find that their use is increasing. Of all bearings the most difficult to quieten is the ball bearing, which is regrettable, because it is the easiest to apply in limited space and its frictional efficiency is, of course, very high.

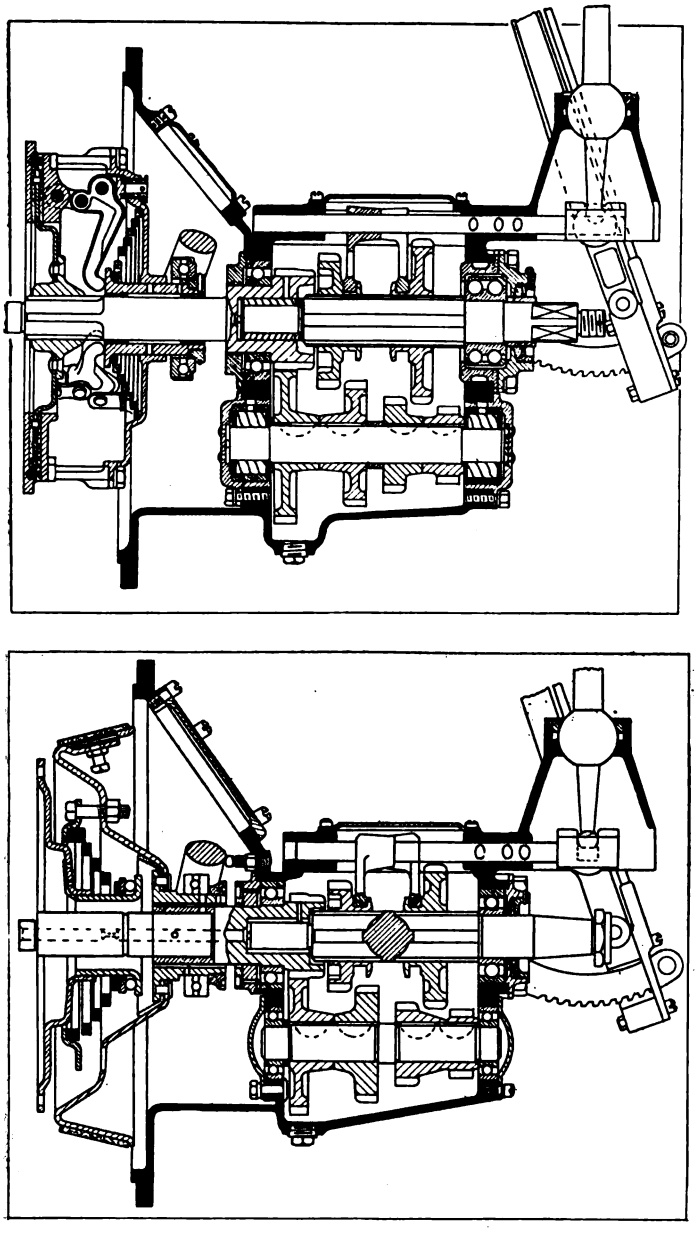
The average gearset, judged from the specifications of a



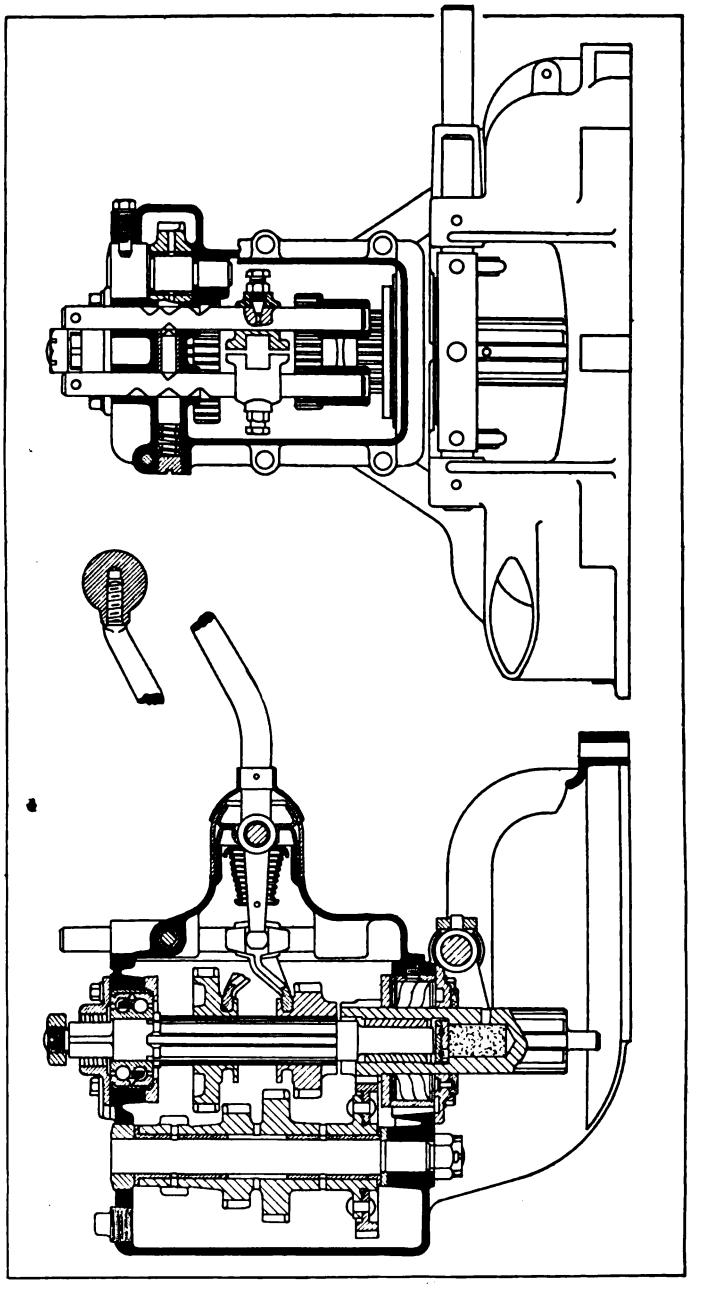


Above — Brown-Lipe four-speed gearset with several characteristic features. Special attention should be given to the mounting of the taper roller bearings and the use of one of these for the spigot. The box is small for a four speed type

Left—A Warner gearset for 3-ton trucks having chain drive. This illustrates a way of using ball bearings exclusively. Nickel-chrome steel is used for the gears to allow of sufficient strength with small dimensions



These two Warner gearsets illustrate above a moderately heavy gear and below a lighter type. The former has a large ball thrust bearing and the roller spigot that is becoming very widely used. It will be noticed that both gearsets have shafts with four splines and that the countershaft gears are separate pieces pressed on the shaft. Two types of clutch are shown and it is a Warner feature that these are interchangeable without any alteration to gearset or flywheel where the size of the gearset is the same. Both the clutches illustrated have very light inner parts.



The Northway gearset uses a stationary countershaft, the gears thereon being bushed. The front end of the main shaft relies largely upon the steady bearing in the flywheel and on the very long roller spigot. Thrust is cared for by the ball bearing at the tail end. In the plan view the interlocking device is shown. The spring support for the shift lever inclosure is a feature

large number of standard types, has ball bearings for the main shaft and roller bearings for the countershaft. Often ball bearings are used for only the front end of the main shaft, but in many cases a ball race is used at the tail end because of its ability to resist the occasional end thrust from the drive shaft.

A conspicuous bearing development is the steady increase in the number of gearsets with a ball or roller spigot bearing. This spigot has always been the weakest point in the direct drive type of transmission, because the bushing is so located that its lubrication is a trifle uncertain, and it runs at quite high speed when the low gear is in use. The load on it may also be considerable, and if it wears and so gets slack the shafts are put out of line and noise results immediately. At present the most popular bearing for the spigot is a small, special type of roller, and this has proved wonderfully satisfactory in service. A ball bearing is used in a good many gearsets but is not so easy to accommodate as the roller.

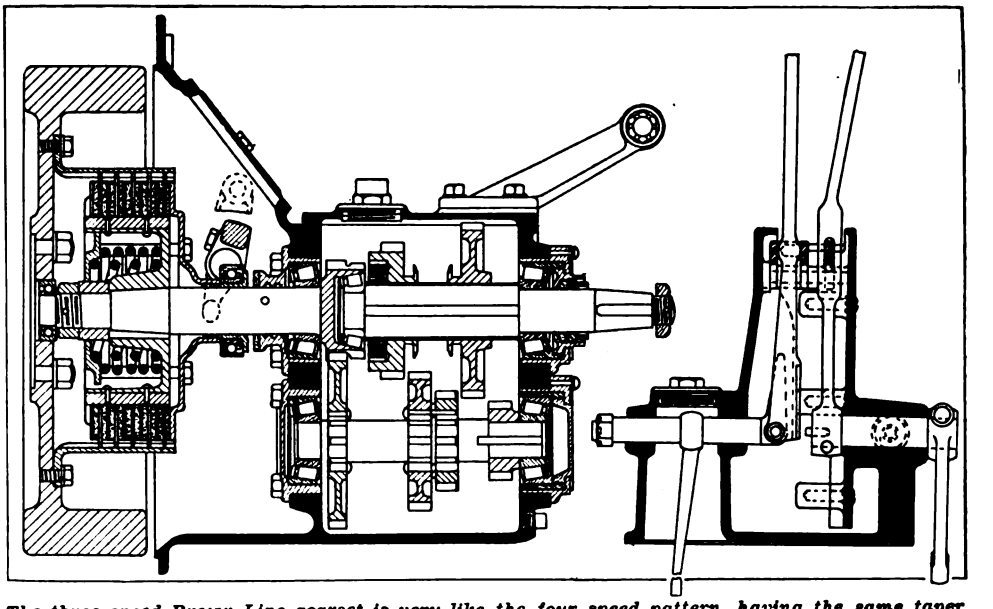
In passing, the comment may be made that it is rather remarkable the general adoption of the unit power plant has not led to the use of plain bearings throughout the gearset, with pressure lubrication from the same oil pump as supplies the engine. It would be easily possible to work out a design which would be both cheap and efficient and the need for quietness would be served in the best possible way. However, to arrange this would need a correspondence in design between motor and transmission and would hardly be applicable in a general way.

Rather curiously, many experiments with helical gears for the constant mesh pair have not led to the general use of this type of tooth; it seems no easier to insure quietness with it than with plain spur teeth. If this really is true, then it seems unnecessary to use helical teeth for the timing gears in the motor. The two cases are contradictory and the situation not easy to understand, for cost hardly enters into the matter.

An undoubtedly important factor is the rigidity of the support given to the short, front portion of the main shaft

which, in many unit powerplant designs often becomes almost an integral portion of the crankshaft when the clutch is engaged. Study of the illustrations shows how different manufacturers have tackled the problem.

Another factor in noise production is the material of which the case is made. Iron it is found, makes a quieter casing than aluminum, which at first seems curious, as iron is certainly a far more resonant metal. Probably the explanation is to be found, at least partly, in the greater rigidity of iron. While it is easier to get a quiet transmission with iron inclosure, it is quite possible to get as good results with aluminum by a careful study of the sections, and, perhaps the addition of a web or rib here and there. Just at present the price of aluminum encourages the use of iron, but it is unlikely that this will continue as the price returns to normal.



The three speed Brown-Lipe gearset is very like the four speed pattern, having the same taper roller bearings. It will be seen that the sliding shaft is of square section. The use of a double clutch spring is characteristic of Brown-Lipe practice

Most important of all, from the noise viewpoint, is the original cause of the noise, the gear itself, and it is noteworthy that manufacturers are steadily year by year, making better gears and mounting them more accurately. The allowable tolerance on the accuracy of alignment between the shafts has been made smaller, the methods for heat treating and hardening the gears have been improved, the machines for cutting the teeth are doing more accurate work. One of the leading gearset makers actually uses a burnishing process after the gears are otherwise finished, so as to remove the least roughness from the tooth faces.

Four Speeds Not Wanted

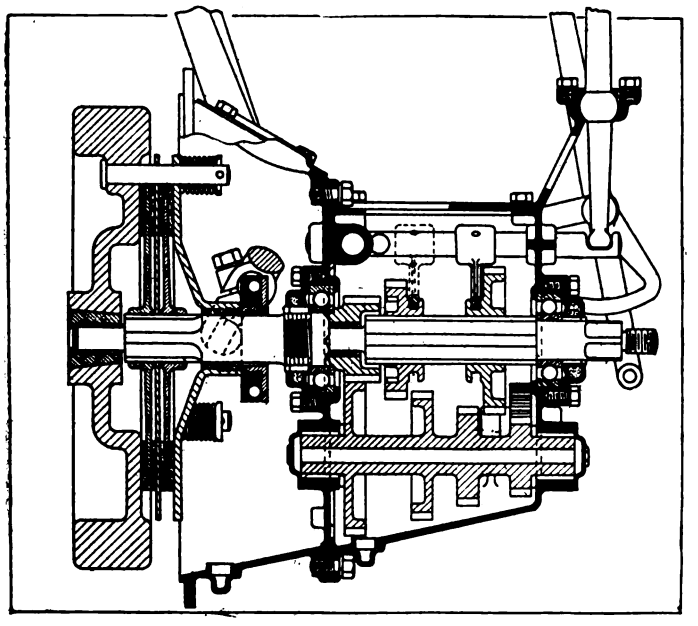
For passenger cars the four-speed gearset has almost ceased to exist, but it is still obtainable from most manufacturers, and it is stated that there appears to be a tendency toward its use for light trucks. With modern engines and the low rear axle ratios of to-day there is little need for more than three speeds in the gearset and to provide four calls for higher cost, greater weight and increased opportunity for noise. It is to be doubted whether the four-speed gear will ever return to favor; more likely is it that some totally new form of transmission will replace the gearset altogether.

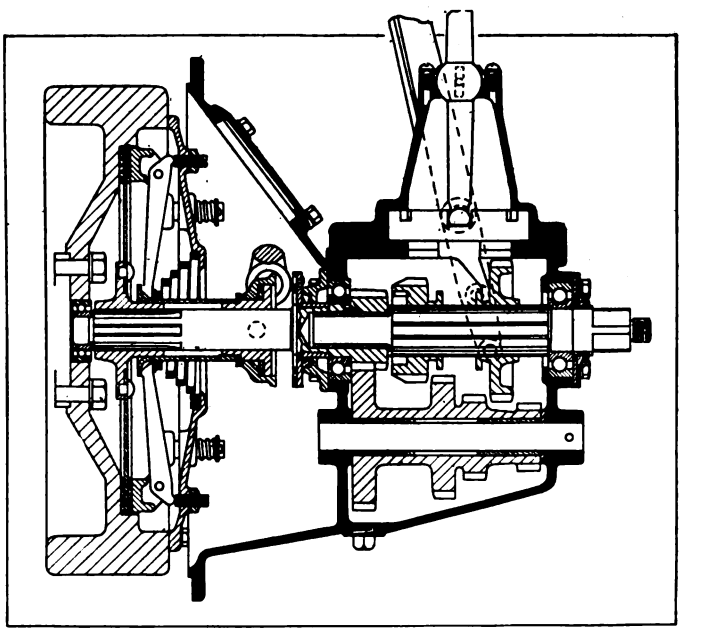
Weight Decreasing

Weight has been cut conspicuously for 1916, but this has not been done by alterations in gearset design so much as by the changes in motors. The general decrease in dimensions and increase in crankshaft speed has lowered the tooth pressures very greatly, so a far smaller gear is amply strong. At 2000 r.p.m. 40 hp. can be transmitted by a gear with half the tooth strength needed to transmit 40 hp. at 1000 r.p.m.

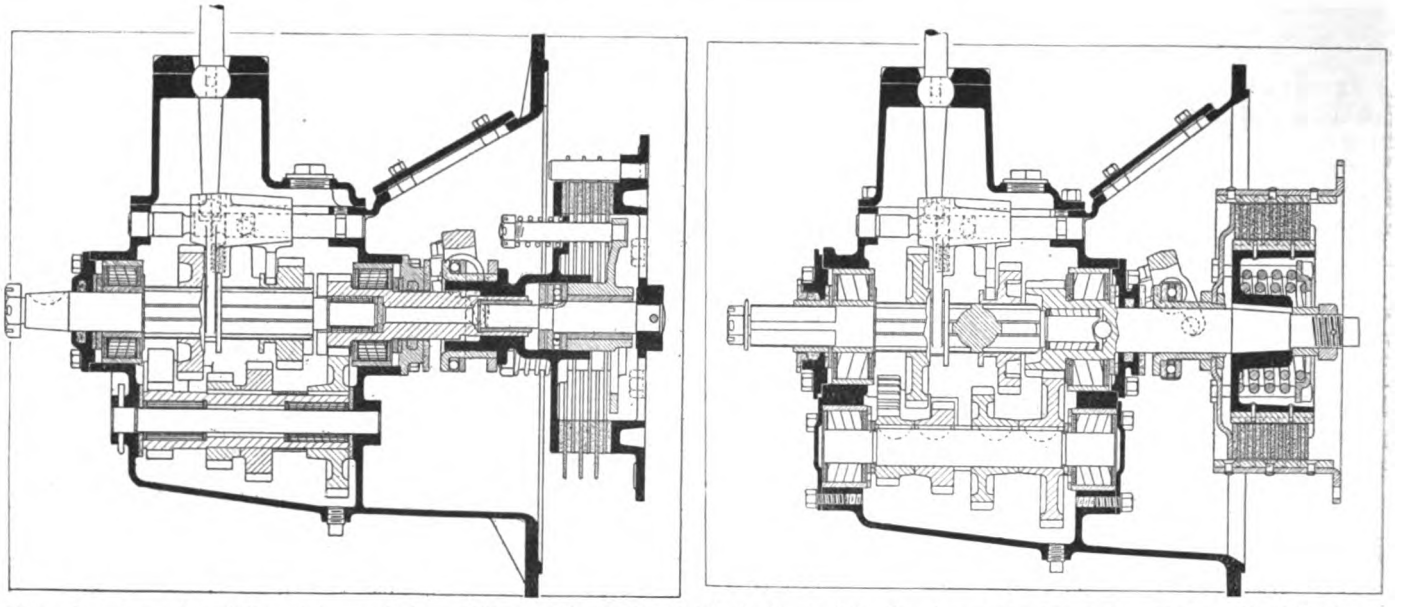
In the gearsets odd half pounds have been cut by simplification, notably in the lever mounting, and center control is, of course, lighter than any other system.

It is unquestionable that the ease of gearshifting is very





Left—A simple design made by the American Die & Tool Co. Features are the special clutch with a two-disk inner member of very light weight, and the hollow countershaft. Another point of ingenuity is the method for mounting the shift lever and its engagement with the extreme ends of the striker shafts. Right—Another simple gearset made by the Mechanics Machine Co. which also has a light clutch, this time with a single plate. The countershaft is pinned to the case and the gears bushed, while the sliding shaft has a larger number of splines than usual



These two examples of Covert transmissions differ mainly in the clutch design and in the size of the bearings. That on the left has a stationary countershaft and long roller bearings while the other has the heavy duty type of bearing and a revolving countershaft. Note how a steel ball inside the spigot is used to take accidental thrusts from the propeller shaft on the gearset shown on the right

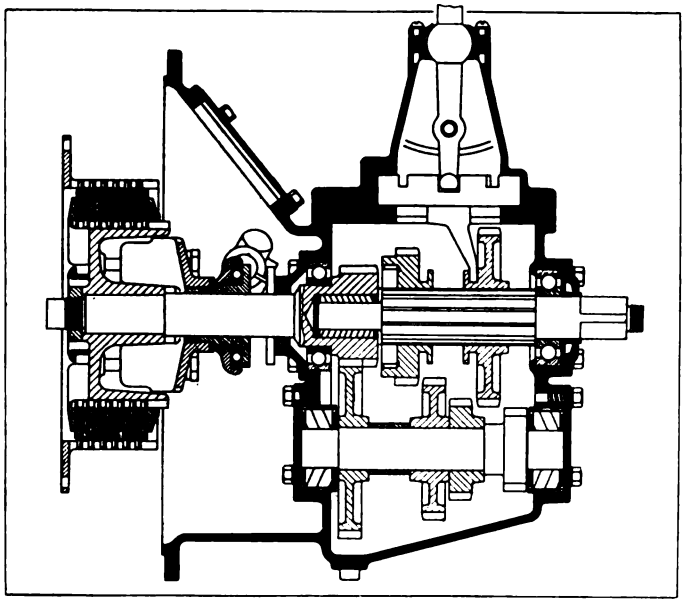
much greater on certain cars than on the average, and almost always it is found that the cars with the easy shift have very light clutch parts. There are some clutches which are so light that it is hardly possible to make a sound in shifting gears however ill judged the time for changing may have been; but the majority need some practice before proficiency is obtained.

Center Control Aids Gearshifting

Center control, and the unit power plant, which two things cut down to the minimum the number of connections between the shift lever and the gears to be shifted, have made the actual lever movement very light and easy on practically all gearsets, but there is still room for improvement in clutches. Where the increasingly popular dry disk type is used it is possible to arrange the inner member to be of extremely light weight and gearshifting becomes correspondingly easy. A very light clutch needs no clutch stop or brake and with it changing either up or down is equally easy.

With a cone clutch the same lightness cannot be obtained, but the weight can be fairly low and the provision of a good brake makes shifting upward as easy as with a lighter clutch. Where the cone clutch fails is in making a quick shift from high to intermediate, for it cannot be speeded up without a double pedal action which very few drivers ever learn to perform. Of course, there are advantages with the cone clutch, notably simplicity, ease of renewing the wearing surface, and facility of spring adjustment. The best of all clutches *when in perfect condition* is the multiple disk running in oil, but it is costly to make and difficult to keep in good condition. The nature of the oil is a trouble, cold weather is liable to cause sticking and the average repairman is not very clever with the type. Hence its use is confined almost to very high-priced constructions where efficiency is insured by an expensive design.

Dry disk and cone still just about hold their relative positions of equality, habit probably accounting largely for the continuance of the cone, and the manufacturer's natural dislike for giving up a thing which has caused him no trouble in the past.



This is a slightly heavier pattern of Mechanics Machine Co. gearset to that illustrated on the preceding page. Larger bearings of heavy type are employed and a roller spigot instead of the plain bush

No Ratio Formula Exists

Among gearset makers there is some difference of opinion as to the proper proportion of second speed to high, and low to second. Some consider that the intermediate ought to be fairly close in ratio to the high, arguing that a car will do nearly everything on these two gears and that the ease of shifting produced by a small drop in ratio encourages the driver to utilize his engine to best advantage. Others take the intermediate as the geometric mean between high and low, yet others leave the matter to the chassis designer and make ratios to suit their customers' ideas. There is no rule or formula, considering the power and weight of the car, which is used generally in determination of gearset ratios, a rather remarkable state of affairs which suggests a useful subject for some investigator to tackle as subject for an S. A. E. discussion. Theoretical ideas seem to be applied in very few cases and the discovery of some good empirical rules ought to be useful.

In conclusion, it may be remarked that the automatic gearshift, whether controlled by springs or by electricity seems to have made no progress whatever during the last year. The electric gearshift has undoubtedly been developed to a state of considerable efficiency, yet no automobile manufacturer has considered it worth its cost as a selling adjunct. This is not in accordance with the expectations of a year ago so we must await the 1916 season for possible developments along this line. They may or may not transpire.

Aluminum Discussion Evokes Enthusiasm

J. E. Diamond's Paper Stirs Detroit Engineers to Appreciation of Alloy Pistons—Future of Aluminum Production Explained by President of Aluminum Company of America

DETROIT was filled with the word aluminum on Nov. 12 for there was quite a gathering in the city of men whose names stand for aluminum in raw and finished states. They had come to hear J. E. Diamond's paper on aluminum pistons, to see what engineers thought of the latest way of employing the useful metal.

Firstly, there was A. V. Davis, president of the Aluminum Co. of America who, after the reading of the paper, held the close attention of the crowded hall while he explained how the price of aluminum came to be where it now stands, and gave a ray of hope for the future. Then E. E. Allyne and W. P. King, president and vice-president of the Aluminum Castings Co., and C. B. Bohn, general manager of the same firm, were present to represent that part of the aluminum industry most closely in touch with the automobile trade. As luck would have it, Louis Chevrolet has just completed his all-aluminum racing motor and the aluminum chiefs enjoyed an hour spent on an outlying road where 90-mile-an-hour joyrides were indulged in, the engine showing a splendid amount of life.

Left—A. V. Davis, President the Aluminum Co. of America. Center—E. E. Allyne, President the Aluminum Castings Co. Right—W. P. King, Vice-President the Aluminum Castings Co.

Large Attendance for Paper

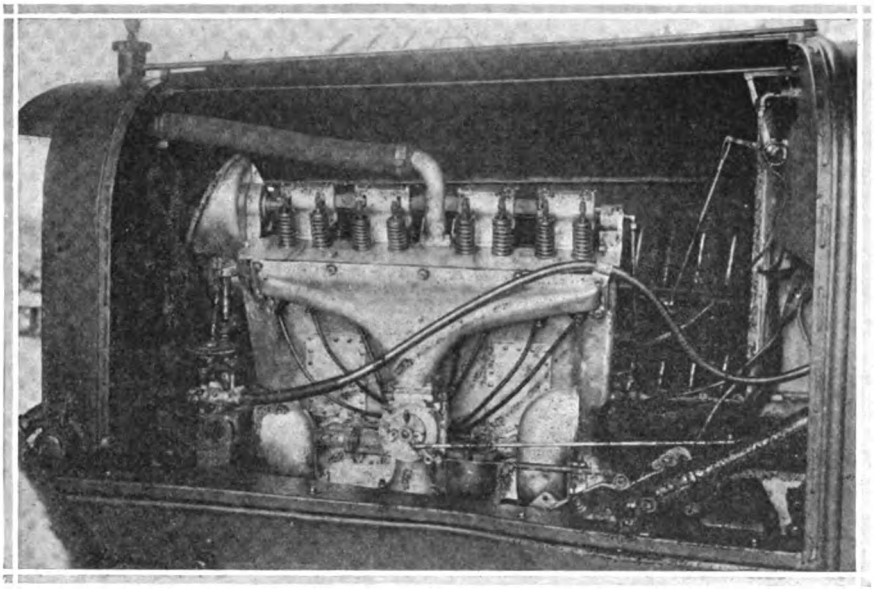
The convention hall at the Pontchartrain Hotel was crowded when, after a brief business session, J. E. Diamond read the paper which was published in THE AUTOMOBILE last week. As soon as he had finished, A. V. Davis was called upon to talk on market matters and the following gives his remarks in condensed form:

I want to say, most emphatically, having been with the Aluminum Co. of America for twenty-six years, that it is not only the desire, but the intention, both now and always, that the Aluminum Co. of America will make all the aluminum that anybody in the United States wants to buy. So that, so far as any future shortage is concerned, if you will only give us a chance and let us alone, we will soon be in the position that we have been in for many years, of making more aluminum than you gentlemen are willing to buy. I suppose that you would hardly believe that March, 1915, was the last month for a period of considerably over five years that the Aluminum Co. of America did not make more aluminum than you gentlemen bought, or any other gentlemen in the United States. Month after month we stocked aluminum, until we went into the month of April, 1915, with not only the biggest stock of aluminum that we ever had, but the biggest stock of aluminum that was ever known in this world. If you gentlemen had been willing to buy, during the last four or five years, considerably more, I can safely say that we would have made considerably more, but we made at least all that could be sold, or at least, all that we were able to sell.

Then in April, 1915, came the beginning of the revival of business. The war had already broken out, but in this country we did not, in general lines at least, feel the effect of it until April or May. Then our stock of aluminum began to be depleted. There were several causes for that, all working to the same end. The first was that the consumption in this country began to jump up very materially. War orders for this, that and the other thing; war orders for automobiles; war orders for automobile trucks; the general revival of business, all tended to make a very substantial increase in the consumption of aluminum. Furthermore, the war itself shut off the importation of aluminum; and there I touch what is to us perhaps a very tender subject, as you can easily understand. We recognize the right of anybody to buy aluminum wherever they wish. We certainly do not pose as the owners of the aluminum industry, although we are proud to say that we are the greatest in the aluminum industry; but, of course, we cannot very well maintain plants of a sufficient size to make enough aluminum to supply this country, and wait patiently for five or six or seven years, until, for some reason or other, there happens to be a shortage, when we can start up those plants, and run them for a year or two until the foreign importation comes on again.

Cessation of Imports Causes Shortage

So far, therefore, as the cessation of importation has anything to do, and it has a great deal to do, with the present shortage, that is something over which we have no control. I feel in a rather delicate position, representing the only manufacturer of aluminum in the country. I wish there were twenty-five others, while I am speaking on this point. Then I could talk about the aluminum industry very much as you can talk about the automobile industry, without seeming either egotistical or seeming to beg for favors. But it is a matter of fact, as you all will see, and must see, that whether we are talking about dyestuffs, or whether we are talking about aluminum, or whatever we are talking about that it is a very difficult thing for the American manufacturers of any product to prevent or to avoid shortage in their particular line, unless, year after year, when there is



The aluminum motor in Louis Chevrolet's special 300 cu. in. racing car, now being tested at Indianapolis

no shortage, *the American consumer buys of the American manufacturer.*

Canadian Plant Under Embargo

Another point, which I will just mention because I want to tell you all there is about it, so far as I see it, is that we have a plant in Canada, as no doubt many of you know, and from that plant in Canada we have always brought a very substantial tonnage into this country; but this year, and also for 1916, when we announced our plans and made our contracts to send in this usual and normal amount of aluminum, the War Office in London stepped in and told us that they needed that aluminum worse than you people did, and that no matter what we wanted to do with it, they were going to take it; and we struggled a little bit, with the result that an embargo was issued, and no aluminum can go out of Canada at the present time, and probably that will continue during the war. So that is the condition, which was rather unexpected, and very unfortunate from our standpoint, and equally so, of course, from the standpoint of the industry.

So much for the shortage as it exists; but you are not especially interested in that; perhaps I have dwelt too long on it. The only cure, aside from the cure that I have already mentioned, is for us to make more aluminum; and, in accordance with our practice and our policy for twenty-five years, we started at once to build more plants. We have laid out a schedule calling for an expenditure of considerably over $20,000,000, this year, and next, but, in our business, it takes a long while to get those plants into shape, get them finished, and it will be about May of next year before we begin to get the results of the more recent of these developments; and it will be, we anticipate, December of next year before they are finished.

It is rather surprising, even to me, when I look over the figures, and see that even now we are making 18 lb. of aluminum to 10 lb. that we were making in 1914. We have screwed up the production a little here, and a little there, until we have made an increase of 80 per cent even now; but when we get these new plants going, we will have such a very substantial increase in production, that unless the consumption of the country should be substantially more than it is now, we will be able to supply it, and have plenty to spare, even though none is imported.

That, I take it, is what you want to know, more than anything else. Although I am very sorry that we have not got the plants finished yet, you can easily appreciate that this condition is not altogether our fault—we did not, at least, bring on the war—if you will only be patient, for a little bit, we will have the production, and insofar as that bears upon the plans for the use of aluminum, I will give you the information for just what it is worth, and you can figure out yourselves what you ought to do in the premises. All I can say is that we are doing everything that we possibly can.

How Aluminum Is Made

The chairman also suggested that I should say a word regarding the process of making aluminum. That seems like bringing coals to Newcastle, to speak to a group of engineers on a manufacturing subject; but it is a bit interesting just in this connection, because it will explain to you why it takes so long to complete a plant to make aluminum.

The ore of aluminum exists in great quantities. There is no shortage there. It is only a matter of buying more picks and more shovels to double the output; no trouble with regard to the ore.

The next step is to treat this ore, by a very complicated chemical process, into a pure product, which we know as alumina, being the chemically pure oxide of aluminum. That is, for a plant to make a substantial increase, you have to spend $1,000,000. That, perhaps, gives you a better idea of how long it takes, because you all know, when you start out to build a $1,000,000 plant, it takes a lot of time, no matter how fast you may work; so that even though we had all the power, and all the other facilities, it takes a lot of time to build an aluminum plant, but the real time is consumed in getting the power. If you gentlemen will pay a little more for aluminum, we could afford to make it by steam power, and possibly hustle up the plant a little quicker; but I have not found anybody yet that would pay any more than they had to, for aluminum; so we have to use water power as the cheap source of power. That is the great expense; and the *sine qua non* in the manufacture of aluminum.

Water Power Scarce

In these days, it is not an easy matter to even get water power. Water power on navigable streams is practically an impossibility, as you perhaps know. I am not here to discuss the political side of it, but as Mr. Cannon, the former Speaker of the House of Representatives once put it to me, any water power bill that you could get through Congress, the President would not sign, and any water power bill that the President would sign, you could not get through Congress; and that is just about the situation.

Perhaps you will be surprised to know that there has not been a water power bill through Congress since the early days of Roosevelt as President, *not one.* We started in to get together a big water power on the St. Lawrence River. We have a lot of money invested in it; but until this deadlock is broken between these people who are conserving the interests of the public, and those who are willing to give corporations a little chance, I do not suppose that water power can ever be developed. That shuts the aluminum manufacturer down to water power on unnavigable streams, and those are necessarily small, and require the purchase of large amounts of property, and that takes a great deal of time. Of course, in this country we do not have the power of condemnation. We have, however, just gotten together a very large amount of property in the South, which we anticipate will be enough to supply the increase in the demand for many

years to come, and I might say that this project is not included in our plans for increase for next year, although we are starting on it already, and I think that, if what we are making next year is not enough for the demands of 1917 and 1918, that these other projects that I speak of, in the South, will come along, and it is our intention to push them just as fast as the market will take the product.

Immense Power Needed

But, after you have got the water power together, you then have to develop it. You take in these days, an increase in the aluminum business means 50,000 hp. or 100,000 hp. to be of any real good, and you, as engineers, all know that to develop a 50,000 or 100,000-hp. water power proposition is no easy task, and two years is a very short time for the most favorably located water power. Three years, four years, or five years, is much nearer the average, and that is where the time is all consumed. So that, with us, it is a question of foreseeing the market, which we always try to do. We are always spending money, and trying to get ready, not for next year, but for four or five years from now, and I feel very certain that the plans that we have on foot now will carry us through, even though we do not have the resumption of importation, which, of course, we will have as soon as the war is over.

If there are any questions you gentlemen would like to ask me, Mr. Chairman, I would be very glad to answer them, except as to how old I am, and how much salary I get.

E. E. ALLYNE—It has been suggested that perhaps this shortage may be partially due to the fact that the Aluminum Company of America may have taken on some war orders. I think perhaps some of these gentlemen might be interested in having a statement from Mr. Davis in that respect.

A. B. DAVIS—I can answer that very simply by saying, that we have not sold 1 oz. of aluminum for any war order, directly or indirectly.

After the passing of a hearty vote of thanks to Mr. Davis the discussion of the paper proceeded and the following gives the gist of the remarks made by the different speakers:

Discussion Centers Round Lubrication

A. LUDLOW CLAYDEN (THE AUTOMOBILE)—Relative to oil pumping, Mr. Diamond, in mentioning the growing practice of drilling a small number of holes immediately below the lower ring, has not mentioned the accustomed number; and I believe this number varies considerably. I think it would be interesting to know what, in his experience, the best number of these 3/32 in. holes is.

Another matter on which I am not quite clear, is, to what extent he favors or does not favor the scraper ring.

JAMES E. DIAMOND—Relative to the first question, to my best knowledge, six holes are used. I do not remember seeing a case with any sized piston, where there have been fewer than six used; of course, these being spaced evenly.

Relative to the scraper ring, I am entirely non-committal as to that. If you can get along without it, so much the better; but in a lot of cases, the motor will persist in smoking, and it is absolutely essential and absolutely necessary to go to the scraper ring to eliminate that.

K. W. ZIMMERSCHIED—I do not know much about piston design, and I am not going to discuss it from the design standpoint; but Mr. Diamond made one remark about grinding these pistons. Now, we have had a little experience with grinding as soft a material as aluminum, and I would look for a very bad source of trouble from that. In a material as soft as that, you will very likely get material from the grinding wheel embedded in the aluminum, and that acts as a lapping agent on this wall of the cylinder, so that with that type of metal, I should say, by all means, the machining or lathe operation would be better.

With regard to the coefficient of friction, I do not just follow Mr. Diamond's argument. We have done a great deal of work trying to find what we might call the wear coefficient of steel against steel, and different bearing metals against steel, and so forth, and the upshot of all our experiments has been that if you have got a film of oil there, you do not get any wear; that the wear that comes is due mostly to the fine grit and the abrasive material that gets into the oil after it has been in use for a while, but if you have always clean oil, and always have a film of oil there, you do not get any wear, and hence the coefficient of friction would not seem to have any great bearing on this matter.

Of course, on the question of a standard piston design, we are very keen for that. We certainly hope that the time will come when we can have a series of standard pistons.

Friction Co-efficient Low

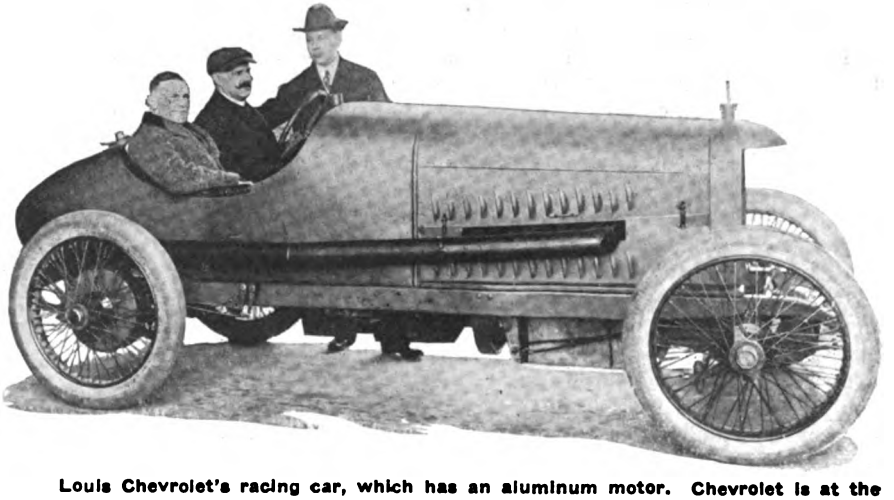
J. E. DIAMOND—That question which Mr. Zimmerschied has brought up, has been put to me before, but the fact remains that in a series of fairly careful tests that we have run out at the plant, we have gotten a coefficient for the aluminum, or rather the Lynite alloy that we use in the Cothias process, of about half that of iron. The conditions were not exactly analogous to those the piston would meet in the motor. We ran blocks, which have a projected area of 1 sq. in., with a load of 1000 lb. per square inch, at a speed, or equivalent speed, of 1000 ft. per minute of travel, we got a coefficient of friction of about 8/1000, that is, 8/10 of 1 per cent. Whereas, with iron, we get in the vicinity of 1.4 or 1.5, that is, 1½ per cent.

I quite agree with Mr. Zimmerschied that if you have a perfect oil film, there ought not to be any wear, but I do not believe you ever get that condition where pistons do not show wear. Pistons do show wear, whether they are iron or aluminum.

On the grinding proposition, if you get the right wheel, there is not very much trouble. Two or three people have solved that problem very nicely, but the fact remains that I think the lathe job is a better job, and cheaper one.

C. C. HINKLEY—I would like to ask Mr. Diamond, just what is going to happen when some of these quick carbon removers use the oxygen flame on the piston head to remove the carbon; if he has taken that into consideration?

J. G. VINCENT—I have conducted a number of tests purposely to determine that one point. I was not worried, be-



Louis Chevrolet's racing car, which has an aluminum motor. Chevrolet is at the wheel; beside him is J. E. Diamond, author of the paper, and standing behind is C. B. Bohn, general manager the Aluminum Castings Co.

cause it was my idea that as soon as the carbon deposit, or whatever it might be, was burned off the piston, the fire would go out. In other words, it requires carbon to cause combustion, and it seems to work out about that way. At least, we have run one motor something considerably over 22,000 miles, and we burned it out a number of times, when there really was not anything to burn out; just to see if any harm would come from putting the flame in there, or attempting to put it in, when there was not any carbon in there, but just a little oil. I personally examined that motor after it was taken down, and I could not find any trace whatsoever of the effects of the burning-out process.

Now, as to the coefficient of friction, I am inclined to agree with Mr. Zimmerschied that the coefficient of friction does not amount to very much, where you maintain a film of oil, of even reasonably good lubricating quality.

L. V. SPENCER—Is there very much of a tendency to offset the wristpin in the pistons? I understand that some of the designs are doing that, for reasons of stopping the slap. I would like to know how many of them are doing it, and what the results have been.

J. E. DIAMOND—I guess it is generally known that the Packard company have offset the wristpin in their pistons for quite some time. I heard of a rather amusing instance the other day, where one company that had been doing a lot of experimenting along that line, had offset the wristpin the other way, and claimed they got better results. So I think this question of slap is very largely psychological.

Objections to Standard Piston

A. P. BRUSH—In discussing some of the points that Mr. Diamond has brought out in his paper, I want to say, first, that, as I understand it, Mr. Diamond has been more of an instrument of transmission than an instrument of origination. His suggestion for the standardized piston, as he says, is largely the result of making a composite picture, so to speak, of the various pistons that he has been called upon to make, so, if I have points of exception to take to Mr. Diamond's paper, I feel it is rather with the rest of you who have to do with engine design, than with Mr. Diamond.

There is one point I should like to ask Mr. Diamond about, because it has a considerable bearing on some of the things I want to say. He says, "Also the piston side pressure may be increased without unfavorable results"; and then, later on in the paper, he makes a plea for a longer piston, for more wearing area. He says that is advisable with an aluminum piston. Those two statements seemed to me a little contradictory. I would like to ask Mr. Diamond if he will harmonize them, please.

J. E. DIAMOND—I think we can reconcile them in this way. In the first place, I have tried to justify the piston which is designated as the hour-glass piston. On that one, the bearing surface is cut away, so that if the coefficient of friction is a factor, and is less than cast iron, we can have a small bearing surface, and at the same time have no greater friction load. On the other hand, I am very partial toward the long piston, where we do not have to use the wiping ring. It is just a question of justifying the hour-glass piston, where it is necessary to use a wiper ring. Do I make myself clear?

A. P. BRUSH—I want to ask about this question of pumping oil, and on the question of the durability and wear of the aluminum piston, and the plea for longer pistons.

It seems to me that this question of piston wear, and pumping of oil, is worthy of very serious consideration, as is the question of standardization. I do not want to be considered a reactionary, but I believe heartily that standardization, if you standardize the right thing, is an excellent instrument of progress; and if you standardize the wrong thing, it is a very efficient obstruction to progress.

Mr. Diamond speaks about the difficulties experienced with aluminum pistons. Speaking of piston slap, as the first point, then the other has to do with the pumping of oil in high-speed motors, when running at low speeds; I think Mr. Diamond meant rather, when running under light loads.

In regard to this question of pumping oil, and wearing of pistons, the number of holes for oil, the elimination groove, my experience with a number of motors does not coincide with the conclusion of Mr. Diamond, or rather, I should say, the conclusion which Mr. Diamond has arrived at by considering the various piston designs which have been submitted to him. I think, before we can come to an intelligent conclusion in regard to this question of piston standardization, we must know whether our engine design, outside of the piston, is up to—shall I say, the standard, or up to the future standard practice.

I am under the impression that the great majority of these piston designs submitted, are used in connection with what I should call a compromise oiling system. That is, an oiling system where the amount of lubrication for any given speed is constant, irrespective of the load, which, in natural consequence, means, I believe, that an amount of lubrication has been chosen which will, so far as possible, meet the conditions of full power and full speed, and at the same time, not give too much excess lubrication at lower powers, and lower or various speeds. It does not seem to me that an oiling system of that kind is quite worthy of standardization. It would seem reasonable to assume that the amount of oil given an engine at any one speed, should logically be in proportion to the work that engine is doing, irrespective of what that speed may be. If we do that, and if, as is entirely possible, the piston is the last working element of the engine to receive lubrication, I see no reason why the lubrication of the piston should not be so accurately controlled, that there ceases to be any problem of over or under lubrication, and a very considerable number of tests bears that out.

I should like to ask Mr. Diamond to what extent has he data as to the kind of oiling system used on the various motors for which they have made the Lynite pistons.

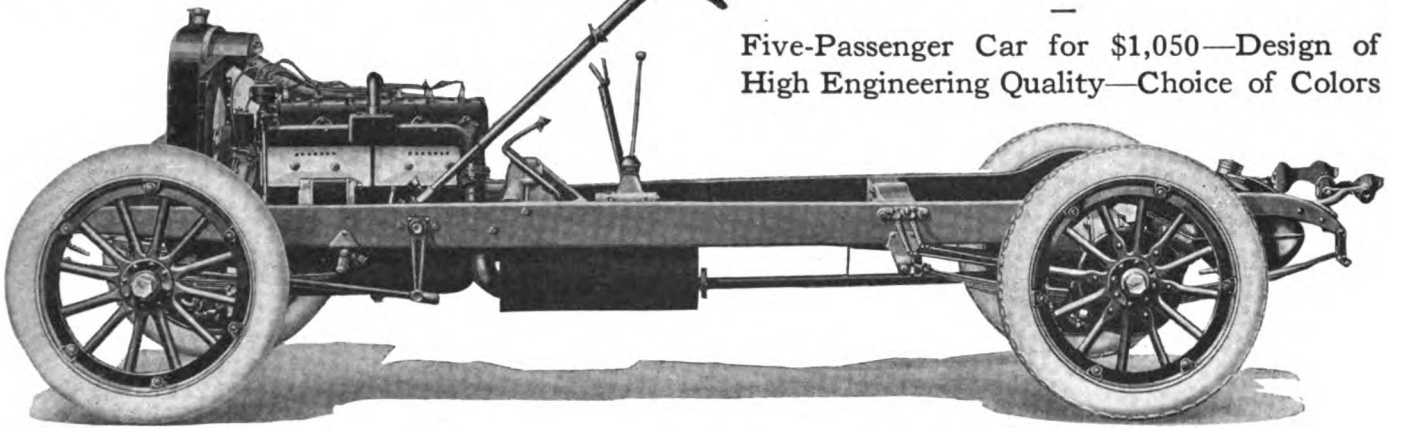
J. E. DIAMOND—That is a puzzler. I know there have been two or three pressure systems. I do not know of any in which the pump is inter-connected with the throttle.

A. P. BRUSH—Of course, the pressure system is also, in a measure, a compromise system, unless it is inter-connected with the throttle. At least, I think we are justified in looking with suspicion upon a proposition to standardize a needlessly long piston, involving a needless amount of material, especially at the present price of aluminum; or a piston in which the piston pin is needlessly far from the piston head, because that problem will also be aggravated by any imperfection of the oiling system.

In regard to the drilling of holes for oil drainage under the lower ring, my experience has been that, with an interconnected oiling system, none are necessary. The practice which I prefer is to have the groove there, not for the purpose of keeping excess oil out of the combustion chamber, but for the purpose of insuring adequate lubrication of the piston pin. That is secured by draining this oil groove below the lower ring, into the ends of the piston pin holes, and providing suitable oil passages, so as to distribute that oil. If the piston pin is loose in the piston, those grooves will take one form; if the piston pin is tight in the piston and loose in the rods, they naturally take another form. But in either case, that is an excellent method of insuring, I should say, copious lubrication of the piston pin, because there is always some leakage around a piston at the moment immediately following ignition of the charge; and those gases leaking by the three packing rings, will, by a process of following the line of least resistance, force a considerable part of oil in that groove through any suitable oil passages, to the piston pin bearing, and with the least oil which will adequately lubricate a piston, that method will insure an abundance of lubrication to the piston pin.

Chalmers Brings Out Light Six

Five-Passenger Car for $1,050—Design of High Engineering Quality—Choice of Colors



The new Chalmers light six chassis which sells for $1,050 as a five-passenger touring car, with color optional. Note depth of channel frame

IT is becoming recognized that it is possible to build a really high-class, well made and finely finished six-cylinder automobile for about $1,000, and the latest addition to this class is a new Chalmers product; a thoroughly handsome five-passenger machine with chassis work of the quality always associated with the Chalmers name. The new car is every inch a Chalmers, it is good to look at, comfortable to ride in, powerful for its size and comparable with the best in engineering quality. With a five-passenger body and full equipment the price is $1,050, and this includes finish in a choice of colors. It is the type of automobile that will appeal to the owner who likes a car with a distinctive individuality.

Briefly, there is a unit power plant with a six-cylinder motor 3¼ by 4½ in., the wheelbase is 115 in. and the springs are long semi-elliptics. Axles are Timken, the new semi-floating pattern being used for the rear. A point of special merit is the frame, which is exceptionally deep and rigid, while the body is as well finished internally as it is pleasing in external lines.

Motor Produces High Power

The overhead valves used for the Chalmers six-40 are not employed for this smaller car, but the new engine is typical of modern L head design, giving its maximum power at over 2500 r.p.m. and at this speed it produces 1 hp. for each 5 cu. in. of displacement. The formula power is 25.4 hp. and the actual maximum over 45 hp., the displacement being 224 cu. in.

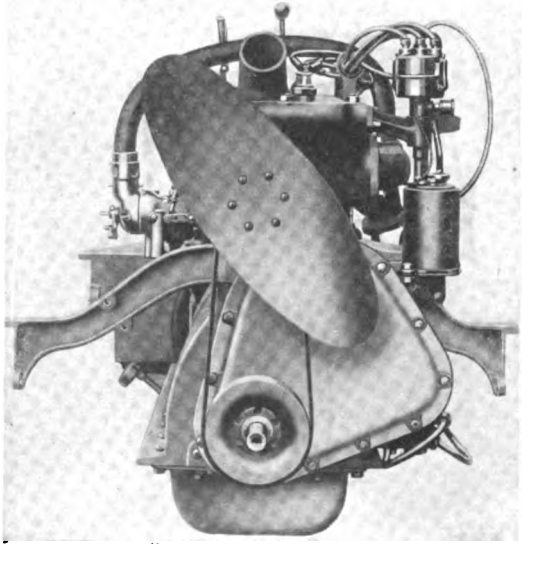
With the desire for eliminating vibration, a very large diameter has been chosen for the crankshaft, the three bearings being 2 3/16 in., 2¼ in. and 2 5/16 in. diameter respectively, reckoning from front to rear, the difference in diameter being to allow for economical, accurate manufacture. Furthermore, as a vibration reducer and efficiency increaser aluminum alloy is used for the pistons, these being made by the permanent mold process. The connecting-rods are quite light forgings, so the total reciprocating mass is small for the bore.

Valves are 1⅝ in. with a lift of 5/16 in., and special attention should be given to the lightness of the tappets, and the method for attaching them. Cylinders and crankcase are a unit casting, but the tappets are assembled in sets of six in two cast-iron racks which are afterwards bolted in place, this making for accuracy and facilitating the assembly. Plenty of space is allowed the valves in every respect, both as to port area and cooling water and around the tappets. A detachable cylinder head makes for accessibility and ease in removing carbon deposit.

Oil Pump a Separate Assembly

One of the neatest parts of the engine is the oil pump and ignition assembly, this being a separate unit bolted to the side of the crankcase at the front end on the left side. Every part is accessible to the last degree and the outside situation for the oil pump helps in cooling the oil. It may be remembered that the Wisconsin-Stutz racing motor has this same feature.

Pressure feed to the main bearings and dip troughs for the remainder of the engine form the lubrication system, while there is an easily visible level gage on the right side of the motor adjacent to the filling cap. As is shown by the photographs, the motor is externally simple, while the drawings show this simplicity to be characteristic of the invisible as well as the visible parts of the engine.



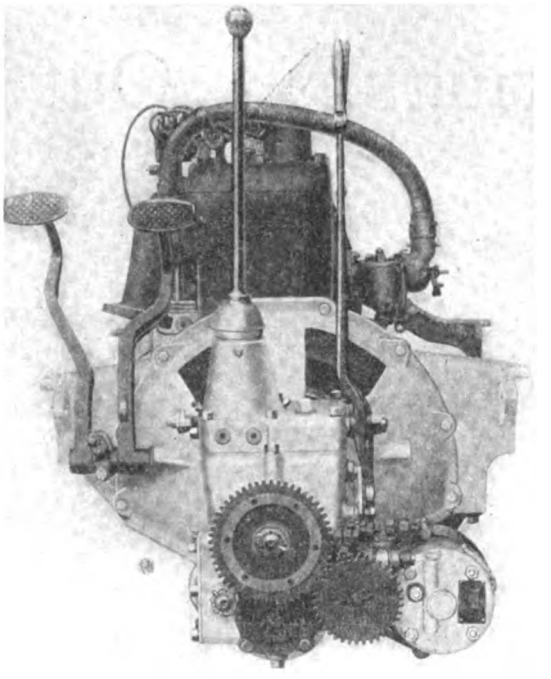
Front end view of new Chalmers six motor, showing simple type of two-blade fan

A peculiarity is the fan, which is probably the simplest two-blade form ever conceived. It is well known that a two-blade type is just as efficient as any other, but it has remained for the Chalmers engineers to show that it can also be the cheapest. A simple piece of stout sheet steel is cut, and riveted to a hub at the middle, and then the ends are bent a little to give a pitch to the blades. The extremely inexpensive driving pulley on the crankshaft is also a clever bit of design as this is practically all press work.

Stampings are used largely throughout the chassis, the Chalmers company having a good equipment for making this class of part. For example, the gasoline tank is pressed from two pieces of steel, thus being immensely strong and cheap withal.

It is on the side of the gearbox

that the starting motor is situated, this engaging the flywheel by a Bendix pinion. The motor is of Westinghouse manufacture and the generator takes its drive from the same pinion as that connecting with the oil pump and ignition assembly. Using this location for the starting motor adds to the space around the engine, and thermo-syphon cooling being employed also relieves the power plant of an accessory. The distributer is a Remy product and the carbureter a 1-in. Stromberg.



Rear end view of Chalmers light six motor, showing mounting of starting motor beside gearbox. Note shaft for ignition drive at left of motor

Light Clutch Aids Gearshifting

Bolted to the motor are the three-speed gearset and the clutch, the latter being the same dry-disk pattern used on other Chalmers models. The inner part is very light in weight, this aiding gearshifting to a pronounced degree and a generous use is made of stamped parts. Having multiple springs the adjustment is very easy, and all parts of the clutch are accessible from beneath, the flywheel being inclosed only as regards the upper portion.

In the gearset the outstanding feature, apart from a general compactness, is the size of the Hyatt roller bearings used. Oil is the recommended lubricant, not grease, and there is a brass cock to gage the proper level. There is a plain bearing at the rear end of the main shaft to take thrusts due to gear shifting or to the propeller shaft, so that the ball bearing in the clutch and the thrust washer on the front part of the main shaft are practically the only ball bearings used in the car, since the axles are Timken equipped throughout.

Hotchkiss drive is used, with a tubular propeller shaft, the rear springs being half elliptic 54 in. long and 2 in. wide, and the rear axle is the new Timken semi-floating pattern with spiral bevel drive and brake drums 12 by 2 in. The gear ratio on high is 4.75 to 1, and the tires 32 by 4 in. so the motor speed is fairly high, the maximum peak of the power curve being reached at a little over 50 m.p.h. At 1000 r.p.m. the car speed is 20 m.p.h. and at 1000 ft. per min. piston speed the car rate is just 15 m.p.h. and the displacement per mile is 670,000 cu. in.

The new axle is typically Timken, having the pressed steel case and taper roller bearings throughout, but the road wheels fit directly upon the ends of the drive shafts. Brakes are, of course, both internal and external to the same drums, the inside brakes being expanded by a cam action and the regular Timken adjustable toggle is used for the contracting brake.

Strong, Light Frame

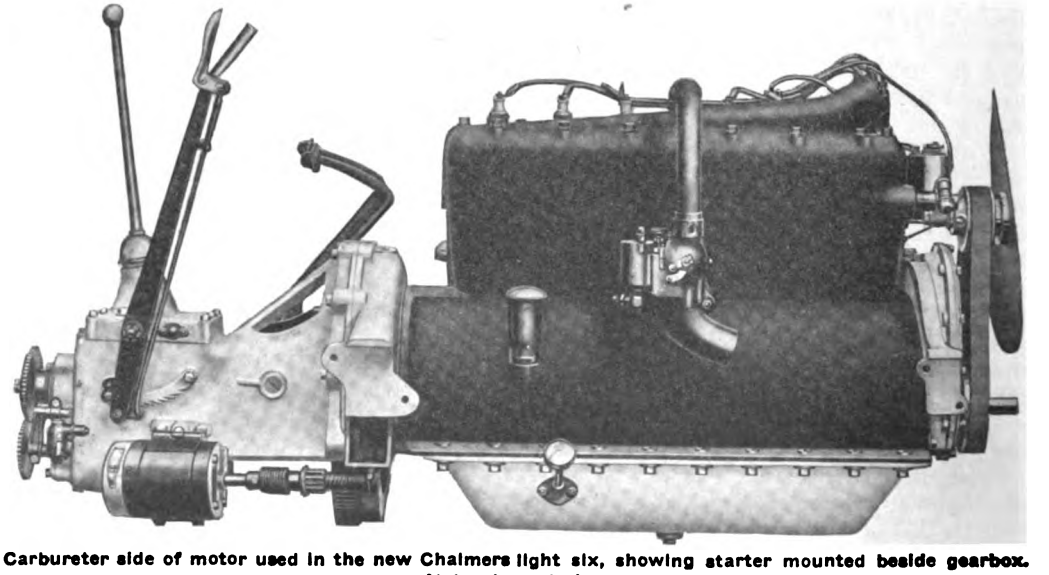
It has been mentioned that a feature of the car is the strength of the frame which is no less than 5 in. deep at the center and for the larger part of the length. Quite a thin steel is used, the thickness being only ⅛ in. and the section is 2½ in. wide. Over the rear axle the frame sides are raised in a short curve, and to give increased rigidity at this point the top and bottom flanges are bent over a little on their edges, so putting a kind of bead on the edge and stiffening the channel section just as a bead on the edge strengthens a fender.

Steering is by worm and full worm wheel, with an eccentric adjustment for taking up slack, and the connections are laid out well, ample size being given to the ball joints and yokes. The front axle is a Timken with taper roller bearings for the road wheels.

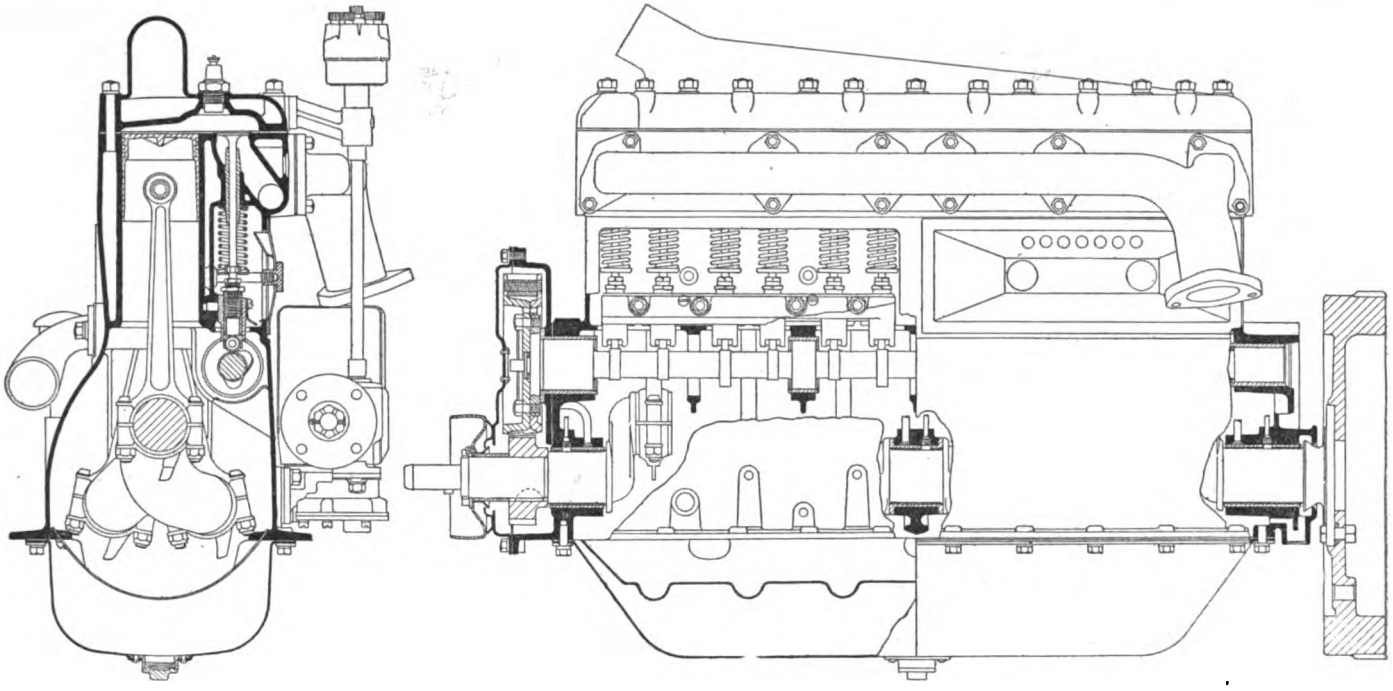
Before passing to the body, mention may be made of a detail of manufacture which should be much appreciated, this being the employment of a wiring unit, all wires being inclosed in a single outer tube. There is no junction box, since the wires attach directly to terminals on a plate which sets in the cowl board and carries the switch, ammeter, etc. It is a matter of minutes only to remove this wiring unit and replace it by another, so if any fault should develop it is as easy to rewire the car as it would be to change a tire almost.

In external appearance the new Chalmers is a reduced scale model of the six-40. It has just the same graceful outline, and the hood and radiator are so alike that it is only in the presence of a six-40 that the difference in size becomes noticeable. At present only the five-passenger type will be made, but a roadster is in preparation. Inside, the front seat is wide enough to accommodate driver and passenger without cramping the former. Sitting at the wheel it is found that the levers are within easy reach, that the lamp switch which gives control of the dimmer can be operated without stretching and that the pedals have a light touch. In the tonneau 46½ in. width is allowed the three occupants, and there is leg room enough without a disproportionate amount of floorspace.

Upholstery is leather with a bright finish, the top is of



Carbureter side of motor used in the new Chalmers light six, showing starter mounted beside gearbox. Note clean design



Chalmers new high-speed, light six engine. The extremely light tappets, the sturdiness of the crankshaft and the method for mounting the oil pump and distributer are distinctive features of this new engine

heavy material and clips neatly to the top of the windshield when erected.

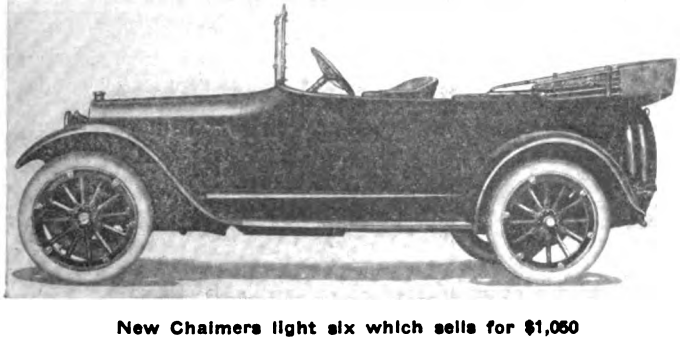
Undoubtedly one of the most attractive things about the car is the really excellent paint work, the colors, blue or dark red or green, are good, rich tints and the hood is painted too, not enamelled.

The fenders are a smoothly rounded shape and the whole machine is distinctly better than its photograph, a thing which is not an invariable rule. As to equipment, the rear tires are supplied with non-skid treads and all the usual accessories are included.

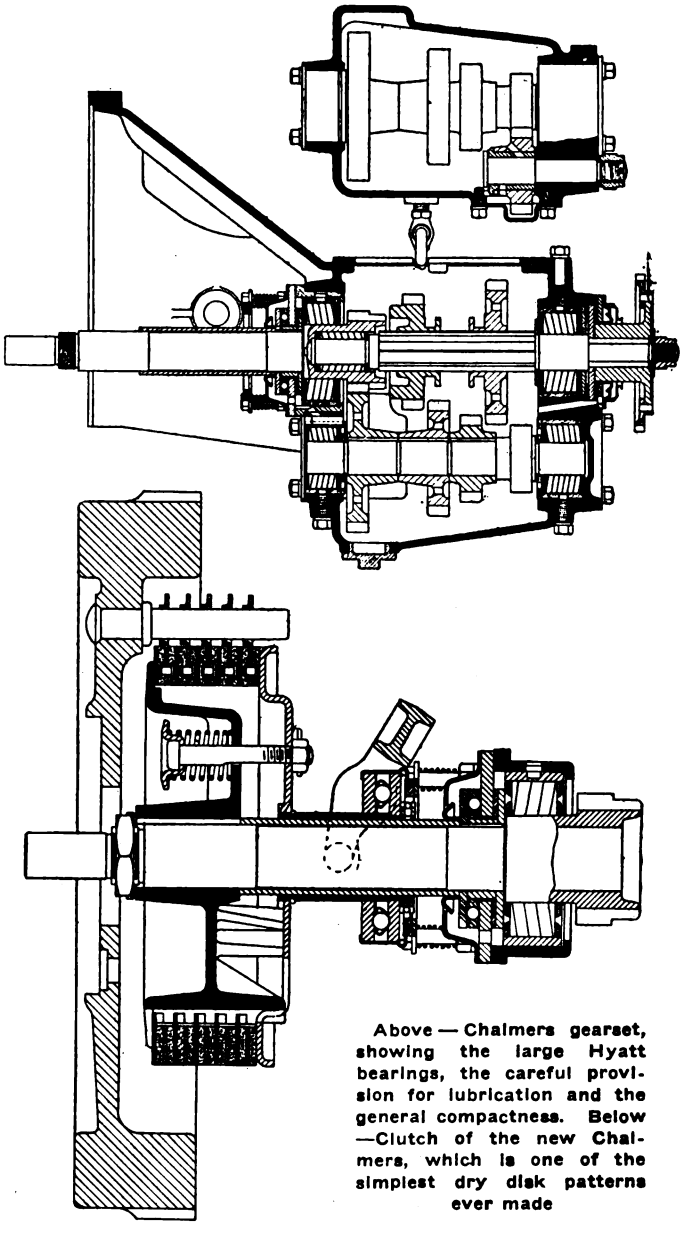
A Car with Character

It is not easy in a printed page to give an idea of how powerfully this car creates the impression of high quality. The design, on examination, shows excellent engineering, up-to-date in every particular, and yet free from debatable points. It is above everything else a sane design. The body is well upholstered and well molded, while having a highly finished exterior. The control is arranged conveniently; the fittings are all thoroughly good.

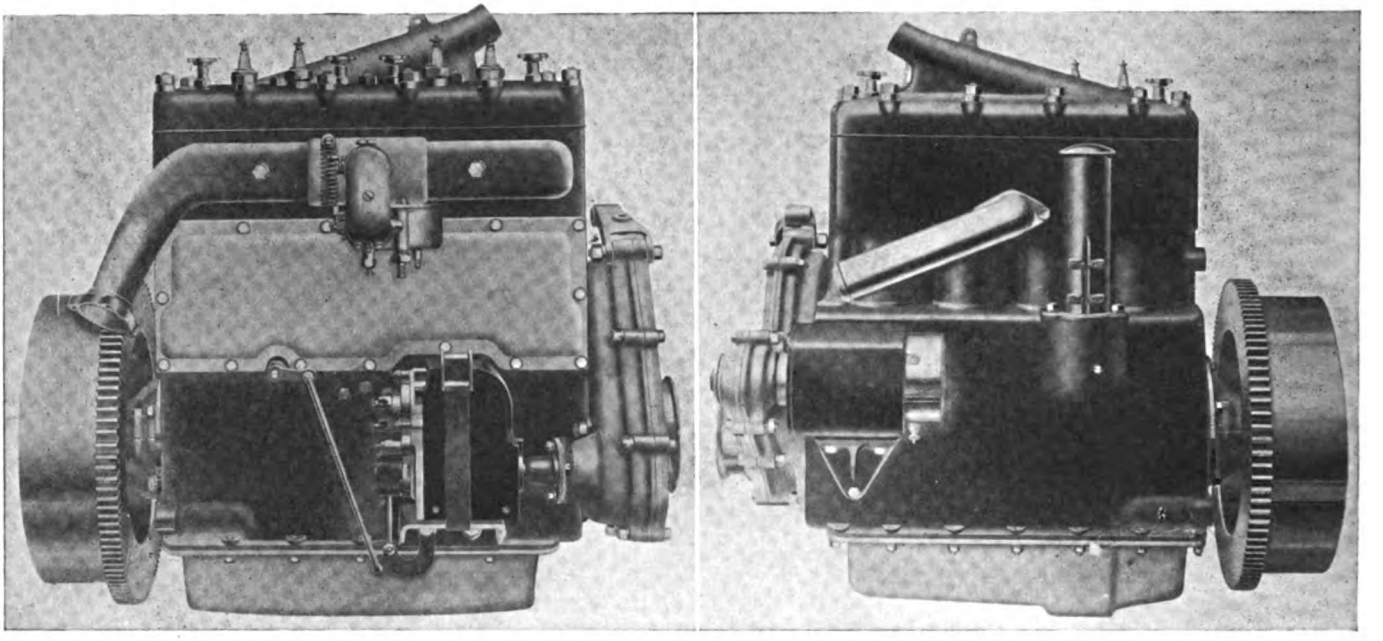
Yet this statement is hardly sufficient to explain why it is that the first sight of the new model stirs the imagination immediately. At once it is obvious that this, comparatively small, comparatively inexpensive machine is one that the wealthiest man would own with the same satisfaction in his purchase that he could bestow upon a much more costly car.



New Chalmers light six which sells for $1,050



Above — Chalmers gearset, showing the large Hyatt bearings, the careful provision for lubrication and the general compactness. Below —Clutch of the new Chalmers, which is one of the simplest dry disk patterns ever made



Both sides of the 3⅛ by 5-in. four-cylinder block motor used on the new Overland 75 which sells for $615

New Overland Four Ready

Model 75 with 3 1-8 by 5 Block Motor, Electric System and Cantilever Rear Springs at $615

OVERLAND'S new four-cylinder model 75, which has been expected for several months, is now ready. It is a typical Overland design with a 3⅛ by 5 four-cylinder block motor and sells at $615 with touring body and $595 as a roadster. It has 104-in. wheelbase, 31 by 4-in. tires, electric starting and lighting with switch box on the steering column, cantilever rear springs, cone clutch in the flywheel and three-speed rear axle gearset. Left drive and center control are used.

Big Production Planned

The plan of the Willys-Overland Co., Toledo, Ohio, is to make these cars on an enormous scale, this being a big factor in setting the price, undoubtedly. However, the point is also emphatically made that the car is not to supersede any other model, the present $750 model 83 being continued on as large a basis as heretofore. It will also not have any effect upon the output of Willys-Knights or of the six.

Economies in the manufacture of the new Overland 75 are seen everywhere in the new plant which has been erected especially for the making of this model. Progressive assembly schemes of almost astounding magnitude are installed, and this, together with the many design features of the car which have been worked out to make an efficient vehicle and at the same time render manufacture as simple as possible, give some inkling of how the big concern is in a position to make the vehicle at the price.

Differs from Former Practice

One has but to inspect the mechanism of the car to realize that it is different from former Overland practice. The motor is a block with cylinders and crankcase in unit and the head detachable. Chains drive the magneto, camshaft and generator. The rear springs are cantilevers, and though the gearbox is in unit with the rear axle as in other models, the axle and the gear assembly are new in design. Many of the features of these parts are the result of the quest for quick manufacture and assembly.

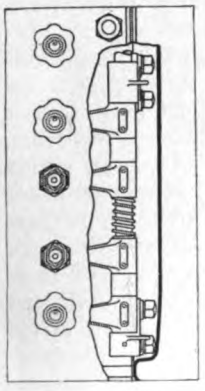
Motor Is Compact

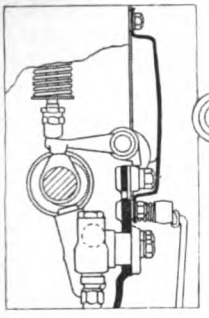
The motor is exceedingly compact, and lends itself well to quick assembly due to the way the parts are designed. For instance, the casting of all the cylinders and crankcase in one piece has not only the advantage of rigidity of construction, but it is at once apparent that one operation at least is done away with—that of combining crankcase and cylinders. There is no intake manifolding, the carbureter simply bolting to an opening at the center of the casting below the exhaust manifold. The gases get to their respective cylinders through cored passages within the block. The cylinder head carries the water outlet connection, the spark plugs and the priming cups. A single cover plate goes over the valve tappet chamber. This in place, there is nothing exposed on the right side but the carbureter, exhaust manifold and magneto. On the left are the oil level gage, the water inlet connection and the generator.

Although the formula rating is 15.64 hp., the 5-in. stroke gives the engine a good displacement—153.4 cu. in. The developed power is 28 at 2000 to 2400 r.p.m., and the advertised power 20 to 25 hp. The pistons are light, as are the rods and their assembly. With a crankshaft 1⅞ in. diameter, the light

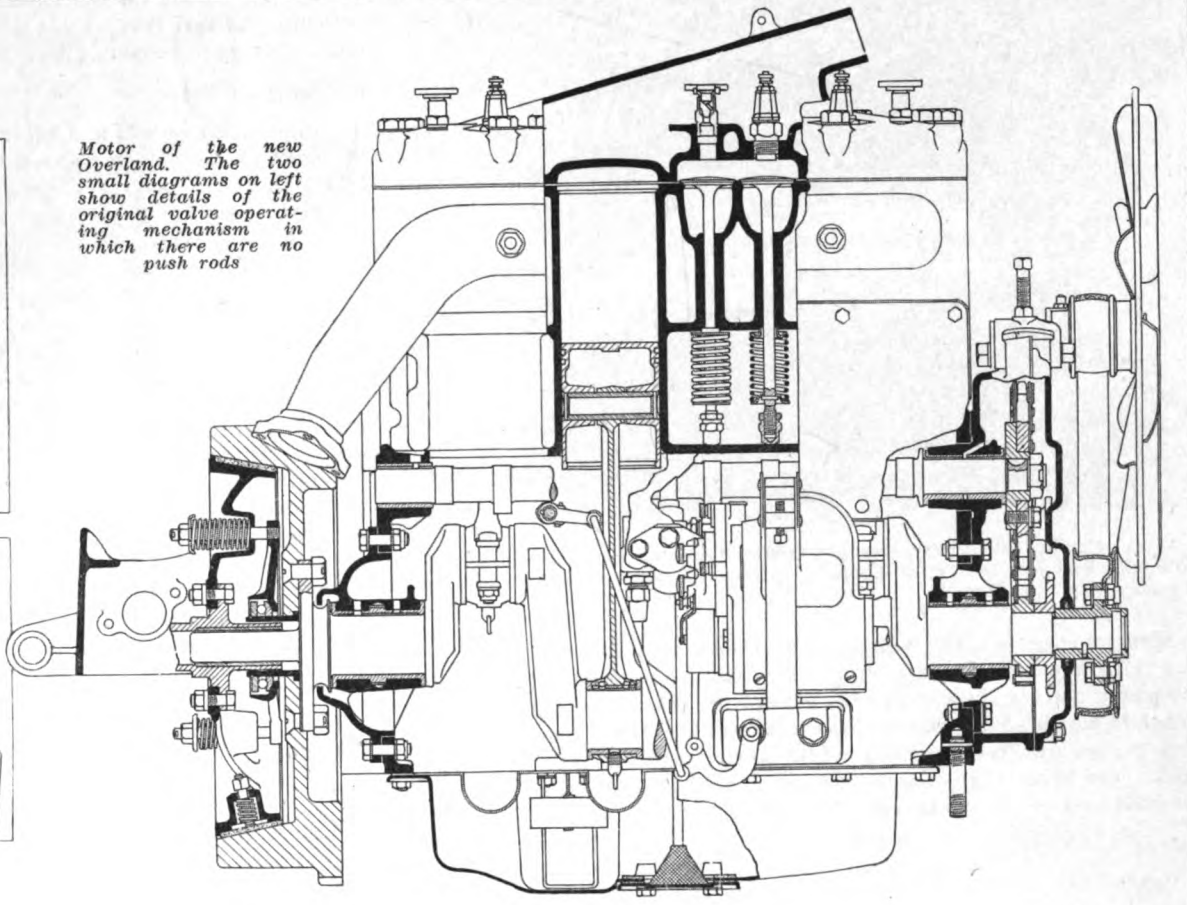
Features of New Overland

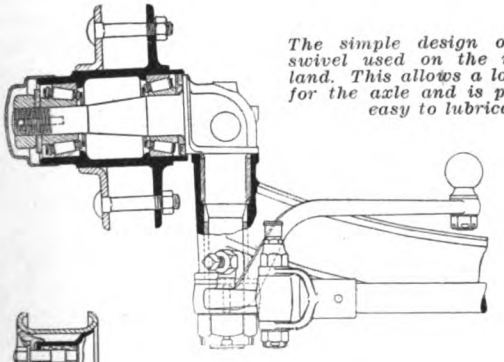
Motor	Four-cylinder Block
Bore and Stroke	3⅛ by 5
Formula Horsepower	15.64
Maker's Rating	20-25
Electric System	6-Volt Auto-Lite
Gearset	Three-Speed, on Axle
Wheelbase	104
Tires	31 by 4
Springs	Cantilever rear, Semi-elliptic front
Touring Car	$615
Roadster	$595



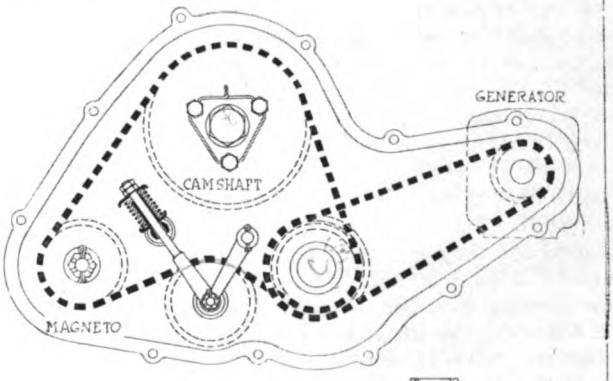


Motor of the new Overland. The two small diagrams on left show details of the original valve operating mechanism in which there are no push rods

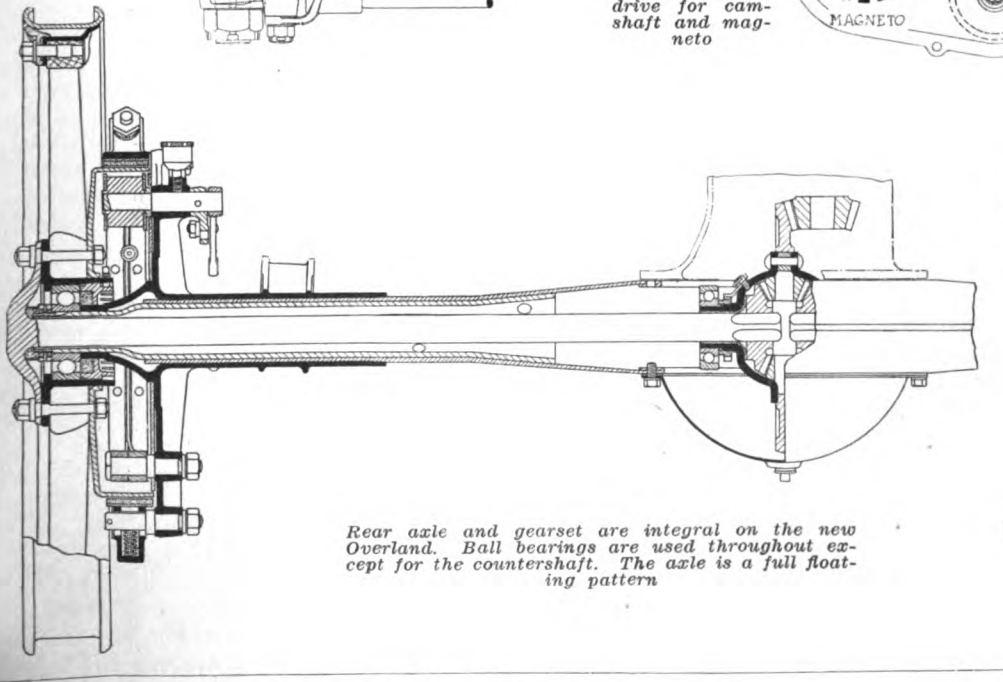


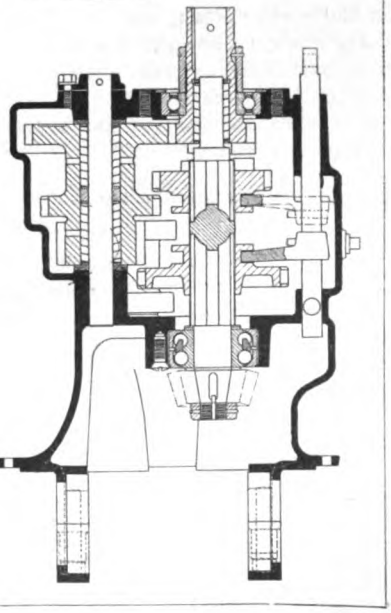


The simple design of steering swivel used on the new Overland. This allows a low position for the axle and is particularly easy to lubricate

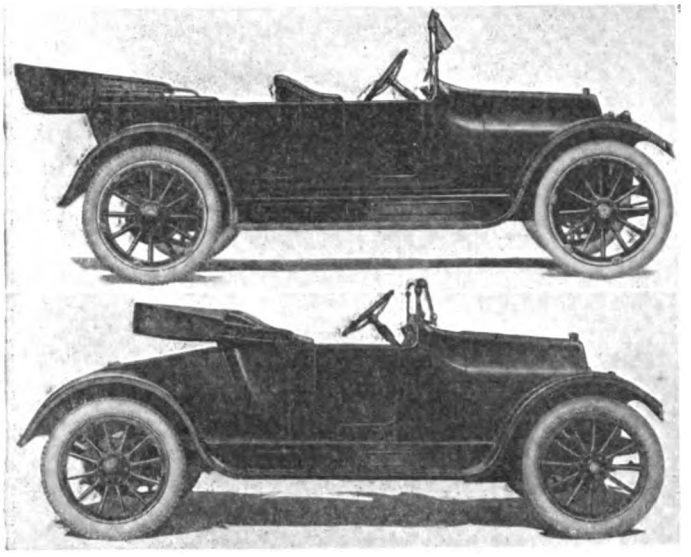


Chain layout, showing idler which maintains the tension of the triangular drive for camshaft and magneto





Rear axle and gearset are integral on the new Overland. Ball bearings are used throughout except for the countershaft. The axle is a full floating pattern



Above—Four-cylinder five-passenger Overland touring car which sells with complete equipment for $615. Below—Roadster on same chassis which lists at $595

reciprocating parts make high speed attainable with no effort and with a commendable lack of vibration. For instance, the piston and its rings weigh 1.9 lb., and the connecting-rod complete with bushing and cap comes to 1.5 lb. Thus a complete piston and rod assembly totals 3.4 lb., which is very light. The pistons are of cast iron, have the pins clamped in the rods and carry two concentric rings each.

Valves Are Large

Valves have a 1 9/16-in. clear opening and lift 5/16 in. The clear diameter is one-half the bore of the cylinders. One noteworthy feature of the valve assembly is the method of valve actuation, and the ease of adjustment. There are no tappets in the engine. Interposed between the valve stems and the cams are rockers pivoted on a rocker shaft just inside the valve compartment and readily accessible. The adjustment is on the lower end of the valve stem. A round-end nut screws to the end of each rod, and is held by a lock nut. This adjustment is usually on the tappet in designs where tappets are used. The rockers relieve the valve stems of any side thrust, and they also make the valve adjustment very simple. Should it be required to take the rockers from under the valve stems, it is but the work of a moment. They are free on the rocker shaft within sufficient range to allow them to clear the valve rods. Springs hold them against shoulders on the rocker shaft, and by pushing them along the rocker shaft against the spring pressure they are freed from the cams and valves. The whole rocker assembly bolts to the side of the cylinder casting so that it is immediately within reach when the cover plate housing it and the valves and springs is removed.

Two-Bearing Camshaft and Crankshaft

Both the camshaft and the crankshaft are carried on two bearings. The latter is assembled through an opening in the flywheel end of the crankcase, a plate here carrying the bearing and closing an opening that is large enough for the shaft to pass through. With a diameter of 1⅞-in., the front bearing is 2⅝ in. long and the rear 3 in. long. Connecting-rod bearings have the same diameter, and a length of 1¾ in. The camshaft front bearing is 1⅛ by 2⅝ in., and the rear 1⅛ by 1¾.

At the center of the camshaft there is an extra cam which operates a plunger oil pump that keeps a constant level of oil in the individual splash troughs, drawing its supply from the oil reservoir in the base plate of the engine. A very legible float oil gage on the left side of the engine shows the amount of lubricant. It rests on the top of the crankcase, bringing the indicator well up so that it is no trouble to read when the hood is raised. This gage housing also acts as the filler.

Roller Chain Camshaft Drive

Drive of the camshaft, magneto and generator is by chains, of which the inner one is a triangular drive with an idler to keep it tight. This chain runs over sprockets on the crankshaft, camshaft and magneto shaft. Outside of this is the chain that drives the generator from an outer crankshaft sprocket. The idler works against the outside of the chain, between crankshaft and magneto sprockets. A coil spring with a tension adjustment draws on the end of a small yoked member that carries the idler. The arms of the yoke pass around the chain and sprocket, making a good mounting. To still further strengthen the idler mounting and keep it in position, there is another member, pivoted at its upper end to the cylinder casting, and having an arm running to the sprocket center on either side. The scheme of this construction is brought out in the drawing of the front of the engine. There is means for taking up any slack in the generator chain at the generator end. The whole chain assembly is compactly housed, and due to the fact that the roller chains are not as wide as silent chains would be, this housing is not so thick as the latter would require it to be.

Two-Unit Electric System

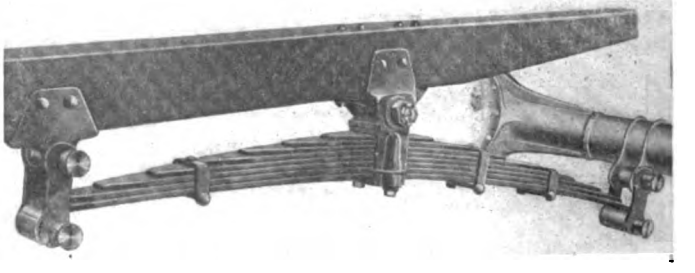
Auto-Lite two-unit starting and lighting are incorporated. The drive of the generator and its position have already been touched upon. This unit runs at 2 1-5 engine speed. The starting motor, geared 11 to 1 to the teeth on the outer rim of the flywheel, is equipped with the Bendix automatic shift which has already been described in detail. In starting, all that is necessary is to press the starting button, when the spinning of the armature shaft sends the driving pinion into mesh with the flywheel, it disengaging automatically when the engine starts under its own power. This unit is carried on the right rear side of the engine close up to the flywheel as shown in the photographs.

Three-Point Suspension

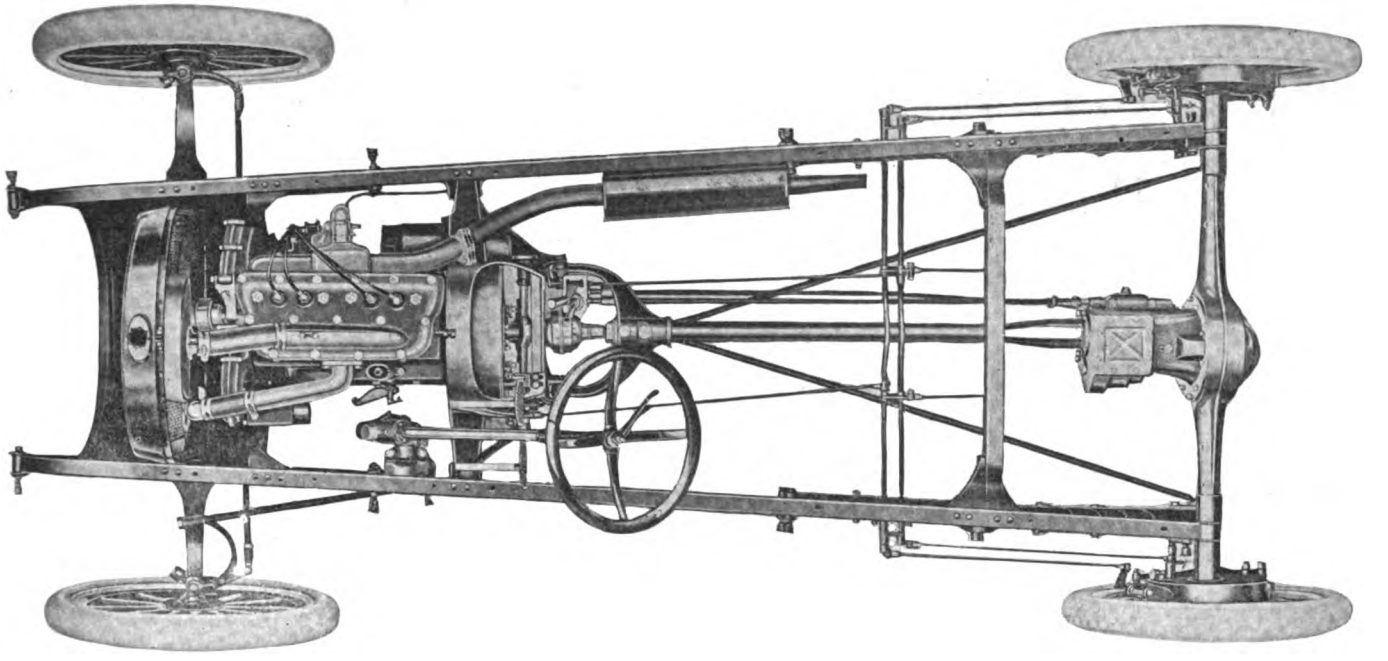
Three-point engine suspension is attained by resting the front on a frame cross arm, and bolting the rear of the motor to an arm construction that performs the functions of partially inclosing the flywheel, carrying the clutch throw-out rod, the pedal and gearshift controls and acts as the support of the ends of the yoke which is the termination of the torsion tube. This makes a nice assembly unit, the rear motor supporting arm feature being only one of its several parts.

Drive is characteristically Overland, with the hinged yoke carrying the front of the steel torsion tube, the rear end of which is flanged to the front of the gearbox. The clutch is leather-faced, on an aluminum cone with spring inserts under the leather and three engagement springs equally spaced. There is a small adjustable clutch brake with a fiber facing that acts against the clutch cone when disengaged, stopping it from spinning.

Compactness of design is notable in the gearset, which has one very interesting feature. The three countershaft gears



Cantilever rear spring used on the new Overland



Overland 75 chassis showing mounting of block motor and rear axle gearset. Note cantilever rear springs mounted under frame

are forged in one piece, the advantages of which from a manufacturing standpoint are readily apparent. This forging is made with a hollow center and there are two Hyatt roller bearings between it and a shaft which is fixed in the gearset housing. Thus instead of attaching three separate gears to a shaft and then allowing the shaft to revolve in bearings at either end, the shaft is stationary and the gears run around it. Fellows gear shapers make short work of the cutting of these gears.

The rear axle has a pressed-steel housing and there are no truss rods or other braces. The bottom and top of the housing are ribbed on the outside to take care of bracing, making a substantial construction. Ball bearings are used in the axle's internal construction, and the design is what is termed a one-bearing floating type. The entire weight of the car is borne by the housing, the axle shafts taking none of it. The axle shafts, which are squared into the differential, have driving flanges integrally forged and these bolt to the wheels. Thus the shafts can be withdrawn entirely without disturbing the wheels in any way. Ample provision is taken against oil leakage out of the axle by felt washers at proper points.

Front axle design is entirely new to Overland cars. It is of the type known as the inverted Lemoine construction, whereby the wheel spindles are suspended from the top of the steering knuckles instead of from a point between the arms of a yoke, as in the more conventional design. There is no yoke support for the knuckles, simply a single support on the end of the I beam. The design simplifies the forging and makes a nearly straight axle. It allows the car weight to be low in relation to the wheel bearings, assisting steering.

Cantilever Rear Springs

Mounted directly under the side members of the frame, the rear springs are full cantilevers, 42 in. long by 2 in. wide. They are trunnioned at the center, and shackled at front and rear. The rear support is below the axle housing, serving to bring the suspension low down, which is desirable. These springs have been so designed that they give exceedingly easy riding qualities to the car.

A straight taper from front to rear is given the frame. It is simple in form, there being a cross member at the front, and another three-quarters back. No cross piece is used at the rear, this not being needed in addition to the member just a little forward. This member, by the way, is located at the point where the cantilever springs attach to the frame, strengthening it where support is needed. The taper of the side rails is such that the body is given good support throughout its length.

Crowned fenders of sheet steel are fitted, these adding their part to the general appearance. The standard body finish is black, and the upholstery Fabrikoid. Equipment is very complete, taking in such items as demountable rims, one-man top, speedometer, electric horn, and all the little fitments that go to make up the finished car of to-day. The gasoline tank is in the cowl and the filler pipe on the dash.

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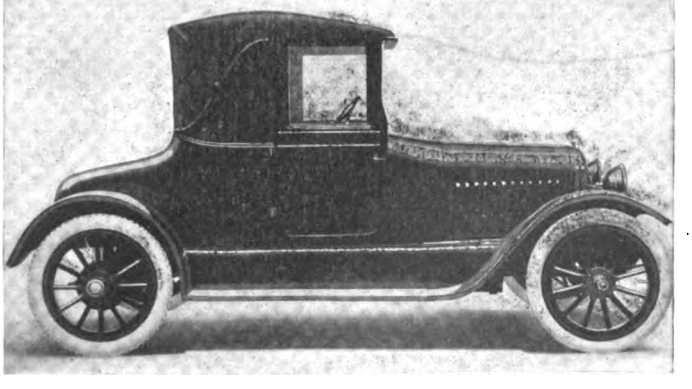
New Grant Roadster and Cabriolet

The Grant Motor Co. has added to its line a new cabriolet at $1,025 and a new roadster at $795. Both new models are mounted on the standard six-cylinder chassis which remains unchanged except for the substitution of special roadster springs scientifically designed from the standpoint of roadster weight and three-passenger carrying capacity.

The cabriolet windows lower for ventilating and are equipped with anti-rattle devices and the windshield is also adjustable to a variety of positions. The back of the body opens up its full width, providing unusually large storage space with ample room for storing extra tire and demountable rim in addition to luggage, repair kits, tools, etc. Like the touring car, the new models are finished in dark Brewster green with black fenders, hood and running gear.



New Grant cabriolet which sells for $1,025

The History of the American Automobile Industry—4

The Development of the Electric Vehicle from 1800 to 1880, Whence the Present Practical Era Dates—Steam Vehicle Progress from 1825 to 1870

By David Beecroft

¶ Review—Last week the development of steam vehicles in America up to 1810 was told, at which time the advent of road building was at hand. A brief review of early road building was included, which review, intended to show why motor vehicle progress was held back in America by lack of roads, is continued in the opening paragraph this week, after which is resumed the progress in motor vehicles in America from 1825 on.

THOMAS TELFORD, England, 1757-1834, was one of the greatest civil engineers of his time, He built the road from Warsaw to Brest for the Austrian Government, and served on many canals, locks and bridges. In 1803 he was engineer for the construction of 920 miles in the Scottish highlands and later perfected communication between London and Scotland and the north English towns, as well as in the more inaccessible parts of Wales. The Telford construction is very similar to the Tresaguet, consisting of a foundation of large broken stones, carefully set, on which the finer broken stone is placed. The Telford system has been very little used in America excepting where the soil has been of such character that it would not support the broken stone without a foundation of heavier stones to assist.

First Street Cars, 1832

Reverting again to the progress of steam road vehicles in America, in 1825 T. W. Parker is said to have made a steam vehicle with three wheels that were 8 ft. in diameter. The motive power was a two-cylinder steam engine. It was only 7 years later, 1832, that John Stephenson built the first street cars ever to be used in America and started running them on the streets of New York City.

At this time the influence of development of other forms of motor vehicles was beginning to be noticed in America, an indication that steam was not going to have clear sailing so far as road vehicles were concerned.

Electricity Grows in Importance

It was at this time also that the influence of electricity was beginning to assert itself, so that as far back as 1840 we see the struggle among steam, internal combustion engine types and electric types starting an industrial warfare that raged with more or less energy until the opening years of the twentieth century, when the ascendancy of the internal-combustion type of vehicle had established itself, when steam was on the wane and the electric type was in second position. The progress of steam vehicles must be set aside for the moment and a few paragraphs inserted on the activities of electricity and also efforts at patenting features of the explosion engine.

While Benjamin Franklin, in 1751, and Joseph Priestly, 10 years later, suggested firing guns by electricity and many minor electric phenomena were known, practical electricity dates to 1801, when Sir Humphrey Davy produced and studied the arc light in England. In 1802 Romagnosi, an Italian, discovered that the magnetic needle was deflected by the electric current. In 1831 the principal facts of electric induction were discovered by Sturgeon, Henry and Page, who followed Faraday's discovery of electric induction in 1831. S. F. B. Morse of New England conceived the electric telegraph in 1832 as he was returning from Europe and exhibited his apparatus in 1837. From this time a wave of electric progress was started which became evident in several countries.

An Electric Boat in 1837

W. Sturgeon, a British inventor, carried his electric experiments further and tested an electric boat in 1837, as did Prof. M. H. von Jacobi on the river Neva at St. Petersburg in 1839. Von Jacobi's motor was of about 2 horsepower driven by a Grove primary battery.

In 1840 Davenport & Cook of Vermont, United States, made an electric motor of the walking-beam type and drove a printing press with it. Their battery used zinc and copper plates and a blue vitriol solution.

A Scotchman, Robert Davidson, in 1842, ran a 5-ton electric locomotive at about 4 miles per hour, using as his source of current a primary battery of seventy-eight cells. The plates were 13 in. square, of zinc and iron, and a sulphuric acid solution was employed. Thus far it seems not to have occurred to anyone that two electromagnets could be combined and give better results than one used in conjunction with a permanent magnet, but in 1844 Dr. W. F. Channing, a Boston electrician, substituted an electromagnetic field for the permanent one commonly used. Two years later King and Starr produced electric light in a vacuum, but Starr died and the matter was dropped.

In 1847 Moses G. Farmer of Massachusetts exhibited a locomotive driven by forty-eight Grove cells of 1 pint capacity each. This little car ran on an 18-in. track and carried two people. Three years later Prof. Charles G. Page of Washington, D. C., used a 16-hp. motor driven by 100 Grove cells, having plates 1 ft. square. This vehicle carried twelve or more people at a time at 19 miles per hour on the W. & B. R.R. between Washington and Bladensburg.

With successes of this kind and an active interest on both sides of the water, it seems to us who are now familiar with electric traction very strange that the devices had to wait so long for public recognition and final success. It must be considered, however, that the wet or primary cells were both expensive and not well adapted for transportation work, and at that time they seemed still to lack suitable means of producing electric power, although the knowledge existed that running a motor by power would convert it into a dynamo and produce a current. Further, the gas engine had not yet been perfected, the steam engine was still very crude and uneconomical, water power was not available at most of the large cities, and even if the electric dynamos had been efficient, the storage battery did not exist and trolley wires were unheard of in their present form. True it is that Henry Pinkus, in 1848, took out a British patent on a sort of third rail so that the car could be driven without carrying its own battery. Lilly & Colton, of Pittsburgh, Pa., in 1847 invented a means of controlling the electric car from the battery station, the current traveling to the car on one rail and back on the other, a method that has not proved very successful."

A Lull in Activity

For the next 30 years electricity made little progress. The telephone was conceived in 1861, but it was over 10 years before its practical life was started under William Graham Bell. In 1879 the practical incandescent light was produced. The first electric railroad was run in Germany in 1881. In 1884 Cleveland, Ohio, was the first American city to have an electric street car system in competition with horse cars; and in 1895 the first electric locomotive was used in America in the tunnel under the city of Baltimore. This brings us up to the time when the practical electric automobile, as we know it to-day, was a reality.

Hot-Tube Ignition Appears

Reverting to 1837 and looking at the progress made in other fields of transportation in America we find that Dr. Alfred Drake, an American whose work extended from 1837 to 1855, brought out what is now known as hot-tube ignition, which in later years found very extended use. Drake's tubes differed from the later forms in that they extended into the mixture in the cylinder and were heated by a flame blown into their open outer ends.

In 1844 Stuart Perry of New York took out United States patent No. 3597, embodying a considerable number of valuable features. He employed liquid fuel and mentions several kinds, but seems to have conducted his experiments with turpentine. His carbureter, called by him a generator, employed heat to convert the turpentine into a vapor which he mixed with about fifty parts of air. He employed compression, flame ignition, air cooling and provided a clutch so that his engine could be started before being connected with the work. Another patent taken out in 1846 shows some improvements and water cooling.

Progress of Steam Vehicles

Resuming again the progress of steam vehicles: The development of steam from 1825 on was very slow in America, it not experiencing the stimulation it received from improved roads in England, so that up to 1860—Civil War days—there is little to record more than sporadic efforts.

In 1835 a machinist in Brattleboro, Vt., built a steam road vehicle that was successfully used on the roads. It resembled an ordinary one-horse wagon and the boiler was made of U-shaped tubes about 1¼ or 1½ in. in diameter, so placed that the lower ends of these tubes served as a grate, while the flame followed them toward the top, the other ends forming an arch or cover to the firebox. These tubes were connected at top and bottom ends by larger tubes or drums and a second drum above the top one served as a steam dome, these drums being about 4 to 6 in. in diameter with the top one somewhat larger. Two cylinders were used, the pistons being about 3 in. in diameter. This was one of the many experiments that were constantly being tried, but which we necessarily omit because they were not known or sufficiently important to be worthy of mention.

A Two-Cylinder Engine

In 1840 J. K. Fisher of New York designed a small steam car, but his British engineer friends advised against it because of the difficulties that had been encountered in England. Later on he took up the work and in 1853 built a vehicle having a two-cylinder engine, 4 in. bore by 10 in. stroke, and developing 15 hp. This vehicle used 5-ft. wheels. Between 1859 and 1861 he made several engines and took many trips with his vehicles.

In 1857 Richard Dudgeon, of Coney Island, built a steam car having two cylinders 3 by 16 in. and capable of running 10 miles per hour on gravel roads. This was exhibited at the New York Crystal Palace and was destroyed there by fire in 1858. Some years later, 1867, he built another, which is still in existence, and has been used frequently in recent years by one of his sons residing at Locust Valley, L. I.

Armored Cars Not New

The Civil War of 1861-5 called the attention of inventors to the self-propelled vehicle for war purposes and *The Scientific American* speaks of steel-clad steam chariots of war which should consist of road locomotives covered with plates and having a rifled cannon mounted on a pivot and protected by a shield platform. Thus it is seen that the armored war-car thought is more than a half century old and probably very much older than that.

The Rostrum

Enlarging Condenser Does Not Affect Spark

EDITOR THE AUTOMOBILE:—Would increasing the size of a condenser increase the intensity, or distance a spark would jump using a given coil and battery? Does the distance that a spark will jump depend upon the magnetic capacity of the core, the ratio of the ampere turns in the two windings, the difference in size of the primary and secondary wire or what?

2—What is the compression in pounds to the square inch in cylinders of modern, well-designed automobile engines?

3—With what type of generator is it necessary to short circuit the field windings to keep them from burning out when the storage battery is disconnected?

4—Is there any automatic device which makes short-circuiting unnecessary, used in any of the systems now on the market?

Ancon, C. Z. E. ALLEN.

—The increase in the size of a condenser over the requirements of a coil would not increase the strength or size of the spark.

2—Anywhere between 40 and 70 lb. per sq. in. absolute.

3—This depends solely upon individual design.

4—Some of the systems, such as the Bosch, are protected by means of a fuse in the field circuit so that if the battery is disconnected and the removal of the fuse is neglected it will automatically blow and protect the instrument.

Burning Paint Requires Care and Skill

Editor THE AUTOMOBILE:—Would you advise burning off present paint on car in order to have change of color from deep navy to grey without varnish? Could finish be kept clean easier without varnish?

Needham, Mass. F. T. R.

—If you have not had any experience in burning off paint do not risk a good car in order to learn how to do it. If you are skillful with the use of the torch, burning is the most thorough way to remove the paint.

Regarding which finish is easier to keep clean, it is just as easy to keep an unvarnished surface clean as a varnished one. The only difference is that a varnished surface has a polished effect, whereas the unvarnished is dull and not so delicate.

Circuits of U-S-L Electric System

Editor THE AUTOMOBILE:—Kindly explain by sketch and description the charging and starting circuits of the U-S-L starting and lighting system?

2—What is the way to find a missing cylinder in an eight or twelve-cylinder motor?

New York City. T. D.

—The two illustrations herewith, Figs. 1 and 2, show a wiring diagram of this system. On Fig. 1 the arrows show the direction of the current flow in all of the circuits when starting and Fig. 2 shows the direction of all the circuits when the car is traveling normally. These marked diagrams should provide you with the information you desire.

The starting switch performs no function when generating. When starting, the plunger, which is represented in the diagram by a bar, connects the three terminals of the starting switch together.

The automatic switch is of the ordinary type which closes the battery charging circuit when the voltage of the generator is sufficient to charge the battery and opens it when the voltage falls below that required to charge the battery.

The touring switch is convenient in stopping the battery charge for long daylight drives when practically no current is being consumed.

2—The best method is by short-circuiting the plugs in each of the cylinders individually while the motor is running slowly. When a difference is detected as soon as the plug is short-circuited it is evident that the motor was previously firing on that cylinder.

Removing Axle Shafts from Olds

Editor THE AUTOMOBILE:—Will you kindly advise me as to the best method of removing the rear axles from the housing on my model A Oldsmobile roadster?

Can these axles be straightened so as to take the play out of wheels?

Can you give me the makes of rims used on these wheels?

Youngstown, Ohio. F. D. J.

—In order to remove the rear axle shafts from the rear axle housing it is first necessary to take off the rear wheels. After this is done there will be found a small lock-nut held to the end of the axle casing by a cap screw to prevent the bearing cup from turning around after it has been properly adjusted to the bearing which runs in same.

The above lock holds in place a

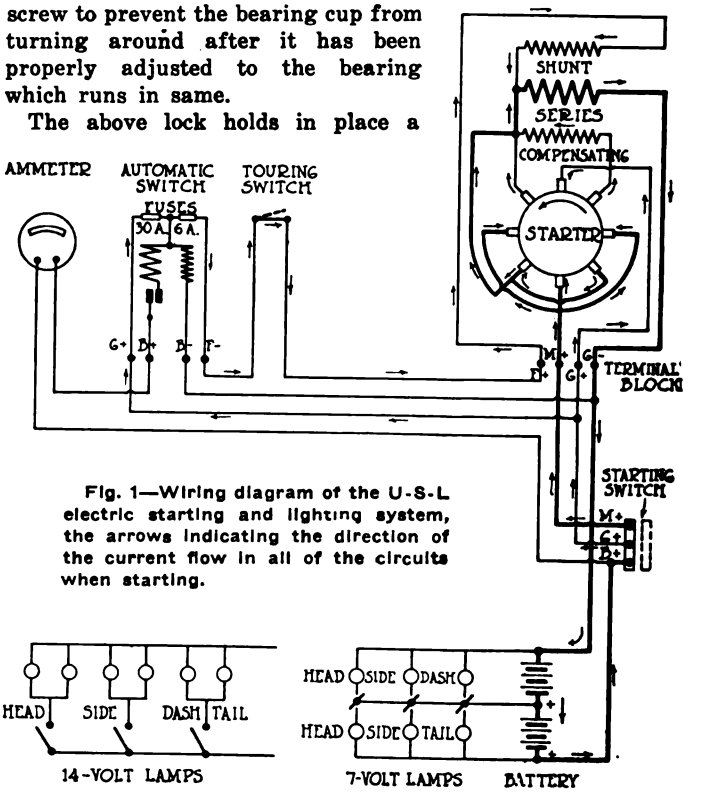


Fig. 1—Wiring diagram of the U-S-L electric starting and lighting system, the arrows indicating the direction of the current flow in all of the circuits when starting.

bearing cup which screws in the end of the axle casing. This cup is threaded with right hand threads and can be removed by the use of a wrench designed for this purpose or by using a small punch and tapping lightly with a hammer until it loosens sufficiently so that it can be turned out the rest of the way by hand.

After this cup has been taken out the bearing can be removed and the axle shafts pulled out.

In regard to straightening bent axle shafts it has been found that once one of these shafts has been bent it will not hold for any length of time. The trouble mentioned in your letter is undoubtedly due to worn out hubs on the rear wheels. It is also possible that the outer ends of the axle shafts are worn. In very few cases has the trouble been found to come from bent shafts. The remedy is generally the use of steel shims unless you desire to replace the parts.

It is impossible to advise exactly the style of rim used on this particular car since at different times the Goodrich, Marsh, Goodyear, Fisk and clincher types were employed. This information can be secured by supplying the number of the car or motor.

Speed Engaged with Lever in Neutral

Editor THE AUTOMOBILE:—We have a 1911 model Brush which has been giving us considerable trouble during the past year and will try to describe this. It seems to have developed during the summer of 1914. The owner could not crank the car as it seemed to be in gear, although the lever was in neutral position. We took the car all down and found the drive gear on the end of the driveshaft had slipped out of place about ¼ in. We cleaned the transmission very carefully, putting the gear back into place. The car ran well again for some time, when the same trouble came back. The car was again taken down and the gear was found to be in the proper place and we could not find anything wrong so we cleaned the transmission and reassembled the car again. The car ran well all last season, and up to about June 1 of this year, when the same trouble returned. The gears were all right and everything seemed to be in place. After cleaning the car it ran all right for a time, but since then have had the same trouble return several times. What do you think may be the cause for this?

Spooner, Wis. G. W. H.

—The trouble you are having is probably that one of the speeds is still engaged while the lever is in neutral. The gearset used on the Brush car is a planetary design using disks in all speeds and no doubt if you will equalize the hand control lever so that it will go the same distance into low speed from neutral position as it does into the reverse, it will overcome the trouble.

It can also be caused from not using the proper oil or grease which would allow the gears to become gummed or sticky. It is therefore suggested that you thoroughly clean out the gearbox with gasoline or kerosene, drain it and then add a new supply of non-fluid oil.

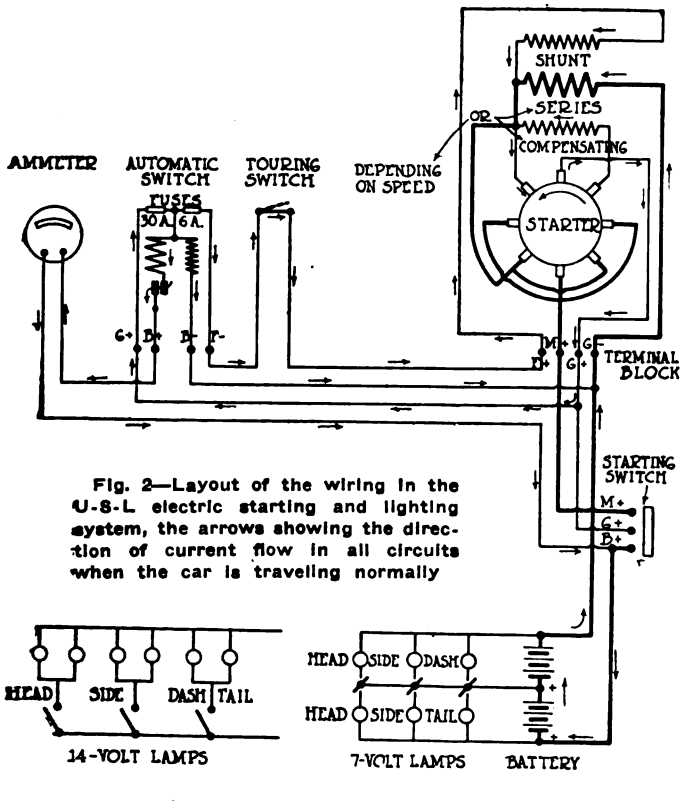


Fig. 2—Layout of the wiring in the U-S-L electric starting and lighting system, the arrows showing the direction of current flow in all circuits when the car is traveling normally

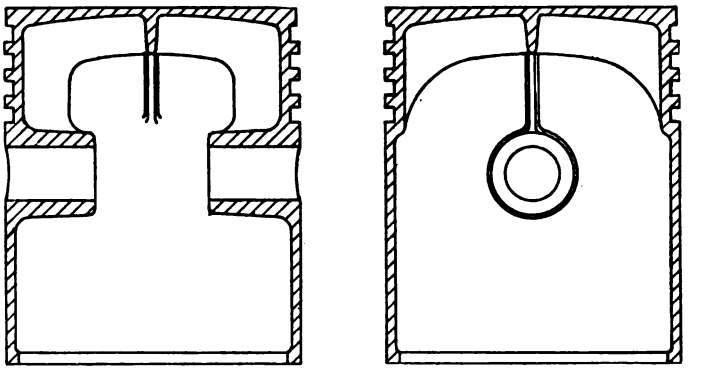


Fig. 3—Illustrating the system of ribbing piston for preventing excessive expansion by dissipating the heat

Aluminum Alloy Pistons for Racing

Editor THE AUTOMOBILE:—Would you advise using aluminum alloy pistons in a racing car using a Buick 17 motor? We now use cast-iron pistons of about 3 lb. and connecting-rods of the same weight.

2—Also, what clearance would you allow for expansion in this motor for races of not over 25 or 30 miles and also have it so that you could run about the city at about 15 on high?

3—Please give us a diagram as to the construction of the pistons on the inside so as to not allow too much expansion.

Saginaw, Mich. B. G. & S. Co.

—Yes, to attain the highest possible speed.

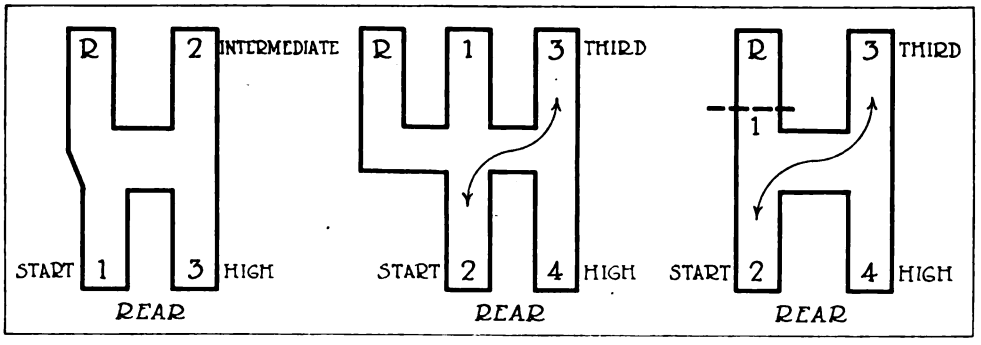
2—For a racing job if the motor is going to be driven at a very high speed, that is, above 60 m.p.h., even for short distances, it would be advisable to allow possibly 0.0035 per inch of piston diameter on the skirt. Possibly as much as 0.005 per inch for at least the first land, tapering back with less clearances on the succeeding one.

3—The best means of keeping the piston expansion down by dissipating the heat would be to put deep ribs across the head. One rib from boss to boss and a transverse rib. The illustration herewith, Fig. 3, will explain what is meant by this.

Probably a Break in Regulator Winding

Editor THE AUTOMOBILE:—On my 1913 Cadillac I have recently experienced a little trouble with my Delco system which baffles me and I would be pleased to have your advice. My storage batteries are in A1 condition, having recently been recharged owing to the cause explained herein.

On pressing the starter switch button on the switch box the current is so weak that the coil in the magneto latch fails to draw the pawl down so that the arm on clutch pedal shaft cannot hook onto the pawl and operate the electric generator switch. On engaging the latch with my finger, however, the batteries will turn over the electric motor (and



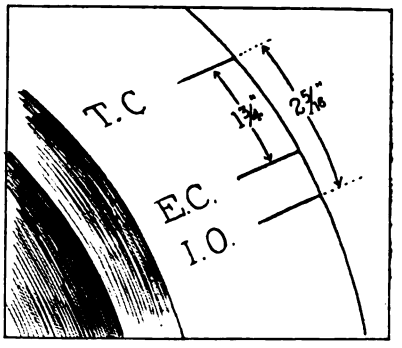


Fig. 4—left—Illustrating the recommended practice in gearshift gates adopted by the Society of Automobile Engineers. Fig. 5—Right—Timing of model 19 Buick by the flywheel face

in turn, of course, the engine) at a high rate, thus proving that the batteries are all right.

But yet when pressing the switch button on top of switch box, the electric motor fails to rotate at all to allow the pinion to mesh with the teeth on flywheel.

The band of the ammeter stands at zero whether engine is running or all lights burning and of course, therefore, neither shows charging or discharging. The engine also misses badly at all speeds and carbureter is all right and distributers, battery and magneto, are in good order and clean. Any suggestions you can offer to help me out will be greatly appreciated.

Branford, Ont. R. T. L.

—While the details you give are not sufficient to render positive the diagnosis of your trouble it seems that the difficulty is that when the starting button is pressed the armature on the motor generator does not revolve so as to permit the clutch pedal to be depressed for meshing the starting gear. The winding of the magnetic latch coil is in series with the starting button and also with the small commutator for generator winding. Across this circuit is connected the shunt field which is the field having the fine winding and this shunt field is in series with a fine winding on the voltage regulator. All this will be readily made clear by noting the wiring diagram which is provided in your 1913 Cadillac instruction book.

When the starting button is depressed the circuit through the winding on the magnetic latch coil and the generator winding is completed and hence the armature rotates, making it possible when the clutch pedal is depressed to mesh the starting gears. Sometimes, however, the small winding on the voltage regulator will break, causing an open circuit in the shunt field. Under these conditions, the generator will not revolve when the starting button is depresed and it is therefore suggested that a new voltage regulator tube be tried in this case.

If the fine winding on the voltage regulator is open, as stated, the matter may be known by connecting the center terminal of the voltage regulator with the left terminal of the voltage regulator. This will short out the fine winding and close the shunt field circuit provided the fine winding on the voltage regulator is open. The car, however, should not be run in this condition but the voltage regulator should be repaired as promptly as possible. Otherwise damage is likely to result to the batteries.

Recommended Practice for Gear Gates

Editor THE AUTOMOBILE:—I wish to call your attention to an article about the late meeting in Detroit of the Safety First Federation published in THE AUTOMOBILE for Oct. 28, page 810. In the right hand column, under the caption, Standard Gearshift Gates, you say: "The successive positions through which the gear-shifting lever has to go in progressing from one speed to another have been standardized by the society and are closely followed by the majority of cars using selective transmissions." Can you inform me as to what this standard is?

I am a car driver of many years' experience; have owned a number of cars and fully realize the danger and difficulty referred to in said article. I have often talked about it and have taken it into consideration in the purchase of cars. At present I am the owner of two cars, each having the system used by the Cadillac, Overland, Studebaker, Regal and others. This seems to me to be the best and most natural position where the gearset is situated at the right hand of the driver.

Washington, D. C. H. E. S.

—The recommended practices adopted by the Society of Automobile Engineers are those shown in Fig. 4.

Buick Timing in Flywheel Travel

Editor THE AUTOMOBILE:—In reading the Rostrum of THE AUTOMOBILE for Sept. 30, I notice that you gave the valve timing of a model 19 Buick for "F. S." of Barberton, Ohio. In your drawing you state that the exhaust valve closes 1/16 in. past top center and the inlet opens 3/32 in. past top center, which is correct in piston travel, but not on the flywheel circumference. As a model 19 has no starter the gear teeth on the drawing might confuse the questioner as his flywheel has none. Below is the correct timing by the flywheel face, Fig. 5.

Newark, N. J. W. C.

Uncertain as to Carbureter Type

Editor THE AUTOMOBILE:—I have a 1907 Pierce-Arrow 28-32 hp. and no one seems to be able to adjust the carbureter correctly. It is of the automatic type and has baffled experts.

2—Is there any way to shift gears silently with the Pierce-Arrow interconnecting device, progressive type?

3—Why is it that the car will run all right on the level, pick up quickly and as soon as it is throttled down to about 15 m.p.h. on every five or six revolutions it begins to miss?

The plugs are all new, valves are ground, etc. Also, on a small hill it seems as though something is holding it back. It simply will not take hills on high.

E. Williston, L. I. M. Z.

—In the year you mention the Pierce company used a carbureter in which the auxiliary air valve was a poppet design held on its seat by a coil spring. The left of the valve was entirely regulated by the weight of the spring and the suction of the motor. In the following year or late in the season this auxiliary air valve was changed to a reed valve design and it is not certain whether the carbureter on your car has the poppet or reed type. In either case it is possible that the throttle valve is worn considerably or that the adjusting needle is scored in the spray nozzle, also perhaps the

intake manifold is leaking through its various joints due to gaskets not being tight or the joints broken from their fastenings.

2—Regarding the shifting of gears the progressive type of gearset was used in that year, the shifting lever being a quadrant directly under the steering wheel. If the gearset is in perfect condition and there is no excessive play between the shifting lever and its various connections to the transmission gear and the car is not accelerated to excessive speeds, the gearshift should be performed quietly for that type of transmission. Of course it must be understood that the standards of quietness in 1907 were not what they are in 1915.

3—This may be either due to carbureter, weak valve springs or ignition. It is impossible to go into any of your questions thoroughly without more data as you do not say anything regarding the condition of the motor and its accessories such as the valves, magneto, etc.

Open Circuit in Armature Winding

Editor THE AUTOMOBILE:—Can you tell me what can be the trouble with my Auto-Lite single-wire system generator? It will not produce current but will run as a motor when the current is applied to it. Everything seems to be all right. What is the cause for the solder melting where the wires are fastened to the commutator?

2—Please explain the relay as used on the first self-starting Cadillac. This one will vibrate, but will not allow the current to pass through.

Clay Center, Kan. G. L.

—The trouble seems to be an open circuit in the armature. That is, one of the connections to the commutator may be loose or broken. The cause of melting of the solder where the wires are soldered to the commutator is impossible to determine without having an opportunity to examine the generator and this should be referred to an experienced electrician.

2—From the quotation which you give, it may be gathered from the words, "first self-starting Cadillac" that this is a 1912 car, as this was the first model on which a starter was placed. There were, however, on this car, two relays—one ignition relay in the dry cell system and one cut-out relay in the generating system, between the generator and the battery. It would therefore, be necessary to know which of these relays you have reference to in order to intelligently answer this inquiry.

Bosch Duplex Ignition System Explained

Editor THE AUTOMOBILE:—Please explain and give full details of the Bosch duplex ignition system.

Lincoln, Neb. P. S.

—The Bosch duplex magneto differs from the independent magneto in that it is fitted with a commutator and in its application requires the use of a small primary coil which is combined with the switch. Aside from these changes the magneto is identical with the independent type which has frequently been described in these columns.

The Bosch duplex coil, which is used in connection with this system, consists of a stationary cylindrical housing containing a single primary coil and in addition a switch assembly. In the coil itself there is an iron core which carries a movable switch plate with both ends of the wire winding connected to metal segment on the switch plate which may be brought into contact with the springs on the connection plate.

With this system the battery aids the magneto at low speeds, the battery current being thrown into phase with the magneto current and thereby assists in producing sparks at low piston speed.

The system above described is the old non-vibrating type. In addition there is the Bosch vibrating duplex ignition, which is a different arrangement. The entire system, aside from the independent Bosch magneto consists only of a low-tension coil, a switch and a battery; these, with the exception of the battery, are furnished by the Bosch Magneto Co. in making up this outfit. The coil is the only part which is special. The method in which this system operates is by effecting an arrangement whereby the magneto circuit is absolutely independent and complete in itself, the battery circuit including both coil and magneto as illustrated.

With the switch in the battery position, the battery and coil are in series with the primary winding of the magneto, thus there is induced in the secondary winding of the magneto armature a very powerful sparking current which, on account of the vibration of the coil appears not as a single spark but as a series of sparks. The current so produced is distributed in the usual manner by a regular distributer. The battery side is not intended to be used separately, but merely as an auxiliary to the magneto for starting. For regular running the magneto operates independently.

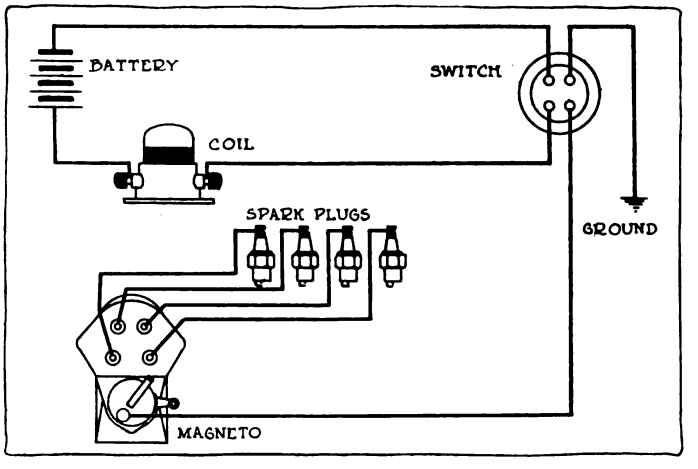


Fig. 6—Diagram of Bosch Duplex System with non-grounded battery

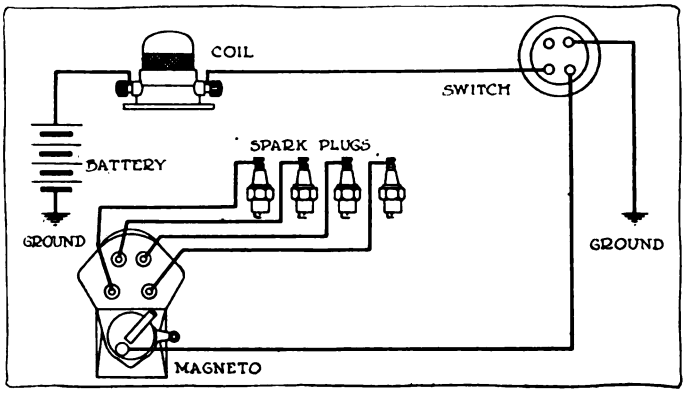


Fig. 7—Diagram of Bosch duplex system with grounded battery

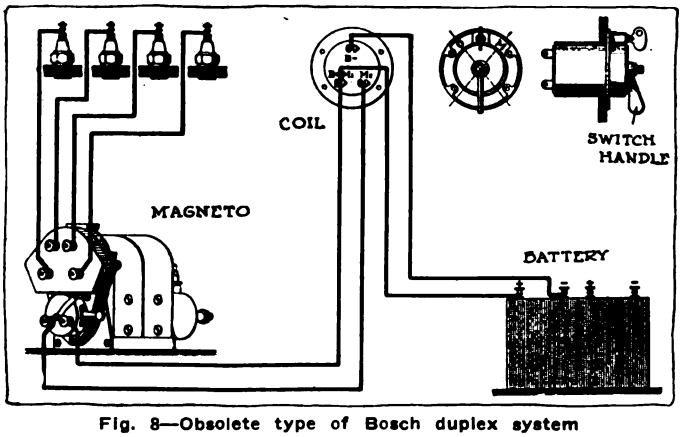
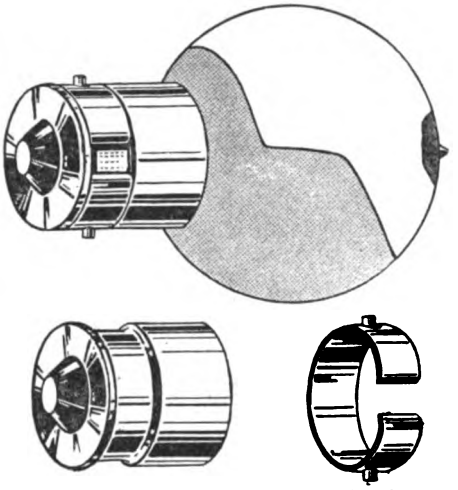


Fig. 8—Obsolete type of Bosch duplex system

ACCESSORIES

Mac Kno-Glare Bulb

THE base used in the Mac Kno-Glare swivel bulb is the same size as the standard Ediswan base and will fit into any Ediswan socket of any make but the pins which hold the lamp in the socket are mounted on a separate ring fitting into a recessed portion of the lamp base. When locked in the socket the bulb may then be rotated to bring the portion of the bulb which has been treated with a semi-translucent compound to the bottom part of the reflector, it being unnecessary to change the socket position. When the current is turned on, the clear portion of the lamp bulb, being at the top part of the reflector, permits the light rays from the filament to strike the upper portion of the reflector which deflects them in an intensified form upon the roadway, while the treated portion of the bulb does away with the glaring rays and softens the light. These bulbs are made in all candlepowers and voltages in both single and double contact for all makes of cars. —A. Hall Berry, New York City.



Mac Kno-Glare swivel bulb, showing base

Defiance Welding Products

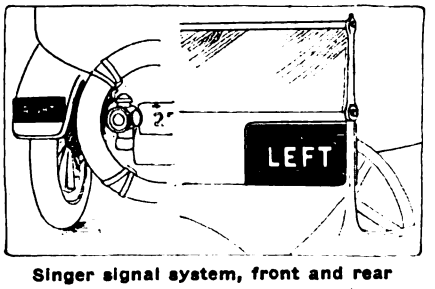
The Boko bucket is of canvas with a hoop rim and handle; it folds against the rim, lying flat. A tube leading from the bottom folds up against the side when not in use as a funnel. Capacity 2 gal. The makers state that they guarantee it to hold gasoline without leaking. The bucket lists at $1.25.

The makers of the Boko bucket also manufacture a folding steel-framed camp stool which, opened, measures 15 in. high and folds flat into a space 7½ by 10. The seat is of 10-oz. army duck and the weight 2 lbs. The stool sells for 75 cents each.—Defiance Welding Co., Defiance, Ohio.

Boko folding bucket, showing method of using

Singer Direction Signals

A signal which shows simultaneously on both the front and rear end of the car any proposed change in the direction or speed of travel is the latest in warning devices. By simply pressing an electric push button attached to the steering post or wheel these signs bear the words Right, Left, Circle, Stop or Slow. The signs are all operated by the one push button. The arrangement is so made that a single push of the thumb gives any desired signal, illuminates it if at night, and sounds the electric warning signal or bell, thereby making it of use for ladies driving electric or closed cars. The signals are inclosed in a small black enamel box, 8 by 6 in., and the letters are 1¾ in. high, a pure white on a black background. The manufacturers state that the letters can be read 150 ft. away. The signals are electrically operated and can be installed, according to the maker, in 15 min. The price has not yet been announced.—C. A. Singer, St. Louis, Mo.



Singer signal system, front and rear

Federal Handy Tire Tool

The Federal is a special tool for removing and replacing split demountable rims, and has ample leverage for doing the work without difficulty. The method of using it is clearly shown in the illustration. The tool folds into a small compass for stowing in the tool box. Price $2.—Federal Sales Co., South Bend, Ind.

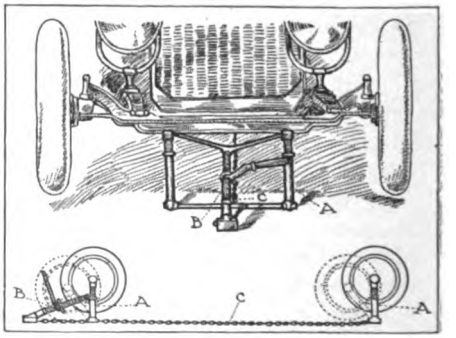
Federal handy tool for split rims

Waco Portable Garages

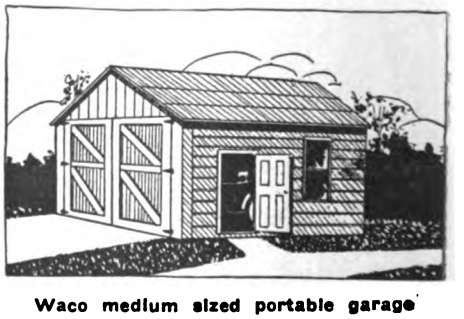
Waco garages are made in a number of styles and sizes, that illustrated herewith being suitable for any medium-sized car. The structure is 9 by 16 ft. of Georgia pine or steel sheeting with felt, rubberoid or imitation gravel roofing. The various parts are interchangeable as to position so that windows and doors may be arranged wherever desired. The standard outfit includes one double door, one single door and a window. Flooring is not furnished at the list price, which is $65 for the garage illustrated, but may be obtained at the rate of 10 cents per sq. ft. for cement, or 8 cents for wood. Other sizes range from the Ford type selling for $55 to a 16 by 18-ft. building for $120.—Wabash Automobile Co., Chicago, Ill.

Reading Four-Wheel Jack

This is a jack which permits the simultaneous jacking up of all four



Reading four-wheel car jack



Waco medium sized portable garage

wheels of a car. It consists of a pair of steel frames *A*, one for the front and the other for the rear axle; each frame carries two adjustable heads to pick up the axle. The frames are connected together by a heavy steel chain *C*, and one of the frames is connected with a screw jack *B* by a short chain. The car is run over the jack, the heads placed in position against the axles and the screw operated, which raises the whole car and holds it steadily with all wheels free and clear. The length of the chain and the height of the lifting heads are adjusted to suit the car on which the jack is used. The makers state that it is perfectly safe to run the motor and do any other work on the car with the jack under it. The weight of the jack is 65 lb. and the safe load is given as 6000 lb. Price, $20.—Reading Automobile Co., Reading, Pa.

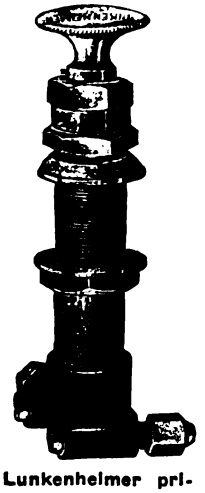
Cox Bumper for Cadillacs

A new Cox bumper has been put on the market especially for the 1916 Cadillac. This car differs from other models and makes in several ways and requires a special type bumper. As shown in the illustration, the bumper is attached by brackets which go over the spring horns and no additional holes need be drilled. The two bolts which hold the splasher and mudguard to the frame are replaced by two longer ones supplied by the manufacturers of the bumper. These bolts anchor the frame, mudguard, splasher and bracket securely. Where the bracket goes over the nose of the frame it is held by a special lock-nut which fastens on the regular shackle bolt which is supplied.

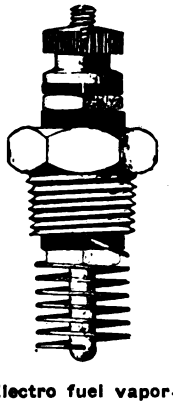
The bumpers are made in channel, diamond and round shapes. Each type is furnished in either nickel or black and the retail prices range from $6.50 to $10.—Cox Brass Mfg. Co., Albany, N. Y.

Hughes-Bull Valve Tool

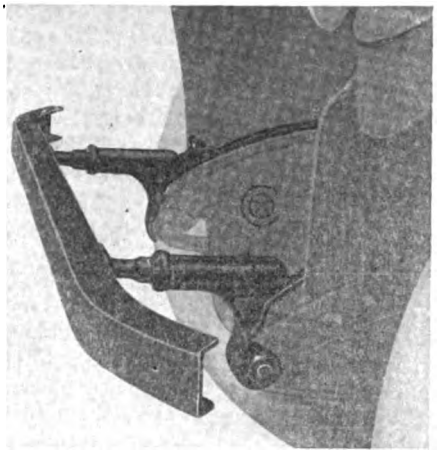
This tool trues both valve and seat in one operation, being of the milling cutter type and double, the seating tool being at the lower end and the cutter for the valve itself in its upper part. In operating it the tool is placed in the valve chamber, the lower cutter resting on the valve seat, the valve is then put in with the stem extending through the tool and down into the valve guide. The truing operation is effected by turning the tool by the driver at the top. The standard set sells for $5.50 and the Ford size for $5.—Hughes, Bull Co., Engineers, Detroit, Mich.



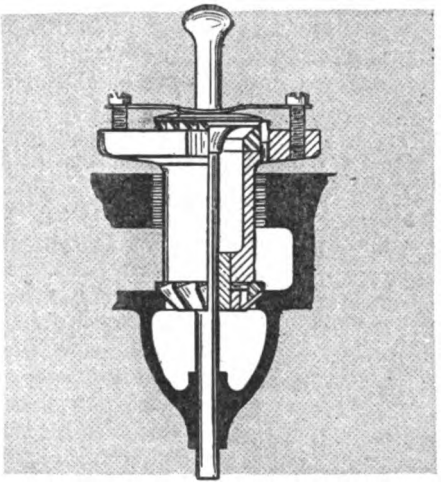
Lunkenheimer primer



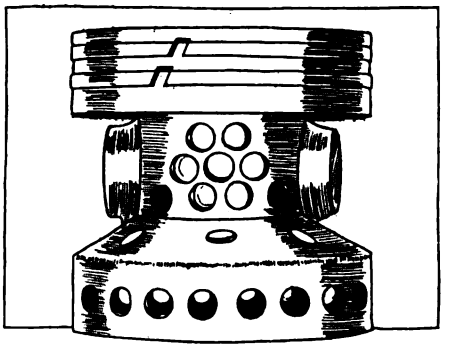
Electro fuel vaporizer



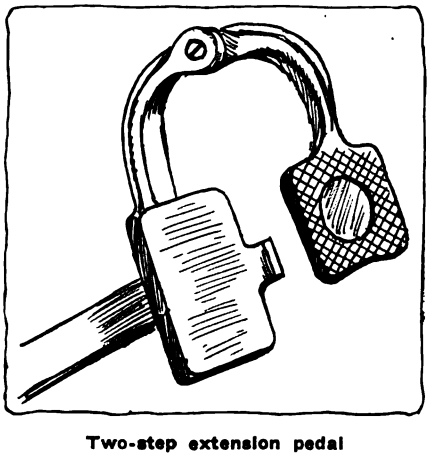
Cox special bumper for Cadillacs



Hughes-Bull valve-and-seat finishing tool



Zephyr extreme light-weight piston drilled for oil drainage and weight reduction



Two-step extension pedal

Zephyr Pistons

These pistons which are of the hourglass type are extremely light, the rings being in the upper part and the wristpin bosses in the center which is smaller in diameter than at the top and bottom. The central and lower parts are drilled for lightness and to promote lubrication.—Wridgway Co., Wilkes-Barre, Pa.

Two-Step Extension Pedals

In order to provide two pedal lengths for cars which are driven at times by people of one leg length and at other times by people of another length of leg, the two-step extension pedals have been brought out. As shown by the illustration, which is the type specially designed for Ford cars, both pedals are always in place and either can be employed. The Ford set sells for $2 per pedal fully nickel-plated.—Van Derbeck-Sayers-Murdock Co., New York City.

Lunkenheimer Primer

This primer occupies but little space, measuring ⅝ in. in diameter and 2⅝ in. in length, its operation is simple and convenient and it is compact and neat in appearance. The material used is a high-grade bronze which will not deteriorate under the chemical action of gasoline and the primer is quickly and easily attached. All necessary connections, such as tubing and unions, are furnished.—Lunkenheimer Co., Cincinnati, Ohio.

Electro Gas Vaporizer

In the Electro Gas Vaporizer a coil of resistance metal is screwed into the cylinder and is heated by an electric current, vaporizing the cold fuel with the object of making starting easy, especially in cold weather. A simple switch turns the current on and off. Current may be supplied from the starting battery or from a set of dry cells. Price $2.—Suburban Lighting & Gas Engine Co., Toledo, Ohio.

Blake Tube Flux

The makers state that the Blake flux for soldering is non-corrosive, and, when used for electrical work, has insulating qualities. It is put up in 2-oz. tubes with long aluminum spouts, so that the flux can be squeezed out on the work without danger of melting the spout. It sells for 20 cents per tube.—Blake Signal & Mfg. Co., Boston, Mass.

Angular Venturi in Edwards

New Carbureter Employs Compensating Dashpot—Combination Weather Adjustment and Starting Lever

THE Edwards carbureter which made its début in an economy run in Chicago recently, in which it made a record of 28.9 miles per gallon with a model D-45 Buick six carrying four people, as described in THE AUTOMOBILE recently, is manufactured by the National Carbureter Co., Chicago, Ill. While the showing of economy made on this test was an enviable one and the fact that the car developed a speed of 58 m.p.h. on a short stretch of country road without changing the adjustment of the carbureter is evidence that the mixture was not kept too lean, the new design of carbureter has other features which make it interesting.

Jet Enters Venturi at an Angle

This carbureter, which is the design of W. A. Edwards, is of the single-jet type in which the jet enters the venturi at an angle, as shown in the illustration. The use of the venturi is to increase the speed of flow. Increased acceleration is obtained by use of a piston operated by the air valve *A* which forces the fuel into the air stream around the needle valve. It is to this feature in part that the acceleration, of from standing start to 25 m.p.h. in 11 1/5 sec. through the gears and on high gear from 5 to 25 m.p.h. in 11 4/5 sec., on the recent Buick test may be credited.

In addition, there is a combination of weather adjustment and starting lever whose first movement regulates the vacuum in the instrument and the final movement seals the air valve to give a very rich starting mixture. To prevent the incoming air from blowing the gas coming from the venturi *V* across to one side of the manifold, the casting is made in a U-shape to provide a baffling wall *BW*, which directs the air upward over the mouth of the venturi. Any condensation is taken care of by a drain *H* which taps the mixing chamber and leads the liquid back into the venturi. This prevents loading when the throttle is opened quickly.

There is only one adjustment on the carbureter and that is the needle valve itself. In fact the company makes a point of the argument that no tools are needed in making adjustment or cleaning but all the work may be done with the fingers.

The Principle of Operation

To explain the principle of operation of the carbureter, it might be stated that it is constructed with the object of taking the fuel in at one point and breaking the particles of gasoline fine enough to be carried in suspension to the cylinders. The difficulty to be overcome in accomplishing this is that the gas particles on meeting the first obstruction or wall that will turn them in another direction have a tendency to revert to their original liquid form. By giving the gas great speed in the venturi *V* and then surrounding it with an outside wall of air which will hold it in suspension in the center, the Edwards design overcomes this.

It will be noticed that an inside needle *D* is used to meter the fuel. The purpose of this is to keep the gas from touching at any point. It is the belief of the designer that if an outside needle were used the fuel would cling to that needle and follow it by capillary attraction outside the zone of high speed so that when it left at the end of the needle it would leave in heavy drops. The needle is controlled by the air valve *A* by a control bar at the lower end of the air valve stem. The end of the bar is bifurcated and sets over a collar *C* on the metering pin or gasoline nozzle. The collar has a groove in it which allows a certain amount of play in the movement of the control bar as it in turn is moved by the air valve. If the metering pin were set to a rich idling mixture, the groove would permit the air valve to open and allow sufficient air to enter to reduce the rich mixture to the economical operating point.

Compensating Dashpot Used

At the bottom of the air valve stem will be noticed a dashpot *B* or compression chamber. This is used to compensate for the lack of the gasoline on the quick opening of the throttle. The moment that atmospheric pressure opens the air valve, that movement is transmitted to the dashpot piston which in turn creates a pressure in the dashpot chamber. This chamber has gasoline in it and the latter is drawn through passages *P* from the float chamber to the upper part of the compression chamber. This is to relieve the vacuum that ordinarily would be created on top of the chamber in the downward movement of the piston. A horizontal venturi passage *E* from the float chamber to the compression chamber is provided to allow a free movement of the gasoline in one direction but restricted in the other and at the same time to raise the compression at that point.

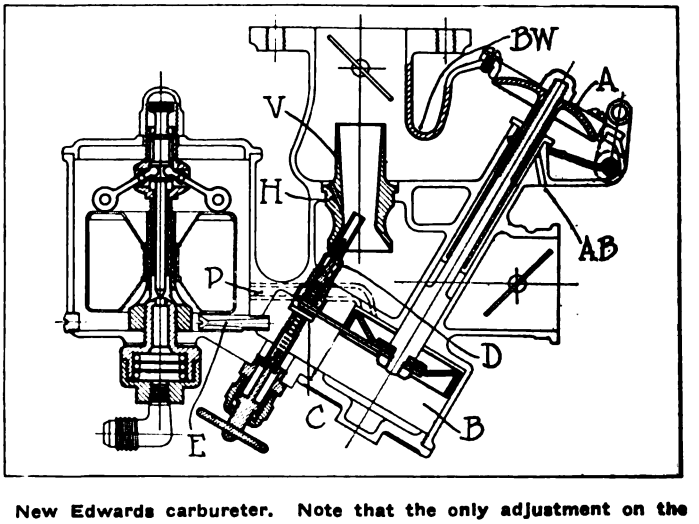
Heating the Incoming Air

The heated primary air passes around the throat of the venturi so that not only will the heat itself help to vaporize the liquid but the venturi also be kept hot. After it is warmed up, the hot air no longer is applied at that point as any heat added to the charge before its entry to the cylinder will be deducted from the final power output.

The cold weather adjustment is not a delicate one but instead of a highly sensitive needle to make adjustments with, the Edwards uses a spring tension which varies the vacuum in the body of the carbureter to draw more or less vapor from the nozzle as the condition demands. In starting in cold weather, the operator will pull up the weather adjustment to its limit which would not only raise the vacuum in the body of the carbureter but also would seal the air valve.

The needle valve has a beveled seat and is floating so that dirt would be unlikely and a twist of the valve releases any accumulating. The outside connections of the float needle permits the location of a leak in the float chamber. The metering pin is ball shaped so careless repairing does not put it out of commission.

To relieve any vacuum that might be caused along the air valve stem, this is open to the air through the hole *AB*.



New Edwards carbureter. Note that the only adjustment on the carbureter is that of the needle valve

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, November 18, 1915 No. 21

THE CLASS JOURNAL COMPANY
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Entered at New York N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October 1903, and the Automobile Magazine (monthly), July, 1907.

$1,000

THE nearer it gets to the time of the national shows the clearer it becomes that one of the outstanding features of them will be the remarkable value offered by cars costing close to $1,000. There is a wonderful difference between the $1,000 car of 1916 and that of a year ago, almost, one might say, it is a totally different class of vehicle.

In 1914 a $1,000 car was a cheap car; it was around $1,500 that one began to find cars that were wholly good and not merely good for the money. To-day, most of the $1,000 class are thoroughly fine examples of engineering, of body construction, and of efficiency in the widest sense.

A year ago a man looking for a quality car without regard for the price would only rarely have been attracted by the engineering quality or the appearance and finish of any machine costing so very much less than $2,000. To-day there are several $1,000 cars which would arrest the attention of any show visitor unless he were seeking an essentially large vehicle. Perhaps this fact records the most remarkable achievement of the automobile industry to date. It is quite as remarkable as the value given in the really cheap cars which still look a little cheap, and it makes a strong appeal to that large class which prefers something small and thoroughly excellent for its limited amount of cash, to a larger and confessedly cheap article.

Aluminum Will Be Cheaper

TAKING a line right through the speech made by A. V. Davis, president of the Aluminum Co. of America, at Detroit, last week, it appears that aluminum will be a little cheaper within a few months, provided that the demand does not increase greatly in the meantime. That it will return to a more normal price only so soon as the war shall end, and importation recommence. But another thing, too, is obvious—namely, that after the war America will be able to turn out far more aluminum than ever before.

At present we are told the output is 80 per cent above normal. In the spring it will be more than double the average for the past five years. In three to five years' time it may be very much greater again. Add to this increase in home production the foreign exports of aluminum to this country, and it follows that the amount of aluminum available in 1918 or 1919 will be vastly greater than ever before in history. Mr. Davis refrained from prediction as to the price to be expected, but made it clear that water power legislation had a powerful influence on the cost of production. Since ore is plentiful and very cheap, it is to be hoped that power will be forthcoming soon, for it is hard to think of any application thereof which would be of greater benefit to the world in general than in providing large quantities of a metal which is ideal for very many purposes besides those of the automobile.

S. A. E. Sections Important

THE present year has seen the various local sections of the S. A. E. increased in number and fomented in activity. Not only are the meetings of the sections showing a better attendance, but they are obtaining papers which rank very highly. In Detroit and at Indianapolis this fall there have been discussions as keen as any in a general meeting, there has been an attendance of engineers equal almost to that on the summer meeting lake trip.

This is a splendid thing for the good of the industry, and the fact that the activity of the sections has grown gradually shows that it is a natural, healthy state of affairs which we now see. To a great extent the success of the section depends on the men who make its officers, but as the sections grow in strength this will change a little and the honorary officials will not be called upon for so great an amount of hard work in getting the men together at the meetings and in securing new members.

The reading of one good paper encourages the production of another, and as the basis of the S. A. E. is wide enough to cover a multitude of subjects, there is always a fresh angle for somebody to tackle. There are many commercial matters quite as important as the engineering subjects and signs are appearing which indicate these will obtain a growing amount of recognition. The section activities are showing non-technical members of the industry how far-reaching is the beneficial influence of the society.

17 Members in G. M. Board

No Action Taken on Common Dividend—Production and Sales Larger

NEW YORK CITY, Nov. 17—At the annual meeting of the stockholders of the General Motors Co. yesterday in Jersey City, the directorate was increased from fourteen to seventeen members. President C. W. Nash said regarding the affairs of the company that all the companies in the General Motors Co. are now for the first time since he has been associated with the company on a paying basis. From Aug. 1 to Nov. 11, the company's production was 12,250 cars in excess of a year ago, while the sales were 13,250 cars ahead of those in the same period of a year ago. The company has a large cash balance, notwithstanding that recently the total of $11,000,000 has been paid in dividends and retirement of notes.

No action was taken regarding a common dividend at the meeting yesterday. The matter was left until the next meeting.

The slate of directors agreed upon at the directors' meeting on Sept. 18 is as follows: Lammont Belin, director of the Aetna Explosives Co.; L. G. Kaufman, president of the Chatham & Phoenix National Bank; Pierre du Pont, S. F. Prior of the Union Metallic Cartridge and Remington Arms Co.; A. H. Wiggin, C. H. Sabin, J. A. Haskell, A. G. Bishop, E. W. Clark, W. C. Durant, H. J. McClement, C. S. Mott, C. W. Nash, Thomas Neal, J. J. Roskob, Albert Strauss and J. J. Storrow.

The old and new boards are compared as follows:

New Board	Old Board
E. W. Clark	E. W. Clark
J. H. McClement	J. H. McClement
Thomas Neal	Thomas Neal
C. S. Mott	C. S. Mott
C. W. Nash	C. W. Nash
J. J. Storrow	J. J. Storrow
Albert Strauss	Albert Strauss
W. C. Durant	W. C. Durant
Lammont Belin	Joseph Boyer
L. G. Kaufman	R. F. Herrick
Pierre du Pont	E. D. Metcalf
S. F. Prior	M. J. Murphy
A. H. Wiggin	N. L. Tilney
C. S. Sabin	Jacob Wertheim
J. A. Haskell	
A. G. Bishop	
J. J. Roskob	

Gatlin Off for South Africa

DETROIT, MICH., Nov. 13—Guy G. Gatlin sailed Nov. 1 from London, where he will proceed to Cape Town, South Africa. He has been appointed South African sales manager of the export department of the Hupp Motor Car Co.

Lockhart Heads Wright Aeroplane

NEW YORK CITY, Nov. 15—Henry Lockhart, president of the Simplex Automobile Co., New Brunswick, N. J., was elected president of the Wright Aeroplane Co., Dayton, Ohio, which was recently purchased by a syndicate headed by W. B. Thompson. The company has increased its capital from $1,000,000 to $5,000,000. Mr. Lockhart sailed for England Friday in the interests of the company.

T. Frank Manville, president of the H. W. Johns-Manville Co., resigned as president of the Wright company because he found that he could not give sufficient time to the interests of the company. He remains, however, as a member of the executive committee and as a director.

Three More N. A. C. C. Members

NEW YORK CITY, Nov. 16—Three more companies have been admitted to membership in the National Automobile Chamber of Commerce, Inc. They are the Denby Motor Truck Co., Detroit, Mich., maker of Denby trucks; Grant Motor Co., Findlay, Ohio, Grant car; and Dort Motor Car Co., Flint, Mich., Dort car.

Vanderlip an S. K. F. Director

HARTFORD, CONN., Nov. 11—Frank A. Vanderlip, president of the National City Bank, has been elected a director of the S. K. F. Ball Bearing Co., this city, recently incorporated to take over the business of the S. K. F. Ball Bearing Co. of New York.

Besides Mr. Vanderlip, the board will consist of B. M. W. Hanson, vice-president of Pratt & Whitney, Hartford, Franklin B. Kirkbride of 7 Wall Street, A. Carlander and S. Winquist, directors of the Swedish S. K. F. Co., which is a large holder in the new American corporation, and B. G. Prytz, who will act as president.

Morrey V. P. of Hayes Wheel Co.

JACKSON, MICH., Nov 11—W. C. Morrey, manager of the timber department of the Hayes Wheel Co., has been promoted vice-president, while William C. Snyder and H. D. Hartley, Piqua, Ohio, have become members of the board of directors. The company's capital stock was recently increased to $1,000,000.

Sun Buys Plant in Elkhart

BUFFALO, N. Y., Nov. 15—The Sun Motor Car Co., this city, is preparing to move its plant to Elkhart, Ind. Preparatory to coming here the concern has purchased for $25,000 the plant of the Sterling Motor Car Co. The company will manufacture a light six-cylinder car and expects to begin operations about Jan. 1.

180,243 Cars in Ohio

COLUMBUS, OHIO, Nov. 13—According to a report recently issued by Registrar W. H. Walker, 180,243 automobiles were registered up to Nov. 10.

Reo 10-Mos. Surplus $3,661,802.20

$1,969,720.20 Over 1914—$2,390,951.60 Cash on Hand and in Banks

LANSING, MICH., Nov. 13—On Aug. 31 1915, at the end of ten months of its fiscal year, the Reo Motor Car Co. had $3,661,802.20 surplus or $1,969,720.20 more than at the end of its entire 1914 fiscal year. During the same period of ten months, the cash on hand or in banks totaled $2,390,951.60 as compared with $738,145 in 1914, meaning an increase in cash disponible of $1,652,806.60.

The assets total $7,373,995.99 while for twelve months in 1914 they totaled only $5,120,782, an increase of $2,253,213.99 in favor of the current year.

These assets include the cash item already referred to; notes and accounts receivable, less reserves, $582,176.46 instead of $684,184 in 1914; inventories, $1,957,708.74 as compared with $1,923,212 in the previous fiscal year. The capital assets are recorded for a total of $2,427,592.45 while in 1914 they totaled $1,765,989. Investments total $3,000 and deferred charges $12,565.74.

Among the liabilities, capital stock remains at $3,000,000; current liabilities total $712,192.79; accounts payable, $653,637.27 as compared with $368,407 in 1914; surplus $3,661,802.20.

Reo Truck Assets Gain $231,510.09 in 10 Months

LANSING, MICH., Nov. 13—During ten months of the fiscal year 1915, or up to Aug. 31, the balance sheet of the Reo Motor Truck Co. shows assets to be $1,409,251.09 or an increase of $231,510.09 over the twelve month's record of 1914.

The cash balance which was $266,242 in 1914 shows a total of $656,616.42 this year. Bills receivable totaled $191,435.95 against $73,027 in 1914. Inventory is recorded at $349,912.35 or $40,000 more than last year. The item of tools, machinery, etc., is credited with $102,884.51 as compared with $96,553 last year.

Among the liabilities the outstanding capital stock is unchanged at $937,500; bills payable total $200,179.67 instead of $142,479 last year; accrued pay roll totals $9,652.07 prepaid expenses, $6,488.61 and the surplus is shown to be $250,680.74 as compared with $91,062 last year.

Ferry Delion Tire Sales Manager

TRENTON, N. J., Nov. 11—C. C. Ferry has been appointed sales manager of the Delion Tire & Rubber Co., Trenton. Mr. Ferry will make his headquarters at the factory in Trenton.

New Abbott Six for Under $1,200

Continental Motor 3¼ by 4½ with Detachable Head—Seven-Passenger Body

DETROIT, MICH., Nov. 15—The Consolidated Car Co., maker of the Abbott-Detroit, will soon have ready for market a six-cylinder model to be known as the Six-44, and to sell at a price under $1,200. Although the complete details will not be available for about two weeks, it is known that the car will have a 3¼ by 4½ motor of Continental make. The six cylinders and the upper half of the crankcase are in one piece with head removable.

The car is to have a wheelbase of 122 in. and will seat seven. The shape of the body and its general lines are to be in accord with latest body ideas, it is said. Nearly straight, semi-elliptic springs are to be used all around, the rear pair being 57 in. long. The clutch is a dry disk type and the gearset three speed. A two-unit starting and lighting system will be fitted, the starting motor connecting through the Bendix drive. Battery ignition is to be used.

Disco Corp. Takes Co.

DETROIT, MICH., Nov. 16—*Special Telegram*—The Disco Electric Starter Co. has been taken over by the Disco Electric Starter Corp., just formed and capitalized at $250,000. The plant will be enlarged and its production facilities greatly increased.

The new officers of the company are: President, S. W. Elston; vice-president, J. F. Johnson; secretary-treasurer, Sol Meyer, and sales manager, Manzell Hackett.

Sterling Four at $550

NEW YORK CITY, Nov. 15—The Sterling Automobile Mfg. Co., Inc., this city, is bringing out a four-cylinder roadster to sell at $550, the price including two-unit electric starting and lighting system. The motor is a Sterling, water-cooled, having a bore of 2⅞ in. and a stroke of 4 in., is block-cast and has overhead valves. The company will put this car on the market shortly and it will be displayed at the New York show.

Ford Reduces Closed Car Prices

DETROIT, MICH., Nov. 16—The Ford Motor Co. has reduced prices on its sedan and coupelet. The sedan, which formerly was $975, is now $740, a reduction of $235. The body sells separately for $400. The coupelet is reduced from $750 to $590, a reduction of $160. This body sells for $250.

The runabout remains $390, the touring car $440 and the chassis $360. The sedan and coupelet are not of the detachable type. Each is a complete body in itself. Both fit the standard Ford chassis. Deliveries on this winter's cars are just beginning. All prices are f.o.b. Detroit.

Frank Briscoe Is Briscoe Manager

JACKSON, MICH., Nov 11—Frank Briscoe, brother of Benjamin Briscoe, president of the Briscoe Motor Co., has been appointed general manager, succeeding Horace De Lisser, who held that position and is vice-president of the company.

Evans Perfection Tire V-P

FRANKLIN, PA., Nov. 11—R. J. Evans, president and general manager of the Franklin Mfg. Co., has resigned to accept the vice-presidency of the Perfection Tire & Rubber Co., Fort Madison, Iowa, which was recently formed to build a heat-and-water-proof tire, guaranteed to give satisfactory service for 7000 miles without punctures or blowouts.

Yoke Is Maxwell District Supervisor

DETROIT, MICH., Nov. 10—John Yoke, who was sales supervisor of zone No. 5 of the Maxwell Motor Co., has been promoted district supervisor of sales and will have charge of all the field men and the twelve field headquarters which are maintained by the Maxwell company as wholesale and contracting centers.

Hinckley with Connecticut

CHICAGO, ILL., Nov. 12—P. P. Hinckley of Chicago has joined the sales force of the Connecticut Telephone & Electric Co. and will handle the jobbing trade East of Chicago. The jobbing connections in Chicago and the West will be managed by J. W. Fulton with offices at 1100 Karpen Bldg., Chicago.

Hanson with Service Truck

WABASH, IND., Nov. 13—A. B. Hanson, until recently manager of service department of the Chalmers Motor Co., Detroit, Mich., is now general manager of the Service Motor Truck Co. The plant of the Service company is now being doubled.

W. McK. White Leaves Esterline

INDIANAPOLIS, IND., Nov. 13—W. McK. White, sales manager of the Esterline Co., this city, has resigned. Mr. White formerly was associate editor of THE AUTOMOBILE, and gave up that work to become advertising manager of the Premier Motor Mfg. Co., resigned that position to handle the advertising of the Marion Motor Car Co. and then entered the Esterline company as sales manager some two years since.

18,000 Chalmers 6-30's in 6 Months

600 Dealers in Convention at Factory Hear Big Production Plans

DETROIT, MICH., Nov. 15—The annual convention of the Chalmers Motor Co.'s dealers opened at the new auditorium of the plant at 10 a. m. to-day. President Hugh Chalmers made the address of welcome.

At this first meeting of the dealers with the officials of the company they were told that it is the intention of the Chalmers company to build, during the next six months, 18,000 of the new Chalmers Six-30 cars, a new model described on pages 925-927, which is to sell at $1,050, or lower than any Chalmers car previously produced. It was stated by officials that dealers have contracted for $22,000,000 worth of the new models.

Out-of-town dealers have been coming in since Saturday and it is expected that fully 600 will be seated at the dinner, which will be served to-night in the convention hall of the Hotel Ponchartrain. At this hotel 238 Chalmers dealers were seated at the breakfast tables this morning. A large number are registered at other hotels. At the Ponchartrain it was stated that the number of dealers there is the largest from one manufacturer which the hotel had to take care of during the last four or five years.

During the morning after the dealers had placed their orders, a parade of some 300 Chalmers cars was held. To-day's morning session was merely one of welcome.

Tuesday, Nov. 16, there will be business sessions throughout the day, and inspection of the plant. In the evening a dinner and cabaret show will be given at the Hotel Statler. Wednesday will be featured by a detailed discussion of the new Chalmers Six-30 by Chief Engineer C. C. Hinkley. The afternoon will be taken up by a business session and the evening will see the close of the convention, the final event being a banquet to be tendered the dealers at the Detroit Athletic Club.

Bell Monarch Sales Manager

DETROIT, MICH., Nov. 12—J. L. Bell, who has been service manager of the Monarch Motor Car Co., has been promoted to sales manager of the company. Mr. Bell has been connected with the automobile business since 1909, starting with the Staver Carriage Co., Chicago, and later being with Abbott and R-C-H. The Monarch company has opened a branch at 270 Jefferson Avenue, under Mr. Bell's management.

Big Truck Orders Keep United Kingdom Our Best Customer—Export Statistics

In September Great Britain Took 2650 American Cars and Trucks Worth $3,119,806—France's Purchases Jump from 1044 to 4885 for Nine Months—Other Increases

WASHINGTON, D. C., Nov. 16—In addition to the gross figures of exports of automobiles for September and the nine months ended September, together with the figures for the corresponding periods of last year, previously published in THE AUTOMOBILE, herewith are presented the export figures for the various countries that have participated in the automobile trade of this country during those periods.

United Kingdom Gains

The big feature of the export trade is the tremendous increase in the exports to the United Kingdom, and while the figures do not show it, the increase is undoubtedly due to the orders for trucks. In September last Great Britain imported 2650 cars, valued at $3,119,806, as against 136 cars, valued at $154,763, in September a year ago. During the nine months ended September, these exports increased from 5130 cars, valued at $4,281,026, in 1914, to 19,434 cars, valued at $28,648,749, in 1915.

There were no exports of automobiles to France in September, 1914, while in September last 421 cars, valued at $916,830 were exported to that country. During the nine months' period these exports rose from 1044 cars, valued at $625,636, in 1914, to 4885 cars, valued at $12,126,628, in 1915.

Coming back to this side of the ocean the figures show that Canada imported 260 cars, valued at $433,620, in September, 1914, while in September last the number increased to 367 cars, but the value thereof was only $278,382. During the nine months of 1914 the number of cars shipped across the Northern border was 3,854, valued at $4,881,062, while during the nine months of this year the number was 5049, but the value was only $3,951,585.

The West Indies and Bermuda are rapidly becoming good customers for American-built motor cars. In September a year ago forty-two cars, valued at $37,240 were shipped to those islands, while in September last the number was 286 and the value $194,832. During the nine months' period the number of cars shipped there increased from 394, valued at $342,550, in 1914, to 2385 cars, valued at $1,305,005, in 1915.

Increase to South America

That American car manufacturers are reaching out for South American trade is indicated by the fact that during September, 1914, there were only twenty-four cars, valued at $19,735, shipped to those countries, while during September last the number was 595 and the value, $273,449. Even greater gains are shown in the figures for the nine months' period, the number for 1914 being 915 cars, valued at $742,262, while in 1915 the number was 2081, and the value $1,066,486.

British Oceania is also taking a liking for American cars, 219 of them, valued at $155,597, being shipped there in September a year ago, while in September last the number increased to 387 and the value to $312,856.

A fine showing is also being made in the exportations to Asia and other Oceanic countries, 387 cars, valued at $312,856 having been shipped there in September last, as against thirty-nine cars, valued at $38,975, exported there in September a year ago. The complete table is given herewith.

Walker Co. Goes to Cleveland

DETROIT, MICH., Nov. 13—The J. H. Walker Co. automobile parts manufacturer who started in business here in 1910 and who has been making many of the parts for the Chandler Motor Car Co., Cleveland, will locate in the Ohio city about Dec. 1. A factory building having 45,000 sq. ft. of floorspace is now almost ready for occupany. Another building will be erected within a short time. New machinery and equipment valued at over $100,000 will be installed.

Joliet Tractor at $865

JOLIET, ILL., Nov. 12—The Joliet Tractor Co., Joliet, Ill., has brought out a farm tractor, which it has christened the Bates Steel Mule. One of the features of this tractor is the oscillating crawler, which acts very much like a human being walking on the ball of the foot. The load-pulling on the compound lever hitch, combined with the downward force of the springs, have a tendency to pull the front end of the crawler into the ground. Offsetting this action is the weight of

Exports and Imports of Automobiles and Parts for September and Eight Preceding Months

EXPORTS BY COUNTRIES

Automobiles and Motor Trucks

	September				Eight months ending September			
	1914		1915		1914		1915	
	Number	Value	Number	Value	Number	Value	Number	Value
France	.....	.....	421	$916,830	1,044	$625,636	4,885	$12,126,628
Germany	.....	.....	.....	.....	1,063	799,552	4	2,801
Italy	2	$1,860	49	34,516	231	150,248	170	109,014
United Kingdom	136	154,763	2,650	3,119,806	5,130	4,281,026	19,434	28,648,749
Other Europe	12	9,570	1,144	3,341,676	2,390	1,896,217	6,688	18,082,964
Canada	260	433,620	367	278,382	3,854	4,881,062	5,049	3,951,585
Mexico	8	8,810	5	4,160	68	79,184	75	71,891
West Indies and Bermuda	42	37,240	286	194,832	394	342,550	2,385	1,305,005
South America	24	19,735	595	273,449	915	742,262	2,081	1,066,486
British Oceania	219	155,597	387	312,856	2,885	2,449,630	3,147	2,681,592
Asia and other Oceania	39	38,975	442	486,757	1,232	1,168,380	2,950	5,189,938
Other countries	32	32,022	180	134,450	961	860,762	1,464	1,326,536
PARTS, NOT INCLUDING ENGINES AND TIRES								
All Countries	.....	$343,618	.....	$1,613,419	.....	$4,451,163	.....	$10,994,859
ENGINES								
	70	$16,211	1,014	$110,330	2,742	$955,982	10,647	$1,447,001
TIRES								
England	.....	$134,801	.....	$920,328	.....	$1,071,061	.....	$4,101,320
Canada	.....	53,419	.....	124,543	.....	795,972	.....	817,463
Mexico	.....	8,341	.....	7,517	.....	50,165	.....	78,904
Philippine Islands	.....	14,886	.....	1,164	.....	92,575	.....	196,486
Cuba	.....	.....	.....	31,954	.....	.....	.....	219,609
Australia	.....	.....	.....	52,341	.....	.....	.....	364,096
Germany	.....	.....	.....	.....	.....	81,917	.....	.....
Belgium	.....	.....	.....	.....	.....	301	.....	.....
Other countries	.....	54,812	.....	253,987	.....	464,362	.....	1,123,743

the tractor body on the hinge in the rear of the crawler. The combination of these two forces holds the crawler evenly to the ground. Its entire length gives it broad traction and flexible gripping as well.

The engine is a four-cylinder Waukasha, heavy-duty tractor type, with a bore of 4¼ in. and a stroke of 5¾ in. Lubrication is by the pump and splash, constant-level system and cooling is obtained by centrifugal pump. A high-tension magneto is used.

Two speeds forward, 2 1-3 and 3½ m.p.h., are offered, and the reverse is 2 m.p.h. The weight of the tractor is 4800 lb.; the ground pressure, 4½ lb. to the square inch.

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Willys-Overland, Ltd., Formed in Canada—$6,000,000 Capital

TOLEDO, OHIO, Nov. 17—The Willys-Overland, Ltd., has been formed in Canada with a capital of $6,000,000 and head offices in Toronto. J. N. Willys, head of the Willys-Overland Co., this city, will be president of the new company. T. A. Russell, at present vice-president of the Russell Motor Car Co., of Canada, will be vice-president.

Five of the directors of the Willys-Overland Co. of Toledo, will be directors of the new company; these are J. N. Willys, H. T. Dunn, Walter Stewart, Harry Shepler, C. A. Earl, T. A. Russell and Lloyd Harris of Toronto, and two of the other Canadian stockholders will also be on the board.

This new company will take over the complete automobile business of the Russell Motor Car Co., and all of the business in Canada of the Willys-Overland Co.

Although the Canadian company will be independent of the parent company and will be conducted entirely independent as a Canadian corporation, it will have the advantage of the advice and engineering skill of the Willys-Overland Co. organization. The plan is to undertake in Canada the actual manufacture of both Overland and Willys-Knight automobiles. For this purpose the plant of the Russell Motor Car Co. of Toronto has already been acquired and this quickly will be enlarged to permit quantity production.

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Racine Rubber Adds

RACINE, WIS., Nov. 13—The Racine Rubber Co., this city, has broken ground for a large addition to its plant at Racine Junction, established about four years ago. The building will be three stories high, of steel, brick and concrete, and with equipment will cost in excess of $100,000. The addition will be used for the mill room and crude rubber storage. It is to be ready for occupancy on Feb. 1, at which time the company will add more than 100 men to the payroll, making a total of 750 operatives.

Peerless Eight at $1,890

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New 2-Ton Truck Is Under Way—Co. Will Maintain Corporate Existence

CLEVELAND, OHIO, Nov. 15—The Peerless Motor Car Co., a majority of the stock of which was recently acquired by the Peerless Truck & Motor Corp., and which has also secured control of the General Vehicle Co., will continue as it has in the past maintaining a separate corporate existence. It will manufacture the eight-cylinder Peerless car, for $1,890, deliveries to begin in December and will also manufacture a regular line of Peerless trucks, to which a new 2-tonner will soon be added. The present executive force, sales, and factory organization will be continued without change.

The Peerless Motor Car Co., will be represented on the board of the Peerless Truck & Motor Corp., by L. H. Kittredge, president of the Peerless Motor Car Co., B. G. Tremaine, and F. S. Terry, all of the Peerless company.

The Peerless Truck & Motor Corp. reports consolidated balance sheet of its subsidiaries, the Peerless Motor Car Co. and General Vehicle Co., Inc., as of Sept. 30, 1915, after giving effect to adjustment incident to the acquisition of stocks as in the accompanying table.

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Transport Is Latest Tractor

NEW YORK CITY, Nov. 3—The Transport tractor is the latest addition to the roster of American commercial vehicles. It is produced in one 5-ton model by the Transport Tractor Co., Long Island City, N. Y. The tractor attains a very short wheelbase by placing the unit power plant between the seats, and is worm-driven. It has a new type of trailer connection for semi-trailers, consisting of a dome and cup, the dome surmounted by the king bolt and the cup carrying the cup and king bolt guide. It is designed to turn in a circle of 25 ft. diameter, and is priced at $2,500.

Consolidated Balance Sheet of Peerless Truck Motor Corp.

ASSETS

Patents, franchises and goodwill ($5,000,000 of this represented by common stock of General Vehicle Co., Inc.)		$5,100,000.00
Capital assets:		
Land	$967,153.61	
Buildings, plant and equipment	3,697,114.81	
		4,664,268.42
Current assets:		
Investments	$19,035.80	
Inventories of finished goods, work in process, raw materials and supplies at factories and branches and on consignment	1,308,832.39	
Accounts and notes receivable	685,946.40	
Cash in banks and on hand	2,376,082.43	
		4,389,897.02
Deferred assets:		
Prepaid expenses and insurance	$46,695.18	
Development, engineering expenses, etc	161,866.02	
		208,561.20
		$14,362,726.64

LIABILITIES

Capital stock issued and outstanding:		
Peerless M. C. Co., 7% cum. pref	$2,100,700.00	
Peerless M. C. Co., common	2,085,500.00	
		4,186,200.00
General Vehicle Co., Inc., 7% cum. pref	$1,200,000.00	
General Vehicle Co., Inc., common	5,000,000.00	
(Amount represents patents, franchises, goodwill.)		6,200,000.00
Funded debt (for the retirement of which cash has been provided for by the new company)	.....	10,386,200.00
First mortgage serial gold 6% bonds of the Peerless M. C. Co.:		
Issued and outstanding	$900,000.00	
Less—Since retired or to be retired by the Peerless M. C. Co.	300,000.00	
(Money has been deposited with the trustee for the purchase of these remaining bonds as shown below.)	$600,000.00	
Mortgage on real estate in New York City	300,000.00	
		900,000.00
Current liabilities:		
Special deposits	$126,275.00	
Accounts payable	557,308.78	
Sundry creditors, including accrued payroll	127,378.17	
		810,961.95
Reserves, including reserve against inventories, doubtful accounts, etc.	.....	197,531.99
Surplus:		
Surplus capital to be created by cancellation of notes payable of General Vehicle Co., Inc., Oct. 31, 1915	$900,000.00	
Undivided surplus	1,168,032.70	
		2,068,032.70
		$14,362,726.64

In the acquisition of the capital stock of the Peerless M. C. Co. and the General Vehicle Co., Inc., there have been issued by the Peerless Truck and Motor Corp.:

Capital stock, 200,000 shares, par value $50 (Authorized issue 400,000 shares.)	$10,000,000
Ten-year 6% convertible gold notes	5,000,000
There has been deposited with the trustee, to retire the balance of the outstanding bonds of the Peerless M. C. Co	600,000
Also there has been deposited with the trustee to acquire the balance of the outstanding shares of the Peerless M. C. Co	637,695
Cash in bank	292,500

The company has no liabilities except the 6% convertible gold notes above stated

S. A. E. Forms Penn. Section

Headquarters and Membership Problems Solved—Engineers' Club to Co-operate

PHILADELPHIA, PA., Nov. 11—At a meeting held here last night, the movement which has been on foot for some time, to organize a local section of the Society of Automobile Engineers has finally borne fruit. A new section, subject to the approval of the council of the parent body has been created under the name of the Pennsylvania Section.

There were about fifty in attendance at the meeting and the dinner which preceded it, out of which about half were members of the S. A. E. and the remainder were members of the Electric Vehicle Association and others who intend to become affiliated with the new section. The unanimity of opinion that the section should be formed and the enthusiasm which marked the initiation of the new organization give promise of a successful and rising branch of the parent organization.

E. S. Foljambe who has been one of the fathers of the movement, acted as toastmaster at the dinner and afterwards as temporary chairman. In speaking of the reason for the failure of the previous attempt, some years ago, to maintain a section of the S. A. E. in Philadelphia, Mr. Foljambe pointed out that the two main causes for lack of success have now been removed and there remains no apparent reason why the present undertaking should not succeed. The two causes referred to were the lack of a permanent headquarters and the former limitations on section membership which rendered it impossible constitutionally to have enough prospective members to draw upon.

Vote Was Unanimous

After stating the purposes of the gathering and dwelling upon the desirability of having a section of the society in Philadelphia, Mr. Foljambe turned the meeting over to Coker F. Clarkson, general manager of the S. A. E. With but little preliminary discussion, B. B. Bachman, of the Autocar Co., moved that it be considered the sense of the meeting that a section of the society be formed with its headquarters in Philadelphia. This was carried unanimously.

The next point which came up for discussion was as to the proposed name of the new section. The name Keystone was suggested by some as having a broad meaning and at the same time giving an idea to the locality. Others wanted the name Philadelphia section, but Pennsylvania was finally adopted. A temporary nominating committee for the purpose of choosing temporary officers was then named by Mr. Clarkson and while they debated this matter the question of a suggested meeting program was brought up.

K. W. Zimmerschied, chairman of the standards committee of the S. A. E., stated that he believed it would be a mistake to have too many meetings in the beginning as they would be apt to lack the importance which would attach to a shorter but more carefully thought-out program. The importance of giving the members of the section something to do he stated as another successful method of promoting interest. Mr. Zimmerschied dwelt on the importance of carefully selecting the officers of the section as the success of the organization depends largely on the efforts of the chairman and secretary. Coming to the matter of standards he went on to state an illustration of the importance of this work to the country. This country is going to manufacture hundreds of millions of dollars worth of ammunition, he said, but of what value will it all be if it is not standardized? This work of standardization is one in which the S. A. E. can be of valuable assistance.

Army and Navy Co-operation

Louis S. Clarke, vice-president of the Autocar Co., brought up the matter of encouraging army and navy officers to take part in the activities of the section. He pointed out that the appropriations of Congress for military automobiles will be enormous and that if this is the case, naturally the officers of both branches of the service will take an immense interest in a field which will undoubtedly claim such a large share of the appropriations. Mr. Clarke's views met with the approval of a great many of those present who spoke endorsing his sentiments.

Temporary Officers Elected

The temporary officers appointed by the nominating committee are E. S. Foljambe, Chairman; B. B. Bachman, secretary and Tinius Y. Olsen, treasurer. An application will be made to the parent organization for a section charter in the near future.

In discussing the manner in which the difficulties formerly encountered were solved it was brought out that the Engineers' Club of Philadelphia, which acts in co-operation with most of the local branches of the national engineering societies, has extended the use of the meeting room of the club to the new organization. Space for announcements has been given in the club bulletin and the members attending the meetings will have house privileges for the night of the meeting. In addition, the extensive library of the club has been put at their disposal.

The other difficulty, that of having but a small S. A. E. membership to draw upon, has been removed by the possibility of having section affiliates. The constitution of the S. A. E. now permits sections to have affiliate members who are not members of the S. A. E. These affiliates are allowed to attend the meetings and enter into the discussions but are not entitled to a vote. The large field of this class of membership in the Philadelphia territory opens up great possibilities for extensive membership.

Many Prospective Members

The section will embrace all of Pennsylvania and will accept members from New Jersey. Since the outbreak of hostilities abroad many steel and other manufacturing companies are engaged in making trucks, included among which are the Midvale Steel and Ordinance Co. and the Baldwin Locomotive Works, in addition to a number of others. Not only these people will be induced to become members but the engineering student body at the University of Pennsylvania will be asked, by reason of the fact that many, upon their graduation, will take up the automobile industry as their vocation.

At the close of the meeting E. R. Whitney, engineer of the Commercial Truck Co. of America, delivered an address on the use of electric trucks in difficult installations. The lecture was illustrated by stereopticon views of the different installations. Those who registered were as follows:

*Coker F. Clarkson, S. A. E., New York City.
*Karl W. Zimmerschied, General Motors Co., Detroit, Mich.
*Frank E. Whitney, Commercial Truck Co., Philadelphia, Pa.
W. A. Manwaring, 1208 N. Thirty-first St., Philadelphia, Pa.
E. J. Hancock, Curtis Publishing Co., Philadelphia, Pa.
W. H. Metcalf, 11 N. Twenty-first Street, Philadelphia, Pa.
W. H. Patton, 1828 Market St., Philadelphia, Pa.
H. A. Koockogey, Tenth and Chestnut Sts., Philadelphia, Pa.
*W. W. Norton, Autocar Co., Ardmore, Pa.
A. H. Burns, 305 S. Broad St., Philadelphia, Pa.
*E. R. Whitney, Commercial Truck Co., Philadelphia, Pa.
*R. B. Daggett, Commercial Truck Co., Philadelphia, Pa.
*B. B. Bachman, The Autocar Co., Ardmore, Pa.
S. M. Wilson, The J. G. Brill Co., Philadelphia, Pa.
M. J. Oswald, The J. G. Brill Co., Philadelphia, Pa.
*Wm. H. Palmer, Jr., Electric Storage Battery Co., Philadelphia, Pa.
*Frank Beemer, Pressed Steel Mfg. Co., Philadelphia, Pa.
William Reiter, Jr., Gibney Tire & Rubber Co., Philadelphia, Pa.
Walter H. Hart, Standard Roller Bearing Co., Philadelphia, Pa.
Geo. T. Gwilliam, 1304 Arch St. and 57 Broadway, New York City.
Frank H. Schoenfus, Standard Roller Bearing Co., Philadelphia, Pa.
Harold Goodwin, Jr., Philadelphia Electric Co., Philadelphia, Pa.
*Edward L. Clark, 825 N. Twenty-seventh St., Philadelphia, Pa.
*A. B. Cumner, 553 W. Twenty-third St., New York City.
*Albert G. Suttill, James Boyd & Bro., Inc., Philadelphia, Pa.
*E. S. Foljambe, Chilton Co., Forty-ninth and Market Sts., Philadelphia, Pa.
*Chas. E. Duryea, 3400 N. Seventeenth St., Philadelphia, Pa.
*Louis S. Clarke, Ardmore, Pa.
*E. S. Fretz, Pottstown, Pa.

*John S. Clarke, Ardmore, Pa.
D. Robert Yarnall, Chestnut Hill, Pa.
*Edward Dixon, Crowther Motor Co., Philadelphia, Pa.
Joseph D. Israel, 1000 Chestnut St., Philadelphia, Pa.
M. G. Lloyd, Chicago, Ill.
R. Louis Lloyd, 1000 Chestnut St., Philadelphia, Pa.
H. Wickland, The Hess-Bright Mfg. Co., Philadelphia, Pa.
*Herbert L. Towle, 214 S. 12th St., Philadelphia, Pa.
H. R. Doughty, The Hess-Bright Mfg. Co., Philadelphia, Pa.
*J. Edward Schipper, *The Automobile*, 239 W. 39th St., New York City.
H. N. Purdy, Edison Laboratory, Orange, N. J.
*H. E. Figgie, The Perfection Spring Co., Cleveland, Ohio.
*N. B. Pope, *Automobile Topics*, New York City.
*A. C. Bergman, Perfection Spring Co., New York City.
*T. Y. Olsen, Tinius Olsen Testing Mfg. Co., Philadelphia, Pa.
*W. H. Sackman, Light Mfg. & Fdry. Co., Pottstown, Pa.
H. W. Berroth, Philadelphia, Pa.
*Walter M. Newkirk, William Harvey Rowland, Philadelphia, Pa.

*Member S. A. E.

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Three Additions for Hydraulic Pressed Steel Co.

CLEVELAND, OHIO, Nov. 11—The Hydraulic Pressed Steel Co. will build three plant additions costing approximately $50,000 at its factory at 3152 East Sixty-first Street. Two of the additions will be inclosed in glass. One will be 360 by 70 ft., and the other 200 by 80 ft., costing about $21,000 and $17,000 respectively. The third structure will be built of brick and steel covering a ground space of 60 by 120 ft. All are to be one story high.

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1000 Briscoes to Be Made in Canada

BROCKVILLE, ONT., Nov. 12—T. J. Storey of Brockville, vice-president of Carriage Factories, Ltd., who was in Montreal yesterday, announces that within two or three weeks the Canadian Briscoe Co., a new subsidiary of Carriage Factories, will be turning out four and eight-cylinder medium priced automobiles, and that before the end of the year the company figures on placing on the market at least 1000 of these cars. The company will assemble the parts at Brockville, where the plant of the old Acme Automobile Co. has been taken over, and Carriage Factories will participate in portions of the manufacturing end. The cars to be placed on the market will be identical with the American Briscoe output, which will supply such portions of the car as are not made in Canada.

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Fickling to Add 25,000 Sq. Ft.

LONG ISLAND CITY, N. Y., Nov. 13—The Fickling Enameling Corp., this city, is enlarging its plant by the addition of 25,000 sq. ft. to accommodate its assembling plant, and the wood-working, metal-stamping and upholstery departments, to take care of several large contracts recently received from manufacturers.

Maxwell to Build 500 Cars a Day

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Extensive Additions Planned for All Plants—Assembly Building Nearly Completed

DETROIT, MICH., Nov. 13.—At all the Maxwell plants in Detroit, Newcastle, Ind., and Dayton, Ohio, extensive enlargement and expansion work has been started, the Maxwell Motor Co. contemplating increasing its daily production, which now averages 250 cars or better, to 500.

The biggest addition is being put up at the Oakland Avenue plant, here in Detroit, which will consist of a one-story building 860 by 130 ft., to be devoted exclusively to assembly purpose. This structure will cover about 4 acres of ground. The Maxwell company owns 50 acres of ground on Oakland Avenue and 12 acres are covered with buildings.

This new assembly building is to be completed within eighty days. Along its length will run two parallel moving platforms, similar to the one on which the company's product is now put together. It was designed by Production Manager Charles Adams, in co-operation with President Walter E. Flanders, for a daily output of 160 cars, but has been turning out more than 250 a day. The Maxwell output record for one day is now 286 cars.

The present platform will form one of the pair to be in the new building. The room vacated will be used in the manufacture of part of the increased number of units which the doubled assembly capacity will make possible.

The property adjoining the Maxwell plant and land on Oakland Avenue and which is occupied by the Gray Motor Co., is controlled by the Maxwell company, and a large part of the main building is operated as a motor factory for the Maxwell.

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Walker-Weiss Gets Martin Plant

FLINT, MICH., Nov. 10—The Walker-Weiss Axle Co. has been advised that its bid for the plant of the H. J. Martin Forging Co., Indianapolis, has been accepted by Judge Clifford, of the superior court, of that city. The Indiana concern has been in the hands of a receiver since last January.

For some time the Walker company has contemplated enlarging its plant, but while it would have been easy to put up new buildings, it was found practically impossible to arrange for the immediate delivery of the machinery necessary for a drop forging concern. Therefore a bid was made for the Indianapolis plant, which has fifteen steam hammers with full equipment for heat treating and much other good material and machinery.

George Desautels, who has been connected with the drop forging business in the United States for the last sixteen years and is vice-president of the American Drop Forge Association, has been appointed general manager of the Walker-Weiss Axle Co.'s Indianapolis drop forge plant.

The Indianapolis plant of the Walker-Weiss Axle Co. will be under the management of Robert I. Gale, until recently purchasing agent for the Keeler Brass Co., Grand Rapids.

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3000 Marion and Imperial Cars Planned

JACKSON, MICH., Nov. 10—According to President J. I. Handley of the Mutual Motors Co. there will be 3000 Marion and Imperial cars made for the season 1916. The entire output has been practically contracted for as the result of a recent business campaign in Texas and the East.

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Efficiency Oil Co. Buys Plant

ST. LOUIS, MO., Nov. 13—The Efficiency Oil Corp. has purchased the plant formerly occupied by the Shiras-Chassing Fixture Co., on Kienlen Avenue, in Wellston. The building, which is a one-story structure, contains an acre and a half of floorspace. The company expects to occupy the new building before Dec. 1. The old plant of the company at Manchester Avenue and King's Highway Boulevard will be discontinued at the expiration of the lease the end of this year. The new building contains about ten times the old plant's floorspace.

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Yale & Towne Increase Wages 10 per Cent

STAMFORD, CONN., Nov. 11—A general increase of 10 per cent in wages was announced by the Yale & Towne Co. It affects 4600 employees, and means an increase in the company's wage outlay of about $300,000 per annum.

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Bijur Machinists Return to Work

HOBOKEN, N. J., Nov. 13—The strike of 200 machinists in the plant of the Bijur Motor Lighting Co., this city, has been settled. The strikers received a 50-hr. week, and a 5 per cent advance in wages.

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Springfield Body Strike Settled

SPRINGFIELD, MASS., Nov. 11—The strike of 400 employees of the Springfield Metal Body Co., this city, on Nov. 1, who demanded an 8-hr. day and recognition of the union, has been settled.

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Joy on Aero Club Board

DETROIT, MICH., Nov. 12—President Henry B. Joy, of the Packard Motor Car Co., has been elected a member of the board of governors of the Aero Club of America.

Hyatt Capital Now $6,000,000

Increase from $400,000 Rendered Necessary by Enlargement of Plants

NEWARK, N. J., Nov. 13—The Hyatt Roller Bearing Co., this city, will increase its capital stock from $400,000, its present capital, to $6,000,000. This increase has been made necessary by extensions to the factory both in the manner of new buildings and added equipment. Four new buildings are under construction, as follows: One building 90 by 115 ft. eight stories high, which is nearly completed; one building, 75 by 200, eight stories; one building, 125 by 200, one story; and one building, 75 by 200, eight stories. Construction work is just beginning on the last three buildings. These buildings will double the capacity of the Hyatt factory, which has been entirely devoted to the manufacture of roller bearings for automobile and other uses. These bearings are manufactured entirely for domestic sales. The present $400,000 stock is all common, and the new capitalization of $6,000,000 is common. It is all held privately and the stock is not listed or for sale.

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Maxwell Offers First Preferred

NEW YORK CITY, Nov. 16—Holders of the three classes of Maxwell Motor stock of record Monday are offered the privilege of subscribing to first preferred stock of the company at par, to the extent of 5 per cent of their holdings. This step is taken in order to comply with legal requirements.

Under the plan recently announced for the funding of the accumulated 14¼ per cent back dividends on the first preferred stock, warrants will be issued to the extent of the 14¼ per cent, and will be convertible into first preferred stock at par. The amount of first preferred stock required for the future conversion of dividend warrants is $1,749,804, of which $720,667, represented by first preferred stock trust certificates now in the treasury, is already available, leaving a balance of $1,029,136 to be provided through the increase in the present amount of first preferred.

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U. S. L. Gets Working Cash Capital of $500,000

NEW YORK CITY, Nov. 13—The United States Light & Heating Corp., through the purchase of 50,000 shares of its treasury stock by Slattery & Co., local brokers, gets a working cash capital fund of about $500,000. This amount includes previous amounts released and surplus cash turned over by the stockholders' protective committee. The company also has a substantial amount of common and preferred stock, still in the treasury. Beyond cash on hand, the other working assets of inventories and accounts receivable total several hundred thousand dollars. There are no liabilities beyond current trade accounts, all of which are now discounted in cash, saving thereby an amount in excess of the interest on the $500,000 bonds outstanding.

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Market Prices Advance

NEW YORK CITY, Nov. 16—Market prices in general were higher last week. Crude rubber, metals, and oil prices saw large advances. The reported closing of the Suez Canal was reflected in the rising in prices. Crude rubber, both here and in London, went up. Fine Up-River Para closed on Monday at 64 cents, 5 cents higher than the opening the previous Tuesday. It was contended by some that the effect upon the trade was not likely to be serious, as it would result merely in a delay of a few weeks in arrivals of rubber from the Far East. The tin market, as a result of the report, was severely upset. Spot tin advanced $7.75 a ton, closing at $44.00 on Monday.

Oil prices in Kansas reached the $1 mark yesterday, when the price was advanced from 90 cents a barrel. Pennsylvania crude is now $1.90 a barrel. Gasoline prices throughout the country went up again last week. The rise in prices was the strongest demonstration the market has yet given of improvement in oil conditions which set in during August last.

Copper advanced yesterday to 18¾ cents a pound. This metal is growing scarce, and since prompt deliveries are being demanded, the result has been an advance in the quotations.

Lead advanced to $5.25 per 100 lb. yesterday. The demand for lead has been very active, and consumers were reported to be running very low on stocks.

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McNaull Tire Co. Increases Capital $2,225,000

TOLEDO, OHIO, Nov. 11—The McNaull Tire Co. has been incorporated with a capital of $2,500,000. The new company is to succeed the McNaull Auto Tire Co., which operates a manufacturing plant on the East Side.

The present capitalization of the McNaull Auto Tire Co. is $275,000. Under the reorganization the capital of $2,500,000 will be divided into $1,000,000 preferred and $1,500,000 common stock.

The plant will be enlarged by the reorganized company and employment given to 1000 more men.

W. D. McNaull was elected president; M. W. McNaull, vice-president, and A. B. Laskey, secretary, at a meeting of the McNaull Tire Co., held Nov. 12.

As the McNaull Tire Co. succeeds the McNaull Auto Tire Co., the directors of the old company will serve as a provisional board, representing Eastern men who have agreed to finance the new concern. W. D. McNaull was president of the old concern.

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Overland to Redeem Preferred

NEW YORK CITY, Nov. 12—The Willys-Overland Co. has given notice that it has decided to redeem the whole of its preferred stock at 110 per cent of par, plus accrued dividends. Each holder is requested to present his certificate of stock at the office of William Salomen & Co., 25 Broad Street, this city, on Jan. 13 next, when he will receive payment. After that date dividends will cease on the stock.

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Bourne Truck to Use Master

DETROIT, MICH., Nov. 13—The Master Carbureter Corp. announces that the Atlantic Refining Co., Philadelphia, Pa., which is a subsidiary organization of the Standard Oil Co., has contracted to use Master carbureters as standard equipment on the Bourne truck, which the company is bringing out.

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26,239 Freight Cars Idle

NEW YORK CITY, Nov. 13—Figures compiled by the American Railway Assn. show that on Nov. 1 the railroads

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.56	.56	.56	.56	.56	.56	...
Antimony	.35	.35	.35	.35	.35	.35	...
Beams and Channels, 100 lb.	1.77	1.77	1.77	1.77	1.77	1.77	...
Bessemer Steel, ton	25.50	25.50	25.50	25.50	25.50	25.50	...
Copper, Elec., lb.	.18¼	.18¼	.18⅛	.18⅛	.18⅛	.18½	+.00¼
Copper, Lake, lb.	.18¼	.18¼	.18⅛	.18⅛	.18⅛	.18½	+.00¼
Cottonseed Oil, bbl.	7.50	7.65	7.82	7.80	7.85	7.85	+.35
Cyanide Potash, lb.	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.46	.46	.46	.46	.46	.47	+.01
Gasoline, Auto, bbl.	.18	.18	.18	.18	.18	.18	...
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.00	5.15	5.15	5.15	5.15	5.25	+.25
Linseed Oil	.62	.64	.64	.64	.64	.64	+.02
Open-Hearth Steel, ton	27.00	27.00	27.00	27.00	27.00	27.00	...
Petroleum, bbl., Kansas, crude	.80	.80	.80	.80	.90	1.00	+.20
Petroleum, Pennsylvania, crude	1.95	1.85	1.85	1.85	1.85	1.90	—.05
Rapeseed Oil, refined	.77	.79	.77	.77	.85	.89	+.12
Rubber, Fine Up-River, Para	.59	.59	.61	.63½	.64	.64	+.05
Silk, raw, Italian	4.40	.....	4.45	.....	.....	4.80	+.40
Silk, raw, Japan	4.25	.....	4.47½	.....	.....	4.55	+.30
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	36.25	37.00	38.50	43.00	45.00	44.00	+7.75
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	...

of the United States and Canada had only 26,239 idle cars on hand. This compares with 78,299 a month ago and with 170,096 on Nov. 1, 1914. Railroad men say that there may be an actual shortage seen.

PHILADELPHIA, PA., Nov. 12—The Pennsylvania Railroad Co. has asked for bids on 9000 new steel freight cars to replace the old equipment. Two-thirds of them are for the lines east and one-third for the system west of Pittsburgh.

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Touraine Co. to Change Its Name to Vim Motor Truck Co.

PHILADELPHIA, PA., Nov. 15—The Touraine Co., this city, has applied for an admendment to its charter changing its name from the Touraine Co. to the Vim Motor Truck Co.

The company is devoting itself exclusively to the production of Vim delivery cars and manufactures one chassis only. Seven types of bodies are mounted on this one standard chassis.

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Miller Rubber Stock Earns 12 Per Cent

AKRON, OHIO, Nov. 12—The Miller Rubber Co. has declared a quarterly dividend of 3 per cent. This places the stock on a 12 per cent per annum basis, against 10 per cent heretofore. The annual report shows an increase of 30 per cent in gross.

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Dividends Declared

Miller Rubber Co., Akron, Ohio, quarterly of 3 per cent.

Willys-Overland Co. regular quarterly 1¾ per cent on preferred, payable Jan. 1, to stock of record Dec. 21.

Security Prices Irregular

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Kelly-Springfield Tire and Paige-Detroit Feature Market with Large Gains

NEW YORK CITY, Nov. 17—Security quotations, though irregular, have picked up in value since their break last week. General Motors rose 23 points; Willys-Overland, 9 points; Maxwell, 10¼ points; Kelly-Springfield common, 219 points; and Paige, 85 points. General Motors on Thursday reached 400, showing pronounced strength. At the top the stock was 318 points above the low of the year, 82, made on Jan. 2. The stock dropped yesterday to 393 after the story had reached Wall Street that the company had declared no dividend. At the closing yesterday, Overland common quoted at 233.

In the tire issues, Firestone with its 50-point drop, and Kelly-Springfield with its 219-point rise, featured the market.

Peerless common dropped 105¾ points, after a 25-point rise last week. Reo rose 9 points, Stewart-Warner common rose 7 points and Maxwell first and second preferred each rose 4 points.

The Detroit quotations, with the exception of 120-point rise on Paige stock, was normal. General Motors common rose 12 points. Continental Motor common dropped 10 points.

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$100,000 Accessory Firm Formed

FORT WAYNE, IND., Nov. 13—Articles of incorporation have been filed with the Secretary of State for a company composed mainly of Fort Wayne men, who will manufacture accessories for automobiles. The capital stock is placed at $100,000. The firm will have its offices in the Schoaff Building, Fort Wayne. The directors are: T. O. Nelson, William N. Ballou, E. G. Reed, Fort Wayne; W. H. Lillich and H. G. Miller, St. Louis. The concern will manufacture a non-skid apparatus consisting of a pair of shoes operated by compressed air, obtained from the exhaust. The shoes are released by pressing a button and drop to the ground, instantly stopping the car. As they lift the car from the ground the device may be used while tires are being changed.

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Hundson Metal Products Co. Formed with $1,000,000 Capital

DOVER, DEL., Nov. 12—The Hundson Metal Products Co., to engage in the manufacture and sale of metal castings, metal forgings and shapes and to do a general machinery business, was incorporated here with a capital of $1,000,000. The incorporators are: A. N. Seaman, D. M. Clark of New York City, and H. W. Davis of Wilmington, Del.

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Toledo-Ford Tire Co. Now Toledo-Findlay Tire Co.

FINDLAY, OHIO, Nov. 15—The Toledo-Ford Tire Co. stockholders met at their general offices here to-day and changed the name of the corporation to the Toledo-Findlay Tire Co., upon the advice of a legal representative of Henry Ford, who claimed the company was infringing upon his rights.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com			300	..	..
Ajax-Grieb Rubber Co. pfd			101	..	..
Aluminum Castings pfd			..	..	..
J. I. Case pfd			88	89	+2
Chalmers Motor Co. com			150	160	—6
Chalmers Motor Co. pfd			102	105	..
Chevrolet Motor Co			123	127	..
Electric Storage Battery Co			68	68¾	—2
Firestone Tire & Rubber Co. com			720	72	—50
Firestone Tire & Rubber Co. pfd			112	..	..
General Motors Co. com			392	396	+23
General Motors Co. pfd			112½	113½	+½
B. F. Goodrich Co. com			73	75	+2
B. F. Goodrich Co. pfd			111	111½	..
Goodyear Tire & Rubber Co. com			328	335	..
Goodyear Tire & Rubber Co. pfd			110	112	..
Gray & Davis, Inc. pfd			..	..	..
International Motor Co. com			38	40	+3
International Motor Co. pfd			64	68	..
Kelly-Springfield Tire Co. com			295	305	+219
Kelly-Springfield Tire Co. 1st pfd			93	96	—1
Kelly-Springfield Tire Co. 2d pfd			75	76	—1
Maxwell Motor Company, com			78	82	+10¼
Maxwell Motor Company, 1st pfd			101	103	+4
Maxwell Motor Company, 2nd pfd			61	62	+4
Miller Rubber Co. com			249	252	..
Miller Rubber Co. pfd			109½	110½	..
New Departure Mfg. Co. com			..	..	..
New Departure Mfg. Co. pfd			..	..	..
Packard Motor Car Co. com			131	135	+1
Packard Motor Car Co. pfd			100	102	..
Paige-Detroit Motor Car			550	..	+85
Peerless Motor Car Co. com			41½	42½	—105¼
Peerless Motor Car Co. pfd			92	96	..
Portage Rubber Co. com			80	85	..
Portage Rubber Co. pfd			98	100	..
Regal Motor Co. pfd			17	..	+2
*Reo Motor Truck Co			..	24½	..
*Reo Motor Car Co			49	51	+9

No quotations available at this time on account of war.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Splitdorf Electric Co. pfd			..	..	..
Stewart-Warner Speed. Corp. com			82	84	+7
Stewart-Warner Speed. Corp. pfd			106	..	..
Studebaker Corporation com			162	164	..
Studebaker Corporation pfd			111	113	—2
Swinehart Tire & Rubber Co			89	91	—1
Texas Company			170	172	+1
U. S. Rubber Co. com			54	56	+1
U. S. Rubber Co. 1st pfd			106	108	+¼
Vacuum Oil Co			215	220	..
White Company pfd			110	..	..
Willys-Overland Co. com			247	249	+9
Willys-Overland Co. pfd			111	112½	+2

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
ACTIVE STOCKS					
Chalmers Motor Co., com	..	97	..	162	—3
Chalmers Motor Co., pfd	..	93½	101	104	—1
Continental Motor Co., com	155	180	230	250	—10
Continental Motor Co., pfd	..	75	89	94	..
General Motors Co., com	61	62	389	395	+12
General Motors Co., pfd	82	82½	112½	114½	..
Maxwell Motor Co., com	13½	15	73	76	+2
Maxwell Motor Co., 1st pfd	43	47	100	103	+1¾
Maxwell Motor Co., 2d pfd	18	20	59	62	+2
Packard Motor Car Co., com	..	100	131	135	+1
Packard Motor Car Co., pfd	89	..	100	101	..
Paige-Detroit Motor Car Co	..	..	600	700	+120
*Reo Motor Car Co	21¾	22½	52½	..	+7½
*Reo Motor Truck Co	10¾	11¼	21½	23	—2¼
Studebaker Corp., com	..	..	158	161	—4½
Studebaker Corp., pfd	..	..	110	115	+2
INACTIVE STOCKS					
*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2,000	2,750	..
Kelsey Wheel Co	185	..	215	..	..
*W. K. Prudden Co	18½	20½	24	25½	+1¾
Regal Motor Car Co., pfd	..	25	18	..	..

*Par value $10.

Test Massachusetts Law

Automobile Legal Association Seeks to Prove License Fee Often Double Tax

BOSTON, MASS., Nov. 13—The first move in a plan to test the constitutionality of the Massachusetts motor law was started here this week. William L. Thibodeau, general counsel for the Automobile Legal Association, took a car that was unregistered and drove it on the streets until he was arrested. In the lower court he was found guilty and appealed. The case now goes to the Superior Court, and it is believed it will find the law is all right there, which will allow another appeal to the Supreme Court. The basis of the case will be fought on the plea that motorists now paying a personal property tax are being unjustly taxed in the guise of registration fees. It is the result of the plan to increase the fees on cars and trucks in the next legislature. The Automobile Legal Association has about 9000 members and is a powerful body, with plenty of financial backing, and not identified with any other organization. It is probable that the various automobile organizations of the State will line up on one side or other of the fight.

New Iowa 3-Year-License Law in Force Jan. 1

DUBUQUE, IOWA, Nov. 13—The new automobile registration law in the State of Iowa will go into effect Jan. 1, 1916. The new law provides for number plates which will last three years. An owner paying the license fee for 1916 will receive number plates for the three years.

In 1917 and 1918 notice will be sent from the State to the owners to pay the registration fees for those years.

The fees for registration have not been changed. Machines used four years prior to Aug. 1 will be registered for one-half of the regular fee. Machines purchased after Aug. 1 will be registered that year for one-half the fee.

Under the new law all fees are due Jan. 1. A penalty of 10 per cent will be added if not paid by April 1 and 5 per cent additional for each month thereafter.

Motor vehicles are subject to lien for all unpaid fees.

10 Days in Canada Free

OTTAWA, ONT., Nov. 13—The Customs Department at Ottawa has just granted to United States motorists entering Canada for touring purposes a privilege hitherto denied them, although Canadian motorists have enjoyed the privilege in the United States. Now a non-resident owner of an automobile manufactured abroad desiring to bring his machine into Canada for a stay of not more than ten days may be granted a free permit at the discretion of the customs collector at the port of entry, provided that the latter is satisfied of the good faith of the motorist. Hitherto American motorists have had to make a formal entry and file a bond costing about $5.

Boyce Motometer Injunction Against Stewart-Warner Made Permanent

NEW YORK CITY, Nov. 12—The temporary injunction granted May 16, 1914, by the district court here to Harrison H. Boyce and the Motometer Co., Inc., against the Stewart-Warner Speedometer Corp., and which was affirmed by the circuit court of appeals last December, has been made permanent. The injunction prohibits the Stewart-Warner corporation from infringing the Boyce Motometer patent by the manufacture and sale of a radiator cap thermometer adjudged by the court to be an infringement of the Motometer.

The suit was brought by Harrison H. Boyce and the Motometer Co., Inc., against the Stewart-Warner Speedometer Corp. April 11, 1914, in the United States district court for the southern district of New York. Stewart-Warner answered May 1, claiming that the Motometer patent was void for lack of invention. The court, however, upheld the validity of the patent and issued the temporary injunction, which has now been made permanent, after having been affirmed by the circuit court of appeals last December. The Stewart-Warner corporation stopped the manufacture of the infringing device as soon as the temporary injunction was issued.

Rumely Plant Sale Dec. 9

SOUTH BEND, IND., Nov. 15—Official notice of the sale of the plants, including real estate, improvements, machinery, patents, trademarks, records, personal property, etc., of the M. Rumely Co., Laporte, gives Dec. 9 at noon, in the main offices of the Rumely company in Laporte, as the time and place, with Receiver F. P. Mount as special master. So far as known the Advance-Rumely Co. will be the only bidder for the property. This is the name of the reorganized company.

New Plant for Bukholt

STEVENS POINT, WIS., Nov. 13—The Bukholt Mfg. Co., Stevens Point, Wis., manufacturing a line of tire and automobile accessories, has broken ground for a new three-story factory, to be 74 by 100 ft. The building will be ready about Feb. 1. In the meantime overtime operations are the rule in the present plant.

A. A. A. Board Fines Oldfield

For Demonstration Performance at Outlaw Race Meet —To Revise Rules

NEW YORK CITY, Nov. 11—At the regular meeting of the Contest Board of the American Automobile Association, held at headquarters here to-day, Barney Oldfield, veteran driver, was fined $250, for driving a demonstration performance in his car on a track at Wichita, Kan., where an outlaw racing meet was being held. Oldfield was advertised as a co-attraction with outlaw drivers, but did not drive in competition. His performance was made in company with an aviation performance by aviator Thompson. This is the second time where the fine penalty has been imposed on drivers and companies for infraction of rules during the last year, and it seems a relatively just punishment.

The board took up the work of revising the contest rules for 1916 which work will be completed before the first of the year.

The board has been requested to issue sanction covering meets in the Philippine Islands, which will be done.

Several drivers who have violated the rules during the past year were reinstated and others denied application for reinstatement. Among those reinstated are: D. K. Sworder, G. C. Bergdoll, Herbert M. Strachan, A. A. Mattison and B. Ward Bean. Applications for reinstatement were denied Arthur Klein and William B. Brown. The following drivers were disqualified for different periods: C. E. Wood, two years, Henry Skutt, A. Ingram, and M. J. Crell, until January, 1917. James B. Ryall and John A. Maiss were disqualified for one year. Frank Topping, a registered mechanic who has violated the rules during the present year, was placed on the ineligible list.

Cooper to Try for Non-Motor-Stop Record in Maxwell

LOS ANGELES, CAL., Nov. 16—Earl Cooper, driving a 1916 stock Maxwell, is going to try for a non-motor-stop long distance mileage run in and around this city during the present month. The stock status of the car is being established, a sanction has been obtained from the American Automobile Association, and official inspectors and technical committee will be employed.

Killen-Strait Gets War Order

APPLETON, WIS., Nov. 13—The Killen-Strait Mfg. Co., Appleton, Wis., builder of the Strait tractor, a 50 hp. gasoline or

kerosene machine, has booked an order for tractors which will not only tax its capacity for more than twelve months but oblige the company to contract for a large supply from outside manufacturers. The tractors will be sent to European governments for use in military operations. William Strait, designer, has just returned from Europe after a 4 months' stay, during which he demonstrated four models of the tractor on the field. The order calls for thirty to thirty-five tractors a week.

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Three More Car Exhibitors

NEW YORK CITY, Nov. 15—The newest additions to the list of show exhibitors are the Barley Mfg. Co., which is to exhibit the Halladay car at the Chicago show, and the S. G. V. car, which is listed to exhibit at the New York show. Application for space has been received from J. B. Ferguson, Ltd., of Belfast, Ireland, and this firm will exhibit a chassis of the Fergus car in all probability. The Fergus is of 14-20 hp., is equipped with a four-cylinder motor and has many mechanical features which will command attention.

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Milwaukee Show Jan. 7-13

MILWAUKEE, WIS., Nov. 13—The Milwaukee Automobile Dealers, Inc., has selected the week of Jan. 7 to 13, inclusive, as the date for holding the annual Milwaukee show in the Auditorium. As for two years past, the show will be opened on Friday evening and close on the following Thursday night. Bart J. Ruddle, assistant secretary of the M. A. D., will again be show manager.

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Franklin Off on Oil Test

NEW YORK CITY, Nov. 17—A Franklin six left the headquarters of the Automobile Club of America to-day en route for Chicago. The car is accompanied by two A. C. A. observers who will note the consumption of gasoline and oil along the route. The first stop will probably be in Philadelphia. An effort is to be made to make the entire distance on 1 gal. or less of lubricating oil.

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Accessory Department at Baltimore Show

BALTIMORE, MD., Nov. 13—Owing to the numerous demands by the dealers in accessories and supplies the committee in charge of the show that will be held in Baltimore Jan. 18 to 22 have decided to set aside a big room in the Fifth Regiment Armory, where the show will be held, for the showing of accessories. Applications for all space for cars, both passenger and commercial, as well as for the accessory division, must be made before Dec. 10, and drawings for the space as to location will be made on Dec. 20.

80 Exhibitors at Providence

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144 Passenger Cars and 32 Trucks on Display—First Night Attendance 10,000

PROVIDENCE, R. I., Nov. 12—The annual show of the Rhode Island Automobile Dealers' Association, and the first automobile exhibition of the season in the East, opened here this evening with eighty exhibitors showing forty-five passenger and seventeen commercial makes. It will continue through until Nov. 20. The show is being held in the State Armory. The passenger cars, numbering 144, are on the main floor, with the thirty-two commercial vehicles in the basement with the accessories. The attendance at the opening this evening was large, running well above 10,000.

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Fifth Avenue Buses Earn $1,451,508.10 in Year

NEW YORK CITY, Nov. 16—The Fifth Avenue Coach Co., this city, during its fiscal year, ending June 30 last, carried 14,050,471 passengers at 10 cents each, in its 133 buses, its revenue from this source amounting to $1,405,047.10, or 34.52 cents per active bus mile. The total mileage of the buses, including 43,929 idle miles, was 4,113,625. Its revenue from the livery service, amounting to 19,374 bus miles, was $15,086, and the advertising in its buses amounted to $31,375, thus bringing the total revenue from operation up to $1,451,508.10, just $274,857.72 more than the previous year.

A feature brought out in the report of the company is that the 133 buses ran at a cost of only 1.504 cents per bus mile, each bus using six tires, the rear wheels each having two tires. Last year the cost was 1.7 cents; the previous year, 2 cents; and the year before that, 3.13 cents. This greater tire mileage is attributed to a better grade of rubber; better supervision; better drivers; better brake mechanism; and the use of steel wheels instead of wood. The company paid out in tire maintenance during the year, $61,941.10.

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Studebaker to Build Branches in Portland and Dallas

DETROIT, MICH., Nov. 12—Officials of the Studebaker Corp. are now in Portland, Ore., and also in Dallas, Tex., where it has been decided to erect Studebaker branches. The plans for the new buildings are not yet finally approved, but it is said that they will be from four to six stories high and will have at least 50,000 sq. ft. of floorspace.

The new branch house in Kansas City, Mo., is nearing completion and will probably be occupied by Jan. 1. Fronting on Grand Avenue, the structure will be five stories high, while on the Twenty-first Street side it will have six stories. On the first floor there will be the show rooms and offices for both the retail and wholesale branches. Repair parts and stock will be kept on the second floor, and on the other floors cars will be stored. The basement will be used partly as repair shop and partly as shipping and receiving room.

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Overland Stores Co. Buys Bowman & Libby, Inc.

MINNEAPOLIS, MINN., Nov. 13—The Overland Stores Co. has bought the business of Bowman & Libby, Inc., distributor of Overland and Willys-Knight cars at 1203 Hennepin Avenue, and will conduct a factory branch there. The Minneapolis company controlled a large Minnesota territory, as well as contiguous territory in Wisconsin, Iowa and South Dakota. F. N. Coats, formerly of the Toledo office, is now manager and will live in Minneapolis and divide his time between the main office and the new wholesale house in the Midway.

Cars will be placed in the new warehouse of the company this month. Operation will start by Jan. 1, or sooner. The plant will be for wholesale storage, sales, service and repairs. Duplicate parts will be carried also. The building covers about 10 acres and has railway connection with all steam lines entering Minneapolis and St. Paul. The floorspace is 432,450 sq. ft., the building being 186 by 465 ft. and five stories.

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Northwest Hupmobile Co. Formed

MINNEAPOLIS, MINN., Nov. 12—The Northwest Hupmobile Co. has been organized here, with S. D. Briggs, formerly with the Pence Co., as manager. The new company will handle the wholesale distributing of the Hupmobile for North Dakota, the eastern part of Montana, Minnesota and the western part of Wisconsin.

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Firestone Day in Des Moines

DES MOINES, IOWA, Nov. 13—H. S. Firestone, head of the Firestone Tire & Rubber Co. of Akron, Ohio, was the central figure of a gathering of over 200 Iowa dealers in Des Moines on Nov. 10 for the celebration of Firestone Day. R. J. Firestone, general sales manager of the company, also was in attendance. An entire day of festivities was followed by an evening banquet addressed by the Messrs. Firestone and by Lafe Young, Sr., former United States Senator, and publisher of the *Des Moines Capital;* Harvey Ingham, editor of the *Des Moines Register;* Henry Wallace, editor of *Wallace's Farmer,* and others.

U. S. Army Wants More Trucks

Dept. Commanders and Quartermasters Recommend Increase of Motor Service

WASHINGTON, D. C., Nov. 13—Recommendations made this year by department commanders and quartermasters indicate that there is a growing desire to obtain additional motor trucks as a means of transportation for military supplies at army posts and in the field.

The quartermaster of the Hawaiian department has made a special report on transportation in the Hawaiian Islands and he has recommended that motor-truck transportation be substituted, in part, for mule and escort-wagon transportation, and that one 6-ton truck for general hauling and one 3½-ton truck with dump body for coal be supplied to the quartermaster depot at Honolulu, in addition to the three 1½-ton trucks now on hand there.

The army medical department also is negotiating for purchase of additional motor ambulances, and a board shortly will make a report concerning the type best adapted for use in connection with field hospitals.

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Must Give Factory Numbers When Registering Cars in Ohio

COLUMBUS, OHIO, Nov. 13—To make identification easier, State Registrar of Automobiles W. H. Walker will require all applicants for licenses to give the serial factory numbers of their machines when they apply after the first of the year. With this information on file the department will be better enabled to trace the owners of stolen cars.

Each application for a license now in addition to giving the full name and address of the applicant, must give the name, make, motive power, style and horsepower of the machine.

Registrar Walker intends to establish a number of branch offices next year from which licenses will be issued just the same as from the main office in Columbus.

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Reorganize Wisconsin Automobile Business Association

MILWAUKEE, WIS., Nov. 16—Milwaukee garagemen, supply makers and dealers and others interested in the automobile business have undertaken to reorganize the Wisconsin Automobile Business Assn., which was organized about a year and a half ago but after brief activity went to sleep. A meeting was held Nov. 11 on call from the officers, and plans laid for a reconstruction of the association on broad lines. The officers are: President, W. J. Schubert, Milwaukee Auto Specialty Co.; vice-president, F. A. Olsen, Curtis Automobile Co.; secretary, Roland Moeller, Auto Service & Supply Co.; treasurer, Oscar F. Fischedick, Auto Supply Co., all of Milwaukee. The association has a membership of 255 and under the new plan will increase this to at least 1000.

The business has been divided into ten distinct sections, each of which will be organized separately but be a part of the association. The first work will be to weld together the garagemen and repair-shop keepers. Fred C. Carter, of the Auto Livery Co., was named chairman of of this division, and H. E. Wilson, secretary. Meetings will be held in four quarters of the city so that all men in this line of business can be reached directly and intimately. Other divisions to be organized are: Car dealers and salesmen; tire dealers; painting and trimming shops; electrical repairmen; publishers to the motoring industry; gasoline and oil dealers; accessory and supply makers; jobbers and dealers in accessories and supplies, etc.

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Delco Repairs, Gratis, Equipment Damaged in Texas Storm

DAYTON, OHIO, Nov. 12—The Dayton Eng. Lab. Co., this city, has to date repaired, without charge, fifty-four cars on which the Delco electric systems had been damaged by the storm and flood in the neighborhood of Galveston, Tex. Of these five were Cadillacs, sixteen Buicks, seven Oaklands, ten Hudsons, seven Coles, three Cartercars, five Oldsmobiles and a Moon. The company is in receipt of a number of letters of appreciation of this service from Galveston, Beaumont and Port Arthur, Tex.

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Vogler in New York for Maxwell—Garth Succeeds Him in Philadelphia

PHILADELPHIA, PA., Nov. 15—J. R. Garth has succeeded H. J. Vogler as district representative in this territory for the Maxwell Motor Co., Mr. Vogler having been appointed metropolitan district representative in New York for the same company.

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F. Shirley Boyd Dead

BOSTON, MASS., Nov. 13—F. Shirley Boyd, one of the pioneers in the accessory trade in Boston who began with the old bicycle regime, died last Friday following an operation for appendicitis. He had built up one of the largest accessory businesses in New England, handling many well-known accessories.

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Olds Branch Heads Meet

LANSING, MICH., Nov. 11—The annual fall meeting of the heads of branches of the Olds Motor Works, also the district traveling men and the salesmen who act as district representatives has just been held. The men were here five days and went over all the details of the plans of the 1916 season. A talk was given by W. H. Mooney, installation engineer of the Dayton Engineering Laboratories which makes the Delco starting and lighting system. Another of the talks was by William Farr, who spoke about the Johnson carbureter. This carbureter and electric system are part of the Oldsmobile equipment.

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George Robertson Joins Dunlap Tire Distributor

NEW YORK CITY, Nov. 13.—George H. Robertson, prominent in the automobile racing field, and recently president of the Auto Supply Co., this city, and later eastern district manager of the Houk Mfg. Co., Buffalo, N. Y., has joined Otto Braunswarth, this city, as vice-president. This company is the American distributor of the Canadian Dunlap tire.

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M. A. M. Adds List Dept.

NEW YORK CITY, Nov. 12—The Motor and Accessory Manufacturers which counts 238 manufacturers of automobile accessories in its membership roster, has recently added to its activities by adding a new department which is prepared to do addressing work for all of its members. The association has compiled in stencil form a list of over 2,000,000 automobile owners and has classified these according to make of car so that any accessory maker can readily address all of these owners in any city, State, or part of the country. The working of this department, which has been under way for a couple of months, is that any member of the accessory organization can forward his envelopes, have them addressed, and returned to his business office. The list is only open to accessory makers who are members of the association.

To properly carry on this work the Motor and Accessory Manufacturers have secured space at 225 West Fifty-seventh Street, where this work is carried on, and where they have a force of 100 men and girls engaged in compiling their lists, making stencils and doing the addressing work.

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Neuman to Distribute Chalmers

MILWAUKEE, WIS., Nov. 15—Harry Newman, Inc., Chicago, Ill., has been appointed distributor for Chalmers cars in the State of Wisconsin, southern Minnesota and northern Michigan, supplanting the Hoppe-Hatter Motor Co., Milwaukee, Wis. The Newman company has leased the former Packard garage at Grand Avenue and Seventh Street, as headquarters and service station. Branch service stations and salesrooms are to be established in every city of consequence in the territory.

Factory Miscellany

Tire Fabric Co. Adds—The Killingly Mfg. Co., Killingly, Conn., maker of automobile tire fabrics, will construct a weave shed in that city.

To Make Tops in Vincennes—J. D. Browdues, Martinsville, Ind., will establish a factory at Vincennes, Ind., for making automobile tops and bodies.

Arrow Co.'s Plant Started—The Arrow Manufacturing Co., has broken ground for a new factory located at Broadway and Emerald Avenue, Toledo, Ohio, to be 60 by 120 ft., three stories high and to cost $20,000. The concern makes electrical apparatus of all kinds.

McClurg Finishes First Tires—The McClurg Rubber Co., Coshocton, Ohio, has completed its first tire. The first actual work of turning out tires in the new plant started last week. Four or five extra men began work recently making a total of about thirty men now employed there.

Hartford Co. to Make Bearings—The Rockwell-Drake Corp., Hartford, Conn., has been incorporated with a capital of $100,000 to make bearings, automobile parts, machines, etc. The incorporators are H. M. Rockwell, L. A. Drake and R. J. Brault of Bristol and R. B. Bennett of Hartford.

To Make Tires in Buffalo—The George Miller Spring Tire Co., Buffalo, N. Y., has been incorporated with a capital of $100,000 and will establish a plant for the manufacture of tires, springs, etc., for automobiles and other vehicles. G. and O. Miller and W. L. Williams, are the incorporators.

To Make Automobile Wheels—The Mutual Wheel Co., Moline, Ill., which has previously limited its output to wheels for wagons, buggies and farm machinery, has embarked in the manufacture of wooden wheels for automobiles. A special building has been erected to carry machinery for the new department.

To Make Towing Truck—The Projecta Co. has been organized at East Milton, Mass., to manufacture the Projecta towing truck. It is designed to meet the demands of owners whose vehicles have been disabled at front or rear and allows the part to be rigidly jacked up and towed for long distances at good speed.

Crow to Increase Production—The Crow Motor Car Co., Elkhart, Ind., has received orders for 200 cars to be furnished to its Kansas City distributing agency, the Velie Motor Co., during the next 90 days, and the Kansas City firm has contracted for 600 cars to be placed in Kansas and Oklahoma during the 1916 season. The Crow company is planning to increase its winter production to 200 cars a month and its spring production to 300 cars a month.

1238 Hupmobiles in October—Sales Manager Lee Anderson, of the Hupp Motor Car Co. Detroit, Mich., states that during October the company shipped 1238 cars, this being the biggest October business in the company's history. The number of inclosed cars shipped was 300 per cent better than last year. The demand for the winter car is general throughout the country, and is such that the original production schedule as to this line of cars had to be changed to increase the output of limousines, sedans and year-'round touring types of cars.

To Make Wheels—The Ideal Wheel Co., Massillon, Ohio, has been formed in this city for the purpose of manufacturing wheels for automobiles, motorcycles and aeroplanes. No directors or officers have been elected yet. It is reported that the Ideal wheel will be constructed of steel, that steel springs will be used as spokes, and tires will be of the airless cushion type. The company will start business by making automobile wheels and will employ about twenty-five men. Arno Merkel of Cincinnati, one of the owners of the patent on this wheel, will be general manager of the concern.

The Automobile Calendar

Nov. 12-20	Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 20	Arizona 150-mile Grand Prix.
Nov. 22-27	Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.
Nov. 23	Phoenix, Ariz., Grand Prix Race, State Fair Course.
Nov. 29-Dec. 4	Electric Prosperity Week.
Dec. 5	Worcester, Mass., American Road Builders' Assn. Day.
Dec. 6-11	Springfield, Mass., Show, Auditorium.
Dec. 7-10	New York City, American Society of Mechanical Engineers Convention.
Dec. 31-Jan. 8	New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.
	1916
Jan. 3-9	Importers' Salon, Hotel Astor.
Jan. 5-6	New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11	New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13	Milwaukee, Wis., Show, Auditorium.
Jan. 8-15	Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15	Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 15-22	Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22	Rochester, N. Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22	Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22	Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22	Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29	Montreal, Que., Show, Automobile Trade Assn. Ltd.
Jan. 22-29	Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30	Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5	Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5	Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12	Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 9-12	Peoria, Ill., Show, Coliseum. Peoria Automobile and Accessory Assn.
Feb. 14-19	Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19	Newark, N. J., Show.
Feb. 20-27	Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26	Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26	Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26	Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4	Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11	Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 28-Apr. 3	Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13	New York City, Sheepshead Bay Speedway Race.
May 30	Indianapolis Track Race.
June 17	Chicago Track Race.
June 28	Des Moines, Ia., Track Race.
July 4	Minneapolis Track Race.
July 4	Sioux City Track Race.
July 15	Omaha, Neb., Track Race.
Aug. 5	Tacoma Track Race.
Aug. 18-19	Elgin Road Race.
Sept. 4	Des Moines Track Meet.
Sept. 15	Indianapolis Track Race.
Sept. 16	Providence Track Race.
Sept. 30	New York City Sheepshead Bay Race.
Oct. 7	Omaha Track Race.
Oct. 14	Chicago Track Race.

The Week in the Industry

Holsworth Joins Fickling—Percy Holsworth, formerly of the Yellow Taxicab Co., has associated himself with the Fickling Enameling Corp., Long Island City.

Rosenwald Joins Detroiter Co.—The Detroiter Motor Car Co., Detroit, Mich., has appointed F. K. Rosenwald assistant in the sales department of the company.

Duggan Denver Briscoe Mgr.—G. A. Duggan is now manager of both the Estarado Garage, 1530 Clarkson Street, and the Briscoe Auto Sales Co., 1646 Broadway, Denver.

Ross Midgley Columbus Mgr.—C. E. Ross has been made manager of the Columbus, Ohio, branch of the Midgley Tire and Rubber Co., located at 224 North Fourth Street.

Kressler Leases Plant—The Kressler Auto Co., organized by G. P. Kressler, P. J. Blazer and Henry Ockchin, has leased the abandoned plant of the Fostoria Stave and Barrel Co., Fostoria, Ohio, which will be occupied after Dec. 1.

Gordon Leaves Boston White—H. M. Gordon, for the past nineteen years identified with the White Co.'s branch at Boston, Mass., with the position of purchasing agent, resigned last week to join the Boston branch of the Kelly-Springfield Tire Co.

Reeves Heads Brooklyn Chevrolet Sales—M. C. Reeves has been appointed sales manager of the Chevrolet Motor Co., Brooklyn, N. Y. Mr. Reeves was formerly connected with this branch as salesman and has been recalled from the factory field work to this present position.

Taylor with N. J. Car Spring Co.—L. H. Taylor, formerly salesman for the Denver branch of the B. F. Goodrich Co., is now Western manager for the New Jersey Car Spring & Rubber Co., in charge of Colorado, New Mexico, Utah, Wyoming and Montana, with headquarters at 238 Temple Court Bldg., Denver.

Wilkins Maxwell Supervisor—F. W. Wilkins, formerly manager of the Maxwell Motor Co.'s interests in Saskatchewan, has been made supervisor of the company's trade in Western Canada succeeding C. L. Acherson in that post. Mr. Acherson has been transferred to Windsor, Ont., and given charge of the distribution of Maxwell cars for the whole of Canada. The change came into effect this week. The Maxwell company has seventy-two dealers in the province of Saskatchewan.

Motor Men in New Roles

Gans Heads Indianapolis Studebaker—E. W. Gans has been appointed manager of the Indianapolis Studebaker district.

Lemon a Denver Mgr.—R. I. Lemon, recently manager of the Colorado Springs Auto Equipment Co., is now manager of the Denver Auto Goods Co., 1600 Broadway.

Bradford Mgr.—W. C. Bradford, recently manager of the Auto Livery Co., Denver, is now garage manager for the Denver Omnibus & Cab Co., 601 East Eighteenth Avenue.

Serfas Co. Opens Fourth Garage—The Serfas Motor Car Co., Lehighton, Pa., has opened its fourth garage in Pottsville, Pa. The others are located in Lehighton and Mauch Chunk.

Roberts Hupp Rep.—H. R. Roberts has been named as Northwestern representative for the Hupp Motor Co., with headquarters at Portland, Ore., and with territory covering Oregon, Washington, Idaho and Montana.

Huntoon in Portland—C. S. Huntoon of the White Co., will hereafter make his headquarters in Portland, Ore., yet covering the territory of Oregon, Washington, Idaho, Montana and British Columbia for the White Co.

Doan Heads Portland Saxon—W. B. Doan has been named distributer of Saxon cars throughout the State of Oregon and will head the Saxon Motor Sales Co. of Oregon, which will be located at 31 North Nineteenth Street, Portland.

Eubanks Heads Halladay Sales—P. J. Eubanks has assumed charge of the sales department and will hereafter look after all matters pertaining to advertising and distribution of the Halladay cars manufactured by the Barley Mfg. Co., Streator, Ill.

De Laite Velie Mgr.—H. R. De Laite, who has been identified with the Velie Motor Vehicle Co. for the past five years, has been appointed manager of the Hampden County agency which the company has opened at Springfield, Mass., with salesrooms at 379 Worthington Street.

Hurd and Cole F. W. D. Reps.—J. S. Hurd and F. A. Cole have joined the Four Wheel Drive Auto Co., Clintonville, Wis. Mr. Hurd was formerly associated with the Gramm-Bernstein Co., Lima, and will be a traveling representative. Mr. Cole will travel in the capacity of a representative of the company.

Joins Automobile Spring Force—C. M. White, Jr., who was formerly manager of the Detroit office of the Stromberg Motor Devices Co., and previous to that of the Detroit office of the Firestone Tire & Rubber Co., has become associated with the selling end of the spring department of the Detroit Steel Products Co.

White Springfield Overland Mgr.—M. T. White has been appointed manager of the new distributing station being erected for the Willys-Overland Co., Springfield, Mass. The new structure will be four stories of reinforced concrete with a 75-ft. frontage on Chestnut Street and 230 ft. depth on Winter Street. Mr. White has opened temporary salesrooms on Worthington Street.

Foster Resigns—J. W. Foster, manager of the Denver Auto Goods Co., 160 Broadway, Denver, and a member of that firm, has sold his interest and resigned as manager. He is well known to the trade in the Rocky Mountain district, being first vice-president of the Automobile Trades Assn. of Colorado and a vice-president of the Retail Credit Men's Assn. of Denver and the Associated Garages of America.

Harry S. Houpt to Make Changes—Harry S. Houpt, president of the Hudson Motor Car Co., New York City, has promoted De Witt Voorhis, assistant secretary and treasurer of the company and H. C. Huber, at present controller of the organization.

Mr. Voorhis will be made manager of the New Rochelle branch which on Jan. 1 will open a salesroom at Main Street and Centre Avenue. Mr. Huber will then become assistant secretary and treasurer of the company.

Curtiss and Ellis Make Change—H. R. Curtiss, for several years manager and treasurer of the Splitdorf Electric Co.'s New England branch at Boston, Mass., has been appointed manager and treasurer of the Excelsior General Supplies Co. at Chicago.

R. M. Ellis, for the past two years export manager of the Splitdorf Electrical Co., with headquarters at New York, has gone to Boston to assume charge of the company's branch there. He was formerly manager of the Bi-Motor Equipment Co. at Boston and is well known in that city.

VOL. XXXIII. NEW YORK—THURSDAY, NOVEMBER 25, 1915—CHICAGO No. 22

The AUTOMOBILE

Tire Makers Enlarge Plants and Develop Product

60,000 Tires a Day—Straight-Side Pneumatic Heavy Gainer—Pressed-On Solids Displace Demountables —Factories Lead in Employees' Welfare Work

OVER 15,000,000 pneumatic tires will be needed to care for the motor car business in America in 1916. There are to-day in excess of 2,200,000 motor cars registered in the country. Add to this perhaps 700,000 cars that will be built by July 1, 1916. When you have added these cars to those already registered your total is 2,900,000 cars. Give five tires to each car and you get a tire total of 14,500,000 tires needed. Some cars will require more than five tires, but five is a conservative average.

To produce this number of tires there are to-day forty tire factories that are manufacturing pneumatic tires. Some of these produce more than 10,000 tires per day, others build 7500, others 1000, others 300, some 100, some 60, and a few but 40 tires per day. While Akron is looked upon as the tire mecca of America, a title it properly deserves, yet other tire centers are springing up, the State of New Jersey, occupying a mid-position between such population centers as New York and Philadelphia, being a particularly active tire center. Pennsylvania and New England have large interests.

To manufacture 14,500,000 tires in a year means to do this in 300 working days. Divide 14,500,000 by 300 and you get over 48,000; in other words our tire factories for home consumption will have to produce approximately 50,000 tires a day to meet the demand. This will not take care of our export trade which is developing, so that it will not be surprising if production may reach 60,000 a day in certain parts of the next few months.

Unparalleled Activity in the Field

Not for years, if ever in its history, has there been so much activity in the tire field. Expansion is in the air. New buildings have been going up all season and to-day the rush of construction is greater than ever. In Akron the big companies are adding enormously to their plants, some of them increasing their output 50 per cent; in other parts of the country some factories are doubling their capacity. The increased output of cars during the past year has necessitated these additions as well as the prospects for increased car outputs for 1916. This numerical growth is alone responsible for much tire factory development, but in addition comes the increase in export business.

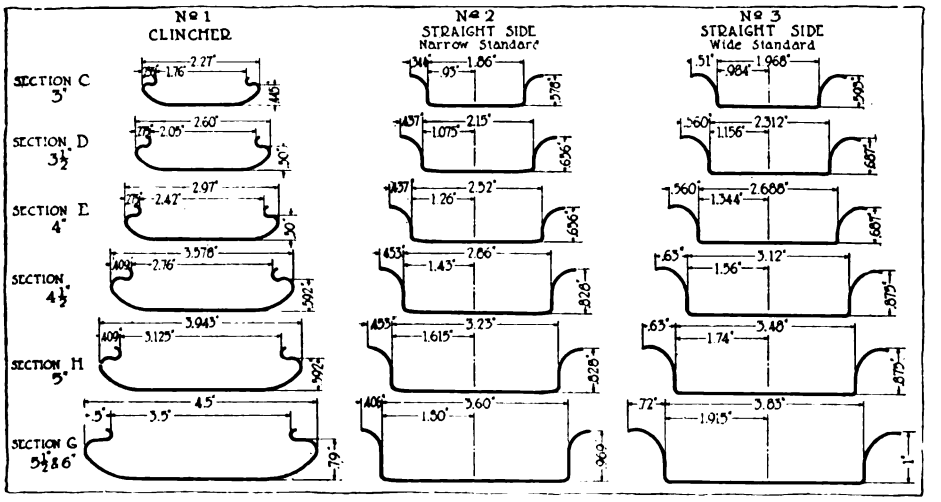
Extend Factory Facilities

To care for these increased tire demands factory additions have been the program of the year, the normal increase in the number of cars in use from year to year creating corresponding increase in tire factories. The Akron makers are among the leaders in this building wave, but other sections of the country are equally active. Firestone is at present working on nine new wings or factory additions which when completed will add 11 acres of floorspace, giving a total of thirty-two acres of floorspace. These wings are nearly all of the same size, measuring 120 by 80 ft., five stories high. In addition the company is erecting a large club house for its employees. The company hopes to double its output of solid tires and increase its output of pneumatics by 80 per cent.

Goodrich and Goodyear, the two largest producers in Akron, are adding to floor area, Goodrich erecting several large buildings, part of which will be used in its cord tire work and part in its line of rubber goods other than tires.

Kelly-Springfield has increased its floorspace 25 per cent during the year and its manufacturing facilities 200 per cent during the past eighteen months. Swinehart has added facilities in the last year to double its tire output.

Outside of Akron the program of additions continues. Fisk is making additions that when completed will give it about 20 acres of floorspace for making pneumatic tires. It has just completed a five-story reinforced concrete warehouse and the foundations are under way for a new factory building. The Pennsylvania company last year added a new building 140 by 200, six stories high. Ajax has just added a new curing room 50 by 100, one story, and is erecting a new factory building 250 by 300 ft., three stories high. The



Standard clincher and straight side rim sections

Falls Rubber Co. has a new plant 80 by 800 ft. with three stories and basement. The New Jersey Car Spring & Rubber Co. has doubled its floor area devoted to tire manufacture during the year.

Several new concerns have entered the field during the year, one being the Midgley Tire & Rubber Co., which started last spring in Lancaster, Ohio.

Too Many Sizes

The curse of the pneumatic tire business has been too many tire sizes, too many models. The Society of Automobile Engineers has been working for several years to reduce the number of tire sizes, and last January recommended the following as the standard sizes for pneumatics, having in all but nine different sizes, with the nine corresponding oversizes, making eighteen in all. Unfortunately this does not mean that the tire maker has only to produce eighteen different tire models; far from it. He has to make these in straight-side types, in quick-detachable clincher types, and some of the smaller sizes in the soft-bead clincher type for cars that use the clincher rim instead of the quick-detachable rim. But you can go further—the tire maker has to produce these in plain treads and also in non-skid treads, so that if these nine sizes were produced in all of these different lines the tire maker would have over seventy different tire models. Add to this the cord tires that are being produced, and if you filled the entire field with the cord models you would have close to 150 different models of tires, truly a big load for the tire manufacturer to produce.

The nine recommended S. A. E. tire sizes with their corresponding oversizes and also the necessary rim sizes for each are:

Rim Sizes Inches	Even Tire Sizes (for Manufacturers and Consumers) Inches	Odd or Oversize Tires (for Consumers Only) Inches	Tire Seat Diameter Inches
30x3	30x3	31x3½	24
30x3½	30x3½	31x4	23
32x3½	32x3½	33x4	25
32x4	32x4	33x4½	24
34x4	34x4	35x4½	26
34x4½	34x4½	35x5	25
36x4½	36x4½	37x5	27
36x5	36x5	37x5½	26
38x5½	38x5½	39x6	27

The object in recommending oversize tires only for consumers is that if an automobile manufacturer fits an oversize tire on his car when sold, the purchaser of that car has no opportunity of fitting any other tire size; whereas, if automobile makers will only fit the standard tire sizes it always leaves the owner with the option of fitting the oversize if so desired.

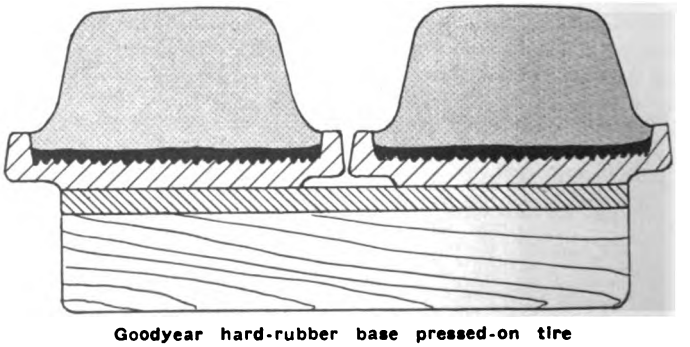
The American tire industry is fortunately free from the annual-model millstone that is clinging to the automobile business. Each autumn does not bring out any new announcement of the 1916 line of tire models. If the tire maker has a new anti-skid tread to announce he announces it in July or October, according as he is prepared to meet the demand. If he has a new hard rubber base solid for trucks he makes his announcement of it when ready, and there is no labeling it an annual model or anything of the kind. It just goes down on the price list as one more type or size.

There are few changes made in pneumatic tires from year to year. The tire contour has been well worked out. There is very little by way of adding a new layer of fabric. The thickness of tread, the formation of the bead or base and the general problems have been well worked out for several years, consequently it is not disappointing to get the reply, "There is little if anything new in our tires," as an answer to the question, "What is there new in your tires for 1916? What new models have you brought out? What are the improvements?"

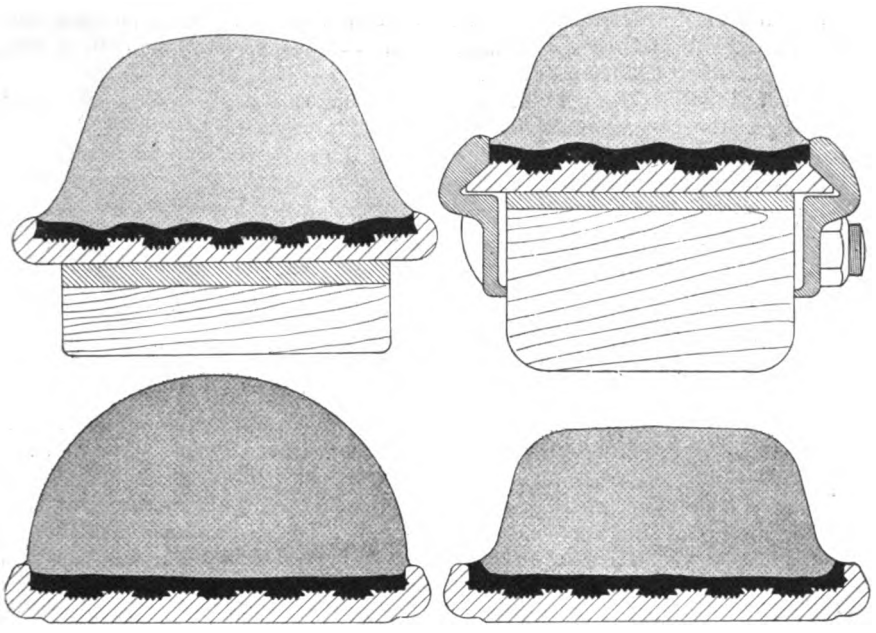
Do not infer that the tire makers are idle; far from it. They all have their corps of tire engineers. Instead of an engineering department at the tire factory it is generally designated the "experimental department." Here the large tire makers have a corps of graduated engineers and the walls and tables are covered with blueprints, just as in a car factory. Draftsmen are busy the year round. Consultations are going on every day and conferences on design and manufacture are a part of the regular program. Go to the garage of the factory and there you may see twenty or more test cars fitted with all kinds of experimental tires, each car being watched very carefully and the performance of all experimental tires watched with the utmost care. All these experimental tires look alike, excepting where a different tread is used. To the novice they are the same, but to the tire engineer, to the head of the experimental department, they are as interesting and different as the new car in the engineering department.

No. 1 car is fitted with tires in which a heavier fabric is used. No. 2 car uses rubber of a new compound; No. 3 has been vulcanized a little differently; No. 4 has the tread slightly different. So the differences go, each tire playing its role in the great enterprise of tire evolution which has been going forward restlessly since the opening days of the present century, identical as the engineers of the car are changing the axle design, adding lighter pistons, using new bearings for the crankshaft, improving the grade of steels in the gears, installing improved bearings in the back axle, using a stamping where a forging had previously been used, etc.

Restless evolution, never ceasing, but concentrating into fabric and rubber the brains of thousands each year, all to make the car go farther on a set of tires, make it consume fewer gallons of gasoline per hundreds of miles, and make it



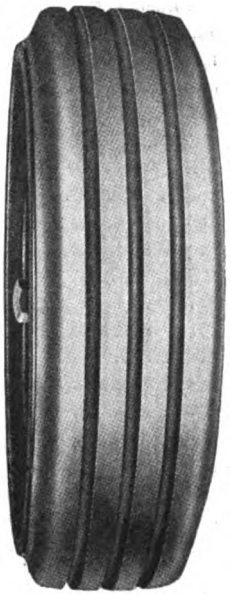
Goodyear hard-rubber base pressed-on tire



Goodrich pressed-on and demountable types. De Luxe deep-section Goodrich on left

Giant Firestone solid to replace twin tires of 6 and 7-in. sections

Alternative sections of Hood hard-rubber base tires, European section at left and American section at right



a better medium to absorb the vibration of the car. No, tire engineers are not idle. Their work is not spectacular, and while the name of an automobile engineer is heralded from ocean to ocean when he brings out a new design of motor, we rarely if ever see in print the name of the tire engineer, yet he is doing his work to improve quality and cut down production costs.

Tire making bears a resemblance to the steel industry: the progress in the fabrication of steel parts in the car has been responsible for many car improvements. By producing better alloy steels we have been able to lighten parts and yet have them much stronger. Add some ingredient to a steel and you make it tougher. Add another ingredient and you give it the ability to withstand fatigue under constant strain.

Go to the tire engineer and he is working in chemistry just the same as the steel man. Take a trip through the calendering room of a tire factory where the crude rubber and the score-and-one chemicals entering into a tire are thrown into metal boxes a couple of feet square, and there you see the starting of the tire.

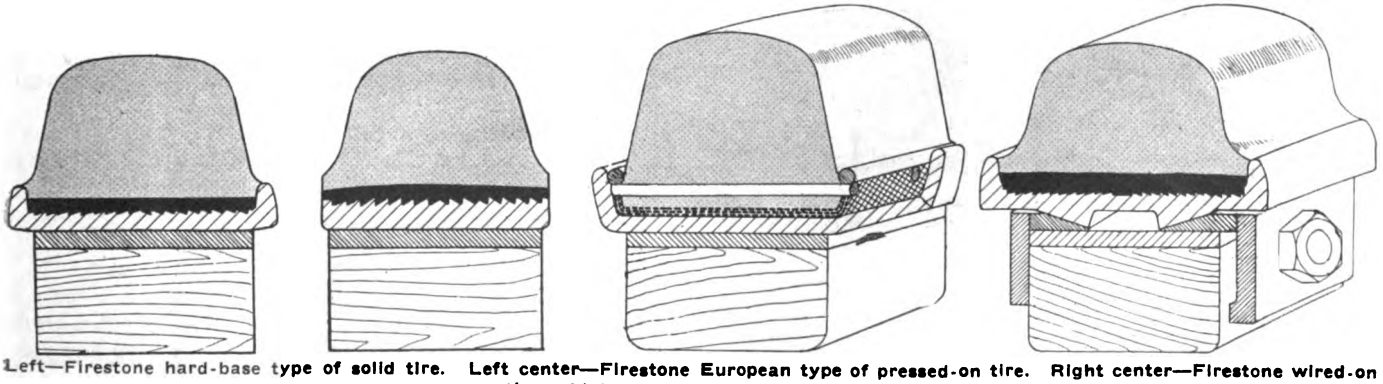
It's an indecipherable mass. You recognize the lumps of black crude rubber. If you have the cultivated rubber eye you can tell whether the rubber is the Para gum from the forests of the Amazon or the better washed product from the plantations of the East Indies and the Straits Settlements, or perhaps from the Congo in Africa. All three may be in the one box, and mixed with them are the chemicals, some yellow powders, some black, others green and others of nearly every color in the rainbow. You see all, you walk between rows of these piled on the floor like baskets of groceries waiting for the delivery boy in a grocery store. You see them, but that is all.

Compounds Are All Secret

Ask what this chemical is, ask about that, and the same reply comes, "That is our secret. Our compounds are all secret. We have hundreds of compounds, but no outsider ever gets a glimpse at the compound book."

That is the treasure of the factory. The compound used in this or that tire is just as great a secret as the ingredients and their proportions in some patented liquid. For this compound perhaps five or six high-grade chemists in the experimental department work year in and year out. The improvements in these compounds make the tires good or bad, make them capable of withstanding heat, make them tough, make them flexible, or make them meet any of the demands that the tire maker has to cope with. Each metal box is carefully measured out by weight, just as carefully as your druggist fills the prescription that your doctor gives you. As great accuracy is necessary. Each box bears its ambiguous label, but not even the workmen have any conception as to the proportions of its contents or the value of each in the whole. It is tire mystery, yet tire science, and represents much tire progress.

But these boxes of crude materials are not the only secrets in the tire factory. These masses of crude after having been chewed and re-chewed, ground and re-ground, lacerated and re-lacerated, extenuated and re-extenuated between the giant steel rolls of the calendering machines that are needed just to thoroughly mix the ingredient. Each compound requires its separate mixing, its special treatment.



Left—Firestone hard-base type of solid tire. Left center—Firestone European type of pressed-on tire. Right center—Firestone wired-on tire. Right—Demountable Firestone

These different compounds require more special treatment. Then the tire is put into the vulcanizing wells to be cured. Each compound demands its special treatment. For one compound the temperature in the vulcanizing well is higher than for another. For one an hour may be long enough, for another too long, and for a third too short; so that the innocent trays of the crude materials for the rubber call for special treatment right through the factory. These different compounds are often just as different as grades of iron and require different treatments. They are like different alloy steels: when tempering a chrome alloy it is necessary to bring it to a certain temperature; treating nickel steel calls for a different temperature, treating tungsten still a different, and so with the other kinds of alloy steel.

Compounds are then the great secret in tire progress, and if we were to tell the story of the annual tire model it would be necessary to lay bare the pages of the compound book, and perhaps after doing so few would be much wiser, and if we wanted to break into the inner secrets of the tire concerns to this extent there is not a single factory that would give you the privilege.

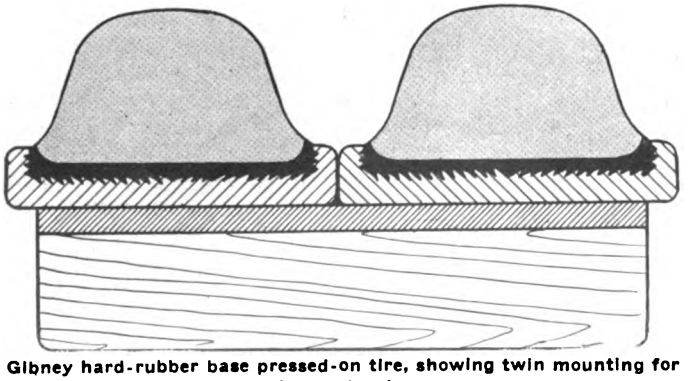
Manufacturing Methods

But tires are not all rubber; there is fabric and there is also the method of bringing the fabric and rubber together—that is, the methods of manufacture. There is sometimes as much mystery about the fabric entering into a tire as there is the compounding of the rubber. Several of the tire factories will not admit you to the rooms where the fabric is inspected and put through its preparation processes. These factories will talk about fabric made from Sea Island products and Egyptian products, and will give you its weight per square unit, but they go further and inspect every strand of it. We all know how to hold our fingers close together between a bright light and our eyes to see the vague skeleton lines. The tire factories require that all fabric pass over rows of electric lights so that inspectors can see every thread, and if there is a broken thread the piece is supposed to be rejected, as a broken thread may mean a premature blow-out.

Lastly the tire maker watches the manufacture of the tire and uses utmost care to see that the layers of fabric, placed one over the other in building up the tire carcass, as they invariably term it in the tire factory, are stretched properly over the mold and at the same tension. To do this the tire-making machine has been developed, and to-day all of our large factories producing tires in quantities of 1000 per day or more use the tire making machine, which is the last word in applying an even tension to the layers of fabric so that the fabric is not under uneven strains and so that there is desired uniformity in all tires.

Machines No Longer Mysteries

These tire making machines for years were shrouded in mystery. Some times they were in locked rooms, with the "No admittance" sign on the door, but of late this mystery has vanished and now you are taken through the tire factory with its special tire making machinery with no more concern than if walking through the machine shop in a large motor car factory.



Gibney hard-rubber base pressed-on tire, showing twin mounting for heavy trucks

Many of the tire making machines are sold on a royalty basis, the tire maker having to pay a certain royalty on each tire built by the machine, the same as is done in the shoe-making field. Not over a dozen of the big tire concerns use these machines, which are of quite different designs, it being almost impossible to recognize scarcely any similarity between a machine of one make and that of another. There is nothing mystifying about them. Building the carcass of a tire is akin to wrapping a bandage around your finger. You start wrapping the bandage one layer over the other and endeavoring to keep the tension about the same, not wrapping one layer very tight and the other loose, but keeping the tension of all the same. Well, in a tire making machine this wrapping is done by the machine. One size of tire may have six layers of the fabric which is impregnated with rubber, another may have seven layers and another may have eight, depending on the size of the tire and the maker.

In wrapping the tire fabric like the bandage on your finger the main difference is that the fabric is wrapped on a metal ring, they call it a core, which is the exact size of the inside of the casing, just the size of the inner tube when in the casing. In wrapping this fabric there are small revolving disks that press the fabric evenly onto the core, making it into the exact form of the casing. After a few layers are on the bead is put on, just a kind of hoop which is placed on each side, and then some more layers are put on and cover the bead.

The great advantage of the tire making machine is that the fabric is always stretched at the same tension, this being done by weights or other combinations. On a tire making machine some of the smaller sizes have the carcass built up at the rate of three every five minutes. The tire is not by any means complete when it comes off the machine, but has to have the tread applied and much trimming and other work done.

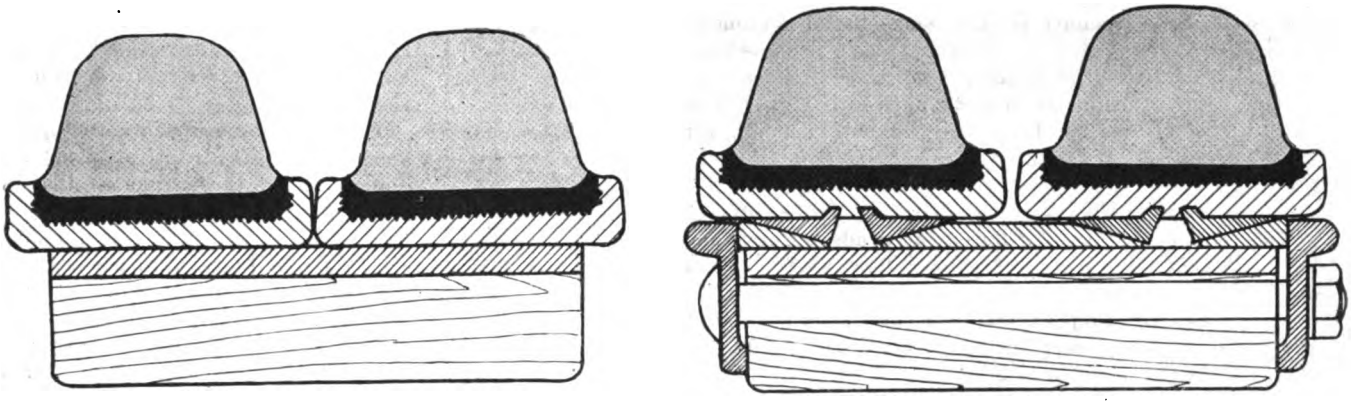
Straight Side Comes to the Front

In the tire world the questions of straight-side, quick-detachable clincher and regular or soft-bead clincher tires are of more or less concern. The straight-side tire is the one without the clincher beads to hold it in the rim. It uses a different style of rim. The quick-detachable clincher is one used on quick-detachable or Q-D rims, which have a removable ring at one side. These tires have the non-extensible bead, that is the bead that cannot be stretched. You could not possibly put this tire on over a clincher rim without the removable side ring. Lastly there is the soft-bead clincher such as used on the Ford car, and other cheap models in which the bead can be stretched so that the tire can be applied over the regular clincher rim.

At present the straight-side tire is making strong gains over the two clincher types excepting in the very low-priced field. One of the largest makers is producing eight times as many straight-side tires as Q-D clinchers, and with many other companies the increase in the use of straight-side types has been very rapid during the last few years. Nearly every tire maker reports large gains in the demand for straight-side types.

There are the usual arguments as to the relative merits of the straight-side and clincher types of tires, but these arguments are not so intense as they were a few years ago, a condition largely due to the gains in the straight-side designs and the fact that practically all manufacturers are building both types according to the respective demands.

So far as price is concerned there is not any difference between one and the other, and when the question of manufacture is considered there is little difference, as the added cost of manufacture in one as compared with the other would



Left—Hard rubber base, and Right—Demountable types of Kelly-Springfield dual solid tires

only be a matter of a few cents which would not matter.

With the car user the straight-side type is attractive, as it is generally conceded to be easier to get on and off the rim. In a canvass of over twenty different tire makers on the relative merits of the straight-side and the clincher types it was generally conceded that there is a somewhat greater air volume in the straight-side type, this increased volume ranging from 5 to 12 per cent or perhaps 15 per cent, depending on the design of casing. Some makers of clincher tires deny that the straight-side type has greater air volume because of the design of their clincher type. Some of the largest tire manufacturers are honestly frank when they say they manufacture both kinds in response to the demand and that they would glady welcome the time when either straight-side or clincher types would be standardized so that it would only be necessary to carry one type in stock, whereas to-day if they have thirty different tire sizes they carry these in both clincher and straight-side types thus doubling the value of stock carried as well as doubling the work of carrying it. Many tire makers are quite settled in their own minds that the straight-side design will be the eventual one and even see the time when the manufacture of the clincher type will be discontinued by a majority.

Cord Tires on Increase

One of the pronounced tire trends of the past year has been the greater volume of cord tires used, cord typifying a form of construction opposed to fabric tires. Goodrich and Goodyear are the great exponents of cord construction to-day, these being the leaders in marketing the cord product, although there are many other concerns that are experimenting with and developing the cord design in one form or another.

Goodrich has been manufacturing the Silvertown cord in quantities, having installed banks of machines by which the tire carcass is built up of two layers of continuous cords laid side by side as closely as thread on a spool, but the arrangement being different. Goodrich has the patents for America for this tire, which is the invention of an American, John Palmer, who now resides in Riverside, a suburb of Chicago, and who is still active in the field of tire invention.

Goodyear has a quite different form of cord tire in which the cords in one layer lie parallel and are so held by fine cross strands, ½ in. apart. These strands permit of the cords being handled the same as a piece of cloth, which in turn enables the company to manufacture its tire practically the same as a fabric tire; whereas the Silvertown cord tire is made by winding a single cord from side to side until you have built up two complete layers, which form the tire carcass. In Goodyear the layers of cord are applied like layers of fabric would be.

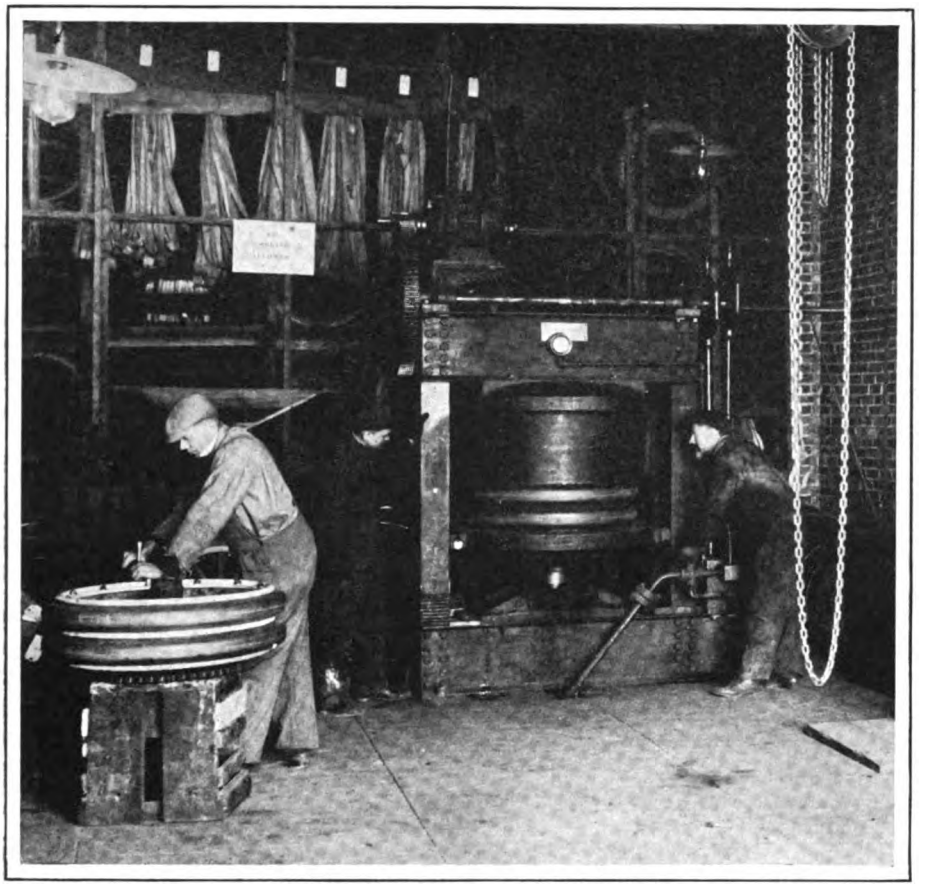
Advantages of Cord Tires

The advantages advanced for cord tire constructions are reduction of vibration, improved coasting, increased speed and reduced gasoline consumption. The theory of explanation is that the cord tire casing is easier to bend or dent when passing over a small obstacle than the fabric, due to the fabric being composed of woven strands lying at right angles to each other, the same as in any woven texture. It requires more pressure to dent such a fabric and consequently more power is required to drive a car over an obstacle. Conversely, when the question of coasting is considered the car coasts further because its coasting is less retarded by passing over obstacles. There are objections, of course, to the use of different forms of cord tires, the objections depending on the form of construction. With some forms of cord tires it is harder to make a repair than with a fabric, it being understood that a cut is a factory repair job, whereas a similar cut in a fabric tire could be repaired as well at a vulcanizing shop as at the factory. The cords used are generally larger than heavy wrapping cord and naturally cutting one is more serious than rupturing a few strands in a woven fabric. Cord tires are considerably higher in price than fabric types, some makes being 40 per cent increase.

The prices on practically all makes of fabric tires are from 14 to 20 per cent lower than they were a year ago, a general reduction having taken place last February. Few decreases have taken place since then. Compared with four years ago the price of tires is 40 per cent lower to-day. The price of crude rubber has been relatively steady during the past year, except soon after the outbreak of the war when the price soared temporarily due to uncertainty regarding shipments of crude from the East Indies and the Straits Settlements, both large producers of crude; in fact, 60 per cent of American crude comes from these sections. There has not been any shortage, and to-day our rubber makers have plenty on hand. Recently England placed an export duty of 2.5 cents per pound on all crude leaving her ports, but that has not resulted in any increase.

Since last spring when Great Britain placed the embargo on crude all of the supply entering America has come consigned to the British Consul General, this being in accordance with a gentlemen's agreement entered into by the American tire makers and the British government. Through the Rubber Club of America, New York, the desired distribution to the different tire companies is effected. The tire companies have agreed to make complete statements regarding articles which are exported, the object of Great Britain being to prevent these articles reaching her belligerent enemies.

To carry this agreement still further the tire makers have agreements with car and truck makers to whom they sell tires, to the effect that all shipments of tires out of the country must be reported and no tires, not even on vehicles are permitted to go to such neutral countries as Norway, Sweden, Denmark, Holland, Switzerland, etc., except by way of England. There have been very few abuses of this working agreement. For a time a few car makers made shipments that were not reported and it looked as if Britain might



Putting on solid tires with a powerful hydraulic press at a Goodrich service station

place restrictions on crude shipments to America, but this has not occurred, and to-day the sky is clear so far as the supply of crude is concerned.

60 to 70 Per Cent of Crude from Far East

At present approximately 60 per cent to 70 per cent of the crude used by the makers comes from the rubber plantations of the East. The remaining 40 per cent comes from the Amazon valley in South America. The crude from the East reaches the factories in a more uniform and workable condition. It is better washed and more quickly and easily handled in the tire factories. The large majority of the plantations in the East Indies are owned and controlled by England. All of it is brought in English boats and it is cleared through the rubber brokers of London. During the war shipments to America have been made easy and simplified since the embargo agreement referred to was made.

The manufacture of the metal rims for pneumatic tires has practically been regulated by the Clincher Automobile Tire Manufacturers' Association, Cleveland, Ohio. This association numbers in its membership nineteen of the largest tire makers, fourteen concerns manufacturing rims, demountable wheels, etc., some of the latter having associate membership only. This association has practically standardized all types of rims such as straight-side, Q-D clincher and regular clincher. These different sizes are illustrated herewith, page 956. Height and width of each only appear as some of the other dimensions have not been entirely agreed upon by the different members of the association. As the illustration shows there is one set of standards for Q-D and clinchers and two distinct standards for straight-side rims, one known as the narrow standard and the other the wide standard. No. 2 is the narrow and No. 3 the wide.

The Clincher Automobile Tire Manufacturers' Association has its inspectors at all factories manufacturing any of these types of rims, whose duties consist of inspecting all rims to see that they are accurately made and also to stamp them with the association's stamp showing that they have been inspected and measure up to the requirements of the association.

Tire manufacturers in turn have set about to manufacture tires to meet the dimensions of these rims so that one make of tire of a given dimension is interchangeable with any other make, in other words if the tires are carefully made one make should fit as well on a standard rim as another make. As the rims used on wire wheels are inspected by the rim association they offer no obstructions to the use of any tire.

Anti-Skid Tires Gain

The use of anti-skid tires is steadily on the increase and new types are being brought out each month or as makers see the demand increase. These are all of the rubber type but with the anti-skid patterns of all kinds. Several rubber makers report that over one-half of their output in the larger sizes are non-skids. One of the last concerns to adopt the rubber anti-skid was the Michelin, that entered the field a few months ago with its Universal tread made for straightside and quick detachable clincher rims. The Universal is a depressed type of non-skid in which it is aimed to combine the features of the suction non-skid as well as that of the raised or studded type, leaving a heavy, broad flat tread on which are two rows of diamond-shaped depressions in the tread with horizontal notches from the diamond to the side of the tire.

While not bringing out anything new in non-skids several tire companies have added slight improvements. Goodyear for several months has been increasing the size of the buttons on its A. W. tread.

Empire is changing the design of its non-skid making the non-skid portion wider and lower, and will bring out a red non-skid cord tire with the same non-skid design as used on its fabric tires. Miller continues its geared-to-the-road non-skid.

The Falls company has nothing new excepting a dead black tread, and expects to add a cord tire during the coming winter. The National company is bringing out a new tire, the Redwall, with a white tread and red side wall. Carspring is making a majority of its tires with non-skid treads and has improved these by slightly altering the bevel of the cups. Globe is now working on a new non-skid. The Mansfield company has a cord tire with its new design of Ohio non-skid.

The Combination Rubber Mfg. Co. will soon bring out its new Hold-On non-skid tire which is a depression type.

The Racine company is manufacturing a cord tire in addition to its horseshoe brand of fabric tires.

Braender has brought out a new model tread during the year known as its new type non-skid. It relies on the hold of arc-shaped cross bars of rubber on the tread as well as the vacuum created in the depressions between these bars.

Hood manufactures two brands of tires, the Hood and Puritan. Hood is in both plain and arrow non-skid treads and the Puritan in plain and gripper treads.

Republic is manufacturing its two non-skid types, the staggard and its newer W-M tread.

Swinehart manufactures a depression type of non-skid, the depression being a series of irregular octagons in the tread.

Hard-Base Solid Tires Gain Followers

AT present one of the most important trends in the solid tire business is that toward the use of the pressed-on tire in preference to the demountable tire. In our larger cities the pressed-on solid tire is gaining, whereas in the smaller outlying cities and towns the demountable tire has the following. The reason is: To remove a pressed-on tire from a truck wheel or put one on a wheel requires a hydraulic press that costs between $500 and $700. This is considerable outlay to the dealer for the amount of work he may get. To make it a little easier some of the tire companies are assisting the dealer by selling these presses at the rate of $100 down and $100 per year until paid for, on the condition that the dealer uses the press only in connection with the make of tire manufactured by that company, although this narrows the field for the dealer.

In small cities and towns the demountable solid tire is looked to to continue in use for some time. From its very nature it can be removed from the wheel and a new one fitted without the truck owner having to take it to a garage. Unfortunately it is more expensive than the pressed-on tire, due to the several forged and rolled steel parts used with it. Practically all of the solid tire makers are continuing their demountable types but the number produced is on the wane.

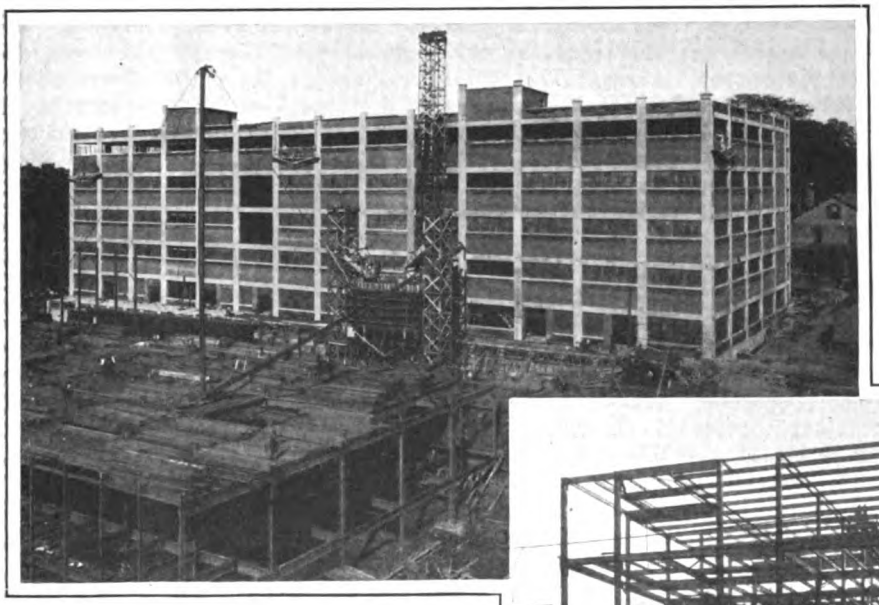
During the past year several movements have been exhibiting themselves in the solid tire field. What is known as the hard-rubber base tire has gained over other types during the year. This tire is built onto the rim in the tire factory and cannot be separated from it. The surface of the rim is cut with grooves, undercut notches or in other ways so that the hard rubber base gets a firm anchorage into the rim. In manufacture this rubber base is applied in some factories in layers just as you wrap a bandage on your finger. The base is relatively thin, perhaps not one-eighth the radial thickness of the tire. On top of this part is built the regular rubber part of the tire, of softer rubber to afford the desired resilience. This part in some factories, is built up just as you wind the bandage on your finger until the desired thickness is obtained, which when done the tire is trimmed to shape and then vulcanized. Thus you see the metal rim is a built in part of the tire. Some of the concerns building this type of tire are Goodrich, Firestone, Goodyear, United States, Republic, Kelly-Springfield, Gibney, Swinehart, Hood, etc.

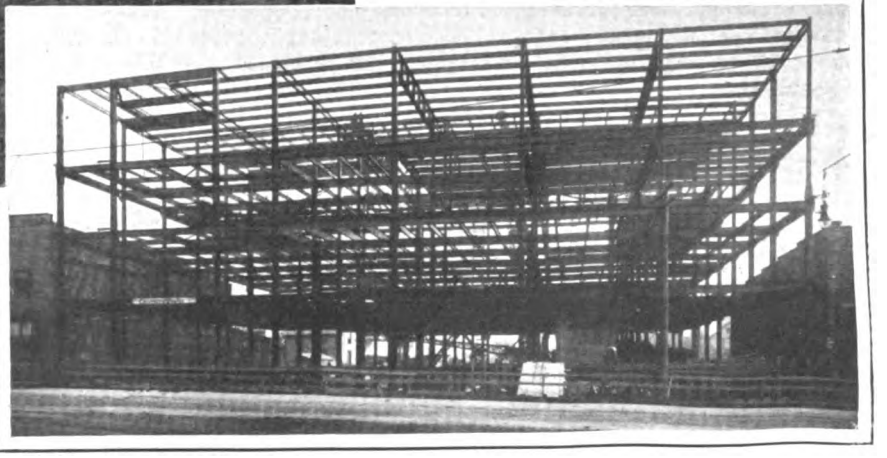
There are other types of solid tires such as the side-wire built by Firestone specially for the smaller sizes. This tire is not manufactured into the rim as is the hard-rubber base type but is afterwards attached to the rim. Into the base of the tire are placed stout cross wires at frequent intervals. When the tire is placed on a channel rim it is held in place by two circumferential wires, one at each side of the tire, these wires resting upon the ends of the cross wires, by virtue of which the tire is retained on the rim. Swinehart manufactures what is called a soft-base tire with cross wires for holding it in the channel rim.

An important movement in solid tires to-day is that of endeavoring to reduce the number of sizes to fourteen if possible. For several years tire makers in connection with the Society of Automobile Engineers have been working on this problem and to-day it looks as if the following will be the eventual sizes for solid tires:

34	in	2.5 in. width
36	these	3 "
40	widths	3.5 "
		4 "
		5 "
		6 "
		7 "

The majority of the tire and truck manufacturers prefer that only the 36- and 40-in. sizes be recognized as standard as they claim 80 per cent and possibly 90 per cent of all solid tires used at present are of these two sizes. There are, however, several makers of small-capacity trucks, 1000 to 2000 lb., who are fitting 34-in. sizes and are to-day making strong arguments to have the 34-in. size made a standard. They claim that the 36-in. size often gives a vehicle with too high a loading platform, as many of this type of vehicle have low platforms.





Above—Fisk's five-story reinforced concrete warehouse nearing completion and showing foundation of new factory building in the foreground. At Right—Steel skeleton of Firestone's new clubhouse for employees. It will have all modern club attractions, including swimming pool, bowling alleys, recreation rooms, restaurant, etc.

These three sizes will be a big improvement as compared with a time ago when solids were made in 32, 34, 36, 38, 40 and 42-in. sizes making in all forty-two different sizes. To-day there are over 150 cities in the country with twenty-five or more motor trucks and the tire depots in these cities in attempting to give the best possible tire service have to carry many slow-moving sizes, which will have to be done for a few years yet, but which work will eventually be much simplified by settling on perhaps two or three different sizes.

Goodrich's New Policy

During the year Goodrich has been promulgating its new policy with regard to single and dual tires for heavier truck work. To-day Goodrich is recommending a 7-in. single in preference to 4-in. duals; 6-in. singles in preference to 3.5-in. duals; and 5-in. singles in preference to 3-in. duals. The arguments are that these singles give better results than the corresponding duals in that often on the road one of the duals has to take the entire weight of load on that wheel and that as it is not designed to take the entire load it is naturally overloaded and perhaps permanently injured by this frequent caring for the entire load weight on the wheel. With singles this is not the case.

Another Goodrich movement of the year is the introduction of the De Luxe type of solid tire in both single and duals. The De Luxe is a higher section tire, one designed after the higher-section tires used in Europe, although the Goodrich uses a quite different contour from the European makers. These Goodrich De Luxes are much thicker radially than their other solid. On a 5-in. size they are 0.75-in. thicker; and on 6- and 7-in. sizes are 1 in. thicker. Greater resilience is claimed as well as longer life and greater load carrying capacity. It has been designed for extra heavy duty and is recommended as an oversize with the same sectional width. The carrying capacity per tire is 500 lb. greater. Hood has introduced higher-section tires during the year.

Firestone has recently introduced what is known as the Giant single solid tire which is made either 8 or 12 in. wide. The extra amount of rubber in this tire is claimed to make it oversize equipment for 6-in. duals and equal equipment for 7-in. duals. The tread has three evenly-spaced circumferential grooves in it.

Tire Factories Leaders in Employees' Welfare

WELFARE work in the factory of the Firestone company, Akron, is being pushed particularly actively at the present time. The company is at present erecting a club adjacent to its factory which measures 125 by 151, four stories in height. The steel construction for this club house is practically completed and the club will be occupied Feb. 1. It is intended solely for the employees of the factory and office. It is expected in the carrying out of the club that each employee will take a membership which may be obtained for a nominal sum, perhaps $1 a year. When finished the club will be very complete. In the basement there will be a tiled swimming pool for the men measuring 60 by 20 ft.; adjacent to this will be twelve showers; and in the remainder of the basement will be six bowling alleys, twelve pool tables and a barber shop.

On the first floor will be a restaurant for the employees with accommodations for 970. The second floor will contain the restaurant for office employees, and will have capacity for 700. On the third floor will be the large club rooms, lounging rooms, library, etc.; and the top floor will be devoted to an assembly room which will be partitioned off into committee rooms, all of which can be thrown into a large assembly auditorium as needed.

In addition to this club work the Firestone factory has its medical department which was started twelve years ago, and which includes, a corps of medical attendants made up of a chief surgeon, resident factory doctor, two trained nurses for day work, one for night work, and a dentist. Arrangements are being made to take blood tests and conduct regular bacteriological analysis. In case of slight injury to employees they are taken to the factory hospital or home.

One of the latest acquisitions to the medical department is the dental office which has been opened in the factory, and which is conducted by a dentist of five years' experience. This department started Sept. 1, and is for the use of all employees in the factory who pay a nominal sum for work done. The factory expects to have all employees' teeth examined once a year.

In the medical department the Firestone company is starting a special series of examinations of all employees with the one thought of determining by accurate physical examination if the employee is physically suited to the job, or if there are other positions in the factory to which he is better adapted. By this department it is discovered, if perhaps, workmen with heart affection are engaged in heavy lifting, which would be dangerous. Such a person would be transferred to some other department.

Goodrich has for many years given very careful attention to its employees, both by means of a well-equipped medical department, to which has been added an efficient dental department, but the latest activity in this factory welfare work is that of installing rest rooms for the female employees of the office, one of which has recently been opened. This is an attractive room in the office building and is well fitted with suitable furniture, rugs, reading tables, etc.

In the medical department Goodrich makes a physical examination of every employee, with the thought of seeing if he is well adapted for the particular work he is doing. These examinations also have a salutary effect, and show the interest the company takes in the welfare of its employees. This department is well manned with resident physicians and nurses. The dental department is for the service of all the employees in factory and office. Tire companies are taking the lead in this welfare work, which must not be considered philanthropic alone, but which at the end of the year shows on the proper side of the ledger. The good health of the employees is a great factor in any factory. Goodrich has a large equipment of restaurants for its employees which are conducted much the same as those in other factories.

Some years ago the Republic company erected its club house for employees which has been operating with particular satisfaction ever since. In addition to bowling alleys, pool tables, gymnasium equipment, restaurant, club rooms, reading rooms, and many other amusements, many educational classes are carried on. The employees in factory and office took readily to the movement which is well patronized throughout the factory. In addition outdoor sports are cultivated.

Practically all of the larger factories are taking up the welfare work with medical attention in the factories. The Pennsylvania company has Paruco Park, the property of the company which is for the use of all its employees. Here is a gun club with a membership of seventy-five members, which requires annual dues of $1. In the factory are shower baths for certain departments, filtered drinking water at numerous fountains and the usual medical and restaurant arrangements.

Kelly-Springfield has carried on special welfare work and has started educational work with its employees. There are reading rooms for foremen and the usual medical attendants.

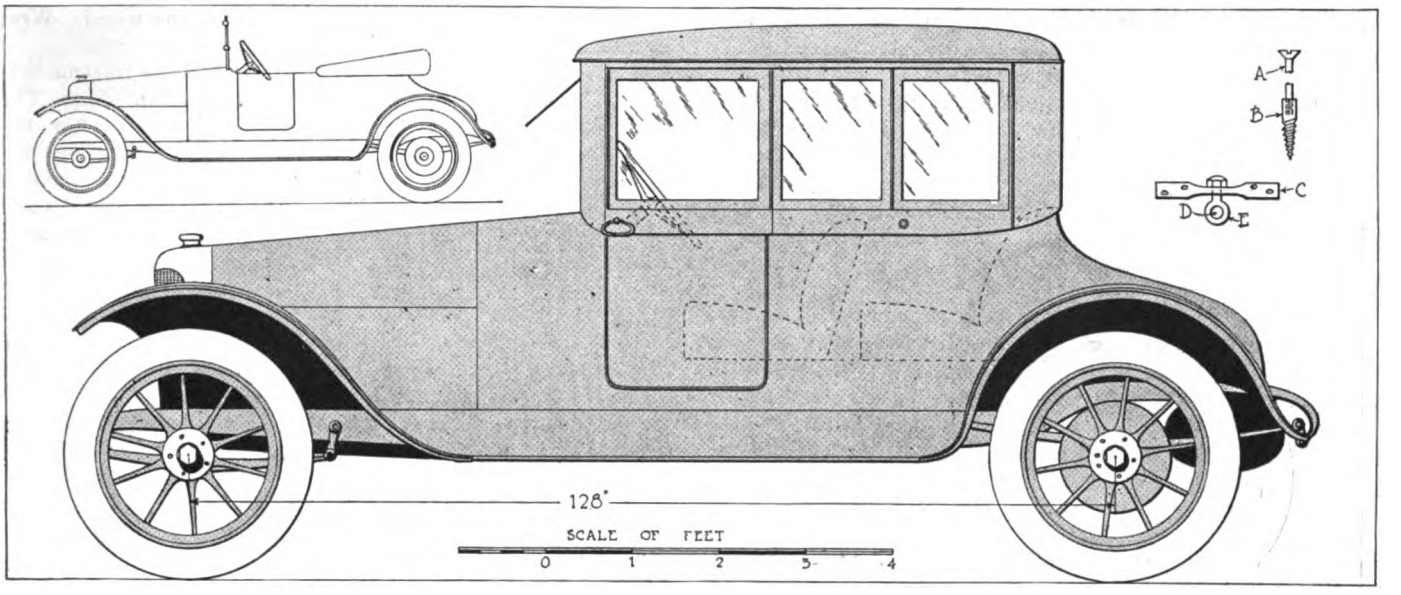


Fig. 1—Center—Apperson four-passenger runabout with suggested design of top added. Fig. 2—Upper Left—The same body with ordinary type of top. Fig. 3—C, D and E—showing how the supports are used in attaching the framework to the body. Fig. 4—A and B—showing how the screws used are made to insure their tops coming flush with the finished molding in securing the framework to the body

Two Demountable Top Designs

Entirely New Type of Body May Evolve from Present Closed Car Development—Types for Apperson Runabout and Chalmers Touring Car Chassis

By George J. Mercer

THE demountable top fitted to touring and runabout bodies is becoming increasingly popular each year, and the coming winter bids fair to outrival in numbers the total output of the past seasons.

The quality of the work and the designing both show improvement, which is no doubt due to the large number of good builders giving their attention to these matters. The demountable top has arrived at the stage where it is accepted as a staple article of manufacture that the public must have. Unquestionably the largest number used will be the type that can be sold complete and assembled on the body, for $75 to $150 as it is for cheapness that the top has come into existence and the majority of buyers are those who expect to economize.

A great range of possibilities is open to the body builder when converting the open body into a closed one. Some use the regular four-bow or the one-man top that is already on the car and simply add side glasses with a framework to hold them in place. In a few designs this addition is made in such a way that the top can be folded down by simply taking out the glass frames. In the majority, however, the entire framework has to be removed in order to fold the top, and this is done only at the beginning and end of the season. There is a considerable increase in the number of car manufacturers who provide a demountable top as regular equipment, and the number will increase in the near future. Eventually a new body design will evolve out of the present efforts.

Novel Body May Evolve

A very good business is being done by individual builders who specialize in converting the bodies in use into closed cars, and this affords a field for all the ingenuity that is latent in the body mechanic. The average body design is stereotyped before the public becomes familiar with it, and the body builder simply makes a copy, taking another body as a model. But supplying the demountable top is a free-for-all race, and it will be strange if in the near future a distinctively novel body is not brought out, that will be as distinctive as was the flush-side body type.

The standard forms of collapsible bodies of the better class, such as the landaulet and the cabriolet, have the distinctive look desired by the buyer who can afford the price, but the full leather top lacks the adaptability that the knockabout car owner needs. A fine carriage body is like a pair of shoes to many people; it only becomes comfortable about the time it is nearly worn out. The rough and ready demountable body, that does not involve the expenditure of much additional money, has the right seasoning to make it popular with a large number of car owners.

All Bodies Easily Converted

There are many manufacturers who are prepared to furnish tops for the standard makes of cars at short notice. They are equipped with forms that correspond with the bodies, and they only require the car, first long enough to check up the measurements, and then later on to assemble the top. All the modern bodies are easily converted, because the trimming roll at the top of the seats does not extend appreciably beyond the body line and the top line of the body is of such a shape that the assembling of the upper framework is not difficult. The worst feature is the adjustment of the hinges, that is, provided hinges are used on the upper part, as most touring doors are made to drop downward when open,

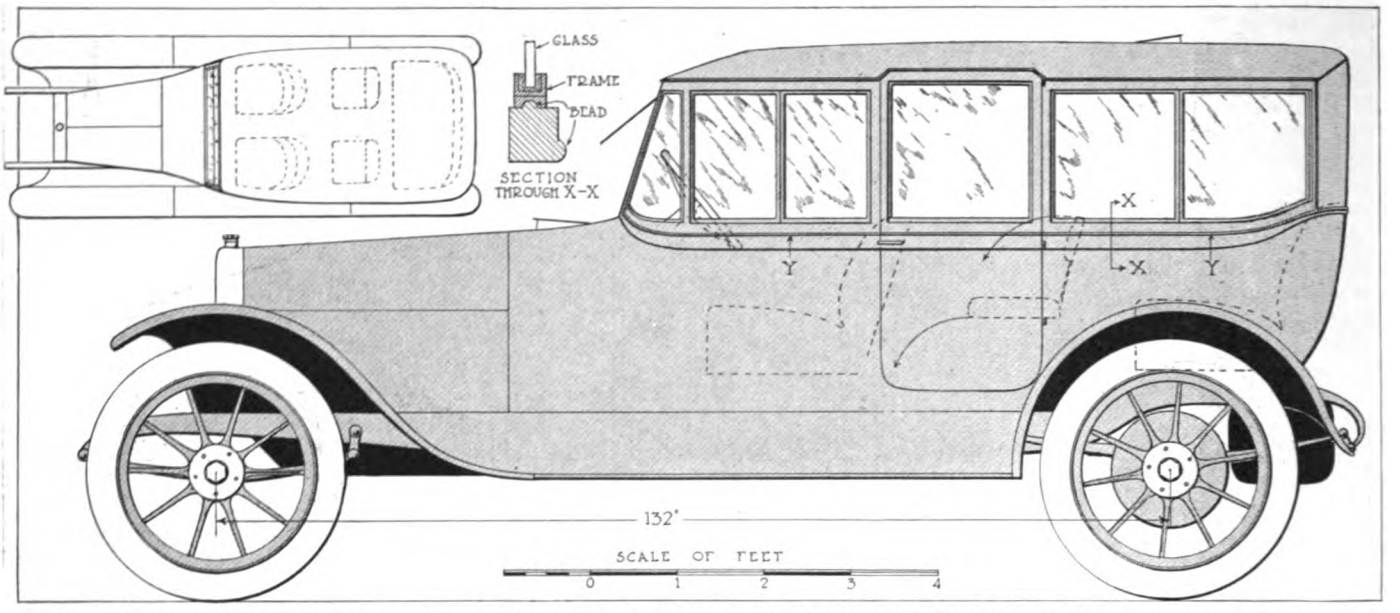


Fig. 5—A demountable top for a seven-passenger Chalmers touring car. Fig. 6—Miniature plan view of this construction, showing how the forward triangular glass is flat and stationary to follow the side sweep of the body toward the front. Fig. 7—X-X—showing how the four glasses on each side of the top are held in place at the bottom. The glasses are metal bound at the top and slide in a groove in the wood top rail, limousine fasteners keeping them tight. Fig. 8—Y-Y—showing the line of separation of top and body. A tee molding covers the joint and the glass side frames are provided with a lip that meshes with its companion glass frame, keeping out the wind and rain

and do not swing horizontally. A great deal of ingenuity has been used to overcome this, some builders making a complete new door that replaces the old one, others placing one long hinge at the top, which projects sufficiently to enable the upper part to swing true with the lower section, but the majority, especially the lower priced designs, do not attempt to have the hinges line; each section has a movement of its own and there is a finger projecting down on the inside of the upper section which engages in a slotted plate on the lower one, this finger traveling in the elongated slide and keeping the two parts in unison when opening and closing, the finger and slot compensating for the different lines of travel. A similar arrangement is made for the lock, the handles in the upper part operating the lock below.

An Apperson Runabout

Fig. 1 shows the Apperson four-passenger runabout with demountable top added and Fig. 2 shows the body without it. To make this top as illustrated, the bow top and the windshield are first taken off and the lower ash rail forming the support for the side glasses is fitted to the shape of the body top line; the rail is cut, part being attached to the door and part to the body and the cut must be made a little back of the door line in order that the part on the door will clear when opening. The jutting out of the added piece beyond the door panel enforces this cut being offset. The side rail continues around the back, the back part not being so deep, and uprights are framed behind the side glass and at each side of the back light; the latter is a separate frame and is screwed to the posts and toprail. The toprail is framed to the posts and the front pillars and the roof is formed with bows, sawed to form the shape of the roof corners, the front pillars are connected at the bottom by a bar that fits close to the cowl panel and the whole front is fastened by irons that engage in the sockets formerly used for supporting the windshield.

Framework Is Light

All the framework is light except the front pillars, and these must be wide to fill the space from the door to the windshield supports. The side glass frames are wood, 11/16 in. thick, and they are held in place at the bottom by resting over a bead, in the manner illustrated in Fig. 7, section *X-X*, the wood frame being grooved to do the same duty as the metal frame in the illustration. This bead keeps the rain from entering and at the top the glass frame rests in a rabbet in the toprail, the rabbet being open toward the inside. There are two limousine window fasteners for each frame, to remove or place the glass frames in position and the fasteners are screwed back until the frame tilts sufficiently to allow it to be lifted over the bead at the bottom. On the rear, the vertical edge of the door glass frame and the one directly back of the door, tee molding is fastened to cover the openings between the frames and at the rear of the third side frame; a rabbet in the post covers the opening, while at the front the pillar has a regular door rabbet. There is no framing between the front and rear side pillars and, when desired, all the side can be open, the four frames can be stored under the seat and the door glass frame is made to be turned down inside the door. The hinges for turning this frame down are placed inside with the centers on line with the bottom of the frame. When up, it is held stationary by two set screws that, passing through plates on the inside of the door top frame, engage in lugs projecting from the under edge of the frame that enter slotted plates on the top face of the framework.

Original Hinges Used

This glass frame forms the upper part of the door, it strikes against rubber bumpers on the toprail rabbet when closed and there are no other turning hinges used than originally are on the job. It projects back of the door line at the rear enough to line up with the line of cut in the framing, and at the front of it is back of the door line enough to give door bevel, so that it will clear when the door is opened and the frame is down. Also the hinge on the frame is long enough so that space is left between the frame and door to permit free operation of the link connecting the door handle in the framework to the handle of the lock.

The front windshield is in two parts; the upper is a visor and the lower swings inward for ventilation; the back light is square cornered and 13 in. high by 24 in. long is the maximum size, though it can be as much smaller as desired, the glass in this being stationary.

The roof can be all metal covered, or metal can be used to form the rounded corners and canvas or top cloth of any waterproof variety stretched over this and fastened under the moldings. The back panel will be metal also, while the lower side framing and front pillars will be painted wood.

Attaching the framework to the body in a manner that will leave few or no blemishes when the top is removed requires careful planning. Advantage is taken of the regular body top irons on the job to do most of the work of fastening as there are always four and sometimes more. In this case, the forward ones are quite long, and a cap is shown covering this. Diagrams *C*, *D* and *E*, Fig. 3, show how the supports are used; *D* is the gooseneck on the body, *E* is an eye bolt that slips over *D* and the end engages in a hole in plate *C* which is fastened to the upper framework. When assembling, the top is down until the four bolts *E* enter the plates *C* and the nut is tightened until *C* rests on the shoulder of the bolt. These bolts take care of the rear, of the top, and the trimming is left loose at these points so that the nuts can be turned up from the inside.

Forward of these supports, and on the doors, *A* and *B*, Fig. 4, are used. *B* is a lag screw with the head cut off, drilled and tapped to receive a 12-24 machine screw, and a sufficient number of the screws *B* are set in the top framing of the body and door, the top of the bolt coming flush with the finish molding.

The upper framing is carefully fitted to the body line, the holes in the bolts *B* located and the framing is bored and countersunk for the screws *A*. When the framing is very deep *A* and *B* will not suffice and, in addition, angle irons are used with one leg screwed to the under side of the framing and the other extending down inside the body. Screws are put through the trimming into the body frame and finish screws are put in all screw holes when the top is removed, this being also done with the screws *B*.

On a Chalmers Touring Car Chassis

Fig. 5 is a large seven-passenger touring body mounted on a Chalmers 132-in. wheelbase chassis and the top is modeled from the lines of the Brewster sedan. The door for this job is the same as for a closed body; it is in one with the top and the glass is made to drop into pillar slides and entirely disappear. The forward triangular glass is flat and stationary, pointing in toward the front, in order to follow the side sweep of the body as indicated on the miniature plan view, Fig. 6. This view also clearly indicates the shape of the windshield glass.

The other four glasses on each side are held in place at the bottom as indicated by the diagram *X-X*, Fig. 7. The glasses are metal bound at the top and slide in a groove in the wood toprail, while limousine fasteners keep them tight. They are placed in position by sliding in from the doorway, the posts at the front and rear of the door being made with an outer and inner member, the space between allowing the glass frame to enter. When not required, these four side glasses are taken out and stored under the seat, or one can be taken out to give extra ventilation and the companion glass can be pushed forward or back to control the air currents. As before mentioned, the door glass drops and is guided by a lift strap. This glass is frameless. The front windshield has the vision, the lower part is stationary, the ventilator in the cowl compensates for a moving lower windshield and there is also a ventilator in the roof. The back light is stationary.

Framing Up the Top

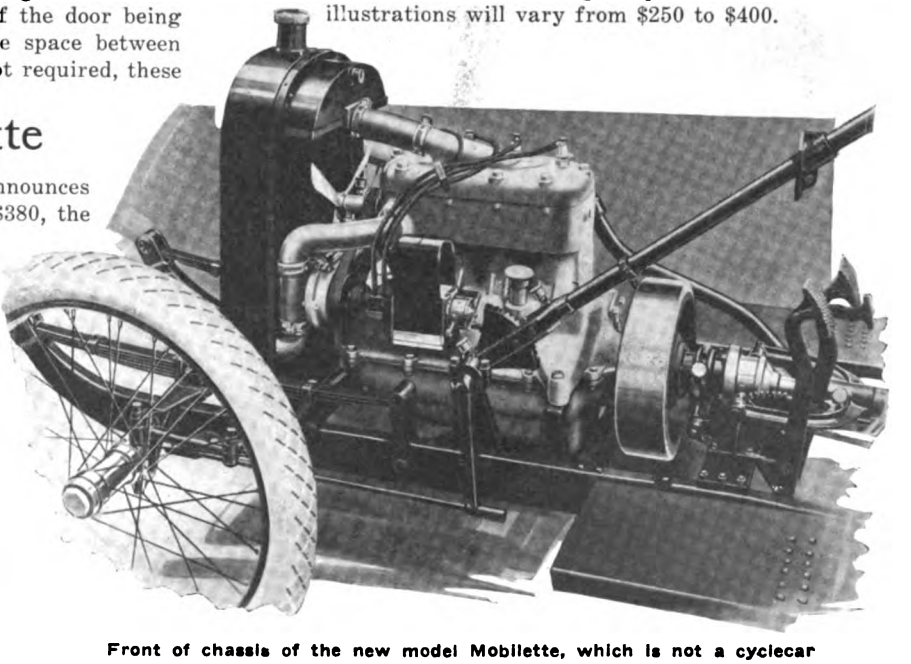
The method of framing up this top is identical with that described for Fig. 1. The line of separation of top and body is on line *Y-Y*, Fig. 5, a tee molding covers the joint, and the side glass frames are provided with a lip that meshes with its companion glass frame. This keeps out the wind and rain where the two frames join in the middle to form the sides at the back and front of the door. The same method of fastening is also used for top and body as shown in Fig. 1, and the door, being made for the purpose, has the lock handle in line to operate the lock without connecting links. The back panel is sheet aluminum in one piece from side window to side window; the roof can be of the same, or the round of the roof can be formed of metal as far up on the roof as where the radius of the corner starts, and then canvas or waterproof top material can be either drawn over the whole roof from side to side and fastened under the drip moldings, or the metal corners can be finished to paint and the roof cloth can form the center deck of the roof, being fastened under moldings running from back to front along the inner edges of the metal forming the corners.

The popular color for painting for the Brewster sedan is the color generally called battleship gray, and the finish is dull, while the part that here is designated as the demountable roof, would all be finished dull painted inside with no trimming of any description showing above the waist line, or the line that corresponds with the top of the seat back trimming, when painted inside. All the woodwork, such as the bows, etc., is nicely rounded and the framing shows very light in size. For Fig. 1, a suggestion for trimming that is commonly used is to cover the seats and backs, which are of leather, with slip linings and line the top with a similar material, this making a uniform appearance inside the body which is not too expensive.

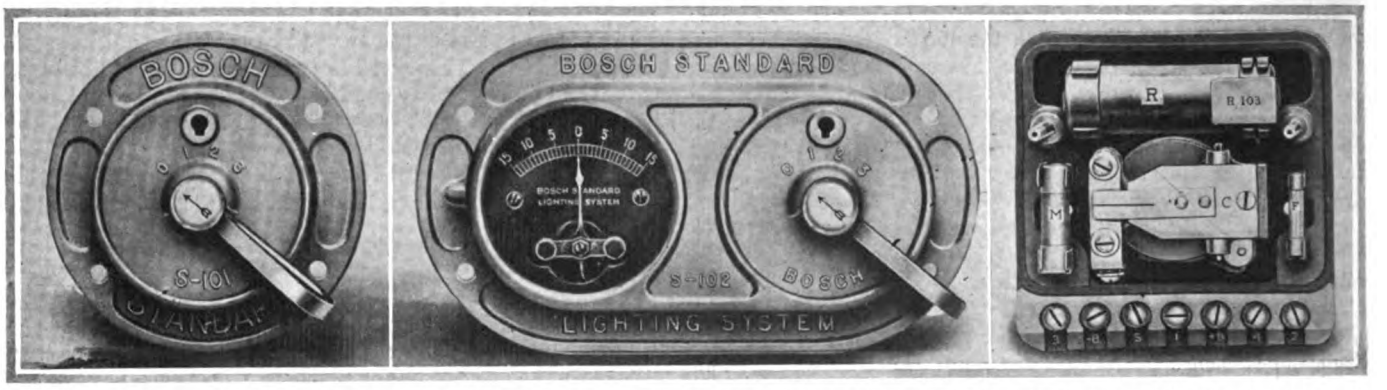
These two designs are drawn to scale and there is sufficient information conveyed to enable the top maker to duplicate them full size. The cost of making a top from either of these illustrations will vary from $250 to $400.

New Model Mobilette

THE Woods Mobilette Co., Chicago, Ill., announces a 1916 model Mobilette that sells for $380, the design being much the same as for the last model, but with a number of refinements. With a 104-in. wheelbase and 36-in. tread the little car is well proportioned. It has a neat four-cylinder engine 2⅝ by 4 in. bore and stroke, with a detachable head. Drive is through a leather cone clutch to a driveshaft with one universal and the gearset is integral with the floating rear axle. Ignition is by Bosch magneto. Two speeds and reverse are given. A feature is the underslung suspension of the front portion of the car, this being shown in the illustration, but the rear axle lies below the frame in the usual way, being attached to a pair of three-quarter springs. Seats are slightly staggered.



Front of chassis of the new model Mobilette, which is not a cyclecar



The switch of the new Bosch Standard lighting equipment combines an ammeter and full control for all circuits, while the switch can be locked. The cut-out, fuses and regulating ballast coil are in a separate box

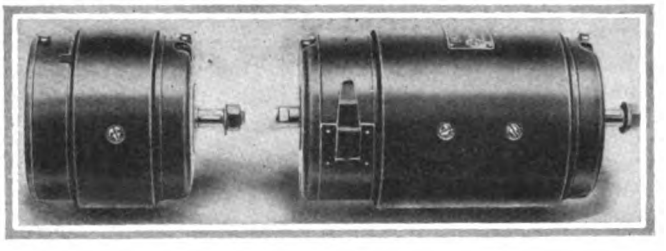
New Bosch Standard Lighting Outfit

Generator in Two Sizes and Has Control for Any Lamps or Starting Motor — Is 12 Volt System

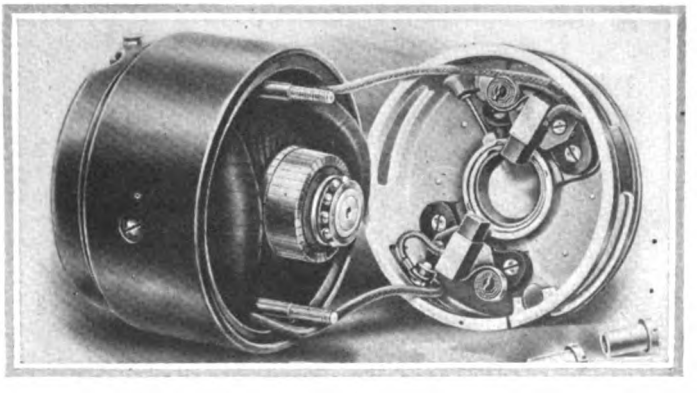
THE Bosch De Luxe equipment which has been known for some time has been supplied only in complete form with lamps and all accessories also of Bosch manufacture, and the purpose of the new generators is to suit manufacturers who do not necessarily desire to change equipment while wishing to employ a Bosch dynamo. The two models of the new type will be known as DSR3 and DSR103, the first being rated at 100 watts and the second at 80 watts. Each equipment consists of dynamo, control box and switch, making three units, and a battery, making the fourth, is necessary to control the voltage of the dynamo.

Inherent Regulation

For regulating the output of the generator the field magnets carry an additional winding which opposes the main winding, the amount of current flowing in these opposition coils being regulated by a resistance coil. If the speed of the dynamo increases and the current output rises, this affects the controlling resistance in such a way as to send current through the opposing winding on the magnets. This in turn, cuts down the strength of the field and so the current, thus returning things to normal.



The casing of the new Bosch generators are made from a piece of solid drawn steel tube and the machine is practically dust proof



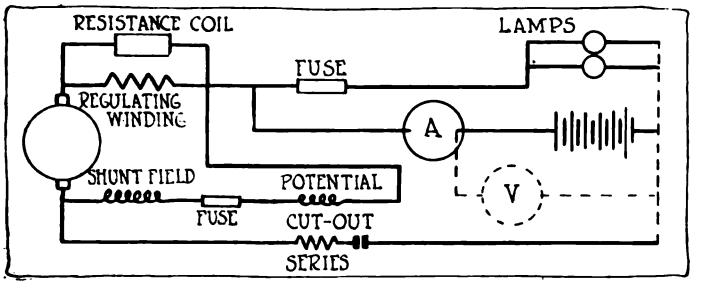
Showing the nature of the brush gear and the method for obtaining access to the brushes

The voltage is therefore determined by the battery, for as soon as the potential difference between the poles of the generator rises above the voltage of the battery when fully charged, the resistance comes into play and sends a restraining current through the field coils in opposition to the main shunt windings. Bosch Standard generators are designed to operate in conjunction with a 12-volt storage battery. It is claimed that the current capacity of the generator is sufficient to care for the full lamp load on an ordinary car, and the battery is needed only for starting or for lights when the engine is not running. The generator is mechanically of extremely neat exterior being sheathed in seamless steel tubing to which a pair of end caps are bolted after everything else is assembled. These caps are secured by a pair of long bolts passing from end to end, inside, so the generator is practically dirt proof.

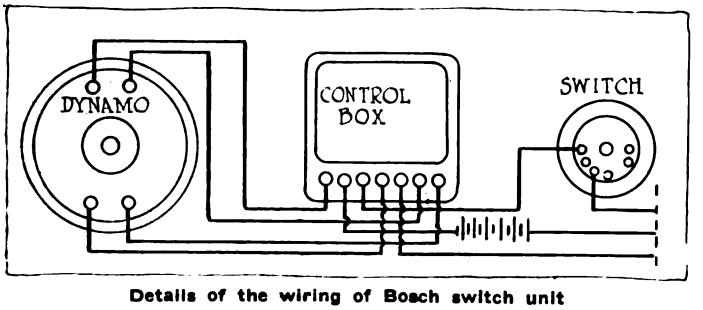
The armature is laminated and is almost entirely encircled by the windings on the two field poles, a feature of design that tends to reduce commutator sparking by damping out armature reactions. There are two brushes, mounted in strong spring holders within the commutator end cap, where they are well protected, and yet readily accessible for inspection as there is an opening of good size that may be uncovered by moving a strap which is held over the orifice by a special catch. To prevent any risk of current loss between the carbon of the actual brush and the clip which holds it, each brush is provided with a flexible conducting cable which goes direct to the terminal.

There are four external terminals, placed in the shaft end cap of the generator and these are clearly numbered, magneto fashion, so that there can be no mistake in making the connections to the external circuits which are shown in the diagram.

The controlling resistance coil and the automatic cut out are assembled in a separate small box together with the main fuse and a field fuse which latter prevents damage to the field coils should the battery become disconnected and voltage



General diagram of the complete Bosch Standard wiring system



Details of the wiring of Bosch switch unit

regulation consequently cease. The cut-out, etc., are accessible by removing the metal cover of the box which can be accomplished by unscrewing two cap nuts.

A remarkable feature of this new system is that it can be used either grounded, for a single wire layout, or with a double wiring system. The switch, which makes the third unit, combines an ammeter and ignition control for the magneto and has four positions, the first is "off" with both ignition and generator out. The second turns on both circuits, the third cuts in the tail and side lamps and the last adds the head lamps instead of the side lamps. The switch box is an extremely neat and ornamental unit in which compactness is marked and would normally be a cowl board fitting, of course.

Although, as stated before, the Bosch Standard equipment will be supplied in the form of the three units, generator, controller box and switch unit, for use with any accessories, the Bosch Magneto Co. will be prepared to supply complete sets of lamps, starting motor, battery, etc., if desired. A feature of all Bosch products is the high finish of every detail, and this will, of course, be maintained in the new equipment, both with respect to internal detail and outside appearance.

New Heinze System

Generator Has Integral Ignition Unit on Armature Shaft

A NEW electrical equipment announced by the J. O. Heinze Co., Springfield, Ohio, is to be made in either single or two-unit form and has for its principal feature the combination of an ignition unit with the generator. The end of the generator is made up with a magneto type of distributer and the breaker cam mounted upon the armature shaft. All this ignition portion is removable and can be cleaned or adjusted with great facility in consequence.

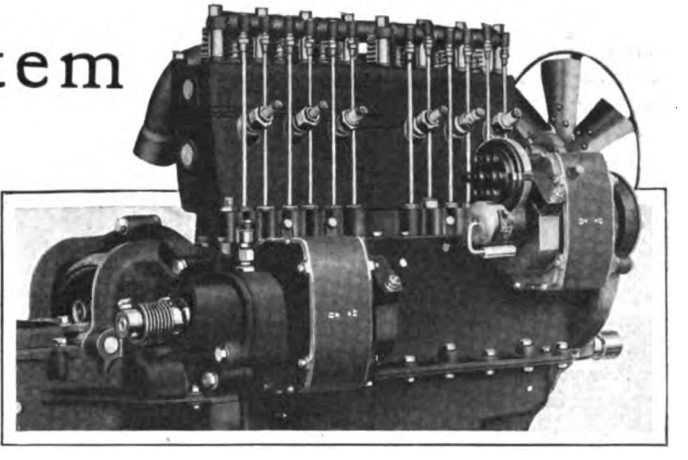
For regulation of the generator output a vibrating reed is employed, this system permitting a tapered charge to be given the battery, a very large current if the battery is low, and a small supply when the battery is fully charged. The machines operate at 6 volts.

For the starting motor a Bendix pinion is supplied for flywheel engagement and it is stated that the electrical design of the motor is such that it produces a large torque with less current than usual.

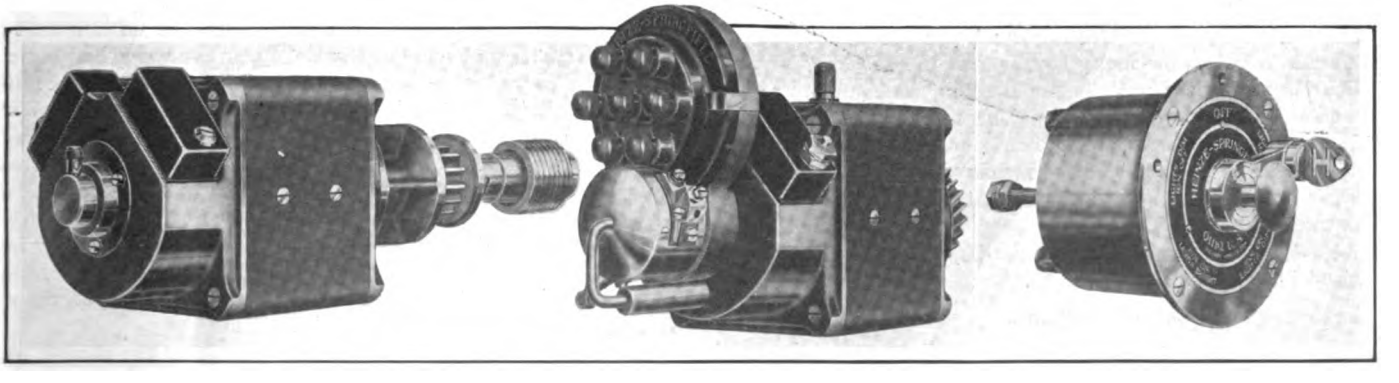
Special pains have been taken with the design of the switch unit, one lever controlling all circuits and giving various lighting combinations while the starting control consists of a button set in the center of the switch. A lock is provided whereby the switch can be secured in the "off" position.

Stress is laid upon the quality of materials employed, it being the makers' claim that by designing and selecting iron with the greatest care they have been able to produce a machine of high efficiency and low weight. Also the construction has been simplified so as to make possible rapid and inexpensive production without losing any of the high quality desired. As can be seen from the illustrations, the machines have a neat exterior with the square section customary on four-pole types.

The factory has been prepared for the production of the new models with accuracy of workmanship as the goal, and it is stated that the inspection, both of details and of the complete machines is exceptionally careful. Each equipment is to be given an exhaustive running test.



Heinze two-unit system on light six engine



Left—Heinze starting motor for flywheel application. Center—Gen erator and ignition unit. Right—Dash lock switch

The FORVM

ANOTHER PLEA FOR THE METRIC SYSTEM OF WEIGHTS & MEASURES —AMERICAN LEADERSHIP IN THE PISTON FIELD—ADVANTAGES OF AMERICAN ALUMINUM ALLOYS COMPARED WITH EUROPEAN

Advantages of Metric System

Details Worthy of Present Study Because of War Conditions

By Charles Vivier

EDITOR THE AUTOMOBILE:—The large volume of foreign business now being done by American firms in exportation of engineering products to Europe turns attention upon the metric system of measurement and makes it necessary for engineers to familiarize themselves more closely with its detail.

The average American reader has had ample opportunity, in the last few years, to observe that various measurements, especially in mechanical and scientific matters, are being given in ever increasing frequency in metric figures. Of late, with the European war, we not only hear of the horrible battle reports, but also our ears are dinned by the continuous sounds of millimeters, centimeters, meters, etc., the terms most commonly used in the metric system. Of all the numerous nations now engaged at war, England is the only one which has not yet adopted the metric system; in fact, the English speaking countries are the only ones which are not yet enjoying its benefits.

The American public should endeavor to familiarize itself as much as possible with the metric system, even if its inevitable adoption by this country is not yet near. The American invasion of metric terms is growing at such a rapid rate that it is obviously to our advantage thoroughly to get acquainted with the new intruders.

Some Special Points of Value

I will not attempt to give a complete description of the metric system; a good many text books have it. I only propose to bring out a few of its wonderful qualities. The fundamental unit of the metric or decimal system is the meter (Greek, "metron"-measure). It is decimal because every single unit is ten, or a multiple of ten, times larger or smaller than its neighbor unit. Therefore, the metric system follows faithfully the fundamental laws of our present universal system of numeration. Let us not overlook the above important fact. This is indeed simplicity reduced to its minutest expression. The direct result is that metric measures can be so easily remembered and compared; that metric calculations can be simply and rapidly made; that metric standards can be unequivocably and permanently created. A school child eight years old can without effort remember the whole metric line; how many grown Americans know the exact number of feet in a mile, how many square feet in one acre?

Starting from the unit, in numeration, we count up to 10; we do not arbitrarily stop at 12, or at 16, or at 64; if we did, we would hopelessly complicate our system of numeration. The American system of measures is confusing purely and simply because it deviates from the law of ten; because it is not decimal. If we insist upon dividing the units into ½, ¼, ⅛, 1/64, etc., instead of tenths, we get badly tangled up and have to suffer therefrom.

Interchangeability of Metric Units

The metric system is so perfect that even Sweden and Germany, the countries par excellence of rigorous mathematics, could not find room for improvements, and they adopted it without hesitation or reserve. Another splendid quality of the metric system lies in the fact that its various branches harmoniously correspond with each other; for instance, one cubic meter weighs exactly 1 ton, 1 liter (1 cubic decimeter) weighs 1 kg., etc. It also offers an easy choice of any unit such as most suitable for the requirements; for example, the millimeter will be chosen for small measurements as the bore and stroke of a gasoline motor, or for the bore of small firearms; the liter will be chosen for measuring the contents of an ordinary barrel, and so on.

Once the metric system was made known to the world, all nations had equal opportunities to welcome it; those with fortunate foresight adopted it at the psychological moment, that is before the enormous industrial development of the last fifty years. England with its customary apathy toward any idea of foreign origin, stubbornly refused its adoption. But of late the metric system has made great strides in the British Isles; the European war, with its vast possibilities of sweeping changes and reforms, may hasten its introduction into the United Kingdom.

For some unexplained reasons, the United States failed to adopt the metric system at the opportune moment, in the meantime, the clumsiness and unreliability of our actual system is being felt in direct proportion to the development of our trades and industries. Compared with the metric system, ours seems ridiculously antiquated. Our present needs demand a reliable measuring system; we also realize that the remedy for the trouble is very close at hand, yet we seem quite willing to get along with the old-fashioned tallow candle instead of the nitrogen electric light.

Difficulty of Change Increasing

On several occasions, the question of the probable introduction of the metric system into this country came up seriously, but each time the difficulties of the change loomed up so enormously great that the attempts were given up at their very inception. These difficulties are not unsurmountable. It is true that some of the European countries had some trouble in changing systems because some of their stubborn citizens insisted upon using the old measures; such trouble could not be experienced here because of the true up-to-dateness of the American public. We must not worry about the past, but rather about the future; our next generation needs a reliable measuring system, and we can afford to inconvenience ourselves a little now, especially so because the delay is making matters rapidly worse. The parcel-post and the federal reserve bank laws made a few malcontents, yet their value to the American nation is inestimable.

It must be admitted that the task of making the change of systems in this country would meet prodigious obstacles. In

addition to a considerable federal appropriation, the appointments of scientific commissions, etc., the opinion and suggestions of the greatest American manufacturers and economists would prove the most important factors in the proposed reform, which, if intelligently and gradually applied, could take place in a surprisingly short time.

Once the metric system is solidly implanted here, it would then be a favorable time to think about finishing up a few minor details like the adoption of the Centigrade thermometer and the final internationalization of the standards of mechanical and electrical power which are now badly intermixed with metric and old figures. For an ideal unit of power, we should greatly favor 1 hp. = 100 kilogrameters-second, a well defined amount of energy, also a unit of power lending itself nicely to our present mechanical needs. It would be a comparatively easy matter, after a rational altering of the old electrical units, to make the kilowatt equal to the above mentioned new horsepower.

In conclusion, let it be known that the metric system is the most remarkable heritage of the French revolution of 1789, which abolished the ancient régime and the slavery in the French colonies. Among the many badly needed reforms, the newly-born French Republic was quite prompt to realize the necessity of a reliable system of weights and measures.

American Alloys Best

By Joseph Leopold

Engineer Walker M. Levett Co.

EDITOR THE AUTOMOBILE:—Continuing our well advanced discussion on the subject of aluminum pistons, it appears that there are still existing several skeptics who are not fully convinced that the aluminum alloy piston has long since passed the débutante stage and is now a product for standard production. It is my opinion—and I am not alone in this conviction—that the remaining skeptics are against the aluminum alloy piston solely because they have failed to come into contact with a reliable and improved mixture. As Mr. Sherbondy points out in his last article, the alloy piston was experimented upon by European engineers several years ago, but did not prove to be worthy of anything more than superficial consideration. May I not suggest here that the alloy experimented with was not what good aluminum alloy is at the present time? I do not believe it exactly fair to condemn aluminum alloy pistons in general, for the reason that *some* have failed to produce results. It would seem to me that America deserves that much more credit for producing an alloy which can show unfailing results. As pointed out in one of my former articles, before the war we were importing a metal from Germany by the name of magnalium, which metal I believe was used almost exclusively for alloy piston construction in Europe. Inasmuch as we were then unable to obtain a further supply, we were thrown upon our own resources to produce a metal in substitution—and luckily too—for we produced an alloy which showed a greater tensile strength and improved physical properties throughout.

Mr. Sherbondy's latest treatise—Analyzing Heat Flow—creates the impression that the American engineer is too hasty; that he has accepted the aluminum alloy piston on the strength of superficial considerations without regard to engineering value; that he has merely followed the crowd, disregarding logic; and that he is inferior to the European engineer in so far as originality, initiative and independence of thought are concerned. The Peugeot and several other cars were then cited as examples of superiority. In refutation of this assertion, I beg to refer to the recent Astor Cup Race, held at the Sheepshead Bay Track, in which five Peugeot cars started. It is my impression that these automobiles were constructed to the limit of European engineering skill—although they were perhaps handicapped by the war—but, as we all know, not one of them survived the race. If we trace the cause of trouble it leads us in the majority of cases to connecting-rod fracture and collapse; and if we investigate a trifle further we may arrive at the conclusion that piston construction was at the root of the whole difficulty.

American Engineers' Progress

Let us now consider the product of the American engineer—the Stutz cars which were first and second and the Duesenbergs finishing third and fourth. These automobiles were equipped with aluminum alloy pistons—the product of American manufacture—and yet they put all former records for the distance to shame. It may also be opportune at this moment to note that American cars hold first, second and third places for the racing season of the year 1915, all of which were equipped with aluminum alloy pistons. It appears to the writer that a more severe test could not be performed, and consequently the opinion is created that the American engineer is fast approaching the mark set by the European engineer.

Concerning Mr. Sherbondy's thermo-dynamic treatise; I concede that the theory advanced is not questioned, nor were my intentions ever to dispute it as it is now related, but quite unfortunately theory may not always be combined successfully with practice, and it is therefore mandatory that we consider actualities at this time, rather than mental conceptions, since the aluminum alloy piston has outgrown its embryonic period of progression. If I remember correctly, Mr. Diamond pointed out that a perfect oil film between the piston and the cylinder wall is non-existent, and in this event metallic contact between the cylinder wall and the piston would be prevalent. Consequently the method pursued for heat disposal would be that of conduction, and not convexion in so far as concern is permitted this factor.

With reference to accounting as negligible the heat given up by radiation in the piston, I beg to disagree, as I have ascertained by actual test that a ribbed head piston throws out its accumulated heat much more rapidly than a plain head piston. This theory is best substantiated by the practice of constructing a series of flanges on air-cooled cylinders, and the fact that a greater cooling area is exposed to the air.

Vibration and Fuel Consumption Factors

In reviewing Mr. Sherbondy's conclusions as to inertia force, I notice some intimation as conceding that same is of some importance, although it is stated negligible as far as commercial production is concerned. The paramount point which may be tendered to uphold the aluminum alloy piston in the respect of commercial production is the fact that vibration is reduced and fuel economy affected, even if high speed is not taken into consideration. The latter mentioned, however, is inevitable in the future design of motor vehicles.

Consider the Service Station!

Automobilists do not seem to realize the importance of planning ahead for their repairs and adjustments. The majority of work done on a car might just as well be done next week as last week. However, many motorists make the mistake of dropping into the service station unexpectedly and insisting that the car be done by a certain time. Often these demands work no hardship because the shop is slack but just as often, the shop is already overloaded with work, and additional customers mean overtime work.

The History of the American Automobile Industry—5

Further Development of Steam Carriages—Public Prejudice Against Them—First Applications of Steam and Other Motor Power to Bicycles—Gas Engine Makes Progress

By David Beecroft

¶ Review—Last week the development of the electric vehicle was traced from 1800 to 1880, which year marked the beginning of the present practical era. This account also dealt with the application of electric power to boats and for other purposes, including the first street cars, running in 1832. It was in 1837 that hot tube ignition, which in later years found very extended use, was brought out. A patent taken out in 1844 embodied a number of valuable features, among which were the use of liquid fuels, a type of carbureter, compression of the fuel, flame ignition, air cooling and a clutch. Armored cars were mentioned at the time of the Civil War, a matter of interest in view of their practical development and use in the great European conflict now being waged. This week further developments in the application of steam to carriages, velocipedes and bicycles are taken up and the growing interest in the problem of self-propelled vehicles outlined.

ALTHOUGH the Civil War called American energy into other lines, the automobile idea did not wholly die, but was kept alive by several inventors. One of these was the well-known steam engineer, Sylvester H. Roper, 1826-1899, who began his various experiments as early as 1859. Until his death in May, 1899, he never wholly ceased this work, doing a mile on the Charles River track, Boston, Mass., in slightly over 2 min. on his latest model motor bicycle. While his preference seems to have been steam, he also built a four-wheeled vehicle driven by a hot-air engine, and later a four-wheeled steam buggy. During the velocipede craze of the later sixties, he fitted several of these with steam motors. Roper's persistence as well as his reputation did much to educate New England people to the steam vehicle, and the ready acceptance of the little steam cars about the time of his death can undoubtedly be partly ascribed to the educational work done by him. His last steam buggy was sold to William Holmes, a prominent brick maker of Boston, in 1894.

Roper's Steam Carriage

Roper's steam vehicle of 1863 seems to have been a conventional four-wheeled carriage for two passengers driven by a 16-in. boiler and having a water tank at the rear. The engine was of about 2 hp. and coal for the day's use was carried under the seat, the estimated cost being about 1 cent per mile for fuel; 15 to 20 lb. of steam are said to have been sufficient to operate, but more could be used, 60 lb. being mentioned in one description. The weight was 650 to 700 lb. and speeds up to 20 miles per hour possible. It will thus be seen that this vehicle was a very excellent construction, considering the time when it was made and that its influence shows very plainly in the steam vehicles brought out over 30 years later.

Public Against Steam Carriages

It may seem queer to our readers that with such light construction and such evident practicability as some of these steam carriages of this period showed, they did not win recognition and become a commercial success. The comments of the *Scientific American* editor in January, 1865, throw light on this matter. He says: "Public opinion is against the steam road carriage. Many have been made, but those existing and in use can be counted on one's fingers." He mentions the effect of the continuous jarring, although why a light carriage driven by a two-cylinder steam engine, such as Roper used, should jar as much as a carriage drawn by a horse feels the jerky stepping of the horse, he did not explain. He adds that they will never come into common use and could not be practical unless one was willing to be one's "own engineer and repairer." His conclusion, and, doubtless that of many others, was that the mechanical road carriage was a "long way off." In this he proved correct, but not because of the inability of mechanics to build a satisfactory carriage. Public opinion, still strong 25 years later, was at fault and much educating is even to-day required to get new things accepted, regardless of how good they are. Verily, we need open minds.

Another New England inventor by the name of Spencer made one or more steam carriages about 1863 or 1864, and ran them on public streets and highways. About 1868 W. W. Austin of Lowell, Mass., built a light steam vehicle which he drove about the country for several years while exhibiting it. The boiler was horizontal and placed lengthwise of the vehicle, which was of steel. The weight of the boiler was slightly under 100 lb. and hard coal was used for fuel. It is said that "a few cents' worth went a long way."

A Steam Man

A fantastic attempt which displays rather more ingenuity than good mechanical judgment is shown by United States patents to Z. P. Dederick and I. Grass of Newark, N. J., in 1868, covering a

steam man attached to the thills of a wagon and supported thereby while he pulled it along the road. A steering wheel and also a controlling wheel permitted the man to be guided and controlled. Some of our older readers will doubtless remember having seen this mechanical curiosity. When seen by Charles E. Duryea, the man was supported by an arm projecting horizontally from the center pole of a show tent, around which he walked when started. Other than as a curiosity and as an example of a light high-speed steam engine, and an ingenious application thereof, the device had no practical value, but its exhibition in many places did emphasize light steam engine construction. So fast did the engine run that it advertised itself by a musical hum.

Large Demand for Power

The rapidly growing Central West was developing a large demand for power since heat and water power were not available as in the more mountainous and wooded East, and this demand undoubtedly stimulated engine experimenters to produce simpler and better forms of engines without which the automobile was not possible.

$5,000 for an Iron Horse

This demand was quite generally felt and inventors very naturally responded to the best of their ability. Just the form of vehicle demanded was not clear. The horse being the accepted motor was naturally the suggestion followed by some. The president of a Philadelphia street railway company offered $5,000 for an iron horse that might be used as a substitute for the street car horse. That he really expected the device to look like a horse may not be true, but the publication of this offer in the journals of 1875 substantiated this thought. Coupled with this was another thought that anything odd scared horses, and many inventors attempted to lessen this feature by making the device resemble a horse as nearly as possible. Many vehicles were constructed and several patents issued, showing horse-like structures, propelled by leg movement, and also mounted on wheels, which wheels were driven in the more common manner. Not only was this true in America, but also abroad, two steam horses being shown in France in 1875.

$10,000 for a Practical Road Vehicle

So important did this need for mechanical traction seem to be that the Wisconsin Legislature voted an award of $10,000 to be given to the inventor who should demonstrate by a 5-year test that his vehicle could traverse common roads in a really practical manner. When the road conditions then exisiting in Wisconsin are considered, it will be seen that this reward was pitifully inadequate, but it undoubtedly did much to stimulate mechanical activity along this line.

Some people protested against raising the hopes of poor inventors who had no real knowledge of the problem, which was thought by many to be unsolvable, but the offer probably did more good than harm, although its conditions were so severe that its time limit expired before the practical vehicle appeared.

H. S. Taylor of Derby Line, Vt., was a very intelligent experimenter who finally gave up the problem because the power required seemed so greatly in excess of the results to be gained. He had not only watched the experiments of others, but had made in 1876 one vehicle at least, driven by steam, which was as light as 500 lb. His conclusion after having tried so light a vehicle, points very plainly to the fact that the roads were not yet good enough for success, and he did not see any way, with the materials and the mechanical experience then available, to make the vehicle overcome the road difficulties.

So fully recognized was this demand for power road vehicles that the Franklin Institute, aiming to lead in scientific matters, published early in 1876 an article in which it strongly advocated the use of steam carriages.

Interest in Problem Grows

Another manifestation of the growing interest in things mechanical, which resulted in an enormous dissemination of mechanical knowledge, was the Centennial Exposition held at Philadelphia in 1876, in commemoration of our country's first century. No better index of this mechanical growth exists than that shown by the records of our Patent Office, which, prior to 1865, did not show more motor vehicle patents than could be counted on one's fingers, and a total issue of less than 50,000 patents, which total issue reached 200,000 early in 1878, an increase of 300 per cent in 13 years. The 400,000 issue was reached early in 1889 and the 600,000 early in 1898. Naturally it is impossible to continue the general history with any degree of total inclusiveness because of the vast amount of work being done which had a bearing on the final solution. Much of this work, however bore more directly on the traction engine, the street car and the locomotive, while the efforts toward the road motor vehicle driven by steam comparatively slackened.

Gas Engine Development

The development of the gas engine had by now, 1876, reached such a point as to attract serious attention for stationary power and boat work and pending its development sufficient for motor vehicles, the road vehicle movement somewhat languished. The velocipede had ceased to attract attention and although it continued in use in England to such an extent that races were held there and was shown at the Centennial Exposition in the form of a high-wheel bicycle it did not attract much attention in this country until about 1879. The bicycles exhibited in 1876 were sold and a few others imported, but, being of the high-wheel type, were considered rather as vehicles for athletes than for the common people. Thus the cycle industry did not make much headway until the advent of the safety bicycle and the adoption of the air tire in the later eighties.

The Rostrum

Worn Thrust Bearings Cause Noise

EDITOR THE AUTOMOBILE:—I have an Apperson 1913 4-45 car on which I would like to make an adjustment of the differential. An unpleasant sound issues from the rear wheels when traveling over 20 m.p.h. and I have found that there is a little play in one of the rear wheels. By play, I mean that when rear wheel is jacked, same can be pushed in and out about ⅛ or ¼ in. The trouble I am sure is not beneath the hub cap as I had tightened this nut, and I think that the differential itself must be adjusted. How can I adjust it so as to stop this ringing, grinding noise?

I have noticed this same noise on quite a few passing cars. I also might mention that on taking off the cover plate of the differential I have found that the edges of teeth of the large gear have been chipped. The chipping I am sure had occurred when the car was on rough road, such as heavy sand or mud and think this was caused by the gears not meshing properly. This had happened on quite a few occasions and every time it had happened I was forced to take these chips out as some had lodged between the teeth, causing a jar through the whole car while going. I also notice that my motor is consuming quite a lot of oil of late, which I think is caused by the oil pump working too fast. There is an adjustment screw on the bottom of the motor where the oil supply can be regulated and also a petcock up above showing how fast oil is pumping, but before adjusting I would like to know just how it should show.

Brooklyn, N. Y. P. K.

—The lost motion in the rear axle appears to be due to worn thrust bearings. If the car will be examined by a competent mechanic it is quite sure to be noted that the differential thrust bearings are badly worn and need replacing.

This same reason may possibly be assigned to the noise about which you speak, although this may also be attributed to the condition of the ring gears and pinion. These should be examined at the same time that the thrust bearings are replaced and the differential overhauled.

After a motor is loosened from running the amount of oil required is considerably less than when the motor is new. For ordinary driving the Apperson company recommends that the adjusting screw at the bottom of the pump be closed entirely and then opened three-quarters or seven-eighths of a turn. Of course, if you undertake long trips or run the car under unusual conditions such as through heavy mud and sand more oil will be required and the adjusting screw should be opened accordingly.

Excess Oil Due to Piston Leaks

Editor THE AUTOMOBILE:—Have a model C-25, 1915 Buick touring car which causes me a great deal of trouble by excess oil getting by piston rings into the combustion chamber, fouling plugs and causing carbon deposit.

Have had a new set of rings put in the car but still have the same trouble, although I keep the oil level low in the crankcase.

Would it be advisable to take out the pistons and have an oil groove cut in them, with small holes to let out surplus oil?

If so, would you kindly advise where to place the groove, also the depth of groove and number and size of holes to each groove? Is there any other remedy you could suggest?

2—Would the wiring diagram for an ammeter for the 1914 B-25 Buick be suitable for the C-25, 1915 model? This is shown in THE AUTOMOBILE for Oct. 21.

Pittston, Pa. W. E. S.

—Excess oil in the model C-25 Buick can generally be traced to badly fitting piston rings, scored pistons and scored cylinders. It sometimes happens also that a car user carries too much oil in the reservoir. All these should be examined and the obvious remedy applied.

2—The ammeter for the C-25 can be wired in the same manner as that for B-25 with the exception that on the C-25 it will not be necessary to take the generator apart to cut the strap.

Improper Spark Timing Causes Heating

Editor THE AUTOMOBILE:—Can a honeycomb radiator be cleaned of scale or other matter without taking it apart, and if so, how?

2—What effect would a solution of lye have on the different metals and rubber if it were put in the radiator and the engine run for an hour or so? How would sal soda affect these parts?

3—On my 1914 Velie the spark is set on upper dead center when full advanced. This I know is too late but it should not heat the motor to the degree of boiling while running in fourth speed on level paved roads. The pump is working well and the water seems to be fairly clear. This leads me to believe the trouble is in the radiator as some of the cells in a straight line from top to bottom seem to be much cooler than others. What would you advise me to do with it? The cylinders are free of carbon.

Euclid, Ohio. L. H. V.

—A honeycomb radiator can be cleaned by a solution of common washing soda and water. The proportion is roughly a double handful of soda to a pail of boiling water. The radiator is flushed with this which will remove the scale.

2—Strong alkaline solutions such as you mention would rapidly corrode the parts by setting up an electrolytic action.

3—If the spark is on dead center when fully advanced, it is the cause of all your troubles, because it should be just the other way and be on dead center when fully retarded.

New Facing Remedy for Slipping Clutch

Editor THE AUTOMOBILE:—I have a 25-hp. Maxwell runabout built this year which I bought in June. The clutch is faced with some fabric and for the past month I have been bothered by the clutch slipping. Have had the garage men put Fuller's earth on the face but of no avail; evidently the face is so smooth that the earth will not stick.

Will you kindly suggest a remedy, as the results are very annoying? The car will stand in the middle of the street on high gear and not affect the running of the engine, that is, the clutch in high will not retard the engine to any appreciative degree, although it will hold on low and second but better in the former.

Bradford, Pa. E. C. C.

—There must be something radically wrong with the particular facing on that car and would suggest your having a new clutch facing applied. If this does not remedy the trouble there must be some interference with the clutch entering the flywheel as far as it should. Perhaps the clutch pedal is striking the floorboard preventing it from engaging. As this trouble has not been noticed in any large number of Maxwell cars it is no doubt due to some local derangement.

Fuller's earth has little or no effect on the clutch lining used in these cars. It is very possible that heavy grease has leaked into the clutch housing and that the lining is more in need of thorough cleaning than anything else. If you will follow the directions given in your instruction book and lubricate with a very light oil, one of the possible causes of trouble will be removed.

Layout of 40 by 90 Ft. Garage

Editor THE AUTOMOBILE:—I am going to build a brick garage 40 by 90 ft., and would like to have you show me the ideal layout for its equipment. I want to use a vulcanizing plant, a lathe, a motor generator, charging set for batteries and such other equipment as necessary for an up-to-date repair shop.

Please list the necessary equipment and where I can secure it. What type of lathe would be best to buy and kindly give me a floor plan of an up-to-date garage of this size.

Montgomery, W. Va. W. C. A.

—The layout which would probably fit your desires better than anything else is shown in Fig. 1. As regards the necessary equipment, that which you have mentioned and a sensitive drill, together with a set of bench tools, will be about all that you will need to start. It will not be necessary to buy this equipment new, as it is better to pick it up wherever opportunity is found.

No Accidents in Elgin Race

Editor THE AUTOMOBILE:—What is the piston displacement of an eight-cylinder motor 3⅞ by 6?

2—What makes of cars and what drivers captured the first five places at the Elgin trophy race? Give time in miles per hour and the prizes.

3—Were any of the drivers killed or injured?

4—What is the difference between a storage battery and a dry battery?

5—Could electricity be used to heat the steam generator on the Stanley car instead of gasoline? If not, why?

6—Is the Stewart starter on the Ford noiseless in operation? Could it be made to operate in either direction?

7—Has the Mercer company retired from racing? If not, why didn't it race this year?

8—Do the valves of the Knight engine require grinding? Or do they need the attention that the valves of a poppet engine require?

9—Is there an electric motor built which can be run in either direction? How is an electric car reversed?

10—Could electricity be used to heat water in any way? If so, how? Give full details.

11—Could compressed air be used in a steam or water turbine in place of steam or water? Would 100 lb. continuous pressure operate a 20-hp. turbine satisfactorily?

12—Where is the Ahems Fox car made? By whom?

Cooper, N. C. S. T.

—The displacement is 566 cu. in.

2—At the Elgin trophy race this year only four cars finished. These were Anderson's Stutz, Cooper's Stutz, O'Donnell's Duesenberg and DePalma's Mercedes in the order named. The speeds in m.p.h. were 77.256, 76.258, 75.769 and 75.690. The prizes for the Elgin trophy were $2,000 for first place, $650 for second place, and $350 for third. In addition to this the drivers all received $100 for each 100 miles completed.

3—There were no accidents.

4—A storage battery is one in which the chemical condition which creates an electromotive force can be restored by causing a current to flow into the battery. A dry battery is one in which the current is produced by chemicals contained within a waterproof case and which is of such a nature that once it is exhausted the battery cannot be again used.

5—There would have to be present some great source of electric current which would be capable of producing enough heat to provide the high temperature required. This, of course, would be impossible.

6—There is no mechanical mechanism of this nature which is absolutely noiseless and it is a matter only of degree of noise. It is quiet in operation. The Stewart starter is designed to operate in one direction but probably could be altered if necessary.

7—The Mercer Co. has not announced that it has retired definitely from racing, although the company did not concentrate any great attention on the matter this year.

8—No.

9—Electric motors can be run in either direction by reversing the flow of the current.

10—Yes. The flow of electric current through any resisting medium provides heat.

11—This would depend on the details of design.

12—THE AUTOMOBILE has no record of this car.

Gear Ratios of 1909 Packard

Editor THE AUTOMOBILE:—I have a Packard 30 runabout, 1909 model, and would like to know the actual horsepower.

2—What are the gear ratios? How many revolutions per minute does the motor turn at full speed? What is the bore and stroke? What speed can the car attain if in good condition? I have never driven it to the limit, but have passed cars which claim 60 m.p.h. and over.

3—Will a 36 by 4½ Kelly-Springfield Kant Slip tire give proper service on the rear wheels? I now have 37 by 5, but would like to put on the smaller size.

4—How many miles per gallon of gasoline and oil should I obtain on good roads at an average speed of 18 m.p.h.?

Mattapan, Mass. H. F. M.

—The motor in the 1909 Packard 30 runabout will develop about 50 hp.

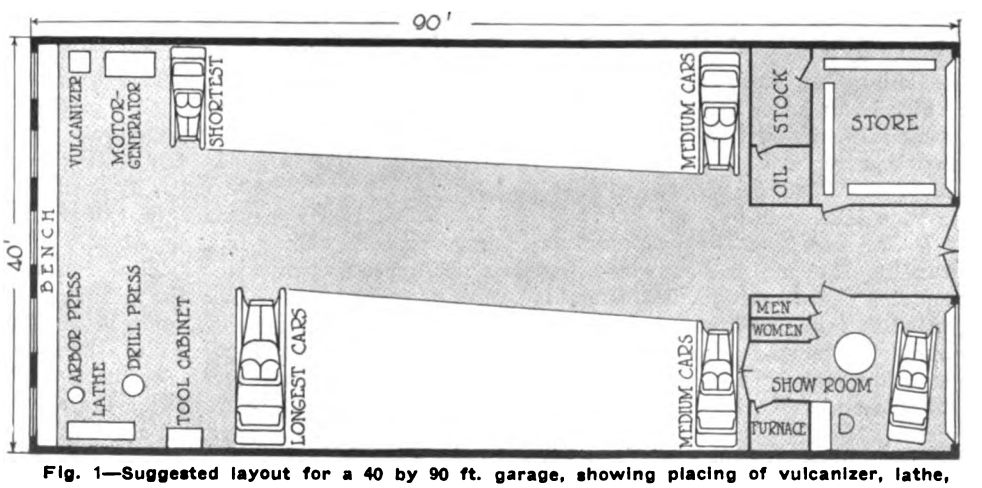


Fig. 1—Suggested layout for a 40 by 90 ft. garage, showing placing of vulcanizer, lathe, generator, charging set for batteries, etc.

2—This model was supplied with two gear ratios, one of which was 3.21 to 1 in which the pinion and ring gear had fourteen and forty-five teeth, respectively, and one of 2.64 to 1 in which the number of teeth were seventeen and forty-five, respectively. The motor develops its maximum horsepower at about 1200 r.p.m. While the speed at which the car will travel depends upon the gear ratio employed, when in this condition it should be able to travel 60 m.p.h.

3—The 36 by 4½ tire size should be adequate for this model when equipped with a runabout body unless unusual loads are carried.

4—The gasoline and oil mileage on a car of this age are difficult to estimate. It should be possible, however, to obtain better than 12 miles to the gallon of gasoline and 150 miles to each gallon of cylinder oil.

Relay Points Not Easily Adjusted

Editor THE AUTOMOBILE:—I have a 1915 model 31 Empire, with a Remy electric system. I just installed a new relay and the fuse burns out almost as quickly as I put them in. The points are not pitted. The generator is all right and there are no grounds or shorts anywhere. I think the trouble is improper adjustment of the relay points. Can you please tell me how to adjust a Remy relay?

Canonsburg, Pa. F. G. S.

—While it is possible to adjust the Remy relay satisfactorily, such adjustment should not be made by anyone who is inexperienced in this work, and if the relay has not been tampered with and thrown completely out of adjustment if you will see that the large regulator points have a maximum opening of approximately 0.02 in.; that they are clean and not pitted and also that all connections are properly made securely with the wiring in good condition, the troubles should be obviated.

Ratio in New Sheldon Axle

Editor THE AUTOMOBILE:—What is the ratio of the worm to the master gear in the Sheldon axle for 1500 lb. capacity cars as described in a recent issue of THE AUTOMOBILE?

2—What was the ratio of the gears in the axle on the car driven by Resta at Chicago?

3—Are aluminum cylinder castings usually lined with cast iron?

4—Was it for lack of speed that the Porter sleeve valve cars were unable to qualify at Indianapolis?

Kansas City, Mo. W. E. B.

—The standard ratio in this axle is 6.5 to 1.

2—The ratio of these gears was approximately 3 to 1.

3—Many recommend the practice of lining aluminum cylinder castings with a cast-iron sleeve.

4—No.

Truck Knocks at Low Speed

Editor THE AUTOMOBILE:—I have an Alco 3½-ton truck which has a knock in the motor. It appears only when running idle and at slow speed. It also disappears when the spark is retarded. Could this be a loose wristpin or a piston slap?

Blue Island, Ill. W. H. S.

—The fact that the knock or pound appears only when running idle and at slow speed, but does not appear when running slow in gear, indicates nothing, as of course, at slow speed in gear, the motor has a wider throttle opening than at the same speed idle; also the inertia of the truck acts as an additional flywheel, so that it may be assumed that the trouble appears only when the minimum throttle opening is used.

That the retardation of the ignition results in the disappearance of the knock indicates that it is in all likelihood a spark knock. An engine in proper shape should not knock when idle, but nevertheless in heavy engines it often happens that with the throttle nearly closed and the spark fully advanced the motor will knock. The sound is a sharp click, somewhat like the sound of one bottle being hit against another.

A piston slap, a loose wristpin or any other mechanical cause would be unaffected by changing the spark adjustment.

Motor R.P.M. at 50 M.P.H.

Editor THE AUTOMOBILE:—On a car with 34-in. road wheels and the engine geared 4 to 1, how many revolutions per minute does the engine make at a speed of 50 m.p.h.?

2—In descending a long grade is it harmful to hold the car in with the brake, while the machine is in gear, the clutch in and the engine idling?

Reedsville, Pa. F. E. K.

—On a car with 34-in. wheels and 4 to 1 ratio at 50 m.p.h. the road wheels make 494.4 r.p.m. and the motor with a gear ratio of 4 to 1 makes four times this amount or 1977.6 r.p.m.

2—As long as the car is tending to push the motor, it does no harm to keep the clutch in while the brake is applied.

Correct Timing for 1912 Regal

Editor THE AUTOMOBILE:—Will you kindly give me the timing of a 1912 Regal 30-hp. touring car? I have had the motor down and think that the valve and magneto timing is wrong because it backfires. I have tried different carbureter adjustments but with no success.

Roselle, N. J. C. P.

—The magneto in the 30-hp. car should be set so that the spark will occur at the instant the piston reaches the uppermost point of the compression stroke. In other words, on upper dead center with the lever in full retard position. The timing of the magneto can be altered by changing the position of the small timing gear on the end of the magneto shaft, but to make this adjustment it is necessary to remove the radiator and the timing gear housing.

If the magneto is timed a little too early this can usually be corrected by merely changing the position of the timing gear on the end of the magneto shaft one tooth to the left facing the engine from the front. If the magneto is timed late, or, in other words, if the spark occurs after the piston has traveled down a part of the distance, the timing gear at the end of the magneto shaft should be set one tooth to the right, or perhaps two if necessary. Changing the gear one tooth means approximately 1 in. on the face of the flywheel.

The timing of the valve is indicated on the flywheel by the figures 16, 34, 40, 10, ¼ and 2/3. These lines and figures represent distances and measurements in degrees from the two lines diametrically opposite to one another, one marked 1-4 and the other 2-3. These two marks coincide respectively with the upper dead centers of 1 and 4 pistons and 2 and 3 pistons.

To determine whether or not the valves are timed properly, first open the relief cock on top of the cylinders, then turn the flywheel to the left until the line marked 1-4 is opposite, or rather directly under the center line of the cylinders. At this point the exhaust valve in either No. 1 or No. 4 cylinder should just commence to close. If you find that the exhaust valve in No. 4 cylinder is beginning to close, and you wish to check up the valve timing of No. 1 cylinder, turn the flywheel around to the left, one complete revolution, until the line 1-4 is again brought under the center line of the cylinders; then continue slowly turning the flywheel about an inch or so to the left until the line marked 10 coincides with the center line of the cylinders. This is the point at which the exhaust valve in the No. 1 cylinder

should just seat itself or close. To determine whether or not the valve is seated, see if the tappet or push rod underneath the valve can be turned with the fingers. If the tappet turns freely the valve is seated, and if the tappet is hard to turn, that will show that the valve is still being held slightly open. If this is the case, loosen the lock nut on the tappet screw and turn the screw down until the valve just seats; then turn the lock nut down tight against the tappet.

To check up the timing of the inlet valve in the same cylinder, turn the flywheel ¾ in. or so toward the left, until the line marked 16 comes under the center line of the cylinders. At this point the inlet valve in the No. 1 cylinder should just begin to open. Turn the flywheel a little better than one-half a turn to the left, stopping when the line marked 34, three lines to the right of the 2-3 center line comes in line with the center of the cylinders. At this point the inlet valve in the No. 1 cylinder should just close.

To see if the exhaust valve in the No. 1 cylinder opens at the proper time, revolve the flywheel three-fourths of a turn to the left, and stop when the line 40, the first line to the left of the 2-3 center line comes in line with the center of the cylinders. This is the point where the exhaust valve in No. 1 cylinder should just begin to open. The above completes the timing of cylinder No. 1.

To time cylinder No. 2, turn the flywheel until the line marked 2-3 is in line with the center line of the cylinders. If the exhaust valve in the No. 2 cylinder is closed, turn the flywheel through one complete revolution, until the line 2-3 is up again; the exhaust valve in No. 2 cylinder should then just be starting to close. Proceed now as in timing the No. 1 cylinder.

The No. 4 cylinder is timed from the center line 1-4 and the No. 3 cylinder from the center line 2-3. When the valves are closed there should be clearance between the valve stems and the tappet screws of from 0.003 to 0.004 in. This amount of clearance is necessary to allow the valves to seat tightly.

Racing Record of Meneghetti

Editor THE AUTOMOBILE:—Kindly give me the racing record of Meneghetti, an Italian, who drove a 120-hp. Fiat. He was killed, I believe, at Savannah when his machine turned turtle.

Charlottesville, Va. C. E. S.

—Louis Meneghetti came to this country some time during 1910 or 1911 and for about two seasons campaigned with the Moross racing team.

In September, 1912, he severed his connection with this team and joined another team then known as the Powell racing organization and competed in several dirt track meetings during that season. In 1913 he competed in some small dirt track events independently and at Norfolk, Neb., on Nov. 17, 1913, his Fiat turned over as he was rounding the turn and Meneghetti was killed.

How Oil Is Consumed

Editor THE AUTOMOBILE:—What is considered a reasonable consumption, by a four-cylinder motor 3⅞ by 4½, of light, medium and heavy oils? Kindly explain how the oil is consumed; also the different ways it can be wasted or lost?

2—What is the function of the small holes through the cylinder walls?

San Francisco, Cal. J. G. H.

—Three hundred miles per gallon would be reasonable; 600 would be good.

Oil is consumed merely through burning in the combustion space. Every time the piston goes down, it leaves the cylinder walls wet with oil and this oil is burned off. This action occurs even when no smoke is emitted. Oil usually wears out by continual passage through bearings, and becomes dirty. It can be restored by boiling, screening, etc., but the trouble is more than the oil is worth.

2—There are no automobile motors with holes through the cylinder walls. Probably you mean the piston. Small holes through the piston are a factor in preventing too great an accumulation of oil on the cylinder walls, as well as in reducing the weight of the piston without impairing the strength.

Ford Magneto Develops 7.5 Amp.

Editor THE AUTOMOBILE:—Can you tell me what amperage is developed by the magneto of the Ford 1915, model T, at different speeds, taking as a minimum 15 m.p.h., also at 20 m.p.h., and at 30 m.p.h.?

Kindly name the defects of this system of lighting, and tell me how I can secure more even lighting at the different speeds.

Hamburg, Pa. C. E. K.

—The Ford magneto at 15 m.p.h. develops its maximum amperage which is quite close to 7½ amp.

As the current generated by the magneto varies according to the speed of the motor, it naturally follows that at very low engine speeds the lights will not be as bright as when the motor is turning over faster. However, for all ordinary purposes, sufficient light is given by the headlamps. The present 9-volt bulbs were determined upon because they provided the best light at the widest range of engine speed. If an owner desires to drive slowly with the lights on at night, he can secure brighter lights by using 7- or 8-volt bulbs, but the probabilities are that the life of the lamp will not be as long.

2000 Maximum R.P.M. of 1910 Thomas

Editor THE AUTOMOBILE:—I have a Thomas six-cylinder 1910 model K and would like to know the following:

1—What speed could this car make originally with standard equipment?

2—What is the maximum number of revolutions of this motor?

3—Where can I get repair parts?

Sea Bright, N. J. F. E. G.

—This car can make about 60 m.p.h. when in good condition.

2—The revolutions per minute of the motor at maximum horsepower are about 2000.

3—Repair parts for the Thomas car can be secured from the following: E. R. Thomas Motor Car Co., Buffalo, N. Y.; J. Rosenfield, 521 Sixth St., So. Boston, Mass., and the Automobile Construction Co., 2637 Cottage Grove Ave., Chicago, Ill.

Crankshaft Speed a Variable Quantity

Editor THE AUTOMOBILE:—Do the cylinder type of shock absorbers cause a car to skid when driving over bumpy roads?

2—Do automobile trade directories give addresses of all shock absorber manufacturers?

3—What is the gear ratio of the Overland on reverse and on low?

4—At what crankshaft speed does it deliver its maximum horsepower?

5—What speed should the model 80 Overland make when in good working order?

Bouton, Iowa. C. M.

—They should not do so and as far as is known, do not.

2—They endeavor to do so.

3—14.5 to 1.

4—The exact crankshaft speed will vary in different motors, but it is approximately 1800 r.p.m. for maximum horsepower.

5—44 to 50 m.p.h.

Use of Optical Indicators for Checking Defects in Functioning of Motors

DURING this period when many motors for automobiles, motor trucks and motor boats are being re-designed or replaced by new ones, with a view to incorporating as much of recent progress in efficiency and economy as the manufacturer considers it safe to strive for in practice, or for any other similar purpose, the use of indicator diagrams, for comparing results from the old and from the new designs and for examining motors submitted for examination, is spreading to factories where they have been used very sparingly or not at all before, and ability to do the work of taking and interpreting the diagrams is coming to be one of the requirements not only of engineers but of foremen and other mechanics as well. Amateurs and dealers may soon take up this method, also, as one of the readiest means for examining the condition of a motor that has seen service.

The data of the most recent American development in this respect are not yet at hand, but meanwhile an account of the subject from the German viewpoint—as presented in a number of recent issues of *Auto-Technik*, will be found of practical interest to a large number of persons.

As American, British and French indicators are generally known in the automobile industry, illustration and description of them may here be omitted, and the optical indicator of Otto Schulze's design which is widely used in Germany may be taken as an example to illustrate the general mode of operation with instruments of this order. It differs from the other designs mainly by the peculiar arrangement and bearings of the carrier for the mirror. Fig. 1 shows the arrangement in elevation and plan, diagrammatically. The water-cooled diaphragm 1 is as usual connected with the motor cylinder by a tube and carries the spindle 2 for transmitting the movement from the diaphragm through the springy lever 3 to the mirror holder. This holder is secured by the thin leaf spring *F* to the slide 5 which can turn around the pin 4 projecting from the bedplate. In the slide there is shown a circular hole making room for a turnable eccentric disk 7, but in practice a crank mechanism takes the place of this device. The manner of operating is as follows:

When the rising or decreasing pressure in the motor cylinder raises or releases the diaphragm, the movement taken through pin 2, lever 3 and holder 6 changes the angularity of the mirror toward the light source *L* and the bedplate. This change in angularity is recorded on the ground glass screen as a change of pressure. The horizontal change of the mirror's position with relation to the light source is effected by the turning of slide 5 around pin 4, the eccentric 7 being connected by a gear with the camshaft of the motor. To obtain a correct diagram, the phases of the movements must correspond; that is, the turning-ratio of the mirror must be brought into a certain relation to that of the motor shaft, and for this purpose there is provided an adjustment for the crank of the indicator between limits of 1 to 4 and 1 to 6, which is usually sufficient. Fig. 2 shows a Schulze indicator for a four-cylinder motor, arranged for producing four similar diagrams for the four cylinders and having them visible in a row for easy comparison.

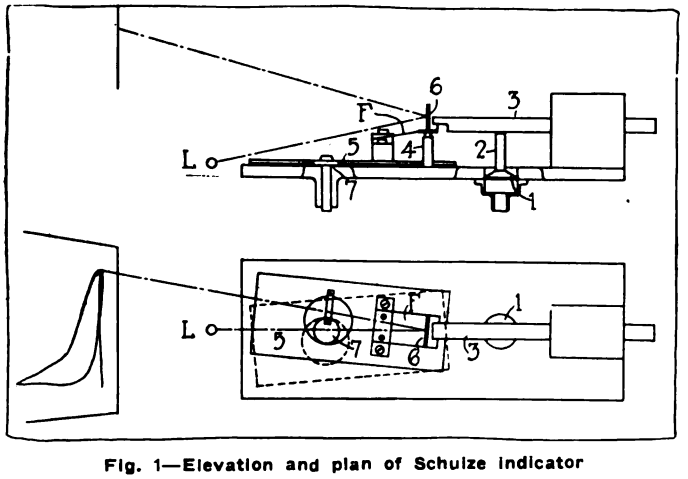


Fig. 1—Elevation and plan of Schulze indicator

A, *B*, *C* and *D* are the ground glass screens on which the diagrams are projected under the influence of the shrouded electric bulbs *E*, *F*, *G* and *H*. The apparatus is secured to the motor by means of bracket *L* and is actuated from the motor by shaft *K* which can be correctly adjusted at *M*. Fig. 3 shows the manner of mounting this indicator on a four-cylinder motor. *M* is here the indicator and 1 is the gear transmission from the motor. The four gas tubes taking pressure from the motor cylinders to the diaphragms are provided with stopcocks 2. Vibrations of the motor have with this mounting no influence on the accuracy of the indicator's work.

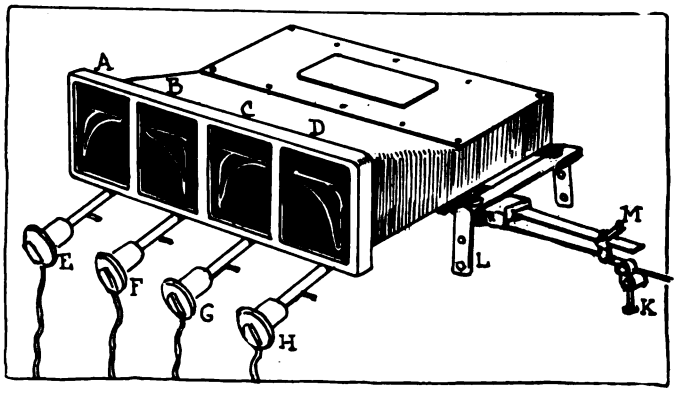


Fig. 2—Arrangement of screens and lights

These indicators are usually furnished with two sets of diaphragms, one for high pressures to indicate normal operation under power and one for low pressure, with which the functioning of the valves can be studied with the ignition and gas admission cut out. The high-pressure diaphragm for the Schulze indicators produces a scale in the diagrams of 3 millimeters per atmospheric pressure, while the more flexible membrane for diagrams of the compression gives a scale of 10 millimeters per atmosphere.

When a multiple indicator is used, the diagrams simultaneosuly traced for the different cylinders should be alike, and any difference in them points in itself to some error. If the diaphragms are not exactly of equal tension, the differences which will appear in the diagrams easily lead to wrong conclusions. It is therefore recommendable to test them by comparing with diagrams obtained by using the same diaphragm successively for the four cylinders.

The ground-glass screen of an indicator is usually so arranged that it can be conveniently replaced by a photographic plate. In some instances photographic films have also been used instead of plates. The curve of the diagram appears as a continuous luminous line on the dark background of the screen, the effect being that indicated in Fig. 4. A Schulze

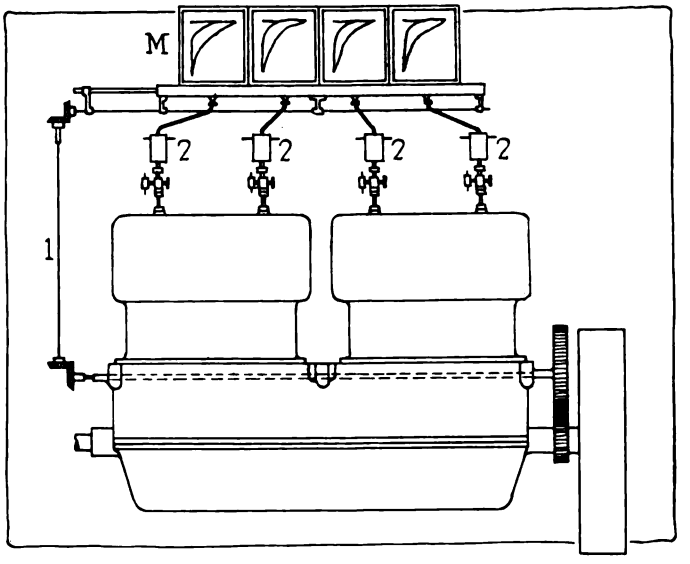


Fig. 3—Mounting of indicator for 4-cylinder motor

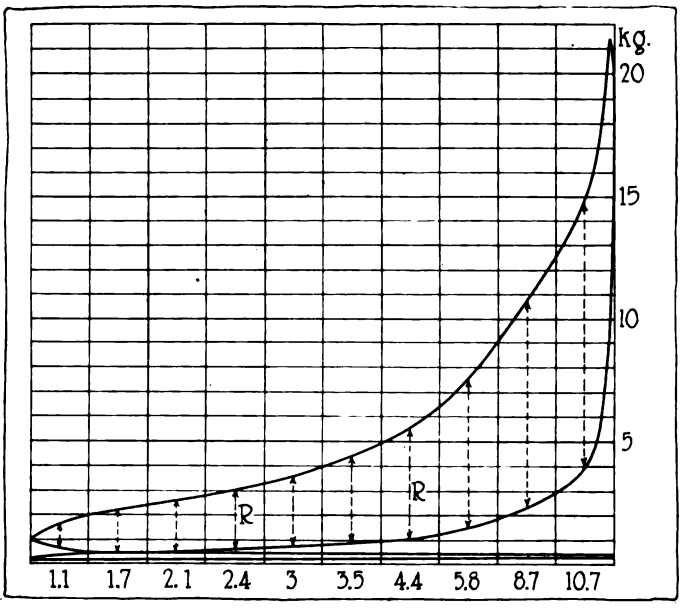


Fig. 5—Method for finding mean effective pressure

diagram, for example, is 70 millimeters long, but, if it is desired to follow the work of the motor more closely than is possible on this scale, a projector lens is employed to throw the diagram on a more distant and larger screen, where its length may be perhaps 500 millimeters. It is especially interesting to observe the lightning changes in the diagrams occurring at the different stages of the motor work so clearly as they appear with this large magnification. With the use of improved light sources the observations can be conveniently made even by broad daylight.

When the diagram is to be permanent a photographic camera is inserted instead of the glass screen, and the plate is taken out and developed in the usual manner. If bromide or other negative paper is used in the camera instead of the plate, the diagram is obtained in black on white by the developing. When no photographic apparatus is used, however, and the motor is operated by its own power the whole curve of the diagram is always visible to the observer, as the retina of the observer's eye easily retains the whole image during the very short period in which it is produced, and all defects in the working cycle of the motor can therefore be at once recognized, whether due to insufficient filling of the cylinders with gas, poor compression, leaks, incorrect functioning of the valves or wrong timing of the ignition, and the proper remedy can thus be devised without long groping or guessing.

[An exception is noted for the case that the motor is cranked slowly by hand to test compression, under which condition the generation of the curve can be followed from point to point but is not seen at any moment in its entirety, on account of the slowness of the movement, and for a test of this kind the photographic method is preferable, even if it is not otherwise necessary to preserve a record of the test.]

Aside from its utility for demonstrating errors in the functioning of a motor, the indicator can be employed to determine its mechanical efficiency. It gives the means for calculating the indicated horsepower, and by deducting from this the power shown by brake test the difference stands for the mechanical losses due to friction. To obtain the indicated power, the diagram is divided by vertical lines in ten equal parts (Fig. 5) and the ordinates R of the diagram are measured in the middle of each part, in millimeters. These figures are converted into pressures in kilograms per square centimeter according to a schedule which accompanies each indicator from its maker. Usually 2 or 3 millimeters represent 1 kilogram per square centimeter. These values are entered and added up at the foot of the diagram, and the sum divided by 10 represents the mean effective pressure. In Fig. 5 this mean is found to be 4.27 kilograms. If the cylinder has, for example, a bore of 120 millimeters and a stroke of 145 millimeters and the motor speed is 950 r.p.m., the indicated horsepower is found from the formula:

$$N_i = \frac{O \times P_i \times n \times l}{60 \times 75}$$

in which O is the piston area (here 113 square centimeters), P_i the mean effective pressure, n the number of explosions per minute (here 950 divided by 2, or 425) and l the stroke in meters (here .145 meter). By inserting these values one has:

$$N_i = \frac{113 \times 4.27 \times 425 \times 0.145}{60 \times 75} = 6.61 \text{ indicated horsepowers.}$$

Frequently, parts of the exhaust, the compression and the suction curves form a loop and in that case include a certain area, but this is usually (as in Fig. 5) so small that it can be neglected. It represents, however, negative work, and, if it is large enough to be considered, it can be figured out from its ordinates in the same manner as the main area, and the mean negative pressure can be deducted from the working pressure to find the value to be used in the formula for indicated horsepower.

After the indicator has been mounted upon the motor the cycle of the indicator movements must first be adjusted to correspond to that of the motor. To this end the motor is turned by hand. During the compression stroke the pressure in the cylinder then rises to nearly that of normal compression, and during the following stroke the pressure

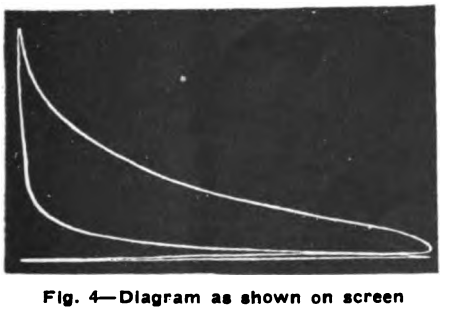


Fig. 4—Diagram as shown on screen

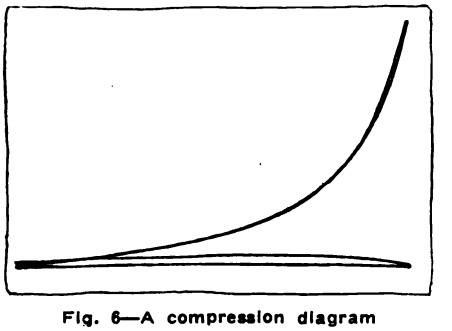
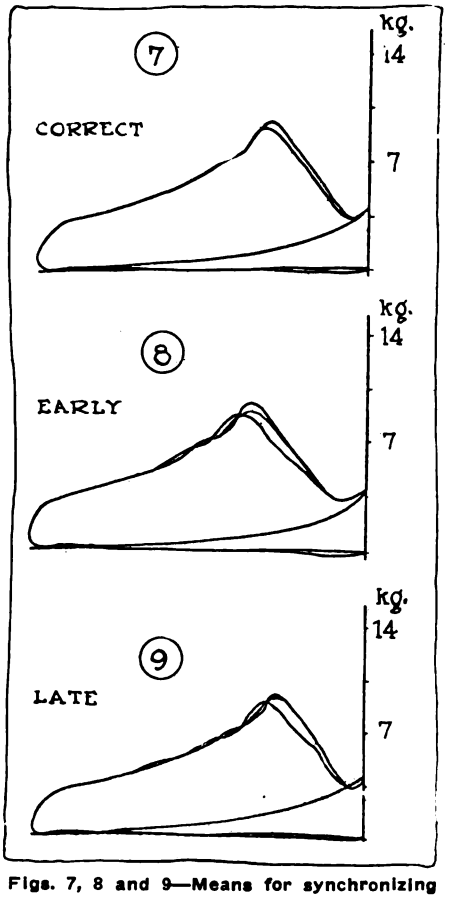


Fig. 6—A compression diagram

is shown to diminish according to the same curve, provided the cycles correspond properly. The total curve is then like that shown in Fig. 6, the compression and expansion curves almost coinciding. The first portion of the expansion curve falls a little below the compression curve, because at that moment heat generated by the compression is taken up in the cylinder walls. If a more marked lack of coincidence in the two lines is shown, the adjustment of the indicator is operated until correspondence is produced.



Figs. 7, 8 and 9—Means for synchronizing indicator and motor

The working diagram can also be used for adjusting the cycle. While the motor is at rest such an adjustment is first made of the indicator's gear or lights that the luminous point is at the end of its course when the piston has reached the end of its stroke. The motor is then started with the spark so late that the charge is not ignited till the dead center is passed. The adjustment for securing synchronic movements is now manipulated until that portion of the diagram which represents the end of the compression stroke and the beginning of the working stroke assumes the shape it has in Fig. 7. If the cycle of the indicator is ahead of that of the motor a diagram like Fig. 8 is obtained, while one like Fig. 9 shows that the indicator cycle is behind. The correct adjustment is of great importance. With a certain motor it was shown, for example, that a fault of 6 deg. in the indicator adjustment gave a mean effective pressure of 7.03 kilograms per square centimeter, while a correct adjustment gave 6.25 kilograms.

When the motor works to best advantage, its indicator diagram should correspond approximately to the ideal diagram which may be construed from the data of the motor. This theoretical diagram is constantly kept in mind when one interprets the meaning of variations in shape of actual diagrams, and it is therefore the basis for making practical use of indicators. It is shown in Fig. 10.

The Ideal Diagram

On the zero line the piston stroke *ac* of the motor is marked as abscissa, and on the vertical axis are measured, as ordinates, the pressures existing in the combustion chamber. The distance from O to *a* represents the compression chamber or dead space in the cylinder. When the piston moves from *a* to *c* in the suction stroke, the pressure above the piston remains in theory atmospheric (under the assumption that the charge follows the piston readily) and the pressure curve becomes the straight line AC which is parallel with the zero or vacuum line. During the compression stroke the piston moves back from *c* to *a*, and the pressure increases at the rate of the adiabatic curve CE (adiabatic = calculated on basis of pressures and volumes only) on the supposition that no heat is transmitted from the cylinder wall to the gas. At point E the compressed charge is now ignited and the pressure rises instantaneously from E to F. At F begins the expansion or work stroke and the piston moves again from *a* to *c*. Again assuming no heat transmission to take place, the expansion curve becomes adiabatic and runs from F to H. The exhaust valve is opened at the end of the work stroke, and the pressure drops suddenly from H to C. By the subsequent exhaust stroke of the piston from *c* to *a* the pressure remains atmospheric and is represented in the straight line CA.

Meaning of Areas

The diagram area ECHF represents the work done by the cylinder. Consequently every motor builder aims to obtain the largest possible diagram area, and Fig. 10 represents the theoretical maximum, which cannot be reached in practice, as the actual conditions in a four-cycle motor deviate considerably from the assumptions under which the ideal diagram is constructed. First, the suction stroke produces more or less depression in the cylinder, so that its curve 1, in Fig. 11, falls below the straight line indicating 1 atmospheric pressure. During the compression the cylinder walls part with a certain amount of heat to the gas mixture, the tension of which is thereby increased, and the compression curve 2 lies for this reason higher than the theoretical curve CE in the later portion of its course. On the other hand, the inflammation of the gas is not instantaneous but requires a little time, and it is therefore necessary to start the ignition before the upper center is reached, for example at *m*, Fig. 11. The straight line EF in Fig. 10 is thus replaced by the curve *m*2 in Fig. 11. During the explosion stroke the gases impart heat to the cylinder wall and their pressure is reduced accordingly, so that the real expansion curve 3 drops considerably below the theoretical

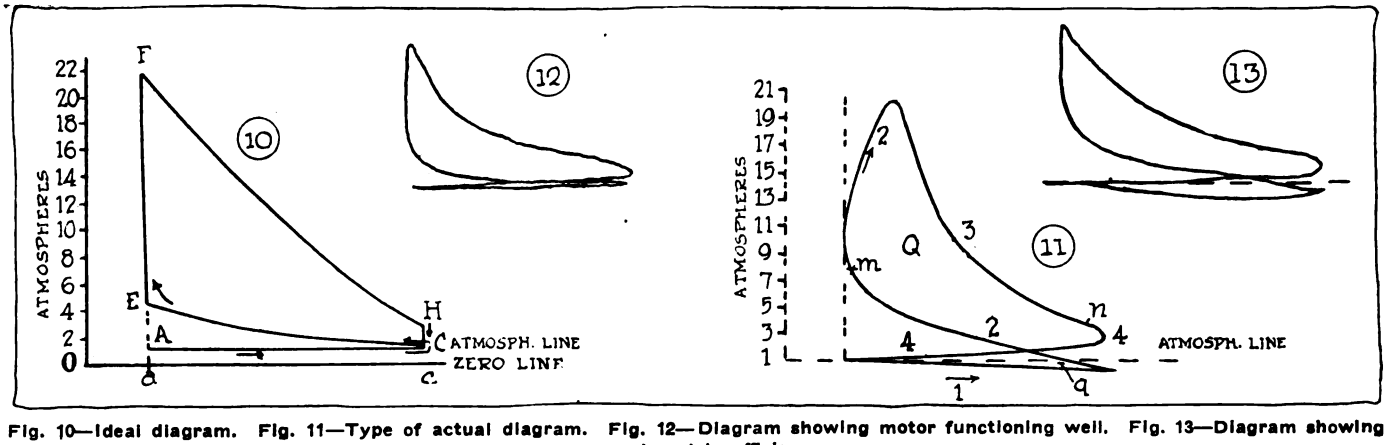
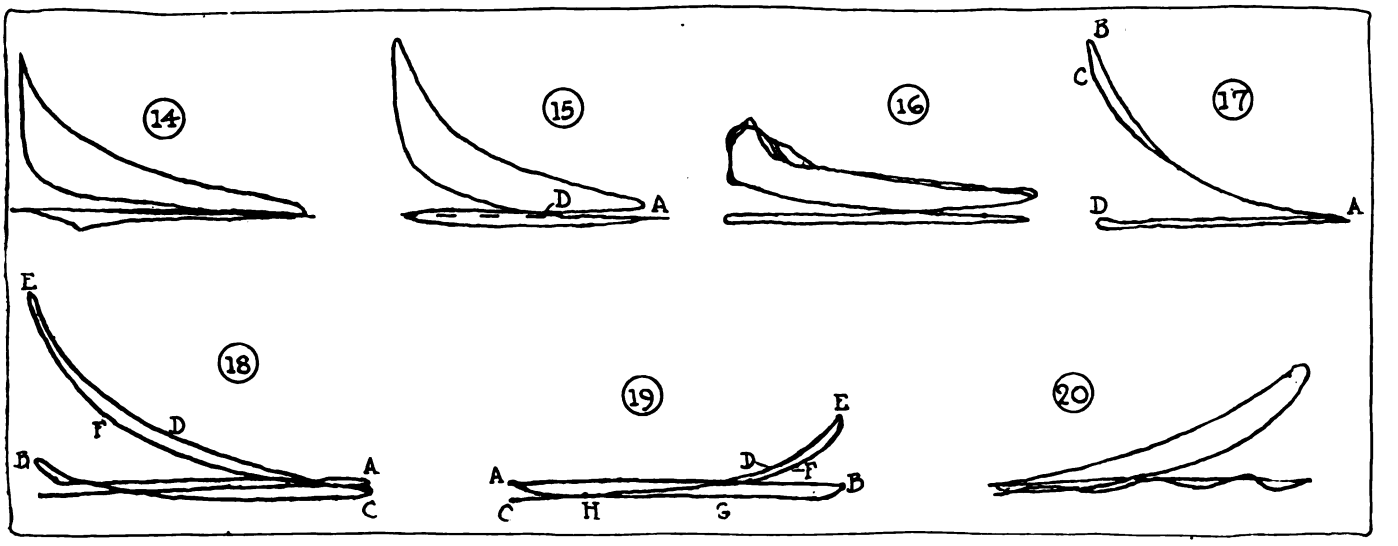


Fig. 10—Ideal diagram. Fig. 11—Type of actual diagram. Fig. 12—Diagram showing motor functioning well. Fig. 13—Diagram showing poor volumetric efficiency



Figs. 14 to 20—Diagrams indicating defects in the intake or in the compression, as explained in text

curve FH. The exhaust valve is also opened before the piston reaches lower center, as at *n*, to avoid back-pressure, and the curve from *n* downward to the right indicates the diminishing pressure. Finally, the pressure of the exhaust gas will be higher than atmospheric during all or nearly all of the exhaust stroke, and the exhaust curve 4 therefore lies higher than the horizontal line of atmospheric pressure.

All these disadvantages are shown with exaggeration in Fig. 11, which however makes it plain that the diagram area Q, from which the lower diagram area *q*, being negative, must be deducted, is considerably smaller than the theoretical diagram area of Fig. 10.

A very good actual diagram is reproduced in Fig. 12. The compression is faultless, ignition and carburetion are good, the valves work properly and back-pressure against the exhaust is reduced to a minimum.

Every disturbance in the functioning of the motor acts at once on the shape of the diagram, and usually a certain deviation from the normal in the curves of a diagram may be correctly ascribed to a certain corresponding defect in the functioning of the motor as its cause.

In the following, causes and effects of this order are explained and illustrated.

Diagrams of Faulty Induction

When the suction curve for its entire length runs considerably below the atmospheric level without showing a definite curvature or break, as in Fig. 13, the intake valve may be of too small diameter or its lift may be insufficient, but it is also possible that the intake channel is too narrow or has been clogged, so as to throttle the whole gas mixture strongly.

If the beginning of the suction stroke shows a rather sharp downward point, as in Fig. 14, the intake valve opens either too late or too slowly, causing a considerable depression in the cylinder before the gas finds the passage open. But when the intake valve closes too slowly or too late, the beginning of the compression curve will coincide with the line of atmospheric pressure, as AD in Fig. 15, and the compression will not really begin till the piston has reached D. It happens frequently at trials of new motors that all of these sharply marked irregularities occur in the same diagram. With the gases so strongly throttled that the cylinder does not receive a full charge, the diagram can take the shape of Fig. 16, where the great reduction of the explosion pressure is conspicuously shown.

To examine the tightness of piston rings and valves it is better to take a compression diagram than a working diagram. It can be obtained either by cutting out the spark and letting the motor run a few turns thereafter or by turning the motor by hand a few turns while it is still warm.

Diagrams of Faulty Compression

Fig. 17 shows a compression diagram of a motor with poor compression. The motor in this case had unmuffled exhaust and was still warm. If all organs had been air-tight, the compression curve AB should have coincided with the expansion curve CA. But as in reality gas escaped at rings or valves or both, the expansion curve CA came notably lower than AB. It is also seen in this diagram that the exhaust curve at D is arched slightly upward, and this was due to too early closing of the exhaust valve, causing some compression at the end of the exhaust stroke. The intake valve, it is also shown here, opens too late, which should be corrected in the valve control.

Fig. 18 shows a very bad compression diagram. The exhaust curve AB has strong back-pressure, and the exhaust valve closes too early, as indicated by the raise at B. The suction curve BC runs far below the atmospheric line, pointing to an undersized intake valve. Finally, the compression is also shown very poor, since the expansion curve EFA falls below the expansion curve CDE.

If the gas mixture is strongly throttled, the compression diagram takes the shape of Fig. 19. BGC is the suction curve, which plainly shows the throttling. CDE is the compression curve and EFH the expansion curve. As the exhaust valve opens as early as at H, the interior pressure in the cylinder is reduced to atmospheric from H to A, and this is maintained during the exhaust stroke AB.

A motor with automatic intake valves gives a diagram in which the suction curve shows a wavy course, as in the compression diagram, Fig. 20. The waves, compared with the steady course of the suction curve for a mechanical inlet valve, indicate plainly the superiority of the latter. Fig. 20 also shows a very inferior compression, the compression and expansion curves being separated.

Diagrams of Faulty Ignition

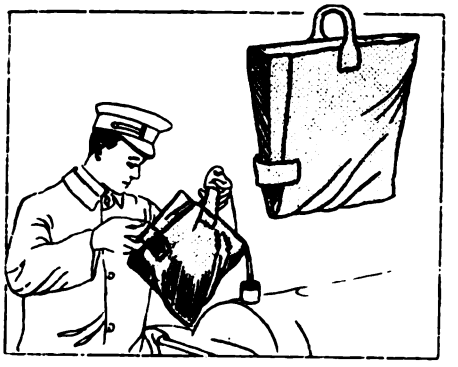
Errors in the timing of the ignition are marked very plainly in indicator diagrams. Fig. 21, *a* to *f*, shows diagrams obtained by different timing. The effect of premature ignition taking place when the piston has finished only three-fourths of the compression stroke is shown in diagram *a*, and *b* shows the effect when there is 20 per cent left of the compression stroke. Both diagrams have the loop which is characteristic of an over-advanced spark.

(To be continued)

ACCESSORIES

Rayntite Folding Water Bucket

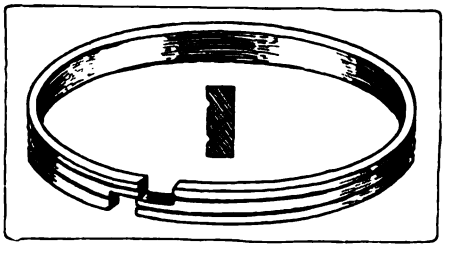
REALIZING the possibilities for a folding water bucket, the Fabrikoid company has brought out a design of waterproof Rayntite which is very compact. Rayntite is the material used by the company in its automobile tops and in the bucket all seams are stitched and cemented with a special adhesive to prevent leaking. It holds 1½ gal. of water and pours easily into the radiator cap. Rayntite does not harden or crack so that the bucket may be folded and put under the rear seat cushion. Price, 75 cents.—Du Pont Fabrikoid Co., Wilmington, Del.



Rayntite folding water bucket and its use

Rittenhouse Piston Ring

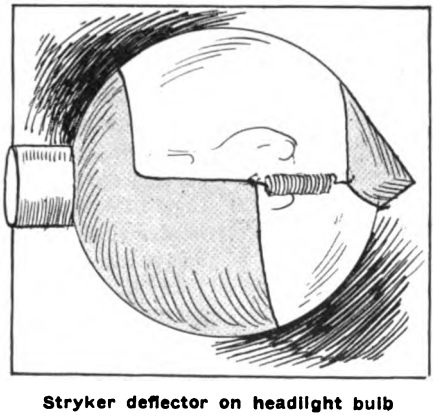
A piston ring designed to eliminate gas leakage has been developed by George R. Rittenhouse and has the feature of having oil rings around the periphery. This provides a film of oil at all times which acts to maintain proper lubrication and to hold the compression tightly. In addition to the V-shaped groove is the step lap joint which eliminates leakage. The illustration shows that this ring differs widely from the ordinary diagonal split type.—Rittenhouse, Fleury Co., Baltimore, Md.



Rittenhouse piston ring with cross section

Stryker Headlight Deflector

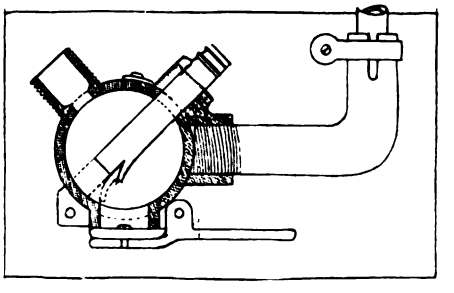
For deflecting the rays of headlights, so as to permit the rays to be thrown on the ground but not to bother pedestrians or approaching cars, the Stryker headlight deflector makes use of a bulb in which the rays of light are brought under control. As shown by the illustration, the bulb is darkened so that the reflector cannot throw the light to a height above the ground sufficient to reach the eyes of the pedestrian. The deflector can be placed on any globe and if one is broken or burned out it can be moved to another, since it is indestructible. The deflector does not dim the rays, it simply deflects them to the place where they are most needed. The price is $1 a pair.—C. L. Stryker, Buffalo, N. Y.



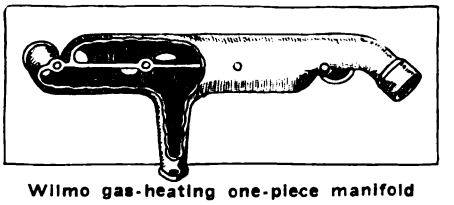
Stryker deflector on headlight bulb

Dietz Carbon Eater

The Dietz system takes water vapor or steam leaving the radiator through the overflow pipe and leads it to the carbureter, where it mixes with the gasoline and air and is carried into the cylinders. An automatic gate in the pipe line between the overflow and the carbureter prevents the passage of liquid which is drained off by a balance trap at the bottom. The makers claim that the device is a preventive of carbon, a softener of old carbon and that it makes the motor run more smoothly on less fuel. It sells for $5, installed.—Dietz Carbon Eater Co., Gray & Thomas, agents, Denver, Col.



Dietz carbon-eater separating valve



Wilmo gas-heating one-piece manifold

Wilmo Manifold

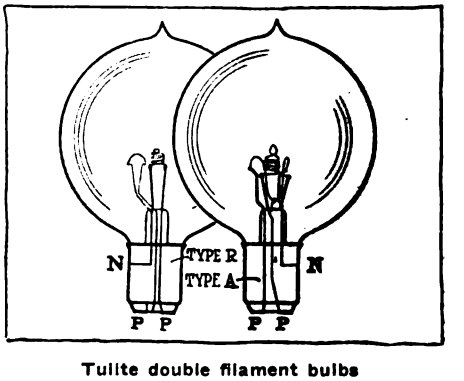
The Wilmo manifold takes both intake and exhaust gases, the two being separated only by partitions. The object is to thoroughly warm the incoming gases and so insure their proper vaporization. Special manifolds are made to fit most of the standard cars on the market and in no case is any machine or other fitting work required, the manifold fitting exactly in the place of the original. Better running and greater fuel economy are claimed for the device. Price, standard model, $10; Ford model, $7.50.—Wilmo Co., Chicago, Ill.

Tulite Headlight Bulb

The object of this bulb is to provide two degrees of illumination within the lamp itself, which is accomplished by using two filaments, either of which can be switched on. The larger filament provides full illumination and the smaller gives sufficient light to see from 40 to 75 ft. ahead of the car. The bulb is made in two types; type R is inserted with the small filament above the larger, projecting the light on the roadway at short range, while type A has the small filament mostly surrounded by the larger so that the diffused light covers a large area. In the standard bulb the candlepowers of the filaments are 4 and 20, but other intensities and combinations can be supplied.—Tulite Auto Bulb Co., Detroit, Mich.

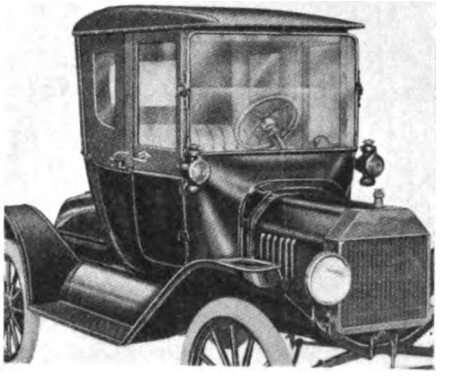
White Coupé Top for Fords

This mohair top makes use of the windshield that comes on the car, but an inner shield is built into the top at the rear of the regular shield. Two bolts secure the door of the demountable top to the car door and a hinge holds it in place at the top. Handles connect with the door lock on both inside and out. The inner shield mentioned and the windows are of heavy celluloid made expressly for the purpose and are fastened to the



Tulite double filament bulbs

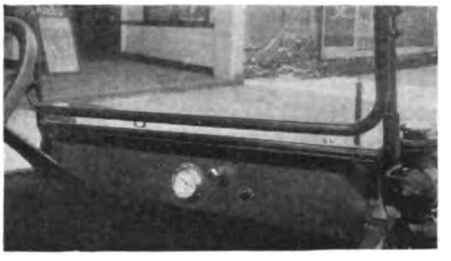
frame of the top with turn fasteners. For summer driving the side curtains and inner shield are removed and the back curtain rolled up, if desired. The door may be dismounted or left on as it is light and correctly hinged. If desired, the coupé top may be removed entirely and used only for colder weather. A fabric cowl is furnished for 1913 and 1914 models. The makers state that the top can be put on in a few hours, full directions being supplied. For 1915 or 1916 models the tops sell for $45 while for 1913 or 1914 models the price is $46. —Geo. White Buggy Co., Rock Island, Ill.



White coupé top for Ford cars

Whetstone Instrument Board

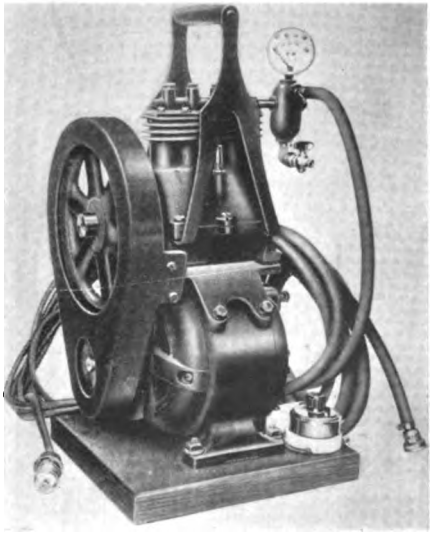
This instrument board is designed for Ford cars and is made of heavy sheet steel, reinforced. It is secured by two bolts, and the makers state that it can be attached in 10 min., the bolts used being already on the car so that no drilling is required. The clock, lamp and switch, furnished with the complete equipment, are finished in nickel. The board is enameled black, and alone sells for $1, while with clock, lamp and switch the price is $4.05.—J. H. Whetstone & Co., Lapeer, Mich.



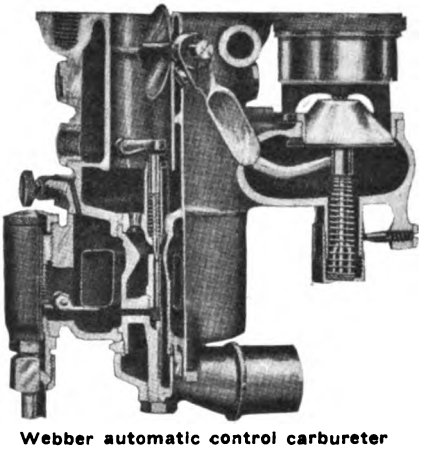
Whetstone's instrument board for Fords

Guco Garage Tire Pump

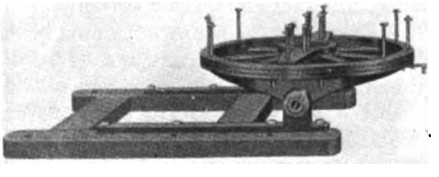
This new garage pump is a self-contained unit, mounted as shown in the illustration. A handle is supplied, allowing it to be easily carried, or it may be mounted on a small carriage, if desired. The air pump, mounted on the motor, has four cylinders, insuring a steady flow of air, the corrugations on the cylinders assisting in dissipating the heat generated and keeping the operating temperature low. Metal pistons, each with two compression rings, are used, the connecting-rods and main bearings being of bronze. The motor is the ¼-hp. standard Westinghouse type CA or CD, depending upon the nature of the circuit. All electrical contacts are shielded and all working parts inclosed, making it dust-proof.



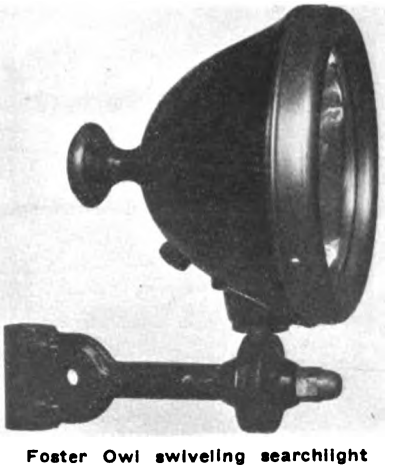
Guco power tire pump for garages



Webber automatic control carbureter



Martin's fifth wheel for trailer



Foster Owl swiveling searchlight

All parts of the pump are lubricated by splash. The complete equipment consists of a motor-driven pump, a pressure gage, an air hose, an acorn connection and a snap switch for starting and stopping the motor.—General Utility Co., Philadelphia, Pa.

Webber Carbureter

Automatic fuel control is vested in the air valve of the Webber carbureter, which is connected to the needle valve in the centrally located spray nozzle through an arm and opens the valve in proportion to the air opening. A dashpot above the air valve prevents fluttering. There are two adjustments in addition to the air-valve spring tension adjustment; one is for low speed and the other for high speed, and these are non-interfering. The richness of the mixture can be regulated by a lever on the steering column without upsetting the proportions at high and low speeds. The carbureter is intended to be used with a hot air supply, and fittings for this purpose are supplied at an extra charge. The instrument sells for 1¼ in., $30; 1½-in., $35; 1¾-in., $40; 2-in., $45.—Webber Mfg. Co., Boston, Mass.

Martin's Fifth Wheel

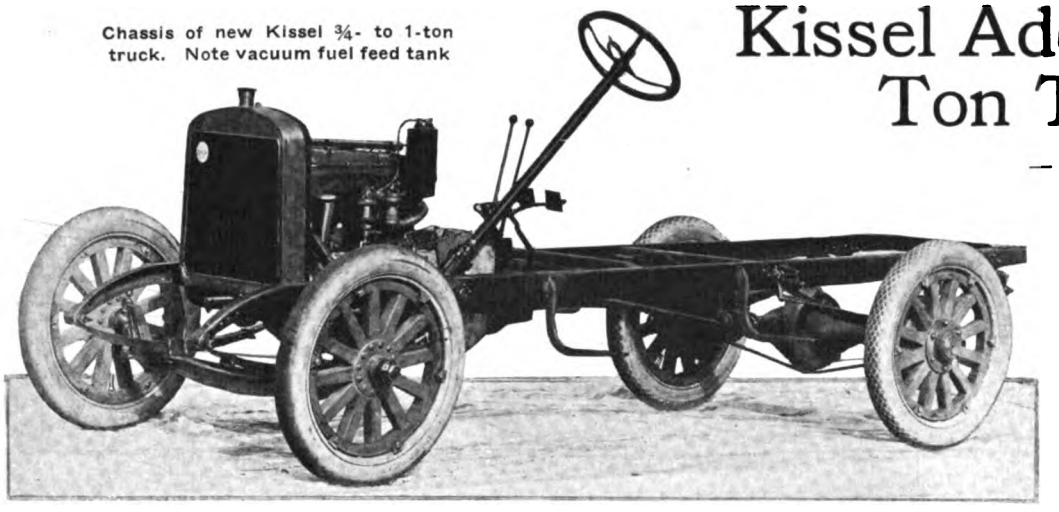
One-half of this fifth wheel is designed to be mounted under the front end of a two-wheeled trailer and the other half on the rear of the frame of the towing vehicle. The lower circle of the fifth wheel is carried on transverse trunnions so that strains due to rough roads are avoided. The springs take care of twisting tendencies. The makers state that a Ford car can handle a 1500-lb. load on a semi-trailer, the trailer wheels being so placed that the weight on the rear wheels of the car is normal and the trailer wheels carry the rest. Price, 18-in., for Fords and other light cars, $25; 32-in. for 1 to 3-ton trucks, $80, and 36-in. for 4 to 5-ton trucks, $90.—C. H. Martin, Springfield, Mass.

Foster Owl Searchlight

The Owl searchlight is provided with a swivel which permits it to turn in any direction, and which is of such size and design that it is unaffected by jolting and vibration, although easily moved by the hand. The bracket may be easily attached to any windshield without other fittings. The lamp is furnished with tungsten bulb, bracket, 3 ft. of cord and two sockets for $7.50.—C. H. Foster Accessories Co., Chicago, Ill.

Shelby Garage Door Holder

This device catches the garage door when it has swung open and holds it until released by a pull on the ring at the end of the chain. It is of wrought steel and no springs are used. Finish is black japan. Price, $1.50.—Shelby Spring Hinge Co., Shelby, Ohio.



Chassis of new Kissel ¾- to 1-ton truck. Note vacuum fuel feed tank

Kissel Adds ¾- to 1-Ton Truck

New Worm-Drive Model To Sell for $1,250—Rear Axle a Feature

A NEW departure for the Kissel Motor Car Co., Hartford, Wis., is in the shape of a new ¾- to 1-ton worm-drive truck which is to sell for $1,250. The details of the new design have just been announced and the factory has already started on quantity production and is ready for immediate delivery.

The feature of the new design is the David-Brown rear axle which has a 56-in. track and 39-in. spring centers. The worm wheel and differential are mounted as a single unit in a cast-steel carrier placed in the center housing of the axle. With this construction the weight of the truck is carried on heavy steel tubes and in the lower part of the axle housing is a spacious oil reservoir. An automatic oil level and filler plug is fitted to secure constant lubrication. One of the meritorious features of the axle is that it can be taken apart and reassembled without removing it from beneath the truck.

32-Hp. Power Plant

A Kissel power plant which is rated at 32 hp. and is built in the form of a four-cylinder motor of 3⅞ by 5½ dimensions is employed. This motor is featured by large bearing spaces to take care of heavy duty jobs and the crankshaft bearings are of white metal, steel-backed and babbitt-lined. Special gage steel is used for the valves and the entire valve action is inclosed by quickly removable covers.

An integral forging is used for the camshaft. The bearing spaces on this also are generous and the construction is so arranged that the entire shaft can be removed without disturbing the bushings. A further move towards accessibility has been made by building the crankcase in halves. The lower section can be removed without disturbing any other part. The crankshaft is supported in the upper half of the crankcase and is an extra heavy drop forging.

Lubrication is by a constant level splash system with a positively driven pump forcing the oil through tubes to the splash troughs. The oil is strained before entering the pump.

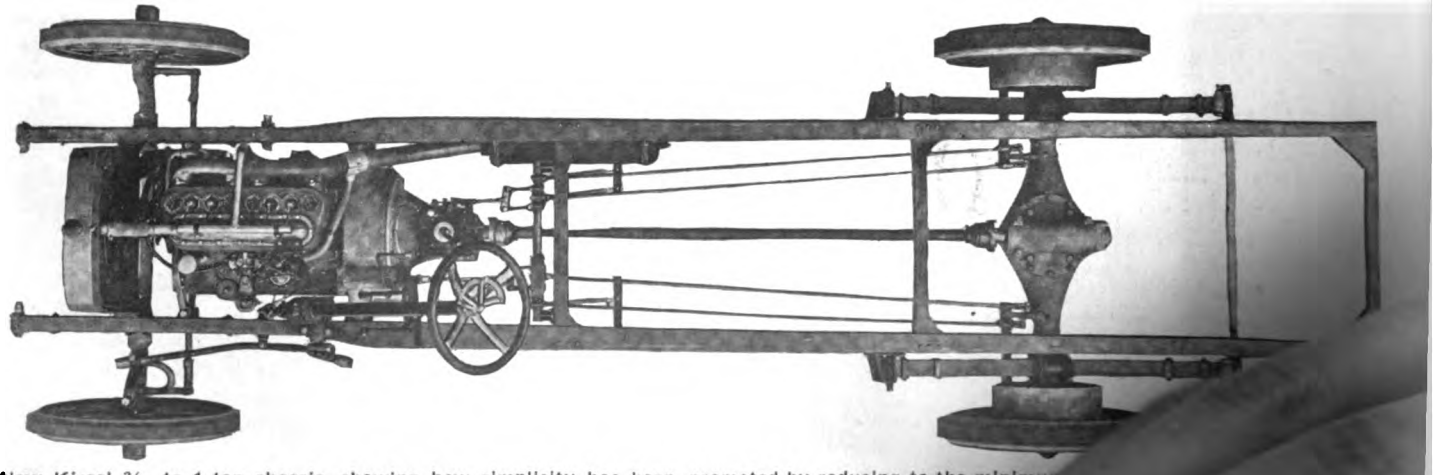
Carburetion is by a specially made Stromberg instrument of Kissel design. Owing to the use of vacuum feed accessibility is secured by mounting the carbureter quite high.

A cone clutch with leather facing and adjustable spring inserts transmits the drive. Accessibility here is secured by rendering the parts all open for inspection through the floor of the truck. The clutch and gearset are in unit with the motor and the whole plant is suspended at three points.

Simplicity in the layout of the chassis is secured by reducing to the minimum the number of operating levers. Both the foot and emergency brakes are internal expanding and both are equalized. The gearset is connected with the rear axle through a grease-packed Spicer Universal joint and driveshaft. The differential is a bevel gear design.

A feature of the truck is that the speeds are automatically governed. Twenty m.p.h. can be obtained on third or direct, 10 on second and 5 on first. The truck has a turning radius of 25 ft. which is short for its wheelbase of 125 in. The tires are optional, being either 35 by 4½ pneumatic or 34 by 3 front and 34 by 4 rear, solid. The wheels are second growth hickory and made to conform with S. A. E. specifications.

The standard express body is furnished for $150 additional. The company will also supply blueprints if a purchaser desires having the body built by local body builders.



New Kissel ¾- to 1-ton chassis, showing how simplicity has been promoted by reducing to the minimu

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, November 25, 1915 No 22

THE CLASS JOURNAL COMPANY
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Entered at New York N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October 1903, and the Automobile Magazine (monthly), July, 1907.

Tire Standardization

THE automobile tire industry is already profiting from the efforts of standardization but, while a little has been accomplished, very much yet remains to be done. Standardization has in mind at all times the elimination of waste and with some tire makers producing considerably more than 100 different models or sizes of tires, the amount of waste is considerable. This waste is the more useless when it may be possible to standardize on nine different sizes, with their oversizes. But unfortunately the entire field is divided into two grand divisions on the type of tire manufactured, whether clincher or straight-side, and were it possible to standardize on either one it would cut the number of sizes carried approximately in half. The economy in manufacture alone would be large, but there would also be the great economy of simplifying the amount of stock carried in the hundreds of cities and towns throughout the country. Instead of fighting each other on this question of clincher or straight-side, it would be better for tire maker, for tire seller, for car maker and car owner, if the tire industry would get together and definitely settle on one form of construction or the other, a condition which will eventually arrive.

There are many other problems to be settled sooner or later in the tire industry. In the solid tire field is the problem of the height of section which is at present being pushed by a few companies. Then, too, is the relative question of the pressed-on and the demountable solids. Many factors enter into both of these questions which could be simplified by the tire makers getting together with the spirit of determination to settle questions in conference rather than endeavoring to settle them by arguments disseminated by salesmen. Much has already been done to simplify the solid tire field. It was not long ago when if you changed from one make of solid tire to another you changed the wheels on your vehicle. Those days are already happily forgotten, and many of the bothersome questions of to-day can be solved with amazing speed by a business get-together; not a get-together having in mind obtaining some inside information on the other fellow, but a business get-together. This has been proved many times in other fields and there is no reason why there should be any difference in this case.

Car Comforts

THE comfort of equipment has certainly a great deal to do with the sale of an automobile, and it is sure that in the coming shows the accessory stands will display yet another crop of fittings designed to provide the greatest luxury for the occupants of the car. It has been a rule of the past that the accessory inventor should develop his ideas, that the accessory manufacturer should put them on the market, and that the automobile manufacturer should, finally, after a few years, apply them to his standard car.

We have seen this happen with the speedometer, the self-starter and electric lighting. It is in the transition stage with the demountable top that will make a true closed car from an open one and there are sundry other attachments which may come to be standard also. One such is some apparatus for warming the interior of a car, whether of the closed or open variety. We have several methods for applying the waste heat of the exhaust gas to the tonneau or the driver's compartment and with a very little more development as independent accessories there should be a place for them in standard equipment.

Another detail which is likely to be slower in coming, but may none the less be expected eventually, is the tonneau windshield, for as an aid to comfort it only needs to be tried once to be ever afterward desired. As an attachment it is possible to make it fold away with fair neatness, but as standard equipment it could be as inconspicuous as folding seats have now become.

That equipment plays a conspicuous part in selling a car is accepted as a fact, and this has stimulated the invention of thoroughly good fittings which will really be appreciated by the motorist. Probably the shows just coming will excell all others for the display of intelligent accessories of this class, and show visitors should make sure they pay proper attention to the accessory section.

Buick to Double Plant

150,000 Cars for 1917—To Enlarge All Parts and Accessory Plants

DETROIT, MICH., Nov. 23—*Special Telegram*—The plant of the Buick Motor Co., Flint, Mich., is to be doubled and for 1917 a production of 150,000 Buick cars is contemplated, or double the production scheduled for 1916. A new motor castings foundry two stories, 470 by 247 ft., with basement, will be put up at once. Additions to the drop forge plant 40 by 200 ft. are under way and further additions will be put up. Half a million dollars will be spent for this purpose and the working force will be gradually increased but this will not be done as rapidly as desired because several thousand new houses will have to be erected in Flint to house the men.

All other plants making parts and accessories for the Buick and General Motors companies will also be enlarged to increase their output facilities. When the new motor castings foundry is completed the old Michigan Motor Castings plant will become a part of the plant of the Weston-Mott Co. Three hundred Buick cars are now being built daily.

—

Crane with Lockhart in Europe

NEW YORK CITY, Nov. 23—H. M. Crane, chief engineer and vice-president of the Simplex Automobile Co., New Brunswick, N. J., has accompanied Henry Lockhart, president of the Simplex company and the Wright Aeroplane Co., on his trip abroad to study the recent developments made in aeroplane motors in England and France. Both Mr. Crane and R. B. Wasson, factory manager of the Simplex company, have joined the Wright company.

—

Work Off for Europe

NEW YORK CITY, Nov. 23—B. G. Work, president of the B. F. Goodrich Co., sailed yesterday for Europe on the Philadelphia. The trip is made in the interests of the French subsidiary of the Goodrich company.

—

Bell Delivery Car $750

YORK, PA., Nov. 19—Shipments of Bell commercial cars are being made from the plant of the Bell Motor Car Co., this city. The car is of the light delivery type capable of carrying 1200 lb. and is made with open and closed body, being mounted on the same chassis as the touring car. It is equipped with a Bosch magneto instead of the battery coil system, as used on the touring car. It has electric lights and starter, Lycoming 3½ by 5-in. motor; 112-in. wheelbase and uses Hotchkiss drive. Orders for quite a number of the cars have already been booked by the Bell company. Its price is the same as that of the touring car and roadster manufactured by the company, $750.

The work on the erection of the two large additions at the plant is about being completed. Operations in the several departments are being gradually increased and the output now averages two cars daily.

—

1916 Pullman on One Chassis

YORK, PA., Nov. 22—The Pullman Motor Car Co. will produce but one chassis for 1916 with 114 in. wheelbase, cantilever rear springs and equipped with 31 by 4-in. tires, non-skid all around on demountable rims. The motor is 3¾ by 4¼, block cast, and a unit with a multiple disk clutch and three-speed gearset. Four bodies are mounted on this chassis, these being five-passenger touring, two- and three-passenger roadsters and a coupé which is equipped with the C-H magnetic gearshift. The price of this model is $990; the others list at $740. Among the changes that have been made are the adoption of independent ignition by Dixie magneto and cantilever springs.

—

U. S. Rubber Co. to Open Lycoming Plant

WILLIAMSPORT, PA., Nov. 19—The United States Rubber Co. will shortly reopen the plant of the Lycoming Rubber Co., this city. Minor repairs are being made to the plant which will be ready for operation before Jan. 1. It is understood that the company intends to use the Williamsport plant as an "overflow" factory, that is to manufacture on a small scale certain lines which the plants of the company already in operation are not equipped to make or too busy to turn out.

—

Kenney With Hyatt Bearing

NEWARK, N. J., Nov. 19—W. C. Kenney has joined the Hyatt Roller Bearing Co. as chief mechanical inspector. Mr. Kenney comes to the Hyatt company from the Northway Motor & Mfg. Co., Detroit, Mich., where he was division superintendent. Previous to his engagement with that company he was factory superintendent of the King Motor Car Co.

—

Hood Resigns from Detroiter

DETROIT, MICH., Nov. 20—Wallace C. Hood, who has been general sales manager of the Detroiter Motor Car Co., has resigned. He was formerly sales manager of the old Briggs-Detroiter Co. Mr. Hood intends to enter another line of business.

Saxon Motor Car Corp. Now

Succeeds Co.; Capital $6,000,000 —To Increase Production —Dealers Buy Stock

DETROIT, MICH., Nov. 20—Another big event in the automobile industry of this city took place to-day. It was the announcement by President Harry W. Ford of the Saxon Motor Co., that the latter concern has been succeeded by the Saxon Motor Car Corp., which has just been incorporated under the laws of New York, and whose capital stock is $6,000,000.

The Saxon Motor Co., which started in business in November, 1913, was capitalized at $350,000 of which $250,000 was common stock and $100,000 was 7 per cent preferred stock. The entire new capital stock is common, and half of this, or $3,000,000 will be offered to the public at $75 per share, a first payment of $5 per share being required with all subscriptions. The subscription books open Monday, Nov. 22, and close Nov. 24.

Dealers Buy Stock

These $3,000,000 worth of stock were bought by a banking syndicate consisting of Merrill, Lynch & Co., of New York and Detroit. They report that Saxon dealers all over the country are buying the new issue.

"Our business has been expanding so rapidly," said president Harry W. Ford, "that we had to make it possible to greatly increase our production and prepare for the future big business, which we anticipate. We have built and shipped 17,000 cars in round figures thus far this year. Our production schedule from the end of August, 1915, to July, 1916, calls for 27,600 Saxon cars. With the increased capital we contemplate greatly increasing our production facilities and the output.

"In October we made and shipped in round figures 2500 Saxons. The November schedule calls for 2800 and in December we expect to turn out and sell 3000. The demand all over the country for our product is growing and I have no fear that the demand for automobiles in general, the lower priced cars in particular, will continue to increase. More and more is the automobile bought as a necessity rather than a matter of pleasure. That is why I believe the automobile business will continue to grow."

The officers of the Saxon Motor Car Corp. and the directors are: Harry W. Ford, president and general manager; Percy Owen, vice-president; Lincoln Scafe, secretary-treasurer. Lee Counselman and George W. Dunham, together with the officers, make up the board of directors.

Springfield Body Co. Formed

$1,000,000 Company to Operate Plant in Detroit as Well as in Springfield

SPRINGFIELD, MASS., Nov. 20—The Springfield Body Co. has been incorporated for $1,000,000 in this city to take over the business of the Springfield Metal Body Co. This reincorporation has been made necessary on account of increased business which has shown a gain of 3000 per cent in the last 120 days.

Plans are now under way for a plant in Detroit which will be used for large orders, while the Springfield plant will be used for small orders.

Hinsdale Smith of Holyoke and A. P. Smith of Granby, the owners of the old company, are included in the list of incorporators with W. L. Fry of New York, E. W. McGookin of Detroit and F. W. Fuller of Springfield.

W. L. Fry has been elected president of the company; Hinsdale Smith, vice-president and chief engineer; E. W. McGookin, vice-president and director of sales; and A. P. Smith, treasurer. Mr. Fry became interested in the company about a year ago and was instrumental in the organization of the new company.

Both Hinsdale and A. P. Smith have been in the automobile business for some years. The Springfield Metal Body Co. was incorporated with a capital of $20,000 in 1905, occupying the old Boston & Albany shops until it moved to Brightwood, where the company owns and occupies three large buildings.

The new stock is divided into $250,000 preferred and $750,000 common. This will probably not be placed before the public, but taken by the trade.

—

A New Motor Company

CANTON, OHIO, Nov. 19—The Ohio Motor Co., a new concern backed by Canton, Springfield and Toledo capitalists, has decided to locate a factory for the manufacture of motor devices and accessories in this city. A site will be secured and a factory 60 by 600 ft. will be erected. One of the specialties to be manufactured is motors for motor trucks, tractors, and aeroplanes.

Steps have been taken to incorporate the concern with an authorized capital of $500,000 of which $200,000 will be paid in.

—

Landis Buys Flinchbaugh Mfg. Co.

WAYNESBORO, PA., Nov. 19—The Landis Tool Co., Waynesboro, Pa., this week purchased at private sale the plant of the Flinchbaugh Mfg. Co. of Greencastle. The price paid was $42,500. The Flinchbaugh company, which was engaged in the manufacture of gasoline engines and tractors, moved from York to Greencastle two years ago and was financed by citizens of Greencastle and vicinity.

The Landis Tool Co., employing 800 persons, manufactures the Landis shock diffuser and other automobile accessories. The company has been rushed with work for the past two years. Last Saturday the employees were given an increase of 1 cent an hour.

—

Hupp Buys American Gear Plant for Axle Plant

DETROIT, MICH., Nov. 22—A deal involving $1,000,000 was completed to-day whereby the Hupp Motor Car Co. acquires the plant and property of the American Gear Co., Jackson, Mich. This is part of the expansion movement started by the Hupp company in conjunction with the recent increase of its working capital.

The Jackson plant has been taken over by the Hupp company and will be known as its axle plant. Dubois Young, who was factory manager of the American Gear Co., will continue with the Hupp organization in the capacity of general works manager. The plant has been employing several hundred men.

Further announcements will be made by the Hupp company concerning further expansion as soon as the details are completed. Plans are being made for a greatly increased production.

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Reisinger Argo Purchasing Agent

INDIANAPOLIS, IND., Nov. 20—N. B. Reisinger, who has been purchasing agent for the Pathfinder Co., this city, has resigned and accepted a similar position with the Argo Motor Co., Jackson, Mich. Mr. Reisinger was for many years connected with the old Stoddard-Dayton Co., before joining the Pathfinder Co.

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Brockway Truck Adds to Plant

CORTLAND, N. Y., Nov. 18—The Brockway Motor Truck Co., this city, has purchased nearly an acre of land east of its present plant and has begun work on the foundations of a new building 186 ft. long and 40 ft. wide. The second building will be added in the spring. The buildings are of concrete block.

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Heads Los Angeles Speedway

LOS ANGELES, CAL., Nov. 20—W. M. Garland has been elected president of the Los Angeles Speedway Association, which is capitalized at $1,000,000. Construction on the 2-mile board track in this city has been started.

Hupp Capital Now $6,500,000

Increased from $1,000,000—$5,000,000 Is Common and $1,500,000 Preferred

DETROIT, MICH., Nov. 19—The Hupp Motor Car Co. has increased its capital stock from $1,000,000 to $6,500,000. Negotiations to that effect had been under way for some time and the re-financing deal was made with the New York bankers Ladenburg, Thalman & Co., and with A. G. Becker & Co., Chicago bankers.

Of the new capital $5,000,000 is common stock and $1,500,000 preferred. Previous to the increased capitalization the entire capital stock of the company was common stock. It is stated, but not confirmed by officials of the Hupp company, that present common stock shareholders will receive a common stock dividend, but no cash dividend. There is also to be a distribution of common stock as bonus to go with preferred stock, but in what proportion this will be, has not been stated.

The Hupp Motor Car Co., was organized in the Spring of 1908, its capital stock being $25,000, and it leased a plant on Bellevue Avenue. Ever since, the business has grown, necessitating the gradual increase of the capital stock while a larger plant was put up first on Jefferson and Concord Avenues and later at Mt. Elliott and Milwaukee Avenues, the present location.

Additions were started some time ago to further enlarge the plant as the production facilities are still inadequate. For the season 1916, the company had planned an output of 15,000 cars, but, according to President J. Walter Drake, this is to be increased.

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Crow Gets Big Export Order

ELKHART, IND., Nov. 20—The Crow Motor Car Co., this city, is preparing to turn out a new roadster called the Crow-Elkhart Clover Leaf Roadster. Five hundred of the cars have been ordered by a distributing agency in London. The car is built on a low model with three seats in the shape of a clover leaf. It sells for $785.

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Chevrolet Assembly Plant for Dallas

DALLAS, TEX., Nov. 19—It was learned authentically in Dallas to-day that the Chevrolet Motor Co. will build in Dallas an assembling plant similar to the Ford assembling plant. It is said $250,000 will be spent on the Dallas plant and that several hundred men will be employed. A site in East Dallas has been secured.

Autocar Doubles Capital

Now $2,000,000—Sales Increase 70 Per Cent in Last Ten Months

PHILADELPHIA, PA., Nov. 20—The Autocar Co., Ardmore, Pa., has increased its capital stock from $1,000,000 to $2,000,000 to provide for doubling its manufacturing facilities and output of trucks and to provide for its rapidly expanding business. According to a statement issued by the company, sales have increased 70 per cent during the past ten months over the corresponding period a year ago, this being entirely due to the growing domestic demand, the company having no war orders. The new stock, which, like the original capital, is all common, is being closely held by the original founders and their associates. There are over 3000 owners of Autocar trucks at the present time.

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Four Gary Trucks ¾ to 2 Tons

GARY, IND., Nov. 20—Gary motor trucks, made by the Gary Motor Truck Co., this city, are produced in four models of ¾, 1, 1½ and 2 tons capacity, all of practically identical build excepting in size of main parts. They are of standard form throughout, employing Buda unit power plants and worm drive, with European motor location and left steer and control. Their general construction is:

Capacity	¾-ton	1-ton	1½-ton	2-ton
Price				
Wheelbase	118	128	135	144*
Tires, front	36x3	36x3½	36x3½	36x4
Tires, rear	36x3½	36x4	36x5	36x6
Drive	worm	worm	worm	worm
Bore	3½	3¾	3¾	4½
Stroke	5⅛	5⅛	5½	5½
S.A.E. hp	19.61	22.5	22.5	29
Speed, m.p.h.	15	15	15	15

*135 optional.

Eisemann high-tension single ignition, with fixed spark is employed and a Stromberg carbureter. All motors are furnished with governors.

Sheldon Worm Axles

Dry disk clutches, faced with Raybestos take the drive from the motor to the three-speed selective gearset amidships, on each model, from which the drive is taken by single shafts with two universals each to the Sheldon worm-driven rear axles.

Goodyear S. V. solid tires are standard, although pneumatics will be fitted if ordered.

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10,886 on Packard Payroll

DETROIT, MICH., Nov. 19—A few days ago the payroll of the Packard Motor Car Co., showed that 10,886 men were working at the plant. Less than three months ago the number was 8200, while on Aug. 21, 1914, when representatives of the Department of Labor of Michigan, visited the factory, there were 4387 men and women in the employ of the company. This is mentioned to show how the Packard business has been growing and has made it necessary to increase its working force more than 50 per cent within one year. This increase in the number of men employed is expected to continue as the payroll for November is scheduled to be more than $800,000 while in October it totaled $773,879.

During October 477 carloads of material and 3,273,560 lb. in less than carload lots were received at the plant.

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Employers in New National Body

NEW YORK CITY, Nov. 18—The nineteenth annual convention of the National Founders' Association, opened to-day in this city at the Hotel Astor. While the session was executive, the speakers unanimously agreed that the time had come when the industrial interests of the United States should join in a common movement to insure a successful foundation by acquainting legislators and the people at large, through one organization, as to their legitimate needs. The plan upon which it is proposed to organize the employing and manufacturing forces of the country into one central organization has not been disclosed in detail, but is said that it contemplates the combination of the employers of labor in the industrial plants throughout the United States with special committees selected from all to take up and deal with one particular object such as foreign trade, the tariff, wages, etc.

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Pontiac Car Builders Prosper

PONTIAC, MICH., Nov. 18—According to reports from four local banks, their total commercial deposits on Nov. 10, showed a gain of $313,681.45 over the total on Oct. 31, 1914. The total saving accounts showed a gain of $285,460.46 for the same period. The total deposits in these four banks were $5,743,922.64 Nov. 10, as compared with $5,144,780.83 at the end of October, 1914. According to officials of the banks, this increase in bank business is due principally to the bigger business of the local automobile and parts manufacturing concerns.

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Detroit Cos. Increase Capital

DETROIT, MICH., Nov. 19—The capital stock of the Columbia Castings Co. has been increased from $30,000 to $100,000; that of the Christie-Kline Forge Co., from $3,000 to $10,000 and the capital stock of the O. K. Motor Truck Co., from $10,000 to $25,000. The latter company's name has been changed to that of Lincoln Motor Truck Co.

Materials Still Scarce

Tungsten, at Present Unobtainable, Raises Cost of High-Speed Steel

DETROIT, MICH., Nov. 20—The scarcity of materials, either raw or finished, needed by automobile and motor car parts manufacturers, does not seem to be improving, although in some quarters it is claimed that the situation is now better than what it was a month or two ago. As a matter of fact, it does not seem possible and likely that this condition will improve as long as so much war material is being made in the country for the nations at war. As one local purchasing agent said, there would hardly be any scarcity of any material if no motor trucks would be exported and as the exports of trucks alone is nearly ten times in number what the exports were a year ago, there may be some truth in the remark.

A man who is familiar with the situation and who, on account of the big business his firm does, might be called on to speak with authority, is W. H. H. Hutton, Jr., director of purchases at the Timken-Detroit Axle Co. Speaking on the subject generally and of high-speed steels in particular, Mr. Hutton said:

Every piece of high-speed steel used in the making of drills and other tools to cut iron and steel contains about 20 per cent tungsten, and as tungsten is a German and an Austrian product, and therefore unobtainable at the present time, high-speed steel is becoming more costly every day. This scarcity of this metal is really alarming when judged from the motor car manufacturing viewpoint.

"For instance, at the present time if we went on the open market we would have to pay over five times more per liter for high grade steel than we did at the beginning of the war. And the grade of steel would be far inferior to any we ever bought before, in fact it would hardly compare to the very poorest grades offered for sale in this country under normal conditions. Not only are we now paying much more for what we are getting, but we are having a very hard time to get any at all.

"Take drills made of this steel, for instance. To-day we are paying about four times the normal price for ½-in. drills and about five times the normal price for inch drills. Not only are the supply houses quoting these steels at the list price, minus discounts formerly offered, but they ask a high premium over and above the present list.

"This condition does not apply to high grade steels solely, though. Other elements that are extensively used in the

manufacture of motor cars and motor car parts are equally if not more scarce. Antimony has jumped six times its normal value. Aluminum has raised 300 per cent while there is a decidedly rising market on copper, tin and spelter, commonly known as zinc.

"The tin market, however, will soon be in much better shape than it is at the present time. Big ore men in this country have recently opened large furnaces in the east to smelt Ecuadorian tin and this will relieve the tense situation on that product if it does not bring it back to normal.

"There is a little antimony being mined now in Death Valley, Southern California, but the price of labor and bringing it out of the railroads is so high that it has not had much effect on the price of the refined article as yet.

"Should the war continue much longer, American manufacturers must find some way of procuring these essential elements, or manufacturing efficiency will be greatly handicapped. We must have these elements. Now is a good time to start producing them commercially in this country."

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Sun Moves to Elkhart

SOUTH BEND, IND., Nov. 22—The deal has just been consummated by which the Sun Motor Car Co., Buffalo, N. Y., purchased the two factory buildings formerly occupied by the Sterling Motor Car Co., Elkhart, Ind. The consideration was $30,000. The Sun company will begin the installation of machinery at once. The new company which was incorporated at Buffalo last July, will manufacture the Sun light six to sell under $1,000. The officers of the company are: R. Crawford, president and general manager; J. P. Black, secretary and treasurer; M. H. Pittman, director; Roscoe C. Hoffman, chief engineer; S. A. Merinbaum, sales manager; H. A. Minturn, advertising manager; John L. Larkin, assistant to general manager. All of these men are residents of Buffalo, with the exception of Mr. Black and Mr. Pittman, who are residents of Chicago and Mr. Hoffman, who is a resident of Argos, Ind. It is the intention of most of the officers and heads of departments to move to Elkhart. The first machinery has been ordered for delivery Dec. 15, and it is expected to have the machinery installed soon after that time to begin operations. Two to four hundred men will be employed.

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Nash as Guest of Honor

FLINT, MICH., Nov. 20—Charles W. Nash, president of the Buick Motor Co. and of the General Motors Co., has been invited as the guest of honor of the semi-monthly dinner of the Board of Commerce of Flint, to be given Nov. 23.

Weight Is Subject of N. Y. S. A. E.

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Gasoline Electric Committee Reports Progress—Analysis of Types—50 at Session

NEW YORK CITY, Nov. 19—At the meeting of the Metropolitan Section of the Society of Automobile Engineers held at the Automobile Club of America last night a report of the gasoline-electric research committee and a paper on Car Weight in Relation to Acceleration were read. The report of the committee was given by each of the members individually covering different sections of the work. David Beecroft, chairman, gave a summary of the activities of the committee, L. G. Nilson, president Nilson-Miller Co., gave an analysis of the different types examined and a description of the Thomas system and W. P. Kennedy described the wiring and circuits under different conditions in the Owen Magnetic car. The paper on acceleration consisted of miscellaneous notes made by A. Ludlow Clayden based on observations on the acceleration of three typical cars.

The Thomas System

The description of the Thomas system which is in extensive use in England was secured on the occasion of the recent visit of Hedley T. Thomson, one of the managing directors of the company, to this city. This drive, which employs two electrical machines with a planetary gearset interconnecting them, is being successfully used in Europe for heavy units. On railway cars having to climb grades of 2½ per cent with maximum load at 10 m.p.h. these systems have proven to be a success.

As the speed of the vehicle increases the speed of the first electrical machine increases while the speed of the second machine decreases until at half speed, the speed of the second machine which has been in a negative direction reaches zero and then after this time increases in positive speed until finally at maximum vehicle speed both electrical machines are running at engine speed. At maximum vehicle speed, since the two electrical machines are running at equal speed with the motor, the whole system can be connected by means of a jaw clutch, giving solid drive throughout.

Another electrical system known as the Autolectric has been discovered by the committee in addition to the previous classifications and a new sub-division will have to be made for it.

Autolectric—A New System

The distinctive feature about this system is that at starting it is purely an electrical transmission while after a certain vehicle speed has been reached it automatically becomes electro-mechanical. The battery is at all times available for starting the engine or running the vehicle without the engine and it can be charged from the dynamo with the vehicle stationary. The motor also automatically becomes a generator and can be used for braking when the vehicle is coasting, the current produced by the motor being supplied to the battery.

With the Thomas transmission the motor speed is theoretically intended to remain constant. The various units of the transmission vary in their speed in accordance with the speed of the vehicle. Owing to the planetary gearing, the second electrical machine runs at the same speed as the engine but in the opposite direction when first starting. At this time the first electrical machine remains still.

Acceleration vs. Weight

At the conclusion of the gasoline-electric committee's report A. Ludlow Clayden read some notes on the observed acceleration of three cars which he said had been tested extensively on the same speedway. He produced tables and diagrams showing the relative power of each car, measured in tractive force between the tire and the road throughout the range of speed of 10 to 50 m.p.h. over which all three cars were tested. He then gave the results of calculating the total amount of work produced by the motor of each car during acceleration from 10 to 50 m.p.h. and compared this with the amounts of power needed to produce the observed acceleration supposing there were no mechanical or air resistance. From these two sets of figures it was made obvious that the lightest of the cars had a large amount of excess power, by reason of its lighter weight. It also appeared that the resistance of the cars through mechanical and air friction varied very greatly, in other words, the air and mechanical resistance which might have been expected to be the same for three cars of closely similar size actually proved to be variable by a large amount.

A Formula Wanted

The author asked for comment on the results which might lead to additional subjects which might be studied, having a bearing on the matter, stating it to be his ambition to discover a formula which would be useful to engineers in laying out a car with a certain acceleration performance as their ideal. To discover what is the inter-relation between the weight, the horsepower curve, the gearing, etc., and the acceleration. It was stated that the author's intention was to complete a paper in proper form in a few months and he asked for suggestions that would help him in his at-

tempt to discover something which engineers would find really useful.

Carburetion a Factor?

Several of the members who entered the discussion were of the opinion that carburetion would have much to do with the final results obtained. Herbert Chase, engineer of the Automobile Club of America, stated that he had noticed in block tests that whereas two motors may have the same horsepower curves the acceleration figures would differ owing to varying carburetion. It was also brought out that accurate drawbar pull figures would help in securing a clue to the performance of the car and would show how much of the lost energy was consumed in the car and how much through the motor.

Parry Co. to Build Commercial Bodies, Tops and Trailers

INDIANAPOLIS, IND., Nov. 20—The Parry Mfg. Co., this city, manufacturer of horse-drawn vehicles, has developed a line of commercial bodies for automobile chassis, as well as two models of trailer and a variety of tops of all styles. The chief activities of the company in its commercial body line have been directed toward designs for the Ford chassis, although bodies for other makes are not to be neglected. The trailers are a two-wheeler and a four-wheeler, the connection provided being an adaptation of the Bradley coupler, permitting a straight pull on both ends of the axle that adapts itself to the motion of the vehicle to which the trailer is attached. These new lines will not interfere in any way with the manufacture of the company's horse-drawn vehicles.

Babcock to Build Commercial Bodies for Fords in Quantity

WATERTOWN, N. Y., Nov. 20—The H. H. Babcock Co., this city, is building commercial bodies for Fords in thousand lots on the unit plan. There are eight different types, to fit every requirement in light delivery service, built up from one standard body-base by adding units. The bodies are delivered painted, complete with all fittings and ready to assemble.

Gobron, French Car Maker, Killed

PARIS, Oct. 28—Jacques Gobron, one of the partners in the Gobron Automobile Co., of Billancourt, near Paris, is reported killed in an aerial fight with a German machine. He held the military rank of lieutenant and joined the French air forces at the outbreak of war. Jacques Gobron was responsible, with his brother Jean, for the Gobron automobile factory, their father, Senator Gobron having died a couple of years ago. The company was very prominent, in the early days of the industry, for its double-piston motors.

Order 21,382 New 6-30 Chalmers

600 Dealers, in Record-Breaking Convention, Find 288 Demonstrators Ready

DETROIT, MICH., Nov. 19—Six hundred dealers representing the Chalmers Motor Co. in all parts of the country took the city by storm, and they are said to have contracted for 21,382 of the new Six-30's before they left. This is more than the factory can produce up to next June, as President Hugh Chalmers promised an output of 18,000 between now and then.

Three very full days of fun and business for the Chalmers representatives ended with a banquet at the Detroit Athletic Club to-night, and it was a fitting climax of a convention which was undoubtedly the largest of its kind ever held here, if not in the industry. An army of the new Chalmers sixes transported the dealers to and from the factory and the hotels, and everything was done for the visitors to make their stay profitable and enjoyable.

Starting on Monday morning, Nov. 15, with an opening address by President Chalmers, the convention was well under way the first day. A dinner in the convention hall of the Pontchartrain Hotel ended the opening day; on the following evening a beefsteak dinner and smoker was held at the Statler Hotel; and Mr. Chalmers' closing address on Opportunity at the banquet at the Athletic Club was the parting word.

Roadster Out April 1

Paul Smith announced that a roadster will be supplied on the same chassis as the touring model Six-30 on April 1.

A feature of the convention was a parade of 288 of the new Six-30 cars and enough other Chalmers cars to bring the total in line to over 300. This long line of machines coursed through the main streets and boulevards of the city in the afternoon of the first day, following the opening session at the factory when the new model was revealed to the dealers. It is said that this is the largest number of cars that a manufacturer has had ready in the history of the industry on the occasion of the coming of the dealers. Following the opening session, the doors were thrown open and the dealers saw before them the long line of nearly 300 cars. Each car was tagged with the name of the dealer to whom it was allotted as a demonstrator, and the men had a merry time finding their own cars. It was like a gigantic dinner party, at which each guest must hunt for his place card.

In addressing the dealers Hugh Chalmers gave them due credit for the part they have played in the development of the Chalmers company. Eight years ago it was started here with a capital of $150,000, and to-day it has a capitalization of $8,000,000, and occupies twenty-four buildings on 26 acres of ground.

"Since we last met at Cedar Point a year ago last July," said Mr. Chalmers, "much has happened in the world. At that time the entire world was at peace. Now about three-fourths of the civilized world is engaged in warfare. Much as we deprecate this war, and would pray God it may end soon, it isn't of our making, and it isn't within our power to stop it. I think we should all pause for a moment and thank God that we are American citizens; and, in the second place, we ought to be thankful that we are engaged in an industry that commands the respect of the entire country, because it has proved in these troublous times that it is not of mushroom growth, but is one of the real, stable industries of the time, and it has done much to steady the hand of business during these disturbed days.

Existence Enforces Progress

"Not only have we seen great world changes in the last sixteen months, but we have seen great changes in our own automobile industry, and while it has been a prophecy for a long time that the automobile business would result in a survival of the fittest, this is no longer a mere prophecy; it is a reality to-day. It is no longer possible for a company to stand still in this business, because to stand still is to retrograde. I believe that the successful companies must continue to grow bigger or else go out of business, because competition is going to be even keener in the future than it has been in the past.

Selling Most Important

"There are four great elements in the manufacturing business. These are selling, making, recording and the management forces. While I do not wish to minimize the difficulties of making or recording, or of the management, yet I can truthfully say that selling is the most important part of any business. The reason for it is quite apparent if you will study the question for a few minutes. If we make one car right, we can from that model make 1,000,000 just like it, if we choose to do so, because the making of these cars is wholly within our control. We buy the materials, put up the buildings, buy the machinery, employ the men, raise the capital, or borrow it, and with these things we can create what is called a manufacturing plant. But this plant would be a mere tombstone in activity if it were not for the selling force which makes it possible for the wheels to run."

Isaac F. Marcosson, a noted writer and lecturer, when speaking before the

Chalmers men on the subject of The War and Salesmanship, said in part:

"Undoubtedly the most impressive feature of the foreign conflict and one that stands out as the single big lesson of the war, is the value of preparedness. The Germans were prepared for the great business of war. When they started the war, they had the map of every country in the world literally under their hats. Before the war cloud ever appeared, they had exhibited similar traits in their business transactions with the rest of the world.

"When they started out to conquer the commerce of the world, they first found out what their customers wanted and gave it to them. They knew their market, and sent out men who spoke the language of the countries in which they marketed their goods. Furthermore these men lived in their adopted countries and became a part of the commercial fabric.

"Contrast the conditions in England at the outbreak of the war with those in Germany at the same period. Here unpreparedness is as great a lesson as Germany's preparedness.

War at Motor Car Speed

"It is hard for us to realize the part the motor car is playing in the war. Without motor cars, the war could never have been carried on in its present scale. Wherever you go in Europe, you find the war geared up to the motor car.

"The war has taught us a great lesson in civilization. I am glad to see that business is neutral—there is no creed in salesmanship. We are at present on the verge of a great era of prosperity, and all conditions point to the fact that the great business of the future will be the defensive of peace, instead of toward the offensive of war."

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Becker Is Lakey Foundry Manager

MUSKEGON, MICH., Nov. 20—With the appointment of Herman A. Becker, as general manager of the Lakey Foundry Co., this company will enter upon a new era of expanding its business. A new machine shop to take the place of the present one will be started at once. It will be constructed around this old shop in order not to interfere with the business of the company, which is growing with considerable rapidity.

Mr. Becker comes from the Rutenber Motor Co., Marion, Ind. Previous to his connection with this concern he was with the Allis-Chalmers Co., Milwaukee, Wis., for fourteen years.

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Foundry Buys Havers Plant

PORT HURON, MICH., Nov. 17—The plant of the defunct Havers Motor Car Co., has been purchased by the Romeo Foundry Co.

Henry Ford & Son Is Tractor Firm

Profits To Be Divided Among Plant Workers and Tractor Buyers

DETROIT, MICH., Nov. 20—The Ford tractor will be made by the firm of Henry Ford & Son, Dearborn, Mich. So it was stated by Henry Ford. There will be no stockholders and the profits of the company, at least a large percentage, will be divided among the workers of the plant and among the purchasers of the tractors, it being intended to sell them under a profit-sharing system.

The big new main plant which is to make Dearborn known a little better throughout the country and the whole world and which is to supersede the present old factory buildings, is to be a four-story building, 160 by 800 ft. Several small buildings which will be a part of the whole works have been under construction for some time, as for insctance the power plant and the pattern shops, the latter now being completed.

Several hundred thousand dollars will be expended in making the plant the biggest and best equipped tractor plant in the world. It is stated that Mr. Ford will invest up to $1,000,000 in the plant.

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Industrial Mfg. Co. Formed

MILWAUKEE, WIS., Nov. 20—The interests owning the Industrial Controller Co., this city, have organized a separate company, known as the Industrial Mfg. Co. to do tool, gage and die work for outside concerns, and make a specialty of such jobs for motor car and truck builders. The regular line of work, electrical and other controlling devices, will not be discontinued, however, as the company has orders to keep it busy for more than twelve months. The works are well equipped and additional machinery will be installed as needed. The owners of both concerns are Charles G. and James B. Welch, formerly of the Welch Bros. Motor Car Co., state agents for the Packard, and Frank W. Magin, engineer and designer. The Industrial Manufacturing Co. is capitalized at $50,000 and headquarters will be in the Controller company's offices and works.

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Newman to Entertain 1400

MILWAUKEE, WIS., Nov. 20—Harry Newman, Inc., Chicago, Ill., appointed distributor of Chalmers cars in Wisconsin, Upper Michigan and southeastern Minnesota, announces that although Mr. Newman will take personal direction of the new business, Stanley E. Comstock, formerly with the Thos. B. Jeffery Co., will be general sales manager, with Snow E. Williams, Chicago, as assistant sales manager. A. H. Speulda, Chicago, will have charge of the business department of the headquarters and service station, now being established in the former packard garage at Grand Avenue and Seventh Street, Milwaukee.

Mr. Newman has issued invitations to 1400 dealers of the territory, to be his guests at Milwaukee on Friday, Dec. 3, which is designated Newman Day. The object of the assembly will be to discuss ways and means for the betterment of conditions in the trade and to establish friendly relationships among dealers. Mr. Newman will tender a banquet to the visitors on the evening of Dec. 3 at the Hotel Pfister.

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Berger Is Manager of New York Lozier Branch

NEW YORK CITY, Nov. 22—L. B. Berger, Lozier factory sales manager, has also been appointed manager of the New York branch. Previous to his connection with the Lozier company he was with the Willys-Overland company in charge of Willys-Knight sales. He has installed a service system which allows any new owner of 50 hr. of free service. A book is issued containing 100 ½-hr. coupons and these are good at any time.

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Simms Additions Under Way

EAST ORANGE, N. J., Nov. 19—Two concrete and brick additions to the plant of the Simms Magneto Co., Bloomfield, N. J., are well under way. One building will be 42 by 70 ft. and will contain the grinding and dipping departments, while the other is 72 by 90 ft. and will house the storage and shipping departments. The additions became necessary to make way for more machinery in the main factory, the entire output of the plant being contracted for well into 1916.

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Baird Saxon Manager in New York

NEW YORK CITY, Nov. 22—Frank S. Baird has become retail sales manager of the Saxon Motor Co. of New York. He was formerly with the Chevrolet Motor Co. in the sales department. H. C. Turner has also joined the New York branch, coming from the Saxon factory.

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Carpenter Represents Pierce in Brooklyn

BROOKLYN, N. Y., Nov. 20—H. L. Carpenter has become associated with the Pierce interests and the Harrolds Motor Car Co., representing both the passenger car and trucks of the Pierce-Arrow company in Brooklyn and Long Island.

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Fafnir Bearing Branch in Chicago

NEW BRITAIN, CONN., Nov. 22—The Fafnir Bearing Co., this city, has recently opened a new branch office at 39 South Clinton Street, Chicago, Ill., with D. D. Davis as manager.

79,759 Cars in Wisconsin

26,600 New Cars Bought in 1915—Expect 80,000 Registrations by Dec. 31

MILWAUKEE, WIS., Nov. 20—Wisconsin automobile registrations by private owners for the calendar year ending Dec. 31 will aggregate approximately 80,000 or 5000 more than anticipated at the beginning of the year. At the close of business on Nov. 18, the Secretary of State's office in Madison reported a total issue of 79,759 licenses to private owners, or only 241 shy of the coveted figure, 80,000. It is considered hardly possible that there will be 241 more licenses issued before the end of the year, when all licenses expire. However, applications have been coming in at the rate of fifteen to twenty-five daily since Nov. 10. On Oct. 25, the total registration was 79,100, showing that between Oct. 25 and Nov. 18, 659 licenses were issued. These figures do not take into account the registration by dealers, of which there are 1581. The motorcycle registration is 8579. Private owners pay $5 as the annual fee, regardless of the period during any calendar year that application is made. Dealers pay $10 per annum, and receive four sets of license plates. Motorcyclists pay $2 per annum.

The total registration of private owners for the year 1914 was 53,161. On the basis of figures issued Nov. 19, the gain for 1915 already is 26,598, or nearly 1600 more than conservative estimates of the probable gain made at the beginning of the year. This goes to prove that Wisconsin absorbed approximately 26,600 new cars during 1915, inasmuch as licenses are annual and licenses are transferable on the sale of the car to hold good on the new car, and the purchaser of the old car is required to take out a $5 license.

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Boston Dealers Win Fight Against Bad Law

BOSTON, MASS., Nov. 20—Boston automobile dealers have won their fight against the law that was being enforced to class them among the junk-dealers and pawnbrokers. It started a few weeks ago when the police officials went about among them and requested that each one take out a license at $5 to do business in second hand cars, and they were notified not to sell any cars that they took in before thirty days. The dealers refused because it would be a very serious hardship to them.

So acting under orders one of the police officials arrested F. A. Hinchcliffe, manager of the New England branch of the Winton Motor Car Co., charging him with refusing to take out a license, and also with the selling of a car before the thirty-day period expired.

The Boston Automobile Dealers' Association decided to fight the case for Mr. Hinchcliffe, and so their attorney John B. Sullivan, Jr., appeared for him. The attorney showed that the intent of the law was to protect people from disposing of small things that had been stolen, not motor cars. He also showed that by paying a license to the State to do business as motor dealers they could not be expected to pay another license to the city of Boston, as no other class of people have to pay two licenses to do business. After hearing the argument by the police attorney the judge stated that there was no violation of the law and discharged Mr. Hinchcliffe.

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Commercial Agency Liable for Misleading Credit Reports

NEW YORK CITY, Nov. 20—The Appellate Division decided here this week that the Bradstreet Co. is liable to its subscribers for damages sustained when misleading information is furnished to them by the company. The case is of importance to all concerns depending upon commercial agencies for information concerning the credit of customers.

The case was that of A. J. Munro, a fur dealer, who lost $1,650 on furs delivered to the firm of Jackson & Sulzer, now bankrupt. Depending upon information concerning the firm supplied him by the Bradstreet Co., Munro extended credit to Jackson & Sulzer who shortly after were petitioned into bankruptcy.

The Bradstreet Co.'s defense stated that its contract with Munro absolved it from any responsibility for errors in information furnished concerning the standing of a commercial house. Justice Laughlin, writing the prevailing opinion, concurred in by Justices Dowling and Scott, says in part:

"A reasonable construction of the agency contract, I think, is merely to relieve the defendant from errors and mistakes, but not from knowingly making a false report, or gross mistake, or gross negligence in making a report to the plaintiff."

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Missouri Registrations Gain 45 Per Cent

JEFFERSON CITY, MO., Nov. 19—In the nine months ending Nov. 1, 20,804 more automobiles were registered in Missouri than in the whole year of 1914. This increase of about 45 per cent is shown in figures given out at the office of Secretary of State here to-day.

Last year a total of 54,489 motor vehicles were licensed in Missouri. In the first nine months of the current registration year, 75,293 licenses were issued. Of these, 15,199 went to St. Louis and 9,168 to Kansas City. One-third of the total are owned by farmers.

Co. To Build Cars and Tractors

Corliss Steel Co., Racine, To Also Make Gas Engines, Tools and Metal Products

RACINE, WIS., Nov. 20—The organization of the Corliss Steel Co., Racine, Wis,. with a capital stock of $10,000, is believed to be the preliminary step in the establishment of a large automobile, tractor and engine business. The promoters of the new company are all well known in the motor car industry, being F. Lee Norton, for many years vice-president and general manager of the J. I. Case T. M. Co., Racine; Capt. William Mitchell Lewis, former president of the Mitchell-Lewis Motor Co., Racine, and Herbert F. Johnson, also of Racine.

The Corliss Steel Co. is organized for the purpose of manufacturing automobiles, engines, tractors, farm machinery, machine tools, and to make and deal in forged, stamped and pressed steel and metal products. While definite plans are withheld for the present, it is reported on good authority that the new concern will begin business in the big engineering works of the defunct Wisconsin Engine Co. at Corliss, Racine County.

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Goby in Motor Engineering Co.

CLEVELAND, OHIO, Nov. 22—The Motor Engineering Co., West Third Street, Cleveland, Ohio, has been incorporated with a capital of $30,000 by C. S. Goby, formerly chief engineer of the Goby Engine Co., and others. The company will manufacture motors and automobile parts; conduct experimental work, such as designing and general engineering work pertaining to automobiles. The new factory building now in process of construction will be occupied by the new organization about Jan. 1.

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Gorey Buys Herreshoff Parts

NEW YORK CITY, Nov. 22—J. C. Gorey & Co., this city, has purchased from the American & British Mfg. Co., Bridgeport, Conn., all the remaining parts, jigs, tools, dies and patterns of the Herreshoff car and can now supply any material for these cars.

Last year the company purchased from the Timken Detroit Axle Co. all the remaining rear and front axles, together with the remaining parts of the Herreshoff car.

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Dimmer Ordinance for Wilmington

WILMINGTON, DEL., Nov. 22—A dimmer ordinance has been passed for Wilmington by the Street and Sewer Commissioners, who have control of the

streets, and it will become effective Dec. 10. It is similar to the Baltimore law, the requirements being as follows:

All automobile lights in the city at night must be dimmed to at least 30 candle-power for headlights and 4 candle-power for side lights, under penalty of from $1 to $5 for the first offense and $25 for each offense after the first.

The owner of a car is held responsible unless he can supply the police with information to prove that some other person is responsible.

The ordinary "dimmer" or auxiliary lights operated by a switch from the seat will not be permitted unless the headlight itself so operated is itself so shaded or constructed that even when cut in from the seat it will not produce glare.

Gas and electric lights are permitted where they do not exceed 4 candle-power.

The use of any headlight of not over 30 candle-power will be permitted where the glass is covered with tissue paper, paint, frosting or any other substance of sufficient capacity to prevent the outline of the flame being made out.

The requirements do not apply to non-residents who are complying with the laws of their own States, unless they are asked by the police to shut off or dim their lights, which they must do.

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After Short-Measure Gasoline Dealers

COLUMBUS, OHIO, Nov. 21—Thomas L. Calvert, chief of the dairy and food division of the Ohio Agricultural Commission, who also looks after weights and measures, is going after garages which give short measure in the sale of gasoline. A number of inspectors have started out in response to complaints from numerous automobile owners that small garages and store proprietors are giving short measure in their measuring apparatus. The law provides for a fine of $500 and six months in jail, upon conviction.

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New Traffic Rules for Ohio

COLUMBUS, OHIO, Nov. 20—Under the provisions of the new Cass highway law, State Highway Commissioner Clinton Cown has prepared a set of traffic rules and regulations to be effective on and after Dec. 5. Some of the rules must be obeyed under penalty of the law while others are merely suggestions, one of the latter being to the effect that all vehicles, whether horse-drawn or motor-driven, be equipped with lights at night. Some of the points forbidden by the new regulations are: Unnecessary emission of dense smoke from motors; riding on any vehicle without consent of the driver; and permitting horses or domestic animals to run loose on the highways.

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Bijur Strike Off in September

HOBOKEN, N. J., Nov. 23—The article in THE AUTOMOBILE for Nov. 18 stating that the Bijur machinists had returned to work was an error as there was not a strike. There was a strike during the latter part of August which was declared off around Sept. 13 without the company giving in to the strikers.

Territories Buying More Cars

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Exports to Hawaii, Porto Rico, Philippines and Alaska Show Increase

WASHINGTON, D. C., Nov. 21—Figures have been compiled by the Department of Commerce showing the commerce of the United States with its noncontiguous territories during September and the nine months ended September, together with figures for the corresponding periods of last year.

Eighteen automobiles valued at $20,879 were shipped to Alaska during September, as against three cars, valued at $5,100 shipped in September a year ago. During the nine months' period the shipments increased from fifty-four cars, valued at $69,703, in 1914, to seventy-three cars, valued at $97,926, in 1915.

Shipments of cars to Hawaii show a healthy growth. During September a year ago the number was seventy and the value $75,976, increasing to 169 cars, valued at $180,083, in September last, while during the nine months' period the number increased from 616 cars, valued at $649,282, in 1914, to 857 cars, valued at $926,994, in 1915.

Automobiles to the number of thirty-four, valued at $33,542, were shipped to Porto Rico in September a year ago, while during September last the number was 103 and the value $83,052. During the nine months' period these shipments increased from 248 cars, valued at $235,357, in 1914, to 529 cars, valued at $421,815, in 1915.

There were eighty-four cars, valued at $168,491 shipped to the Philippine Islands in September last, as against four cars, valued at $4,240, shipped there in September a year ago. During the nine months' period these shipments rose from 355 cars, valued at $360,751, in 1914, to 573 cars, valued at $681,712, in 1915.

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French Automobile Men Not Captured—Where They Are

PARIS, Oct. 23—German newspapers have informed their readers that M. Delaunay, of the Delaunay-Belleville Automobile Co., has been captured while serving as an aeroplane pilot in the French army, and also that Georges Sizaire, Albert Guyot and Arthur Duray have been made prisoners while driving automobiles at the front.

Fortunately there are a few errors in the report. No person of the name of Delaunay is attached to the Delaunay-Belleville company, the proprietors of that concern being Robert and Pierre Delaunay-Belleville, both of whom are attached to their factory, in the suburbs of Paris, and engaged on the construction of war material. The report seems to have as its foundation the capture, early this year, of a young aeroplane pilot named Delaunay, who has no connection whatever with the Delaunay-Belleville family. Delaunay was a competition driver before the war and won the last Tour de France on a Pierron car. After serving as an automobile driver at the front, he was transferred to the Flying Corps, and on his first outing lost his way and came down in the enemy's lines.

Guyot in Argonne

Since the German report appeared, Georges Sizaire has taken President Poincare on two trips to the front, and at the present moment is in Paris, attached to the President's reserve staff. Albert Guyot is attached to the headquarters staff of one of the armies operating in the Argonne, and has only been away from the front six days in fifteen months. Guyot, who is a certified aviator, having been the first man to fly in Russia, has applied for a transfer to the Flying Corps, and expects to be moved shortly.

Duray on Special Work

Arthur Duray, runner-up in the 1914 Indianapolis race, is attached to what is known as the General Automobile Reserve, and is driving a Delaunay-Belleville car. Duray, who volunteered for service, was attached to Minister Viviani for several months, and is now undertaking special missions from Paris to the front. Boillot has been made sub-lieutenant and is learning to be an aeroplane pilot. Goux is driving the military governor of Belfort. Jean Chassagne, the Sunbeam expert, has been taken out of the artillery, where he was serving as a sub-officer, and is now attached to an important aerodrome in the suburbs of Paris. He is in charge of a team of mechanics fitting Sunbeam twelve-cylinder motors to French aeroplanes. Victor Rigal, who has been both a Sunbeam and Peugeot driver, and has performed in America, is now a sub-lieutenant in charge of an automobile convoy.

Among the old-time automobile drivers Victor Hemery is a driving instructor; Louis Wagner, of Vanderbilt fame, is serving in the artillery; Rougier is an aviator; Henry Fournier has charge of a shell-making factory; Maurice Sizaire, of the Sizaire-Berwick Co., is in command of an automobile repair shop at the front; Caillois is doing similar work at Chalons; Charles Faroux, automobile editor, is attached to the government aeroplane motor laboratory and tests all new motors before they are accepted by the army; René Thomas is making aeroplane motor parts in his own shop, near Paris.

Gasoline Prices Are Higher

1-Cent Advances Reported Throughout Country—Miller Rubber Co. Elect Officers

NEW YORK CITY, Nov. 23—The rise in the price of gasoline in this city yesterday to 19 cents a gallon, has followed similar ones in the large cities throughout the country. The 1 cent rise in New York results in a corresponding advance in the retail price to 21 cents a gallon.

In other eastern cities, such as Boston, Newark and Buffalo, prices have received 1-cent advances, tank wagon basis.

In the West, including such cities as Chicago, St. Louis, Denver and points in Texas, gasoline yesterday was quoting at 1 to 2 cents higher. In Texas, the present price is 19 cents a gallon, an advance of 2 cents. For the fifth time in about two months the price of gasoline has gone up 1 cent in St. Louis, quoting at the filling stations at 15 cents. The price will be duplicated by the independent companies. Gasoline prices have been advanced 1 cent a gallon, tank wagon basis throughout Wyoming, Montana and Colorado by leading distributors. Denver prices are now 18 cents a gallon, tank wagon basis. The price to consumers is 19 cents. This is the sixth advance in the retail price within sixty days. Chicago prices have been advanced 1 cent to 14.102 cents a gallon, flat, tank wagon basis.

A further tightening of gasoline prices in the Milwaukee district is indicated by the announcement issued on Nov. 19 by the independent jobbers to the effect that the quotation on tank wagon delivery in lots of 100 gal. or more has been withdrawn, and in the future the quotation will be on the existing tank wagon delivery basis, any quantity. The 100-gal. quotation has been uniformly 1 cent under the ordinary tank wagon price, which is about 1 cent lower than the filling station quotation. The announcement, in effect, means a 1-cent increase in tank wagon prices for large lots. Only two sets of quotations will be issued until further notice, as follows:

Sp. Gr.	Filling Station (cents)	Tank Wagon Delivery (cents)
59°	14.5	13.6
62°	16.0	15.0
65°	19.0	18.0
70°	22.0	21.0

Miller Rubber Officers Re-elected

AKRON, OHIO, Nov. 20—At the annual stockholders' meeting of the Miller Rubber Co., recently held here, all the officers and directors were re-elected. This includes Jacob Pfeiffer, president, C. T. Grant, vice-president; F. B. Theiss, treasurer and assistant secretary; W. F. Pfeiffer, secretary and assistant treasurer. They, together with J. M. Doran, comprise the board of directors.

The president's report showed an increase in surplus to $813,000, and common dividends were increased from 10 to 12 per cent per annum, as reported in THE AUTOMOBILE for Nov. 18. Sales for the year were 30 per cent greater than the year previous. The company also increased its floorspace during the year by 6½ acres.

Markets Continue Rise

NEW YORK CITY, Nov. 23—Market prices soared last week. With the exception of tin which dropped $3.75 per 100 lb., prices were extraordinarily high. Crude oil from Pennsylvania is now selling at $2 a barrel and Kansas crude is quoted at $1. Both electrolytic and Lake copper reached new high marks when the market closed last night. Eectrolytic, after an advance of ¼ cent, closed at 20 cents a pound. There is an enormous domestic demand with large buying for future delivery. Foreign orders for copper have not shown any signs of slackening.

Crude rubber prices reached new high marks. Up-River Para yesterday sold at 75 cents a pound. First latex pale crepe rubber from Ceylon rose to 88 cents. For several weeks the quotations for both Para and Ceylon grades have been advancing, but at no time has there been such a big jump as between last Saturday and yesterday. Higher prices are looked for. The recent closing of the Suez canal by the English government had a potent effect on the quotations. Authorities state, however, that this is not the only reason for the high prices. The stocks of plantation rubber actually in the London market are not very large. According to a recent cable, there were 3200 tons lying outside that had not been unloaded. The closing of the canal will mean that it will take three weeks to a month more to lay down plantation rubber in London than formerly. The amount of Para rubber on hand in Brazil is said to be only moderate.

Bill for More Severe Punishment in Bay State

BOSTON, MASS., Nov. 20—A bill has been filed in Massachusetts to make the penalties more severe for motorists. If a motorist goes away after an accident the penalty is to be a fine of not less than $100 nor more than $1,000, and imprisonment for not less than three months nor more than three years, or both a fine and imprisonment.

In case death results and the driver is apprehended after fleeing the penalty is to be not less than ten years nor more than twenty years. Also it makes it prima facie evidence of willful neglect and criminal intent, and in a suit for damages if the injured person wins the judge shall order that whatever sum is awarded by the jury shall be tripled.

Where convictions occur on charges of operating while under the influence of liquor the clerks of the courts are ordered to notify the Highway Commission within 24 hr. That body is then to suspend the license indefinitely. A second conviction on the same charge calls for the permanent revocation.

New Paterson Distributor in Phila.

PHILADELPHIA, PA., Nov. 19—The Paterson Motor Sales Co., this city, has been formed by C. O. R. Kindig and D. M. Martin, formerly with the Maxwell Motor Co., with temporary offices at Broad and Race Streets. The company has been incorporated and Mr. Kindig is president. Mr. Martin, who is vice-president and treasurer, will concentrate on the wholesale end.

Stewart-Warner Salesmen Meet

CHICAGO, ILL., Nov. 22—The sales force of the Stewart-Warner Speedometer Corp. concluded a five-day meeting here yesterday in which three days were given to factory inspection and two days to a convention at the Hotel Sher-

Daily Market Reports for the Past Week

Material.	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.58	.58	.58	.57	.58	.57	—.01
Antimony	.36	.37½	.37½	.38	.38	.38	+.02
Beams and Channels, 100 lb	1.77	1.77	1.77	1.77	1.71	1.77	...
Bessemer Steel, ton	25.50	28.00	28.00	27.00	27.00	27.00	+1.50
Copper, Elec., lb	.18½	.19	.19	.19¼	.19¼	.19¾	+.01¼
Copper, Lake, lb	.18½	.19	.19	.19¼	.19¼	.19¾	+.01¼
Cottonseed Oil, bbl	7.74	7.77	7.80	7.88	7.85	8.06	+.32
Cyanide Potash, lb	.23	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.47	.47	.47	.47	.47	.48	+.01
Gasoline, Auto, bbl	.18	.18	.18	.18	.19	.19	+.01
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb	5.25	5.25	5.25	5.25	5.25	5.25	...
Linseed Oil	.64	.64	.64	.65	.64	.64	...
Open-Hearth Steel, ton	27.00	28.00	28.00	28.00	28.00	28.00	+1.00
Petroleum, bbl., Kansas, crude	1.00	1.00	1.00	1.00	1.00	1.00	...
Petroleum, bbl., Pennsylvania, crude	1.90	1.90	2.00	2.00	2.00	2.00	+.10
Rapeseed Oil, refined	.85	.85	.85	.85	.85	.85	...
Rubber, Fine Up-River, Para	.64	.64	.65	.67	.68	.75	+.11
Silk, raw, Italian	4.80	...	4.90	...	...	4.95	+.15
Silk, raw, Japan	4.55	...	4.75	...	...	4.85	+.30
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb	43.50	43.00	41.63	40.63	40.63	39.75	—3.75
Tire Scrap	.04¾	.04¾	.04¾	.05	.05	.05	+.00¼

man. Thirty-eight representatives from all parts of the country were in attendance. During the three days at the factory they were given practical demonstrations of the mechanical features of the company's product and at the two-days' convention, that which they had seen demonstrated at the factory was further explained by means of charts and diagrams. Luncheon was served on the last day.

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White Not to Exhibit

NEW YORK CITY, Nov. 22—The White Co., Cleveland, Ohio, has decided not to exhibit at either the New York or Chicago show. It is understood that one cause of the company deciding not to exhibit was that at the recent drawing for space, a new rule was put into force by which the order of drawing was in proportion to the amount of passenger car business done during the previous year, whereas formerly the order of drawing was determined by the total volume of business of passenger cars and trucks. White is one of the largest producers of trucks and voting this part of their business out of the reckoning naturally placed them further back in the list of drawing.

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Ames Co. Handles Packard and Dodge

OWENSBORO, KY., Nov. 20—The Ames Motor Car Co., this city, has secured the agency for the Packard and the Dodge.

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Ford Parts Sold in 10-Cent Store

PHILADELPHIA, PA., Nov. 20—Parts for Fords are being sold in a 10-cent store in this city. A counter is being devoted exclusively to the sale of parts for Ford cars at 10 cents each.

Securities Continue to Rise

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Paige 110-Point Rise and Ajax-Grieb 50-Point Feature Market

NEW YORK CITY, Nov. 23—Automobile and tire issues continued their upward movement in prices last week, some of the stocks reaching new record marks. General Motors gained 27 points and reached the high mark of 419; Goodyear closed at 338 with a gain of 10 points; Paige-Detroit made a record mark of 660 or 110 points higher, the stock last week showing an 85-point rise, and Ajax-Grieb, which closed on Saturday at 350, developed a 50-point rise.

A number of the stocks rose to high points during the week and then dropped, among these being Willys-Overland, which rose to 245 on Wednesday and then dropped to 228 on Saturday, and Studebaker, which rose to 167½ on Wednesday and then dropped to 151 on Saturday.

Saxon Stock Sells Well

The subscriptions for stock of the Saxon Motor Co. are coming in very heavily and it is expected that the stock will be oversubscribed.

Several issues dropped, notably Portage Rubber common, which went down 15 points, and Kelly-Springfield second preferred, which dropped 18 points. Peerless common went down 5½ points and Chalmers common dropped 5 points. Willys-Overland common closed with a 19-point loss.

There were a few small gains such as 5 points for Reo Car; 6 and 2 points for Stewart-Warner common and preferred; and 2 points for General Motors preferred.

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Auto Wheel Co. Adds Again

LANSING, MICH., Nov. 17—For the third time since March 1, an addition to the plant of the Auto Wheel Co., is to be built. It will take the place of a wooden building and will occupy all the vacant land on the west side of the plant. Ten new dry kilns will be installed, bringing up the total the company will have to twenty-seven. At least fifty more workingmen will be given employment by Jan. 1. The additions and new equipment put in by the company this year represent an expenditure totalling to $75,000.

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Studebaker Service Building Finished

NEW YORK CITY, Nov. 22—The Studebaker storage and service building in Long Island City has been completed and will be occupied this week. It is a concrete structure 80 by 160 on the western side of Anable Avenue, south of Meadow Street.

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Owner Convicted of Manslaughter in New York

NEW YORK CITY, Nov. 18—The first conviction for manslaughter resulting from an automobile accident that ever has been found in Queens County was returned yesterday by a jury in the case of M. H. Conroy, who ran over a Long Island Railroad flagman. The conviction was liable to carry a 15-year sentence, but Judge Humphreys inflicted a penalty of only three months imprisonment.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co., com	150	..	350	450	+50
Ajax-Grieb Rubber Co., pfd	100	..	101	110	..
Aluminum Castings, pfd	..	..	..	..	..
J. I. Case, preferred	..	..	..	..	..
Chalmers Motor Company, com	..	97	145	160	—5
Chalmers Motor Company, pfd	..	93½	102	104	..
Chevrolet Motor Co	..	..	123	126	..
Electric Storage Battery Co	..	..	..	..	..
Firestone Tire & Rubber Co., com	..	..	..	..	..
Firestone Tire & Rubber Co., pfd	..	..	..	..	..
General Motors Company, com	61	62½	419	423	+27
General Motors Company, pfd	82½	83½	114½	116	+2
B. F. Goodrich Company, com	20	22	70	71½	—3
B. F. Goodrich Company, pfd	87	..	111	112	..
Goodyear Tire & Rubber Co., com	175	187	338	342	+10
Goodyear Tire & Rubber Co., pfd	..	..	111	112½	+1
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co., com	..	..	35	38	—3
International Motor Co., pfd	..	..	55	65	—9
Kelly-Springfield Tire Co., com	53	54	297	302	+2
Kelly-Springfield Tire Co., 1st pfd	70	75	75	77	—18
†Kelly-Springfield Tire Co., 2nd pfd	85	95	270	277	..
Maxwell Motor Company, com	14	14½	72¾	73¾	—5¼
Maxwell Motor Company, 1st pfd	43	45	99	101	—2
Maxwell Motor Company, 2nd pfd	17	18	56	56½	—5
Miller Rubber Company, com	..	..	248	250	—1
Miller Rubber Company, pfd	..	..	109½	110½	..
New Departure Mfg. Co., com	..	..	..	..	..
New Departure Mfg. Co., pfd	..	..	..	..	..
Packard Motor Car Company, com	..	100	130	135	—1
Packard Motor Car Company, pfd	89	..	99	102	—1
Paige Detroit Motor Car	..	..	660	710	+110
Peerless Motor Car Co., com	..	..	36	40	—5½
Peerless Motor Car Co., pfd	..	..	..	..	..
Portage Rubber Co., com	..	..	65	75	—15
Portage Rubber Co., pfd	..	..	98	100	..
Regal Motor Co., pfd	..	..	17	..	..
*Reo Motor Truck Company	10½	11½	21	22	..
*Reo Motor Car Company	21½	22½	54	56	+5
Splitdorf Electric Co., pfd	..	..	..	..	..
Stewart-Warner Speed. Corp., com	40	42	88	93	+6
Stewart-Warner Speed. Corp., pfd	92	98	108	110	+2
Studebaker Corporation, com	27	..	151	153	—9
Studebaker Corporation, pfd	..	81	111	113	..
Swinehart Tire & Rubber Co	..	..	..	90	..
Texas Company	..	..	..	..	..
U. S. Rubber Co., com	43½	44½	53	54	—1
U. S. Rubber Co., pfd	94	96½	107	108	+1
Vacuum Oil Company	..	..	..	..	..
White Company, preferred	..	..	110	..	..
Willys-Overland Co., com	69	71	228	232	—19
Willys-Overland Co., pfd	85	90	113	114	+2

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co., com	..	97	..	162	..
Chalmers Motor Co., pfd	..	93½	..	..	..
Continental Motor Co., com	155	180	242½	255	+8¾
Continental Motor Co., pfd	..	75	90½	..	+1½
General Motors Co., com	66½	68	400	430	+23
General Motors Co., pfd	85¾	87	114	116	+1½
Maxwell Motor Co., com	14	15	72	75	—1
Maxwell Motor Co., 1st pfd	42½	45	99	101	—1½
Maxwell Motor Co., 2nd pfd	18	20	53½	57	—5¼
Packard Motor Car Co., com	..	100	134	..	+3
Packard Motor Car Co., pfd	89	..	100	..	..
Paige-Detroit Motor Car Co	..	..	675	..	+75
*Reo Motor Car Co	21⅝	22¼	53½	54½	+1
*Reo Motor Truck Co	10½	11⅛	21¼	22¼	..
Studebaker Corp., com	..	..	150	154	—7½
Studebaker Corp., pfd	..	..	109	114	—1

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2000	2750	..
Kelsey Wheel Co	185	..	220	..	+5
*W. K. Prudden Co	19	20½	24¾	25¾	+ ½
Regal Motor Car Co., pfd	..	25	18	24	..

*Par value $10. †Old stock.

40 More Show Exhibitors

39 Additional Accessory Firms —Greer Co. To Show Ford at Chicago

NEW YORK CITY, Nov. 20—Thirty-nine accessory exhibitors have been added to the coming New York City and Chicago automobile shows and the Erwin Greer Co., will also exhibit the Ford car in Chicago. The new accessory exhibitors are:

AT BOTH NEW YORK AND CHICAGO

Cleveland Worm & Gear Co.	Cleveland, Ohio
Compression Inner Tube Co.	Louisville, Ky.
Gas Engine Efficiency Co.	St. Louis, Mo.
K-W Ignition Co.	Cleveland, Ohio
Motor Knowledge	New York City
Pull-U-Out Sales Co.	St. Louis, Mo.
Strauss & Buegeleisen	New York City
Swedish Crucible Steel Co.	Detroit, Mich.
Victor Lamp Co.	Cincinnati, Ohio
X Laboratories	Boston, Mass.

NEW YORK ONLY

J. Alexander Mfg. Co.	New York City
Bridgeport Coach Lace Co.	Bridgeport, Conn.
M. K. Bowman-Edson Co.	New York City
Cox Brass Mfg. Co.	Albany, N. Y.
Dayton Rubber Mfg. Co.	Dayton, Ohio
Disco Electric Starter Co.	Detroit, Mich.
Eastern Rubber Co.	Philadelphia, Pa.
Ericson Mfg. Co.	Buffalo, N. Y.
Hartford Clock Co.	Hartford, Conn.
J. H. Tonneau Shield Co.	New York City
Marathon Tire Sales Co.	New York City
Marvel Mist Mfg. Co.	Brooklyn, N. Y.
Motor Appurtenances Corp.	New York City
Motor Necessity Co.	Chicago, Ill.
Motor Products, Inc.	Stamford, Conn.
Norparell Horn Mfg. Co.	New York City
G. Piel Co., Inc.	Long Island City, N. Y.
Stewart Accessories Co.	Detroit, Mich.
Utility Products Co., Inc.	New York City
Weston Electrical Instrument Co.	Newark, N. J.
Woodbridge Chemical Co.	New York City

FOR CHICAGO ONLY

Apex Electric Mfg. Co.	Chicago, Ill.
Auto Parts Mfg. Co.	Milwaukee, Wis.
Columbus Varnish Co.	Columbus, Ohio
Gray Bros. & Co.	Chicago, Ill
Greer College of Motoring.	Chicago, Ill.
W. H. Howell Co.	Geneva, Ill.
Simplex Short-Turn Gear Co.	Anderson, Ind.
Wales & Anderson.	Chicago, Ill.

Mail Trucks in St. Louis

ST. LOUIS, MO., Nov. 15—The St. Louis mail service to-day was motorized. Fifty new government owned motor trucks replaced the wagons, street cars, leased automobiles, bicycles and whatnots which heretofore had been used in collecting and delivering mail in this city and its suburbs.

Twenty of the trucks were delivered to the government by the General Motors Truck Co. of this city at a cost of about $30,000. Fourteen are of 1500-lb. capacity and six of 3000 lb.

Curbstone Dealers Need No License

LANSING, MICH., Nov. 18—According to an opinion given by Attorney-General Grant Follows, to Secretary of State Coleman C. Vaughan, automobile dealers or agents who sell cars but have no garage or do not operate a garage, and who are generally spoken about as curbstone dealers, do not have to take out a dealer's license. They must, however, register each machine they control and operate or get a general license number for them as provided by the law.

The opinion was brought about in reply to the following letter from the Secretary of State: "We have several parties in this place that are running a curbstone agency, that is, they have the agency for different makes of cars and are selling same but still do not run a garage. Can you tell us if these parties are supposed to have a dealer's license and pay a license of $50 like other parties who own garages, or are they exempt? We feel that if they are selling cars they should have a dealer's license and we would be pleased to have you advise us on the matter."

Cooper in Stutz Wins Ariz. Grand Prize

PHOENIX, ARIZ., Nov. 20—*Special Telegram*—Earl Cooper added another victory to the Stutz string to-day when he was awarded first honors in the Arizona Grand Prize, the closing feature of the annual State Fair. The race, scheduled for 150 miles was called at 5.25 p. m. because of darkness and dust. At that time Cooper was leading. He had covered 109 miles in 1 hr. 42 min. and 30 sec., an average of 63.8 m.p.h.

When the race was called Parsons, also at the wheel of a Stutz, was second, having completed 108 miles in 1:42, while Walterman, driving an Overland, was third, his time for 103 miles was 1 hr. 42 min. 31 sec. Out of a field of thirteen starters the following cars were still in the race when flagged:

Sebring, Haibe, 102 miles; Apperson, Price, 100 miles; Durant Special, Durant, 97 miles; Duesenberg, Bolden, 93 miles; Stutz, Wood, 93 miles; and National, Reeves, 86 miles.

Barney Oldfield's Fiat went out with a broken connecting-rod before it had covered a mile.

90 Per Cent Rebate to St. Louis Exhibitors

ST. LOUIS, MO., Nov. 19—A rebate of 90 per cent to exhibitors at the last annual automobile show held by the St. Louis Manufacturers' and Dealers' Association has been declared. Joseph A. Schlecht, chairman of the show committee, said that the earnings of the show would warrant even a 92.8 per cent rebate, but it was considered advisable to divert 2.8 per cent of the earnings into the treasury of the association.

This is the largest rebate ever paid in the history of the organization. The largest previous rebate was 60 per cent, paid to member exhibitors at the 1913 and 1914 shows. Exhibitors at the 1915 show who were not members of the association will not share in the rebate.

Rules for Amateur Race

Drivers Must Own Cars Which Must Be 1914 Models or Newer

CHICAGO, ILL., Nov. 22—The contest board of the Chicago Automobile Club has accepted a set of rules, drafted by a special committee, under which the amateur drivers' race, tentatively scheduled for the Chicago speedway in May, probably will be run.

The rules, which have been sent to the A. A. A. contest board for ratification, stipulate that only amateurs may participate in the proposed event and that each entrant must own the car. The nomination of any car antedating a 1914 model will be refused.

Each car must carry complete equipment as listed in the catalog of the maker, with the following exceptions—spare tires and wheels, tool box and jack. Lamps and windshields may be removed at the track on the day of the race but tops must be carried.

In order to qualify, each driver must make one lap of the 2-mile track at an average of 55 m.p.h. or better. After the time trials, the cars will be divided into three equal divisions and three elimination heats, each of 20 miles, run. The first four cars to finish in each heat will be eligible to compete in the finals, which will be a 50-mile contest.

Although the date of the proposed race is more than five months away, twelve entries already have been promised. They include four Mercers, three Stutzes, two Nationals, two Cadillacs and a Stearns-Knight.

Motor Mail Service for Chicago

CHICAGO, ILL., Nov. 19—Beginning Nov. 21, seventy-six White trucks will supplant the street car service between the main postoffice and the outlying substations. When circumstances permit all horse-drawn vehicles in the postal service of Chicago will be superseded by motor vehicles. The cars are to be owned and operated directly by the federal government, whereas the team and street car service which they will replace was under contract by private owners.

Speedwell Receiver Finishes Work

DAYTON, OHIO, Nov. 18—C. R. Green, receiver for the Speedwell Motor Car Co., in the action of the Dayton Savings & Trust Co. for foreclosure on mortgage bonds, has filed his final account and been discharged as receiver. His report shows $19,180.20 received and expended as receiver between Aug. 4 and Nov. 4, 1915.

Howe Rubber Adds—The Howe Rubber Co., New Brunswick, N. J., maker of automobile tubes, will expend $70,000 for the construction of a new factory building in that city.

Equipment Co. to Build—The Champion Auto Equipment Co., Chicago, Ill., has purchased a plant at Wabash, Ind., where it will manufacture automobile tires, tire inflators and pumps.

To Make Parts in Boonton—The Central Machine & Supply Co., New York City, has acquired a site at Boonton, N. J., where it plans to establish a plant for the manufacture of automobile parts.

To Make Tires—A tire plant is planned for Wichita, Kan., by the Wichita Auto Tire Manufacturing Co. with a capital of $600,000. The incorporators are Charles Darrigrand, Ransom Stephens, C. H. Matson, W. T. Watson and M. V. Price.

National Rubber Adds—The National Rubber Co., Pottstown, Pa., is having a two-story reinforced concrete factory and a one-story power house built at Pottstown. The former is 135 by 170 ft. and the latter 45 by 120 ft.

To Make Spring Wheels—The Montana Improved Wheel Co., recently incorporated, contemplates the construction of a plant at Bozeman, Mont., for the manufacture of a spring wheel for automobiles.

Savage Tire Adds—The Savage Tire Co., San Diego, Cal., will build an addition to its plant on Main Street.

Oregon Co. to Build—The Oregon Motor Car Co., Portland, Ore., is preparing to build a plant 100 by 100 ft., costing $30,000.

Double-Tread Tire Plant in Salt Lake City—A. C. Friedman and Frank Sale, president and vice-president of the Western Double Tread Tire Co., 1241 Broadway, Denver, and Leo Jacobson, are organizing a Utah corporation to operate a double-tread tire plant in Salt Lake City.

To Make Steel Wheels—A new firm to be incorporated as the Ideal Wheel Co. will be established in Massillon, Ohio, for the manufacture of steel wheels for automobiles. Arnold Markel, Cincinnati, will be general manager. It will occupy a building at the plant of the Everhard company.

Limousine Top Buys Bldg.—The Limousine Top Co., Kalamazoo, Mich., has purchased a two-story building, 50 by 200 ft. which was part of the old Michigan Buggy Co. plant. A warehouse, 40 by 80 ft., has also been acquired. The company's business required these additions to meet the big increase in sales.

A. O. Smith Adds—The A. O. Smith Co., Milwaukee, Wis., pressed steel frames, parts and motor trucks, is about to erect a new boiler house to accommodate the increased demand of its power plant. The building will be 40 by 70 ft. in size and 50 ft. high, and contain three 300 hp. boilers, together with the latest conveying, stoking and pumping equipment. The company will spend $35,000 in the improvement.

Gemmer to Increase Production.—The Gemmer Mfg. Co. of Detroit, Mich., which makes steering gears, will greatly increase its production when additions to the plant, now under way, are completed. One addition consists of a two-story building, the size of which is partly 171 by 60 ft. and partly 138 by 60 ft. An alley, 20 by 350 ft., has been closed to give further room. These additions will enable all departments, principally the assembling, service and machine departments, to be relieved of their present pressure. According to officials, the business of the company is very good and orders now on hand will keep the plant running to full capacity for the next six months. The outlook is the brightest the company ever had.

The Automobile Calendar

Nov. 22-27.....Binghamton, N. Y., Show, State Armory, Binghamton Automobile Dealers' Assn.
Nov. 23.....Phoenix, Ariz., Grand Prix Race, State Fair Course.
Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 5.....Worcester, Mass., American Road Builders' Assn. Day.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 7-10.....New York City, American Society of Mechanical Engineers Convention.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

1916

Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13.....Milwaukee, Wis., Show, Auditorium.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 10-15.....New Bedford, Mass., Show, State Armory.
Jan. 15-22.....Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22.....Rochester, N. Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22.....Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 9-12.....Peoria, Ill., Show, Coliseum. Peoria Automobile and Accessory Assn.
Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Battle Creek Hupp Moves—W. E. Teeter, Battle Creek, Mich., Hupmobile agent, has removed from 27½ West Jackson Street to 14 West Jackson Street.

Philadelphia Body Co. Adds.—Contracts have been awarded for the erection of two warehouse buildings 55 by 270 ft. and 64 by 90 ft., respectively, at Nineteenth Street and Glenwood Avenue, Philadelphia, for the Hale & Kilburn Manufacturing Co., makers of automobile bodies.

Philadelphia Metz Makes Lease—The Metz Automobile Co., 338-340 North Broad Street, Philadelphia, has leased property at 3437 North Broad Street, which has been converted into a showroom and service station, for the accommodation of the new Metz commercial car.

Recent Changes in Seattle—The McQuay-Norris Manufacturing Co., St. Louis, maker of Leak-Proof piston rings and Lynite pistons, has established a factory office in Seattle to look after the firm's interests in the Pacific Northwest. E. G. Norris, brother of President W. K. Norris of the St. Louis factory, is in charge of the office there.

The Willard Storage Battery Co., Cleveland, Ohio, has opened a branch office in Seattle in the Joshua Green Building, in charge of J. P. Schiller, Jr.

Recent St. Louis Changes—The Megue Rubber Co., St. Louis, has been appointed distributer of Mohawk tires in eastern Missouri and southern Illinois. Twenty-four subdealers have been established in St. Louis and ten in surrounding towns.

The Johnson Automobile Co., 3667 Olive Street, has been appointed distributer of H. & D. shock absorbers in Missouri and southern Illinois. Clermont Rider, formerly distributer in the St. Louis territory of H. & D. shock absorbers, has been appointed sales manager of the company and hereafter will be stationed at Goodland, Ind.

The Vehicle Top & Supply Co. has been appointed distributer in Missouri and southern Illinois of the Murphy disappearing truck body. The body is especially adapted to Ford roadsters and takes the place of the tool box.

A. H. Sullivan & Co., St. Louis, has been appointed distributer of the Form-a-Truck in the St. Louis district. This is an extension attached to the chassis of Ford cars lengthening the wheel base to 125 in. and increasing the capacity to 1 ton.

Motor Men in New Roles

Wert Marion Supervisor—G. E. Wert has been made supervising distributer of Marion cars in practically one-half the State of Ohio and southern Michigan.

Nickolous Changes—H. J. Nickolous, formerly with the Studebaker Corp., has been made secretary of the Newell Motor Car Co., Hayes distributer in eastern Missouri and southern Illinois.

Jeffery Hupp Manager—C. E. Jeffery, Jr., formerly of the Wheelock-Jeffery Co., agent for the Oldsmobile at Boston, Mass., has been appointed manager of the Hupmobile Co., New England.

Reed Hollier Rep.—G. G. Reed, until recently New England distributor for the Detroiter, has become New England traveling representative for the Hollier Motor Sales Co., covering Maine, New Hampshire and Vermont.

Cramer Joins Carr—V. C. Cramer has been appointed manager of the Detroit branch of the F. S. Carr Co., Boston, which makes material for automobile tops. Mr. Cramer was formerly president of the American Distributing Co., Detroit.

Toebe Heads Hupmobile Station—The Harrington-Roebe Auto Repair Co., 717 North Grand Avenue, St. Louis, has been designated an official Hupmobile service station. The garage will be open day and night and will carry a complete line of Hupmobile parts. J. C. Toebe, formerly with the Weber Implement & Auto Co., is in charge.

Alfred Resigns—J. N. Alfred, who has been cashier of the Wilson Foundry & Machine Co., Pontiac, Mich., has resigned to become auditor of disbursements of the Timken-Detroit Axle Co., Detroit. Mr. Alfred was for over two years in charge of the credit and collection department of the Oakland Motor Car Co.

Dealers

Times Square Opens New Branch—The Times Square Auto Co., New York City and Chicago, has opened a branch at Kansas City, Mo.

Pittsburgh Packard Builds—A service station, three stories high, 100 by 224 ft., will be erected at Pittsburgh for the Packard Motor Co.

New York City Leases—The Hudson Motor Car Co., New York City, has purchased a site, 100 by 100½, on the north side of West Sixty-seventh Street, 125 ft. east of West End Avenue, and will erect a six-story automobile building to cost $150,000. The site cost $55,000.

The Nordyke & Marmon Co. has leased a site, 60 by 100, at 42-44 West Sixty-second Street, and will erect a five-story sales and service building. The present building was first occupied as a car establishment in 1903, by the White Co.

The Goodyear Tire & Rubber Co. has leased a store at 10 Central Park West, together with a basement space and offices on the second floor.

St. Louis Westcott Moves—The Westcott Motor Sales Co., St. Louis, has closed a lease for the garage of the former Cherokee Automobile Co., 3334 South Jefferson Avenue. This building with 8000 sq. ft. of space, will be used as a service station for Westcott owners and for general repair work.

Madison Dealer Builds—Rademacher & Jaeger, Milwaukee, Wis., Paterson distributers, are building a salesroom, 66 by 100 ft. and two stories, at 2805 and 2807 Vliet Street. The company has closed a contract with the Paterson Co. for 100 6-42 light sixes.

New Willard Service Stations—The Willard Storage Battery Co., Cleveland, has added the following service stations, making a total of 565: Keokuk Armature Works, 1001 Johnson Street, Keokuk, Iowa; A. P. Louch, 32 King Street, Brockville, Ont.; Bond Electric Co., Inc., 186 Main Street, Hornell, N. Y.; T. Carlson Electric Co., Brownwood, Tex.; Macan Jr. Co., 129 Ferry Street, Easton, Pa.; Fairbanks Electric Co., 58 North Main Street, Norwalk, Conn.; Beebe Electric Co., Bedford, Iowa; J. H. Spinharney, Cherokee, Iowa; Norfolk Tire Repair Co., Fourth and Braasch Streets, Norfolk, Neb.; Danville Storage Battery Co., 326 Craghead Street, Danville, Va.; Anaheim Ignition Depot, Anaheim, Cal., and Central California Electric Co., Elmwood Avenue, Lindsay, Cal.

Overland Building in Boston—The Overland Stores Co. is the name of the company that has taken title to a tract of land in the Back Bay section at Boston, Mass., upon which will be erected a four-story structure for the Connell & McKone Co., New England, distributor of Overland cars. The land has a frontage of 215 ft. on Brookline Avenue, and 495 ft. on an adjoining street. The Willys-Overland Co. is erecting another big place at Springfield and others will be put up elsewhere.

VOL. XXXIII NEW YORK—THURSDAY, DECEMBER 2, 1915—CHICAGO No. 23

The AUTOMOBILE

Lighting Systems Simplified

Standard Lighting and Starting Equipment for 1916 Is Lighter, Simpler, Neater and More Efficient —Better Wiring—Oiling Only Attention Needed

By A. Ludlow Clayden

LIGHTING and starting systems, of which there are many makes, divide naturally into main divisions. First come those which hold between them the great bulk of the car manufacturers' business; second, are many more which share with some of the former the growing trade in equipments for Ford cars and old vehicles which were sold originally without any electric equipment. In the following the first class will be considered, though the general remarks apply to both fields to a very great extent. The second class of instrument is frequently as interesting from the viewpoint of its method for attachment as from that of its electric system, and this class will be considered in a later review.

Still Enormous Variety

Being the newest portion of the automobile chassis it is natural that the lighting and starting system should be the furthest from a settled form. Both electrically and mechanically there are still many systems of construction, there is little agreement between one manufacturer and another, and it is difficult to trace any definite trends except in a very broad way.

One definite thing which is more distinctly traceable this year than it was last, is the growth in popularity of the two-unit system. There are a few notable exceptions, but it is the opinion of the majority of manufacturers of generators and starting motors that the two-unit for large cars is a settled type. For small cars, cars of which the engines are sufficiently small not to need much electric power for starting, the single unit is cheaper and is giving satisfactory service.

Another striking point is the gradual elimination of "controls." At one time it was a common idea that some regulation was necessary so that the difference between summer and winter conditions could be met. For instance there are some systems which allow the generator to be set to cut in and start charging at a lower engine speed for winter work. Now only quite a few of these remain, since it is found that a system which will give all the current needed for winter driving will not overproduce to a harmful extent in the summer.

Next in order of development may be put a general mechanical simplification, which brings in its train some reduction in weight.

Starting Motor Drives Simplified

There are hardly so many methods in use for connecting the starting motor of a two-unit system to the engine. Practically the Bendix pinion reigns supreme in every instance where the toothed flywheel is employed and there is no additional gear reduction between the crankshaft and the armature shaft of the motor. The success of the Bendix pinion is a remarkable instance of what can be accomplished by a timely invention; certain small drawbacks found with the first installations have been overcome, and at present the magnetic and other forms of pinion shift find extremely little favor, though they have each special points of advantage.

Too Many Patterns

There is still a ridiculous number of shapes and sizes and patterns for generators and starting motors, not because of the numerous makes, but on account of the multifarious patterns made by each manufacturer, in the majority of instances. Time will cure this, of course, since the present state of affairs is uneconomical, bad for the electrical firm, bad for the automobile manufacturer, bad for the user and terrible for the repair shop men. It makes for inefficiency all along the line.

The cause for the state of affairs is twofold. First, the electrical specialists had to make many large scale experiments, and it is only lately that the two or three best electrical constructions have been decided upon. Secondly, automobile manufacturers called for generators and motors of such and such dimensions to suit their engines and their chassis, and the electrical manufacturers did not hesitate to produce a "special model" to meet the detail requirements of each car builder.

The worst of this chaos is over and another couple of years will see the situation in a properly standardized condition, probably with the help of the S. A. E. which will be forthcoming as soon as everyone agrees that the time is ripe.

Starting and Lighting Systems Forming Standard Equipment Upon 1916 Cars

Westinghouse	Delco	Remy	Gray & Davis	Bijur	Apco	Dyneto	Auto-Lite	Disco	U. S. L.	Allis-Chal.	Wagner	Bosch	Detroit	Lerch-Nev.	Simms	North East
Allen	Auburn	Auburn	Chalmers	Apperson	Arbens	Detroiter	Chevrolet	Argo	Dispatch	Grant	Moline-Knt.	Marmon	Ross	Haynes	Maxwell	Dodge
Barley-Halladay	Buick	Inter-State	Chandler	Farmack	Briscoe	Franklin	Empire	Bell	Mercer	Partin-Palmer	Studebaker	Simplex	Saxon			
Biddle	Cadillac	Madison	Lozier	Hupmobile	Cameron	Harvard	Jackson	Crow-Elk.								
Case	Cole	Oakland	Metz	Jeffery	Elkhart	Regal	Overland	Mecca								
Daniels	Davis	Partin-Palmer	Morse	Packard	Herff-Brooks	Chalmers	Willys-Knt.	Monitor								
Dorris	Moon	Reo	Paige	Scripps-Booth	Luverne	Spaulding										
Dort	Oakland	Stutz	Peerless	Winton	Wayne-Richmond											
Enger	Oldsmobile	Velie	Velie													
Glide	Paterson															
Kissel	Pathfinder															
Lexington	Pilot															
Locomobile	Premier															
Marion	Republic															
McFarlan	Westcott															
Mitchell																
National																
Pathfinder																
Pierce-Arrow																
Pilot																
Pullman																
Singer																
Standard																
Stearns-Knight																
Stewart																

From the user's viewpoint the weak parts of the electrical equipment are the wiring and the battery. For the latter the user is himself altogether responsible. If the battery is not kept full, and if the hydrometer is not used regularly, trouble is certain. It takes longer to kill a battery by refusing it water than it does to kill an engine by withholding oil, but ultimate death is equally sure in either case.

For the wiring the automobile manufacturer has to take the blame. It is infinitely better than it was a year ago. Wires in armored casings are the rule and wires are generally shorter than of yore. Clearly marked connecting terminals, easily accessible fuses, different colored wires and such aids to upkeep are found on most cars, but it is still possible to see room for improvement. It is becoming recognized that the proper place for all junctions and connections is on the dashboard or the cowl board, preferably the latter, and that all switches and other controls should be brought close together. It is easy to trace a long wire to a lamp or to the battery, but there is danger in a maze of cross connections from switches to fuses, fuses to junction boxes and so on.

However, considering the limited time in which the whole electrical part of the gasoline automobile has been developed the state of comparative perfection reached is very remarkable indeed. It reflects the greatest credit upon the electrical manufacturer, and upon the automobile maker. Apart from the battery and the wiring the next weak spot seems to be the tendency of users either to swamp the generator with oil or not to oil it at all. An armature spindle of a generator needs a little oil, but only a little, and usually it needs that little fairly frequently. Two or three drops is enough for a dose, but a big supply at infrequent intervals is *not* by any means equivalent to a proper oiling at proper intervals.

Next in rules for owners should be "suspect the generator last of all."

First make sure of the state of the battery.

Second, make sure of the tightness of all wire connections.

Third, test for broken wire.

Fourth, see that the switches are operating properly and are not broken or loose.

Fifth (only after the first four are made sure), see if the cut-out is misbehaving, and then—

Sixth and last, there may be something the matter with the generator, though the chances still will be that something has been overlooked in the first four examinations.

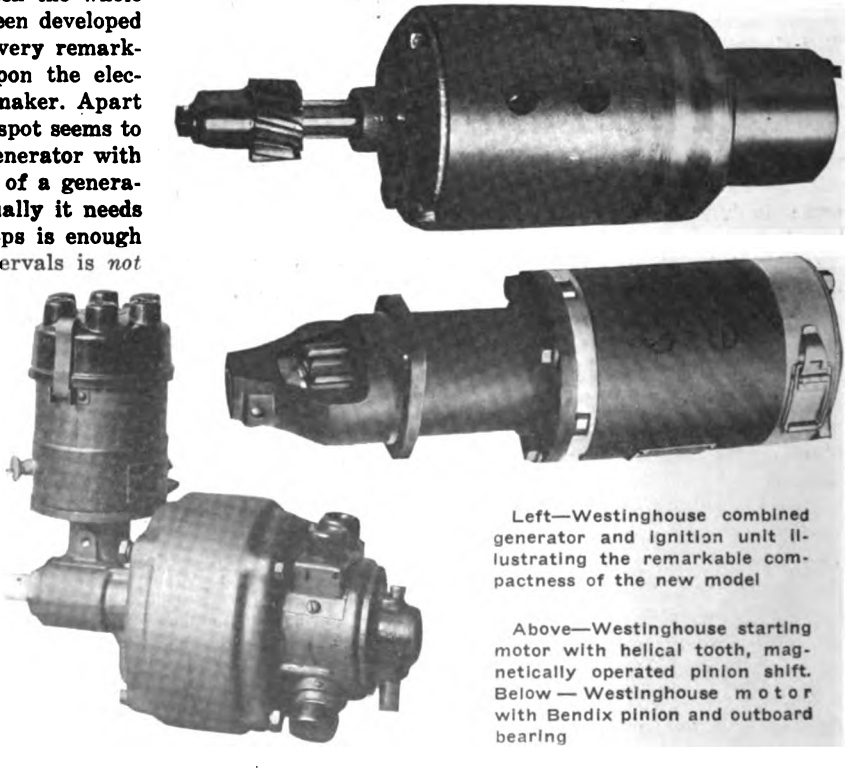
All a generator or starting motor needs is to have the commutator cleaned once in a while and the brushes reset or renewed, but this last is not a job for any man who is totally ignorant of electrical machines.

Electric Systems Simpler

The main reason for the reliability of the modern generators and motors is their increased simplicity and much better protection against dirt and moisture. The modern system of insulating by impregnation under heavy pressure and considerable heat has almost made impossible any internal leaks in armature or other windings, and materials have now been found to support the arduous conditions of service of the brushes. Commutator construction has also been improved, this being a purely mechanical problem. On the electrical side, the methods for regulating the current are, on the whole, simpler and more effective. For one thing, such an enormous amount of data is now available that it is easy to determine the output which is necessary for a car of given size. Then, too, the special points of one or another system have been discovered to have specific applications of especial merit; electrical manufacturers have found out how best to meet required conditions of weight, size, cost, etc.

As an example of the sort of problem which has been brought to a less unsettled state, it is found that the current required for lighting a small car is almost as great as for the largest vehicle, while the current needed for cranking is much greater with the larger engine. Thus to make a single unit generator and starting motor is much easier for small cars as the motor part can be small, the generator part needing to be practically of the same power as that required by a large car.

The main systems of regulating the output of generators



Left—Westinghouse combined generator and ignition unit illustrating the remarkable compactness of the new model

Above—Westinghouse starting motor with helical tooth, magnetically operated pinion shift. Below — Westinghouse motor with Bendix pinion and outboard bearing

so as to produce enough, but not too much electrical energy under all the various conditions of speed and loading, were dealt with in THE AUTOMOBILE on Oct. 21, 1915, so there is no object in going over the ground again, as there are no new principles.

The 1916 designs show that the vibrator system for controlling either voltage or current has increased greatly in popularity. Meanwhile the third brush system is likewise popular and there are many machines that utilize the reversed series system, the simplest of all if not the most efficient perhaps.

Bucking coil regulation is less frequently encountered, but it is used for some machines of the highest possible quality.

It seems that we are still a very long way indeed from agreement as to which is the best system of all.

The Westinghouse System

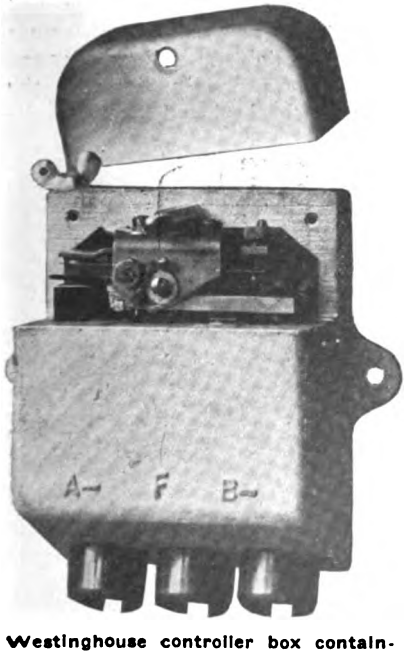
As might be expected the Westinghouse Co., holding such an important position in the electrical world, has not let any grass grow beneath its feet, and as a result Westinghouse lighting and starting systems are to be found on very many cars to-day.

Making a variety of patterns the most popular type for 1916 is the one which uses the vibrator system of control, this machine having a practically constant voltage whether the battery be connected or not. Once start the engine and the battery becomes hardly necessary. The Westinghouse generator is usually a four-pole machine. If for current supply only, the generator is round and has all four poles wound, but if it combines the ignition coil it is rectangular with all windings contained in the upper part and the armature at the bottom. Various sizes are made to suit different cars, but the construction is similar in all.

Single unit Westinghouse systems are made for some special purposes and these operate at 12 volts, but the most usual two-unit systems are all 6 volts.

The Westinghouse company are protagonists of the single wire principle, in which the frame of the car is used as the return for each circuit, and all their machines are made for use with single wires only.

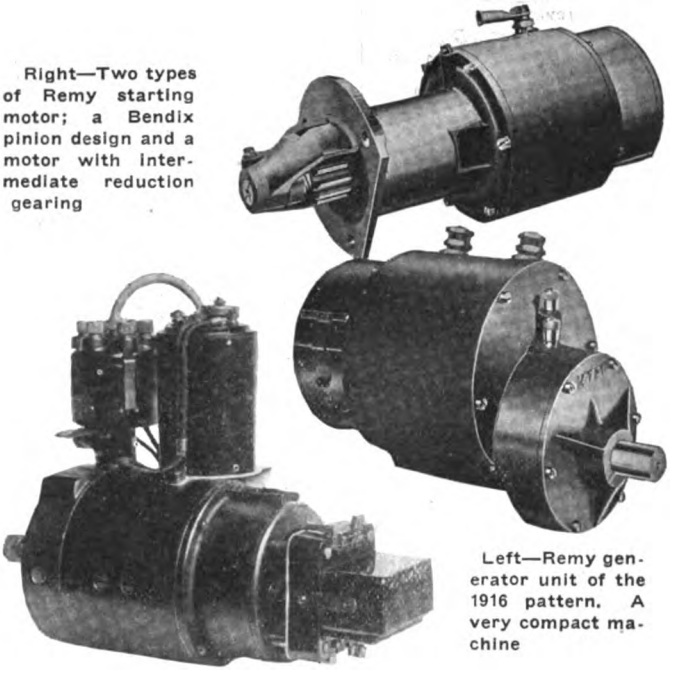
During the past year development has been almost all in mechanical matters connected with the manufacture of the machines; for instance, a much more extended use is now being made of laminations. The field magnets for the generators in many sizes are made up of stampings of sheet iron instead of from castings or forgings, this being the preferred method, both from electrical and mechanical viewpoints, but it has taken some time to lay down the necessary plant to take care of the present large output.



Westinghouse controller box containing voltage vibrator

Commutator and brushes are extra large and are designed to give several years of service without renewal.

The regulator requires no attention whatever except at very long intervals, indeed, but is provided with a voltage regulating screw which can be used by the factory in setting the machine to produce the required characteristic curve of performance.


Right—Two types of Remy starting motor; a Bendix pinion design and a motor with intermediate reduction gearing

Left—Remy generator unit of the 1916 pattern. A very compact machine

For the motor generator and for some special types of two-unit the Westinghouse Co. also make use of the inherent system of regulation and of the bucking coil system, but the vibrator is far the most popular this year. Westinghouse starting motors are supplied in several shapes and sizes for different requirements and for use with either the Bendix pinion engagement for the flywheel or a similar pinion with magnetic control.

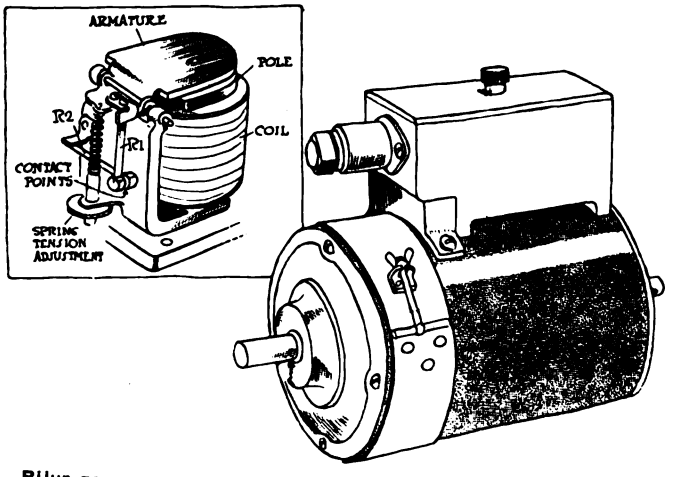
While the Bendix is the most popular the magnetic shift is being used for a few high-priced cars, owing to the fact that it needs but the depression of a button, a much heavier switch action being needed for the other. The magnetic shift motor has an armature capable of moving longitudinally and there is a simple pinion on the flywheel end. This normally overhangs the flywheel gear and has *helical* teeth as has the flywheel ring gear. At the front end of the motor is a little box containing a coil of wire through which passes all the current on its way to the motor, and there is a soft iron end piece on the armature shaft, a spring back of everything keeping the pinion normally out of mesh with the flywheel. When current is switched on, as the pinion starts to move, the current in the end coil sucks the armature forward and meshes the gears.

Now, as soon as the motor reaches a certain speed which is a trifle above cranking speed, the back current generated within the motor greatly reduces the power of the suck on the armature and the spring breaks the pinion out of mesh automatically. The helical teeth make for instant engagement and assist disengagement, since the flywheel tends to throw out the pinion. Further, if the pinion should fail to engage and start to spin the back current prevents the engagement taking place. Either the pinion slips in without a sound or nothing happens, but in practice it is very rarely indeed that engagement fails.

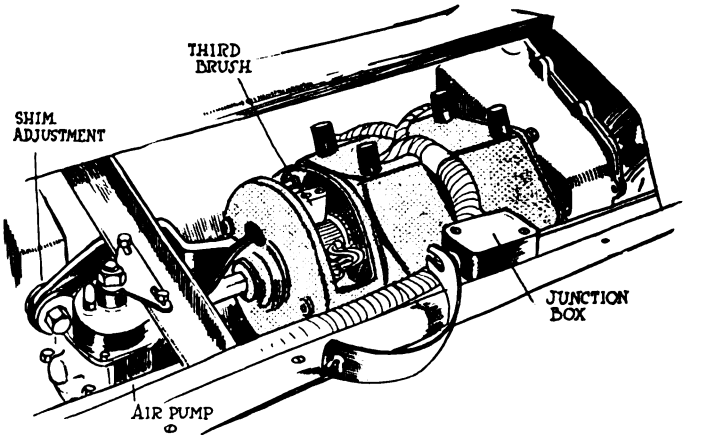
A strong feature of complete Westinghouse equipments is the robust nature of the switches and fuse boxes and other small parts.

Delco Systems Have Strong Hold

The Delco system is usually a single unit, but the name is a misnomer, for the single Delco apparatus would be described more correctly as a compound system. The main advantage of the two-unit system is that the armature of the generator can be geared to suit the crankshaft speed so that it runs



Bijur generator with voltage control mounted on it in sealed box. Also details of voltage controlling vibrator R1 and R2, being the two blades which allow the contacts to vibrate in two directions



Dyneto single unit as applied to Franklin car. It can be seen that there are three brushes and that the wiring connections are simple and accessible

normally at the most efficient rate, which is far less than the rate necessary for starting when the machine is used as a motor. With a constant ratio between armature and crankshaft the armature has to be larger than necessary for generation in order to get enough starting torque. The Delco machine has a single armature with a pinion on the rear end and a drive connection on the front end, but inside the front end there is a roller clutch so that the armature can overrun the engine. If the engine stops the armature can spin on till its own small friction brings it to rest.

Thus, when the current from the battery is turned into the armature it can spin freely without affecting the crankshaft of the engine. When in use as a generator the machine operates quite like any single unit type with inherent regulation. It is but little larger and but little heavier. To use it as a motor for cranking there is a duplex intermediate pinion which can be slid mechanically, like a transmission gear, and this engages simultaneously with the flywheel ring gear and the armature pinion. By an ingenious switch combination the action of depressing the pedal that slides the gear also operates the switch, so meshing is performed and current turned on by one movement.

The effect of using the intermediate gearing, which as the sketch shows is in itself a reduction gear, is to give the armature a very high cranking speed, and this is highly desirable from the electrical viewpoint.

Improvements in the Delco system have been progressive for years, but they have not affected the principle, nor have they altered the external appearance very much. Reliability on an increasing scale has been sought by ever better methods of manufacture.

Early in the present year the Delco two-unit system appeared, this being made to suit a particular car which was not readily adaptable to the usual single unit. This two-unit type is to be employed on more than one 1916 car, but the single machine remains the Delco standard. Probably there are few leading firms who concentrate so closely upon a single design as do the Delco and the company is to be congratulated on the fact that its original system has held its place from the very beginning of electric equipment right up to the present moment.

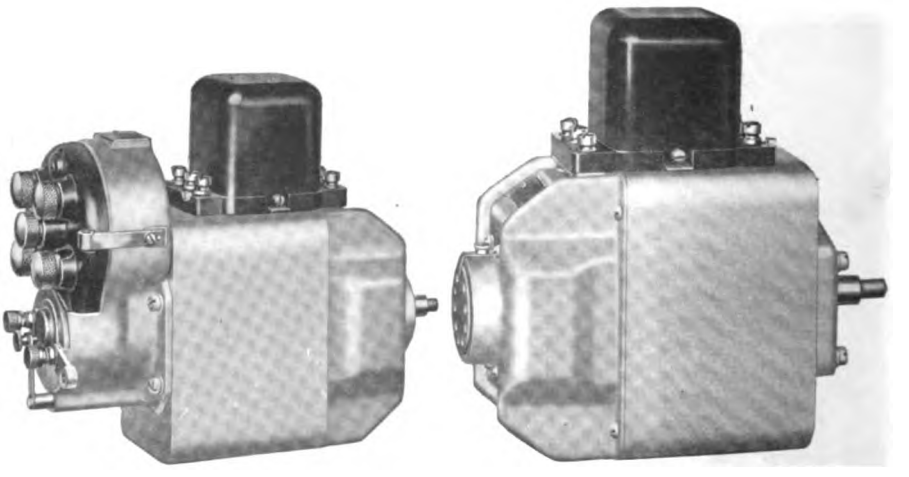
Remy Has New Two-Unit

The principal Remy system for 1916 will consist of a unit generator and ignition system, with a separate starting motor. The generator is regulated by a vibrator, but this is arranged so as to control the current output instead of controlling the voltage. Should the current rise above a predetermined point the magnetic action of the vibrator introduces resistance and reduces the current instantaneously, then as the vibrator lets go again the current rises, only to be cut once more as the vibrator is again pulled open. The action is extremely rapid and the fluctuating current produced has the same effect as a steady current, it is steady to all intents and purposes, the variations being infinitely more rapid than can be detected by any recording instrument. Of course, the voltage varies in just the same way with the other method for linking in the vibrator, the average being steady in just the same manner. The only difference which affects the user is that the current controller type like the Remy generator cannot be used without the battery in circuit as it is the battery which controls and restrains the voltage.

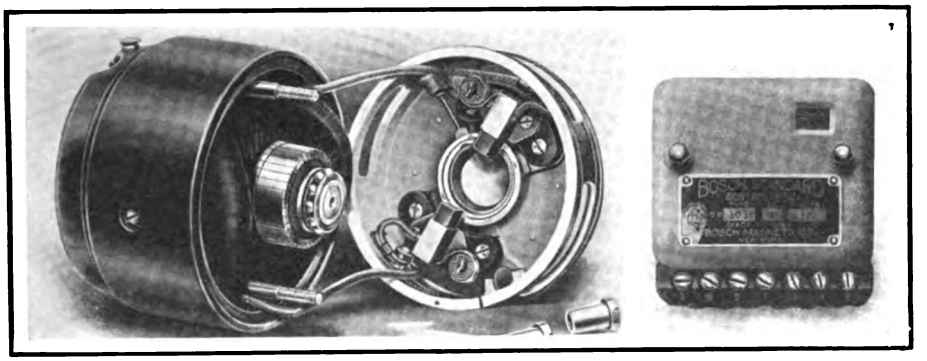
With the Remy arrangement there is a four-pole field magnet with all poles wound, and three brushes are employed.

Externally, the generator is wonderfully compact, the vibrator and the cut-out automatic switch being housed in a small box which is screwed to the generator base. The ignition distributer is mounted on the other end of the machine and the ignition coil stands on a pedestal on top of the field magnets. The system of control allows a high output from a small machine, so the new Remy is light as well as compact.

For the Remy starting motor the Bendix pinion is the standard form of coupling to the flywheel and the motor it-



Left—Gray & Davis generator and ignition unit with regulating vibrator in box on top of field magnets. Right—Gray & Davis generator for separate ignition equipment



Details of brush gear and external view of the control box used with the new Bosch Standard generator set

self is a substantial four-pole machine with plenty of power. The commutator and brushes have been constructed with the intention that they shall operate without needing attention during the life of the car and they are certainly of extremely generous proportions.

Gray & Davis 30 Per Cent Lighter

For 1916 the electrical system of the Gray & Davis machines has not been altered, but substantial changes in the mechanical detail have enabled the weight to be reduced by almost one-third. This reduction is mainly owing to the adoption of a four-pole machine of the roll frame type with pressed steel end caps. In addition to this commendable saving of weight the Gray & Davis reliability has been improved still more by giving great attention to the mounting of the bearings, which are each provided with a large oil container and efficient means for excluding dust or dirt.

Also the accessibility of the brushes has been improved so that by sliding off one side cover both brushes are laid bare for examination.

Both double and single unit Gray & Davis systems are made, the latter being used for small engines and the former for larger types, and a feature is that the machines are designed to operate at a rather lower speed than usual. The generator is controlled by a vibrator linked in so as to control the voltage of the current supplied and this vibrator, together with the automatic cut-out, is mounted in a neat case that attaches directly to the generator itself.

For the starting motor of the two-unit system the Bendix pinion is the preferred drive and the makers claim that the motors they select for the automobiles supplied with their system are capable of cranking at a speed which is above the normal.

Bijur Has Special Regulator

The Bijur equipment was described in THE AUTOMOBILE of Oct. 28, 1915. The main changes for the coming year are that the weight has been reduced and the efficiency increased, the main principle remaining unchanged. Both constant current type generators with inherent regulation and generators with vibrator voltage regulation are made, and the latter type has a special feature which has now been in use for some time, proving very satisfactory. This is the use of a vibrating reed which can vibrate in two directions. Not only does the blade vibrate up and down, as it has to do in order to make and break the contacts, but it is flexibly supported so that it can shake sideways also. The purpose of this is to allow the contact points to meet in all sorts of relative positions instead of always square together, the idea being that this spreads the slight wear and prevents any danger of pitting.

The saving of weight has been brought about by using seamless steel tube to make the outer shell of the machines, the pole pieces being screwed on after the windings are in place. This makes the generators and motors of neat exterior appearance and is frequently of assistance in fitting to an engine. Accessibility is well cared for, but the cut out and voltage regulator on that type of generator are sealed up in a case which is attached to the generator shell. Should any trouble be traced to this portion of the equipment it can be removed as a unit without touching any wires, and replaced with another, the regulator base being of standardized form, and the makers will attend to the faulty apparatus if returned with the seal unbroken.

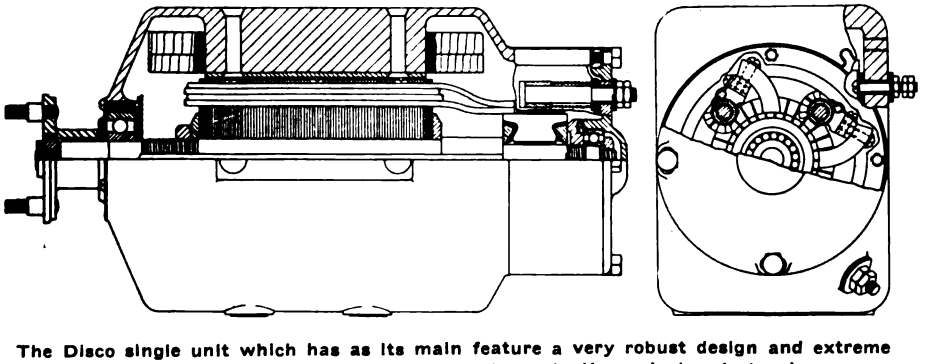
Aplco Single and Two Unit

Made by the Splitdorf Co., the Aplco machines are of both single and duplex type. The motor generator has been developed to a high pitch of perfection and is found on one car in an almost unique position, this being alongside the gearset. When acting as a generator this machine operates at 6 volts and is thus usable in connection with the preferred 6-volt lamp equipment. When acting as a motor the connections are such that 12 volts are supplied from the battery and the starting torque thereby enhanced.

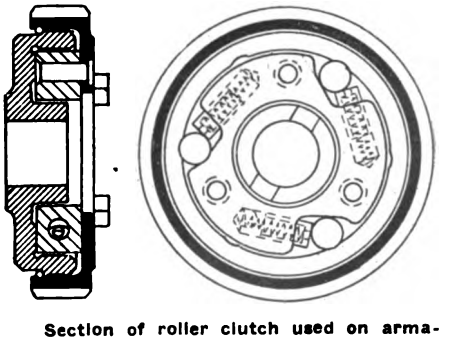
Regulation is performed by a compound winding with reversed series coils and the arrangement is such that both series and shunt windings are used for the starting current. As a single unit machine operating on two voltages it is necessary to have an automatic cut out, and this is part of the equipment. Features claimed as peculiar to this outfit are light weight and high efficiency.

Dyneto Prefers Single Unit

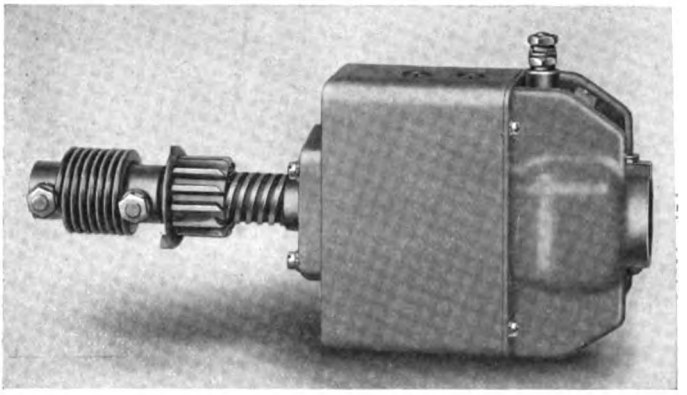
For 1916 there will be available four Dyneto systems, two of the single unit type and two of the double unit. The manufacturers express strong preference for the single unit, believing that its simplicity which is very great, overcomes any other advantages which may belong to the two-unit sys-

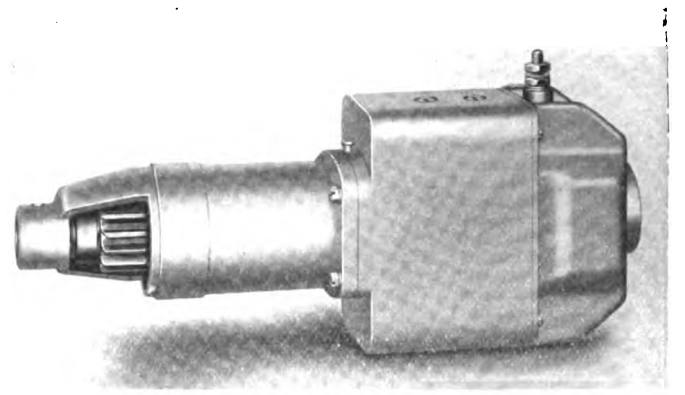


The Disco single unit which has as its main feature a very robust design and extreme simplicity. The purpose of the curved brushes shown in the end view is to give square contact with the commutator



Section of roller clutch used on armature drive in Delco single unit equipment shown on page 1002





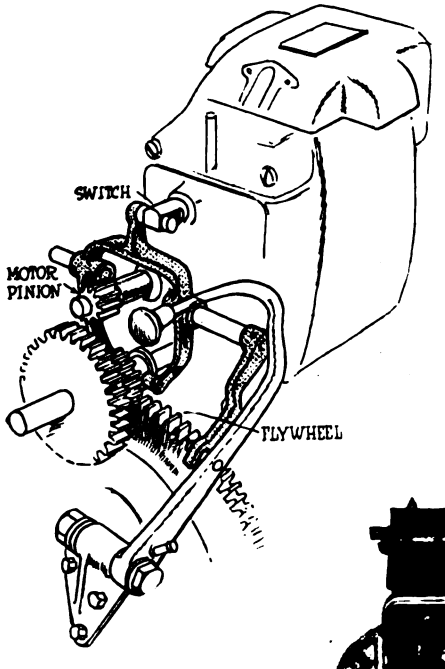
Gray & Davis starting motors with Bendix pinion drive. That on the right is provided with outer bearing for support of shaft extension

tem. Regulation of output is by compound winding with reversed series coils and the voltage is 12. There are no automatic cut-outs so the battery drives the gasoline engine automatically if the latter should stall, recommencing generation directly the engine picks up again. Changes for the coming year have been quite small and center mainly upon means for attaching the single unit machines which have been improved so that the fitting to a variety of different engines is facilitated.

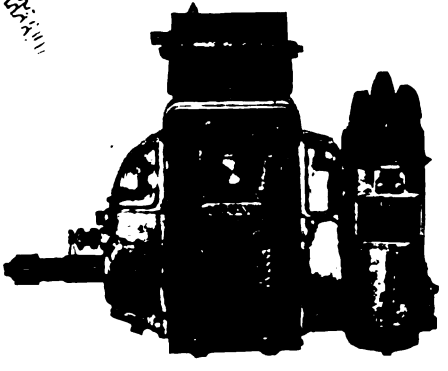
Geared with the crankshaft at from 2.5 to 3 to 1 the starting torque developed is large and cranks the engine at a rapid rate. No attention whatever is needed beyond oiling and occasional adjustment of the chain when this form of drive is used, and it is the recommended drive.

Auto-Lite Have No Novelties

Known, perhaps best of all by reason of the enormous number of systems fitted to Overland and Chevrolet cars, the keynote of Auto-Lite two-unit equipments has been simplicity. For generator control the reversed series winding is employed, this reducing the mechanical attachments to a simple cut-out of ordinary design.



Left—Diagram of Delco single unit system. The switch is operated by the same pedal that shifts the gears into mesh. Below —Delco lighting, starting and ignition unit



The Auto-Lite generator is of very distinctive design, having magnets shaped like those of a magneto with the winding coil concentrated upon the arch of the horseshoe. In the Auto-Lite factory there is an immense press plant for cutting out and shaping parts of sheet metal, and the field magnets are, consequently, made up of laminations like the armature.

This press plant is utilized to the fullest advantage in order to produce the equipments with a minimum of weight and without undue expense, in fact it is a most striking example of how very much manufacture can be simplified by the ingenious employment of pressed parts. Not only are these used for laminations, but switch parts, casings, covers, etc., largely come finished from the press room and need no machining. It is noticeable that practically all machine work in the plant is on small parts like screws and terminals.

No new models are announced for next year, the machines produced twelve months ago being continued. Generators of similar design are made in several sizes and there are several models of starting motor to suit different applications.

Disco Is Single Unit

Two sizes of single unit motor-generator makes up the Disco line at present, but it is expected that a two-unit system will be announced shortly, the company considering that both types will be permanent. Rather an unusual feature for a single-unit machine is the use of a vibrator form of controller which restricts the current output at high speeds and is, of course, cut out entirely when the machine operates as a motor. The Disco Co. draw particular attention to their brush gear which is very accessible for examination, while the brushes can be removed for the purpose of cleaning the commutator at the rare intervals when such attention becomes necessary. It is claimed that the brush wear is extremely slight owing to the excellent commutation, which is assisted by the regulating system.

U. S. L. Only Flywheel Starter

The only flywheel dynamotor now standardized as regular equipment on any well-known automobile is the U. S. L., which was one of the first systems to be produced. For 1916 the system has been improved in detail quite considerably by a large reduction in the number of parts and simplification of detail. In this machine the armature forms the flywheel of the gasoline engine and it is surrounded by the field coils which are, of course, stationary.

Regulation is on the inherent principle and is so arranged that the maximum charging current occurs at a low engine speed, the rate of charge falling off as the speed rises. A special switch is provided by which the current can be cut off altogether for long, high speed runs to prevent the battery receiving an overcharge.

An especial improvement for 1916 is the provision of an

electrically operated relay switch for starting. All switches, fuses and connections are now concentrated upon the cowl board attachment and pressing a small button sends a small current through a relay coil which then operates a powerful magnetic switch and throws on the full starting current. The new device not only removes the necessity for a foot actuated switch, but overcomes any danger of burning the switch contacts, by reason of the instantaneous action of the magnetic switch.

Two Types of Allis-Chalmers

Both single and double unit Allis-Chalmers systems are made, a vibrating reed current controller being employed for both types, and 1916 changes have been mainly along the line of improved mechanical detail and reduced weight. Greater accessibility has been secured through changes in the brush holder and commutator design and weight reduced from 15 to 17 per cent by refinements which permit reduction of waste material.

For detail equipment there is a new cowl board panel upon which all the switches and the ammeter are grouped and this panel also carries every wire necessary except the main leads to battery and lamps. Thus wiring is simplified and the ease of fitting enhanced, while reliability is increased. All the connections to outer circuits are made in the fuse and terminal compartment wherein each connection is clearly marked and tracing any wire consequently made perfectly easy.

Another improved detail is the starting switch which is foot operated. The contacts are heavier and yet the whole part is lighter, and additional protection against ingress of dirt or water is given by a tubular cap which covers the plunger.

Wagner Builds to Order

Wagner starting equipments are not made in standard form but are designed to suit the needs of automobile manufacturers and may vary in detail accordingly. Only two-unit systems are made however, this being practically the only limitation.

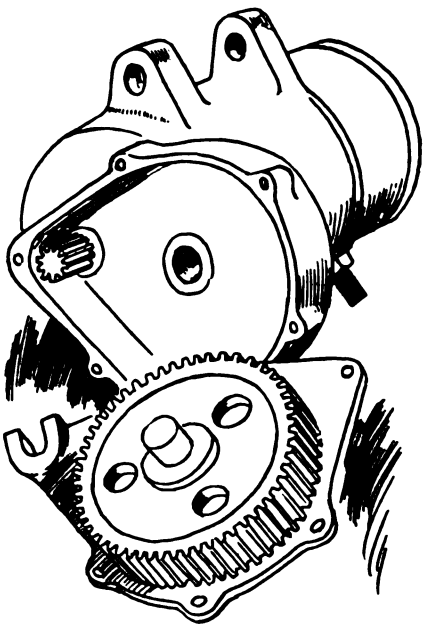
An almost unique feature of one of the best known Wagner outfits is found in the starting motor used on the Studebaker car as this has a double reduction gear. Made integrally with the starting motor is a case containing a pair of steel gears giving a reduction of about 8 to 1, and it is to the spindle of the large gear that the engine drive is connected. This double reduction permits the use of a very high speed, small and light motor.

Bosch System New

As the Bosch system just introduced was described last week in full, there is no need to repeat the account here. The new set is called the Bosch "Standard" and consists of generator, motor and switch unit with a box containing the automatic cut-out separate. Regulation is by ballast coil or hot wire controller and the special features are light weight compared with neat design and fine workmanship.

Leece-Neville

Up to the present no new models of this system have been announced, the standard equipment being that as fitted to the Haynes car. This is a two-unit type, the generator having inherent regulation. The use of a 12-volt potential is now rather unusual with a two-unit system but the Leece-Neville Co. believes that it is possible to obtain higher efficiency from both generator motor with this voltage, so it has been the standard employed and is still being continued.



The intermediate reduction gearing used on the Wagner starting motor fitted to Studebaker cars

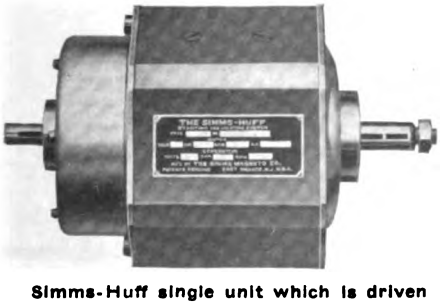
Simms-Huff Continue Single Unit

The unique feature of the Simms-Huff system is that it is a single unit with two connections to the engine. Arranged to be driven by belt or any other approved method it operates as a generator with inherent regulation, charging at 6 volts. When operated as a motor, a 12-volt current is used and an over-running clutch is employed to prevent interference between one drive and the other. Having the ability to operate at a high speed for starting, the weight of the unit is not great, in fact it is extremely small, it being stated that a machine weighing but 30 lb. can exert a starting torque of 24 lb. The brush gear is of ingenious design, only one wire being used to make connection. Being hexagonal in shape the unit is also short, and its compactness allows it to be fitted in a very confined space.

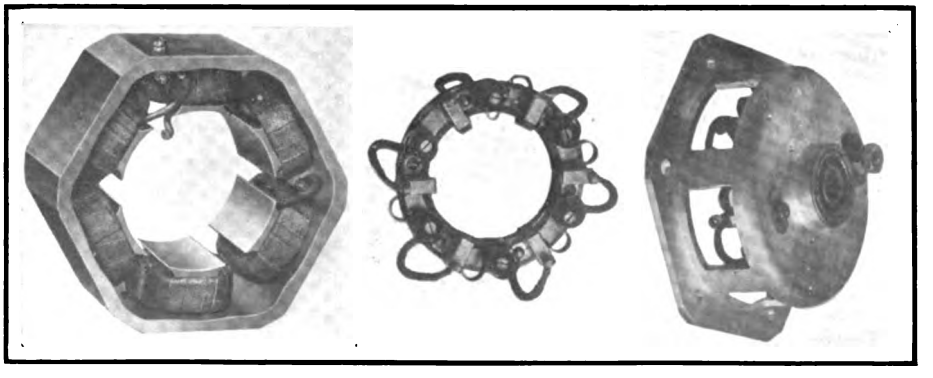
In Conclusion

In concluding this brief review of the most widely used lighting and starting systems it should be again emphasized that it has only been attempted to include those which are employed extensively by automobile manufacturers as standard equipment.

There are a very great many other systems which can be applied to standard modern cars or to old cars, in fact most of the systems which can be bought one at a time are different from those which are used as standard equipment. It is hoped to review these at a later date.



Simms-Huff single unit which is driven at one end and drives for starting from the other



Right—Details of magnet windings and brush gear of Simms-Huff single unit

Increasing Activity in Axle Field

Many Small Changes in Design—Return of Semi-Floating Type—Gear Ratios Touch Bottom—Brake Problems—Contest Between Different Drives for Trucks

By A. Ludlow Clayden

THE rear axle arrived at a state of comparative perfection only quite recently, in fact it is probable that there is much more room for development still existing in the axle field than remains in the sphere of the clutch and gearset. The earliest "live" axles suffered from the ill effects of poor design and unsuitable material, they were apt to fail altogether by actual fracture of some part. As soon as the engineers and the steel makers had found means to overcome these troubles, there arose the noise question. This is almost finished with now, apparently, but to replace it there is the new demand for decreased weight. All the time the price obtainable has been falling steadily, so altogether the lot of an axle manufacturer is not the happiest imaginable.

Fundamental Types

Taking the expressed opinions of some of the leading axle makers on the question of the probable future popularity of semi-floating, full-floating and the intermediate types of axle shows that the protagonists of the three divisions are about equal in number. The following are interesting as answers to the question: Do you consider that there is a present trend toward semi-floating axles? If so, what do you regard as the explanation?

American Ball Bearing Co.:

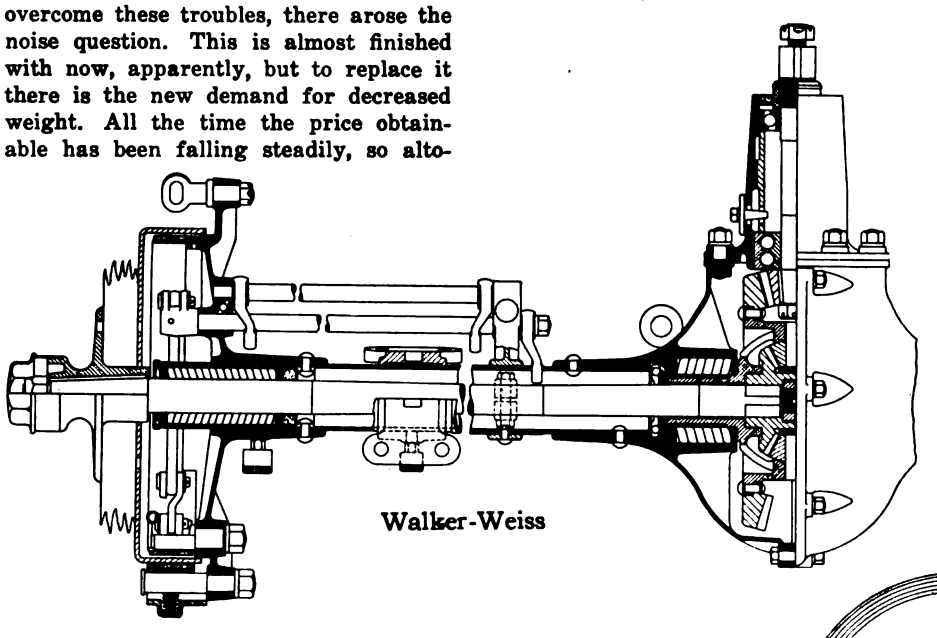
"Prefer full-floating."

Hess Spring & Axle Co.:

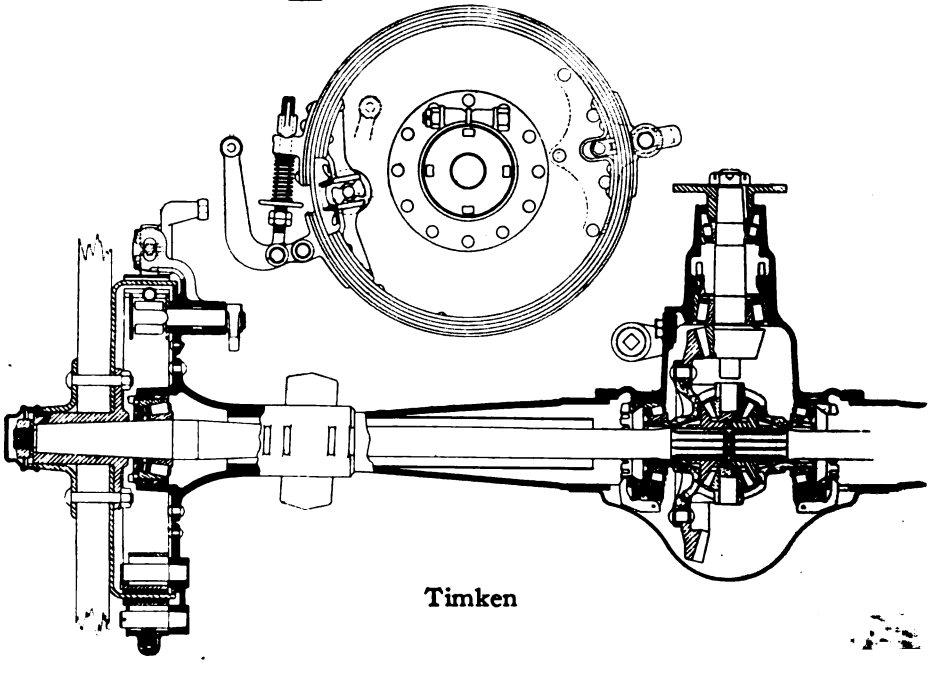
"We do consider that there is a present trend toward semi-floating axle. The only thing against the semi-floating axle is its name. The average buyer gets "cold feet," so to speak, when the agent tells him that the car is equipped with semi-floating axles. If the word semi was omitted, it would leave an entirely different impression. The buyer gets the idea that he is only getting half an axle. Our explanation for the trend toward semi-floating axles is principally because they can be made cheap. In the second place, theoretically they are easier on wheel bearings. The constant demand for cheaper and better equipment will undoubtedly bring the semi-floating into its own very shortly. If properly designed it is absolutely the best axle that can be made."

Peru Auto Parts Mfg. Co.:

"We do not feel there is a tendency toward returning to the semi-floating

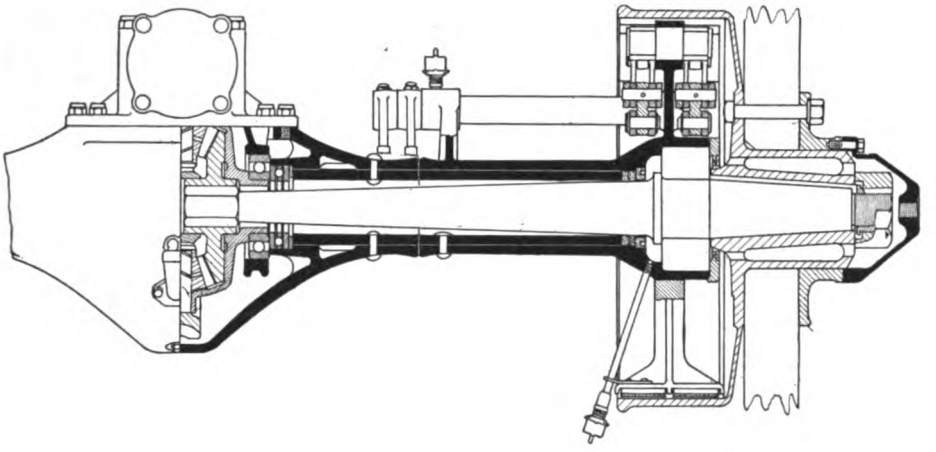


Walker-Weiss



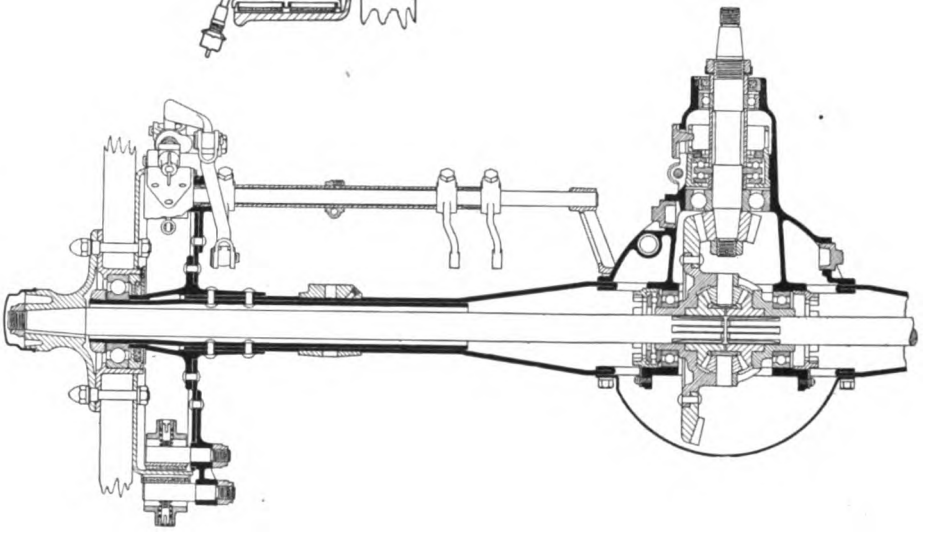
Timken

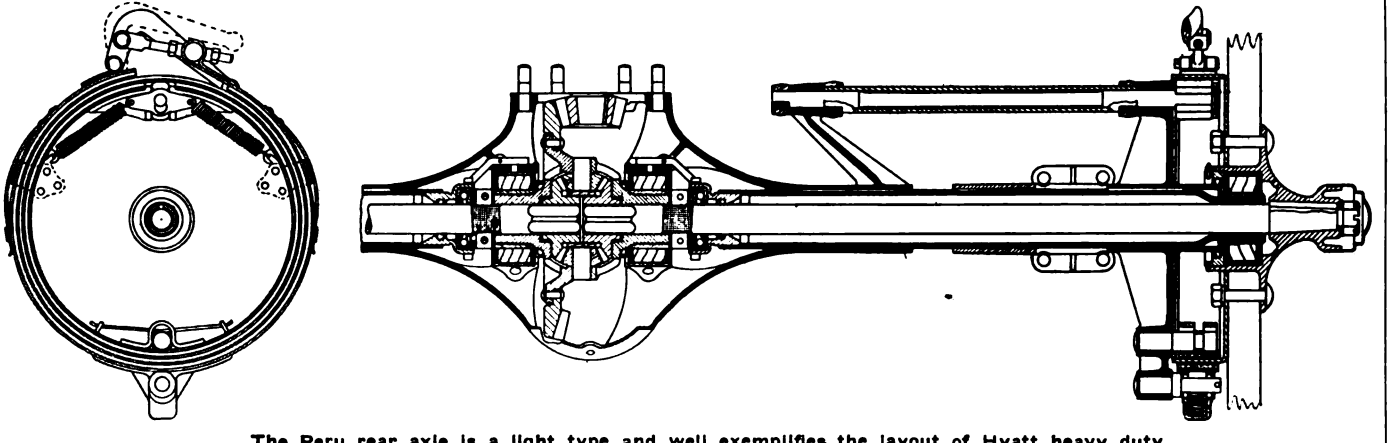
These two cuts of the Timken and Walker-Weiss semi-floating axles show two principles of construction. The former has a pressed steel case to which the whole differential assembly is bolted; the latter uses the differential assembly as the center case of the axle. In the Timken four taper roller bearings support all loads and thrusts on the driving shafts while two more carry the bevel pinion. In the Walker-Weiss the bearings that carry the load are very long, small diameter Hyatts and ball thrust washers are provided to resist end stresses. In the end view of the Timken brake, attention may be called to the light weight and the simple thumb nut adjustment for the outer band. On the cam which operates the expanding band sufficient lift is provided to enable the lining to be used up almost completely



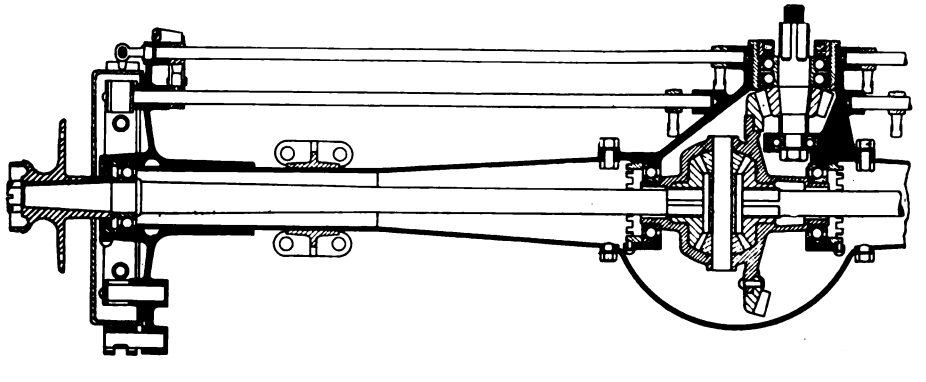
The Sheldon semi-floating truck axle is one of the heaviest constructions made on this principle, though it is claimed to be conspicuously lighter than the majority of worm drive truck axles of the full-floating type. It is equipped with ball bearings and has two internal brakes located side by side within the same drum

This Columbia axle is an example of three-quarter floating design, the single ball race on the end of the axle tube being in the plane of the wheel. Weight is carried by the tube, but the wheel is steadied by the drive shaft. A feature of this axle is the use of a very large double thrust race behind the bevel pinion, and it will be noticed that the differential assembly is made up independent of the axle casing. Bronze bushings are used for the brake operating shafts to prevent rusting and consequent sluggish action

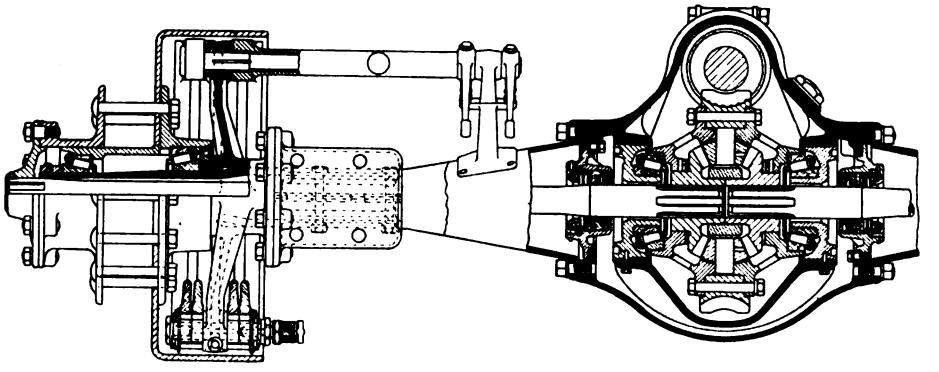




The Peru rear axle is a light type and well exemplifies the layout of Hyatt heavy duty bearings in axle construction, thrust being taken by ball bearings on either side of the differential. This axle is an example of built-up construction which the makers consider to be lighter and more satisfactory than the pressed steel type so far as small car work is concerned



The Hess axle typifies the pressed steel pattern as applied to light cars and the makers consider it to be simpler than the other type where the casing is a built-up job. On the question of weight they say there is little to choose, pointing out that a pressed axle needs no tie rod. In this axle the brake operating rods are longer than usual, but the method of mounting them does away with a bracket and so saves some weight



A worm-driven truck axle made by the American Ball Bearing Co., notable features are the double expanding brakes and the use of Bock taper roller bearings throughout. It should also be noticed that the worm and the worm wheel are mounted in the center case of the axle and the former is not removable from the wheel without taking down its mounting. This is a full-floating design all the weight being carried upon the tubes

construction. About 75 per cent of our rears are full-floating and balance three-quarters."

Salisbury Wheel & Mfg. Co.:

"No calls at all for semi-floating axles."

Sheldon Axle & Spring Co.:

"We do not manufacture anything but semi-floating axles and very few for the pleasure car trade, devoting our energies exclusively to the truck requirements. There is no more reason for a full-floating axle on a heavy automobile truck than on a locomotive. If locomotive engineers had to design a full-floating type, the bearing equipment would have to be so extremely large that there would be very little room left for spokes between the hub and the felloe.

"One has only to stand beside the railroad tracks and see a locomotive coming around a curve at 40 or 50 m.p.h., to see how very important it is to make as large a spread of bearing as possible. Very similar conditions are realized in motor truck operation. Sheldon was the first to use the semi-floating on anything above 2 tons. Their latest 5-ton axle has a factor of safety built into it very rarely realized in this form of drive.

"Where the wheels are pressed on to a tapered driving shaft, the demountable feature is also quite an item, particularly when the changes of tires are fairly frequent. If these changes have to be made in an ordinary garage with a pressed-on type of tire, the wheel has almost always to be taken off and with the full-floating type of axle the bearings are usually thrown on a dirty floor and put back with an improper adjustment, and in the case of the semi-floating, the wheel can be taken off without disturbing the bearing mounting or losing the oil in the least, and this is certainly a marked advantage over the full-floating type."

Timken-Detroit Axle Co.:

"Reduction in cost, accompanied with no reduction in serviceability."

Walker-Weiss Axle Co.:

"The general trend seems to be going toward the semi-floating type although in general we believe that the three-quarter floating type is somewhat better. The semi-floating type is liable to be a little better and cheaper to machine and makes a better manufacturing proposition."

Weston-Mott Co.:

"We do not believe a semi-floating axle is as good as the three-quarter or full-floating, one or two hub-bearing type, as in the semi-floating axle the shaft has to stand not only the torque but the weight of the car, while in the three-quarter and full-floating the shaft practically carries no load at all."

It is to be noticed that among these opinions at least one manufacturer expects the semi-floating type to come into general use for trucks. Of course there is no question but that either or any type will prove more than strong enough with modern design and modern steel.

Hotchkiss Drive Gains

It is not necessary to quote any figures to show how greatly the Hotchkiss drive is gaining in favor, the chassis descriptions published in the past year show this. Of course it is a great advantage to eliminate the weight of torque or radius rods and also remove their ever-present tendency to rattle; modern springs seem well able to care for the additional work imposed upon them by the driving stresses. Another advantage, from the owner's viewpoint, is the elimination of the spring table bearing which is obtained by securing the table to the axle in the way necessary for the Hotchkiss construction. The separate table needs lubrication where it rocks on the axle and is liable to squeak if neglected. Against this advantage we have the drawback of the necessity for two universals, but this is itself an advantage because the two joints give a better action than one alone. Altogether simplicity and all that it means to manufacturer and user is on the side of the Hotchkiss arrangement.

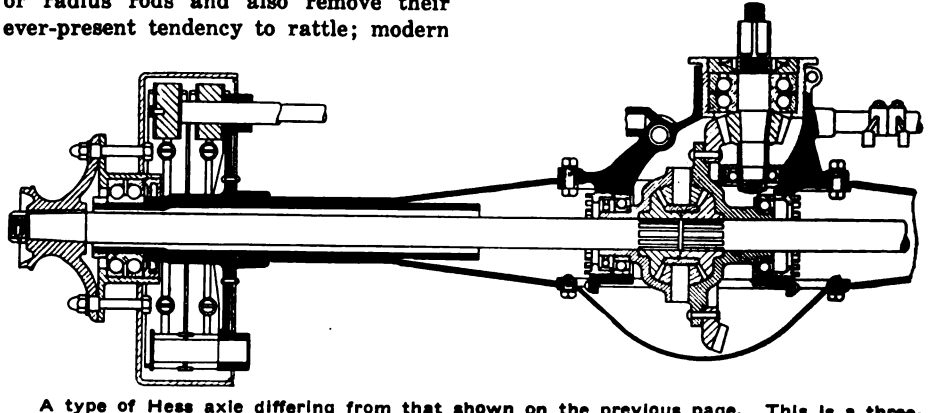
Gear Ratios Touch Bottom

When the spiral bevel came along it seemed that the noise trouble was overcome for ever by simpler means than the substitution of a worm gear for the straight bevel. The spiral bevel is a vastly better manufacturing proposition and gives a quietness so nearly equal to the worm that the difference is not worth considering. Then high gear ratios began to fall and with an approach to five to one the limit for the spiral bevel came in sight, since to go below this ratio calls for a large diameter and clumsy differential case. However, it is the opinion of axle manufacturers generally that gear ratios have touched bottom and that the cars of 1917 may be geared a little higher again than is the rule now.

This means that the spiral bevel is going to hold its sway and will probably completely displace the straight form just as soon as enough machines can be built for making the gear. At present there are thousands of straight tooth bevel cutters in existence for each spiral machine, and it will be some time yet before there are enough spiral cutters to take care of the needs of the automobile industry.

Worm V Internal Gear

In the truck field the situation between worm and internal gear drives is just



A type of Hess axle differing from that shown on the previous page. This is a three-quarter floating pattern but is otherwise similar in general respects. In this drawing the spigot bearing for the bevel pinion is shown very clearly. This feature of design is not very popular, but it certainly gives excellent support to the pinion and makes the outside of the axle very neat. It will be noticed that double internal brakes are employed

commencing to be interesting. Till quite lately the heavy field has been taken care of almost solely by the makers of worm gear axles, and the light trucks have been supplied mainly by the internal gear firms. There have been, and still are, only a few heavy pattern internal gear axles available, and there are correspondingly few worm axles suitable for *light* trucks. Thus the two types have developed side by side without much competition, each holding its own field and each giving great satisfaction.

Now the two are beginning to overlap a trifle and in the next two years the respective spheres of the two forms ought to be defined finally and conclusively.

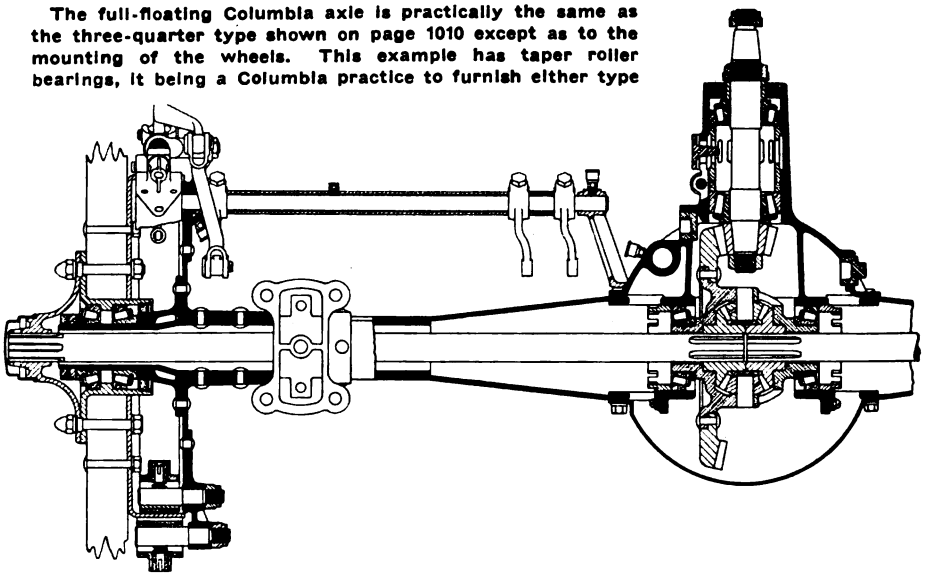
Without doubt, fashion has had something to do with the great rise to popularity of the worm gear for trucks of 3 ton capacity and over. Undoubtedly simplicity, ease of changing ratios and smaller susceptibility to abuse by neglect has encouraged the internal gear form. The pros and cons of each type are so intimately wrapped up with the service of the vehicle that it is going to take a couple of years more before any definite conclusions can be anticipated.

It may be—in fact it probably will be—that neither type of truck drive will become universal, but that both will continue to exist side by side, the advantages of the worm deciding its special field of application, and those of the internal gear fixing its sphere.

Ball or Roller Bearings

As to the relative advantages of ball bearings and of the various types of roller bearings, axle manufacturers are divided into as many sections as there are bearing patterns. The question is sometimes decided, apparently, by the limitations of space produced by other features, by cost, or by abundance of supply. In the axles illustrated on these pages almost every sort of bearing combination can be seen.

The full-floating Columbia axle is practically the same as the three-quarter type shown on page 1010 except as to the mounting of the wheels. This example has taper roller bearings, it being a Columbia practice to furnish either type



Some axle makers pin their faith to bearings of not only particular type but of particular make, this being where long experience has shown the reliability of the product in question. Others are prepared to supply either of several types and almost any make according to the desires of their customers.

The only possible conclusion is that each of the types of bearing used is capable of giving full satisfaction. Ball bearings of all sorts, taper roller bearings and roller bearings with parallel rollers depend upon the materials and upon the accuracy of their manufacture for durability and efficiency. A good one of either type is better than a poor one of any other, so with the quality of workmanship at the wonderfully high standard it has reached in America today the axle engineer is safe in following his personal predeliction.

Pressed-Steel and Built-Up Housings

In a similar way different axle makers prefer different methods of construction, some supporting the built-up axle while others prefer the pressed-steel. Where output is not very large the pressed-steel becomes the more expensive type without any question, but with large quantities it seems that there is little or nothing to choose on the score of cost.

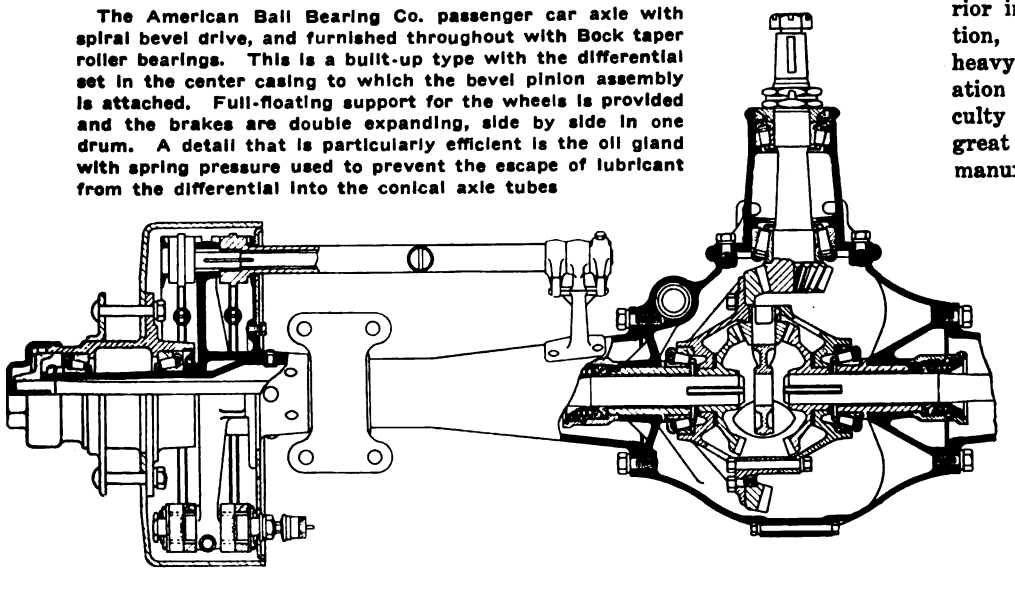
Naturally the manufacturers who have always used one type or the other prefer that with which they have had their experience, but when they make both their opinion as to which is the most advantageous is that it depends upon the exact circumstances of the case.

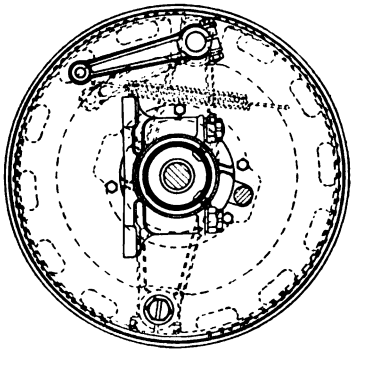
Brakes a Problem

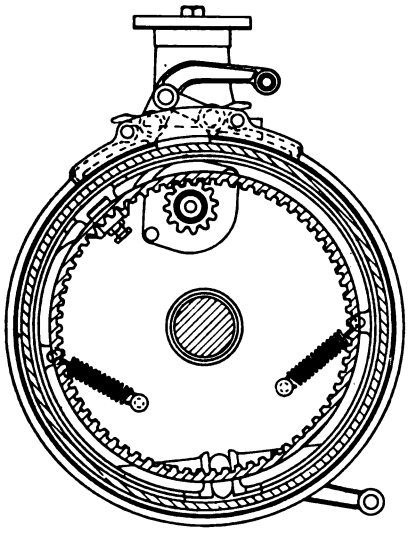
It is hardly possible to consider the question of brakes without going outside the specialized field of axle manufacture and observing the practice of the lesser number of automobile manufacturers using special designs. Of course the combination of internal band brake connected to the hand lever and external band to the pedal is still by far the most popular design, but there will be one or two more propeller-shaft brakes this year and a few more cases where double internal brakes on the axle are employed.

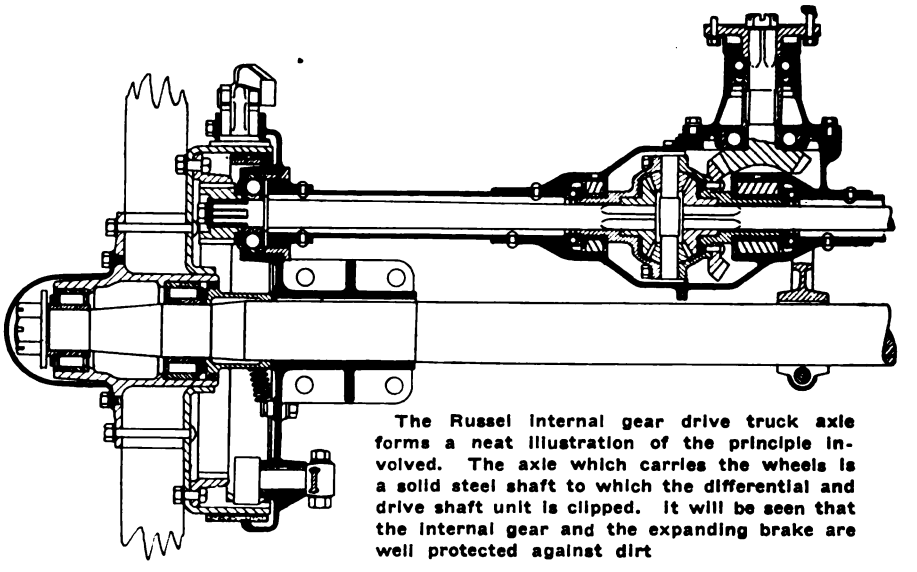
Brakes are a much neglected part of an automobile; they are infinitely inferior in design to almost any other portion, and their inefficiency is taking a heavy toll of life. The probable explanation is that there is considerable difficulty in making a brake which combines great power, smoothness and reasonable manufacturing cost. The band brake

The American Ball Bearing Co. passenger car axle with spiral bevel drive, and furnished throughout with Bock taper roller bearings. This is a built-up type with the differential set in the center casing to which the bevel pinion assembly is attached. Full-floating support for the wheels is provided and the brakes are double expanding, side by side in one drum. A detail that is particularly efficient is the oil gland with spring pressure used to prevent the escape of lubricant from the differential into the conical axle tubes









The Russel internal gear drive truck axle forms a neat illustration of the principle involved. The axle which carries the wheels is a solid steel shaft to which the differential and drive shaft unit is clipped. It will be seen that the internal gear and the expanding brake are well protected against dirt

has never, in any form, been entirely satisfactory unless made very large, and consequently heavy and clumsy, while however well it is made it needs constant adjustment to keep it in proper condition, and the number of links and joints provide opportunities for lost motion and an ever-present weakness under the increasing attacks of dirt and water.

It is notable that the layout of brake-operating rods on the chassis has improved greatly this year; there is far less spring in them and less joints, but the axle brakes remain practically unimproved.

From some points of view the double internal brake is ideal, as it is easy to inclose and can be very smooth and powerful if provided with heavy rigid shoes. But it must essentially cost more to make, and it is liable to be distinctly heavy, while the necessary width of the drums is often excessive and troublesome.

Laying Out Chain Camshaft Drives

The Principles Involved Discussed, and Some of the Problems

By F. L. Morse*

THE call for chain-driven timed shafts in the automobile probably first came because of its flexibility as to center distances, as evidenced by the International Harvester Co.'s application on overhead camshafts in 1908. Here the centers were long, and the chain was the easiest way to drive the camshaft, so upwards of a thousand were thus equipped. Next its use was suggested as a remedy for excessive noise, or what passes for the same fault—a regular variation in the noise so often found in gearing, as it is found nearly impossible to get a pair of gears exactly true mechanically and in tonal qualities.

The silent chain met these requirements of flexible centers and quiet operation, but brought a different trouble in its train, viz., short life due to the lengthening pitch. This was not a matter of chain destruction as understood by the chain maker, but rather of design or special application, as the accumulated lengthening of but 0.003 or 0.004 in. per pitch permitted the chain to become so loose as to strike some interfering point, and it was for this reason that removal was required.

This lengthening, however, of 0.003 or 0.004 in. per pitch is but a small percentage of the total life of a chain if adjustment had been provided, and, as a matter of fact, little trouble would be found from lack of correct timing until the chain had lengthened six times this amount, or 0.024 in. per link. However, thousands of drives had been put out with non-adjustable centers, notwithstanding every chain maker knew the desirability of and recommended adjustment. It was imperative that a chain be furnished that would lengthen less rapidly in order to give a reasonable life to the car user, so the chain makers immediately commenced to better their product.

The first and easiest expedient was to what is termed run the chain in, i.e., to take out the initial lengthening that would come from quick smoothing up and seating home of the joint parts in the punched holes in the links. Then followed as promptly as possible experiments to get more suitable steel and refinements in the process of manufacture. This was accomplished to a large extent within a year or two, so that then these early applications of chains to automobiles on a whole proved fairly satisfactory to all concerned, the average life being between 10,000 and 20,000 car miles. The chain then several years ago became a competitor for gears for the timed shaft drives on gas engines, and at an initial greater first cost, which indicated some added desirable feature, and a comparison between the two forms of transmission may indicate the future trend in design, which, I understand, is of particular interest to the automobile engineer.

In the general description of silent chains you have been told (1) that the chain contacts with and drives through all the teeth embraced by the chain, and (2) that it rises higher on the teeth as the chain lengthens, thus maintaining its correct pitch diameter, and (3) that it is only the free chain in between the sprockets which affects through its lengthening the angular relation of the two shafts. As a matter of fact, these statements are only partially true as far as the Morse chain is concerned, and, being interested in that product, I

*From a paper read before the Indianapolis Section of the S.A.E., November, 1915. Mr. Morse is president of the Morse Chain Co., Ithaca, N. Y.

will only speak of its action, as possibly a discussion may bring out the action of other products and wherein they differ, if at all, as I trust representatives of the chain makers are here.

The links of the silent chain contact with the sprockets at an angle greater than the angle of friction, and therefore tend to slide up the tooth, and the distance from engaging point to engaging point being obviously greater on the larger diameter, this action in effect compensates for an increasing pitch. Further, the engagement with the tooth is at a point below the line of pull, so there is also a lever action that tends to maintain the chain at a point higher than its true pitch, in addition to any centrifugal force that may exist.

Three Forces on Chain

We have, then, three forces that tend to slip the chain outwardly and over the teeth, requiring a definite opposing force to keep it on the teeth. Part and sometimes all of this restraining force is represented by frictional resistance to sliding up the teeth, it being a matter of the number of links in engagement on, as well as the size of the sprocket, varying with different sized wheels. Experiments have shown that five to thirty teeth in engagement are sufficient to keep the last link away from the direction of pull from raising on the tooth with any appreciable force. (The number of teeth in the wheels can be reduced so all except the first tooth engage with less than the angle of friction, but under these conditions the drive does not operate quietly or in accordance with the general design of silent chain.) If, then, more than this number of teeth engage the chain, it will float between the teeth, not touching either face, till the tension—there always being more or less—of the slack side pulls the chain against the idle or non-driving face of the teeth.

Drive Force Is Tension Difference

The effective driving force of the chain is the difference between the tight and slack strands, the same as in belting, and something of the same "creep" that is found in belting takes place on the tooth faces, as the chain is driving through frictional contact with many teeth. The drive gives a positive speed ratio because, either by friction against the teeth, or tension on the slack side, or both, it is prevented from going over the top of the teeth, while it still drives through frictional contact with, and has a slight movement on many teeth. The first tooth in engagement with the chain on the tension side is taking the largest share of the burden of driving, and the chain rides higher on this tooth than on the next tooth back, due to the angle of pull to the face of the tooth, and also because the chain is slightly elastic, and, due to the tension, is longer at this point.

At each successive tooth the lengthening due to elasticity decreases, due to the lesser tension, and also due to a lessening tension the chain gradually creeps down the tooth on the driving wheel until it gets to a point at or below its pitch diameter. Under these conditions the chain is drawing a spiral on the sprocket, the larger diameter on the driver at the entering tooth, on the driven at the leaving tooth, while the smaller diameter may be anywhere between these points and the leaving or entering tooth of the driver and driven respectively, depending on the number of teeth engaged by the chain. If these statements are correct, it follows that only a limited number of teeth on the chain wheel may do the driving, not all in contact with it, and as a corollary that it is always desirable to have this minimum number of teeth engaged by the chain. The distribution of the tension necessary to drive over a number of teeth is what makes the chain so quiet in action, as the taking up by the links of the pressure of driving is gradual and produces no blow effect.

The lengthening of the chain, and particularly that portion in tension between the chain wheels, causes a change in the angular relation of the connected shafts, and in camshafts a lag in timing is obvious. In addition to this, on account of the tooth face being at an angle to the line of pull, when the chain has lengthened and climbed higher on the tooth, this has permitted the wheels also to lag slightly more, but this is the worst that can be said, and can almost be neglected.

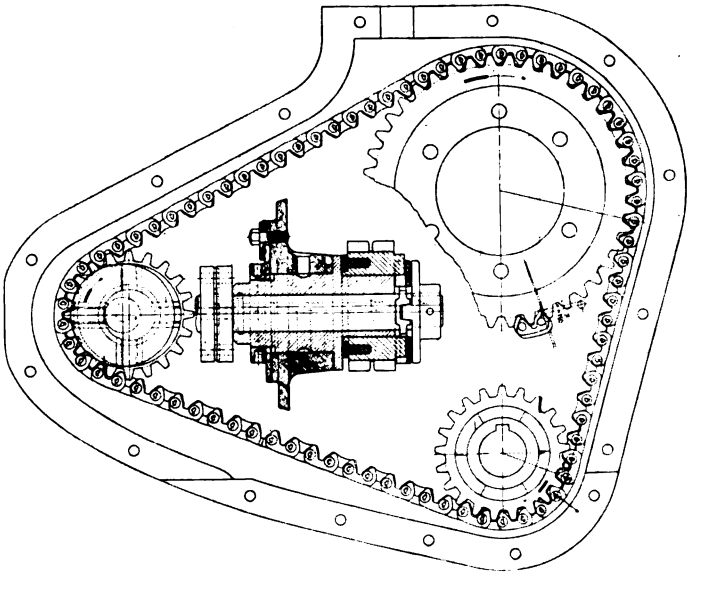
Details of Typical Layout

For instance, there is illustrated here a typical triangular drive, crankshaft sprocket, twenty-one teeth, camshaft sprocket forty-two teeth, on 6.406-in. centers. The chain has seventy-nine links, and the Morse adjustable sprocket is used on the accessory shaft. The adjustment will take care of a lengthening of one link, when the odd link furnished can be removed and the adjustment set back to zero, thus allowing for lengthening of another link, or ½ in., or a total of 1 in. This is an extreme case, and should be good for 50,000 to 100,000 car miles. We now have a lengthening of 1 in. in seventy-nine links, or 0.01265 in. per link, the crank sprocket being 3.355 in. and cam sprocket 6.691 in. pitch diameter. The wheels are on 6.406-in. centers, thirteen links in the tension run to the camshaft wheel, and thirteen times 0.01265 in. equals 0.16445 in. as a total, which in itself permits of a lag in the timing of approximately 2.8 deg. In lengthening this amount the chain has climbed radially 0.084 in. on the larger and 0.042 in. on the smaller wheel, and this has permitted the wheel to lag 0.072 in., equaling 1.2 deg., or a total for both causes of 4 deg. This is not very serious, as I understand it, and could in any case be compensated for by cutting, say, two keyways in the camshaft sprocket, the one in correct relation to a tooth when new, the second when one link is removed, so at no time could the lag in timing amount to more than 2 deg.

On the triangular drive above referred to, there was used a chain 1½ in. wide, ½-in. P., and this drove the camshaft, with water pump and generator on the third shaft. With this arrangement the total space parallel to the crankshaft was 1¾ in., or, allowing for back clearance, 2 in., which with gearing might have been reduced to 1½ in., so the saving in room by the use of gearing would have been about ½ in.

Unless a third or intermediate gear is used, there is generally more weight with the chain drive, but this amounts to not more than 4 lb. on an installation such as above, this being the total weight of the chain. The cost of chain wheels is less than that of gear wheels, as they can be cut faster, and there are practically no rejections. A case-hardening steel

(*Continued on page* 1037)



Details of chain layout and of Morse adjusting sprocket

The History of the American Automobile Industry—6

Copeland's Steam Bicycle Capable of 15 M.P.H.—Anticipating the Present-Day Side Car—$500 the Maximum Price for Motor Vehicles?—Public Confidence Grows

By David Beecroft

¶ Review—In the last installment the early development of steam road vehicles in their various forms was traced up to 1880, the prejudice of the public against them being mentioned. There were a number of three and four-wheeled steam carriages, as they were called at that time, and even a steam man for drawing a wagon, the figure being fitted with a light, high-speed engine. A growing demand for mechanical power became manifest in the seventies, there being several instances where advertisements appeared offering $5,000 and $10,000 reward for the invention of substitutes for street car horses and of practical road vehicles. By 1876 the gas engine had reached a stage of development where it was attracting serious attention for stationary power and boat work and about this time bicycles became of interest to the public. ¶ This week the narrative takes up the first motorcycle—a steam bicycle—and the prototype of the present-day side car and tells how $500 was thought to be the maximum price possible for a motor vehicle. It took nearly 10 years to get the public above this low-price limit, which was one reason that the motor vehicle did not come into common use much earlier. The wide publicity given the steam bicycle, however, did much to increase confidence in the self-propelled conveyance for everyday purposes.

OF experimenters whose influence has reached down to the modern automobile movement, dating from 1880 to the present day, although not a part of it, the first position seems to be due to Lucius D. Copeland, who, 35 years ago, was living at Phoenix, Ariz. Copeland began his work in 1881 by attempting to attach some form of motor to a Columbia bicycle that would not do all the work, but would assist where the going was hard. Possibly the sands of that southwest country were responsible for this desire for help. The high-wheel Columbia bicycle was hardly a structure to which a successful application of power could be made, and he reports his first attempt as both very inefficient and dangerous. About this time, the Star bicycle, which carried the large wheel at the rear in a frame and steered by the small front wheel, appeared on the market and one was purchased by Copeland. To this, he attached a small boiler on the inclined front frame tube and fitted a small engine just below the saddle with belt to a large pulley on the rear wheel. On a good road, this device would drive the bicycle at 15 miles per hour, a very creditable showing for so small an equipment. This was finished in the fall of 1884 in time for exhibition at the Maricopa County Fair at Phoenix. Later, being anxious to secure assistance, he showed the steam bicycle at Mechanics' Pavilion in San Francisco in 1884. The engine was ¼ hp. with the weight complete, including water, as 18 lb. Later reports describe the motor as 1 hp. and able to make 1000 r.p.m. and drive the vehicle 12 m.p.h. The entire equipment could be easily removed or transferred from one bicycle to another. When the date, 1884, is considered, it will be seen that this was a wonderful accomplishment and it is another illustration of the fact that the self-moving idea has always accompanied wheeled vehicle progress.

A Company Formed

The next spring Copeland showed this motorcycle in many California cities, such as Oakland, Berkeley, Sacramento, Stockton, Napa, Suisun, Watsonville, Santa Cruz, Vallejo, San Rafael, San Jose, and other places, besides several skating rinks and exhibition halls in San Francisco, but did not find the financial assistance wanted. He then proceeded to New York, where he exhibited at Madison Square Garden and other places. After 3 years of searching with a persistence worthy of a better reward, he met Sanford Northrop, who, with Drs. Starkey and Palen, of Philadelphia,

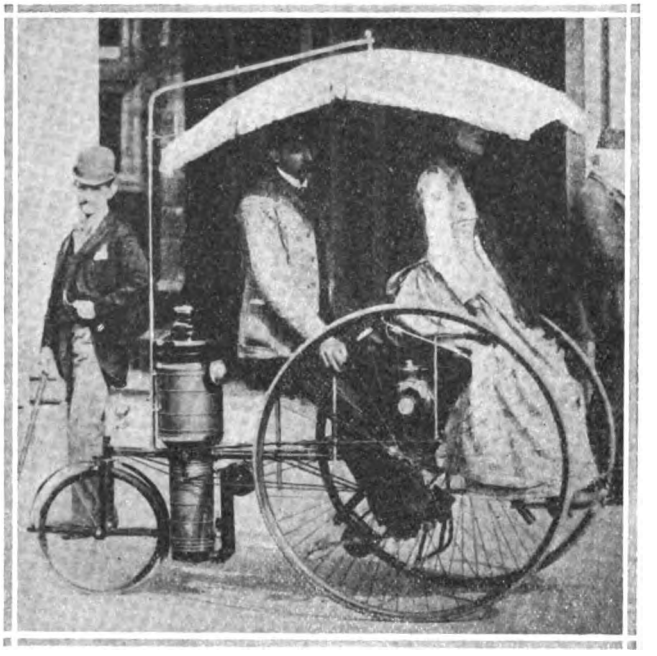
Lucius D. Copeland and his first successful steam motor, which is shown fitted to a Star bicycle of the vintage of 1884

formed a company known as the Northrop Mfg. Co., with a shop located in Camden, N. J. Here, having some capital, he was able to make improvements and 3 months later was running a steam tricycle on Camden streets. He fitted automatic water-level control and automatic fire control which depended upon the boiler pressure. He connected what would now be the brake and clutch levers by making the operation of the brake lever shut off the steam. He made many trips to adjoining towns, drove often in Fairmont Park, Philadelphia, and his longest trip was to Atlantic City, 60 miles, and return, carrying a son of Dr. Starkey as a passenger. His tricycle patent, applied for in October, 1886, was issued April 5, 1887, and covers the use of the framing tubing for an oil receptacle and the use of the exhaust steam to heat the feed water and fuel oil.

Prototype of the Side Car

In 1888 Copeland brought out a motor bicycle along the lines of the safety bicycle, which was beginning to make its appearance at that time and of which he, quite rightly, recognized the value. With his previous success, it is needless to say that this machine ran well. Afterward, he attached a wheel at one side on an adjustable reach so it could be fitted to any gage of road and on this reach was placed a seat for a third passenger, thus anticipating the modern side car by nearly a score of years.

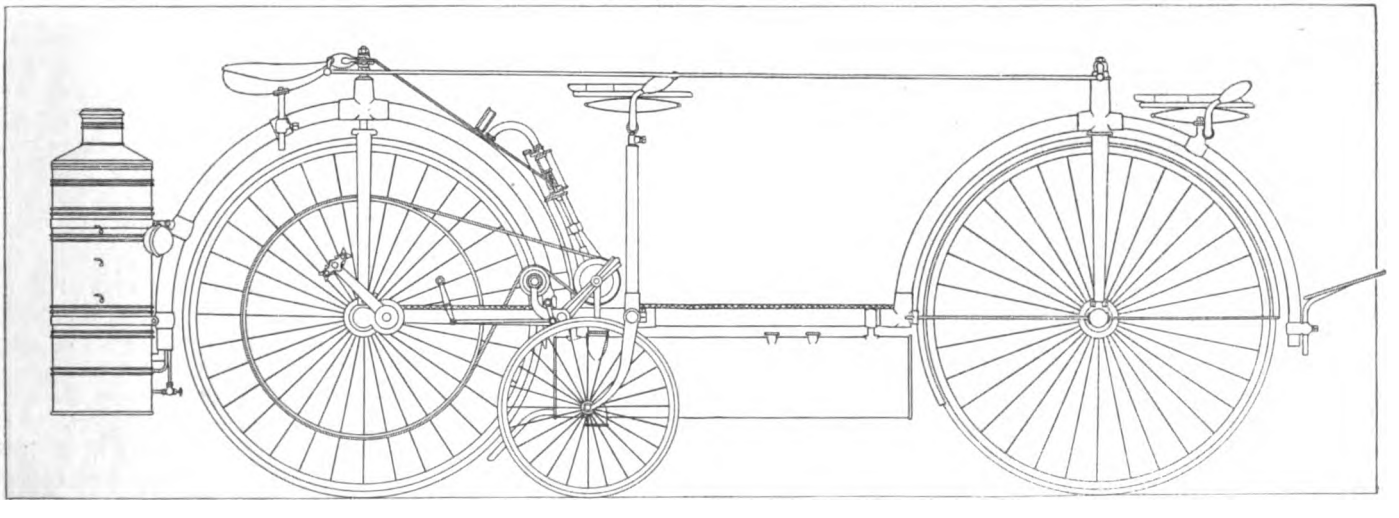
The Moto-Cycle Mfg. Co. of Philadelphia controlled Copeland's patents on steam bicycle motors, and in 1890 the vehicle produced used bicycle wheels with heavy rubber tires and a two-cylinder horizontal engine on the frame of the machine connected to the axle of the driving wheel by noiseless gearing. A safety boiler could get up steam in 5 min. and one filling of the water tank would suffice for 3 hr., or a 30-mile run. Fuel was carried on the other side of a partition in the same tank and some distance from the fire. One hand steered while the other held the throttle lever, and, releasing the throttle, stopped the engine. It is not known that any of these vehicles were sold and probably they were not.



Copeland's second machine, built in 1886, was a rear steering invincible tandem tricycle to which he fitted his steam motor

$500 the Maximum Price?

Mr. Copeland, now of Sawtelle, Cal., says he became discouraged, thinking the people would not pay more than $500 for a motor vehicle and that there would be little or no profit in the business. This coincidence of opinion in the matter of maximum price, with that of Charles E. Duryea, who, in 1891, thought $500 the maximum, probably indicates very closely the feeling of the public. It took nearly 10 years to get our people above this low-price limit. The motor vehicle would have come much earlier had they been open minded enough to have accepted it. These exhibitions and the Copeland patent with the wide publicity given by the published descriptions undoubtedly did much to give the people confidence in the steam vehicle.



Copeland Moto-Cycle to carry three passengers. The rear rider steered and controlled the machine. Starting was accomplished by foot power by means of a lever and clutch arrangement driving the rear wheel. Adjustable idler wheels on both sides served to hold the machine upright when at rest

The Rostrum

Nickel-Steel Is Stronger Than Cold-Rolled

EDITOR THE AUTOMOBILE:—Strictly speaking, what is meant by a cast steel gear? A drop forged? Are there vanadium gears in use on many cars, and which of the three are the best and which costs the manufacturer the most to produce?

2—Is nickel-steel best to use for axle shafts, and must it heat-treated? If so, what effect has it on the shaft by treating it so? Which is the best to use, cold rolled, or vanadium steel, and which costs the most to produce?

3—Is cold-rolled steel simply a mild steel, or is it alloyed somewhat differently?

4—Which of the above materials does Overland use in its model 83 cars and what does Buick use in its 1913 to 1915 cars? Also the 1913 to 1915 Hupmobile?

Plentywood, Mont. J. S. K.

—A cast steel gear is one in which the gear is a steel casting. A drop-forged gear is one in which it is a forging. Vanadium steel gears are used on a few cars, but where alloy steel is used nickel is employed to a much larger extent. The alloy steels are the most costly. Forging is the method generally carried out in all cases, the forging being a blank and the teeth afterwards cut upon it.

2—In order to secure the benefit from nickel when used as an alloy, the steel must be heat-treated. Heat-treating the steel makes it tougher and stronger and increases the elastic limit. There is no comparison between cold-rolled and vanadium steels. Cold-rolled steel is that in which the metal has been rolled into shape while cold. It is only a simple carbon steel and is quite soft, as a rule.

3—Cold-rolled steel is not alloyed with any of the substances used to increase the physical properties of the metal. If you will refer to THE AUTOMOBILE for April 8, 1915, you will find a series of articles entitled "The Pathology of Steel," which will make clear to you the points upon which you desire enlightenment.

4—Regarding the materials used in the various cars you mention, it may be stated that all three of these concerns use a wide variety for different purposes. If you will mention the parts to which you particularly refer, the information could probably be given.

Excessive Carbon in Cylinders

Editor THE AUTOMOBILE:—To what would you attribute excessive accumulation of carbon in cylinders? The compression is splendid, the level of oil is correct, and the mixture is correct. The car is a 1911 model and has seen a great deal of service. Could the cylinders have become oval or could the rings have lined up so that the openings are all in line?

2—Would it be advisable to install aluminum pistons in the above car if I had the cylinders re-ground? In this case, would it be necessary to have new connecting-rods made? Do you recommend standard pistons and rings in preference to the aluminum ones in an old car?

3—Do you know of any way to repair broken celluloid windows in a top, without replacing the same?

These questions are relative to Packard 30 cars.

Orange, N. J. N. S. B.

—The excessive accumulation of carbon in the cylinders of the model 30 car is no doubt due to the natural wear of the cylinders and pistons which have now left enough clearance between same to allow the oil to work up. Although good compression is observed and the piston rings seem to be all right, this clearance will permit the oil to work its way through. The only thing to do in a case of this kind is to be sure that the oil level in the crankcase is kept at the proper level. If the cylinders still carbonize, they should be removed and a set of reground cylinders with properly fitted pistons should be installed.

The Packard Motor Car Co. keeps reground cylinders and pistons of all sizes on hand for this particular purpose, and you can get details regarding price from the nearest Packard agent.

2—It would not be advisable to install aluminum pistons in this model as the complete design of the motor is not intended for high-speed reciprocating parts and you would be apt to run into clearance difficulties. It would probably be more satisfactory in an old model of this sort to use the standard pistons and rings.

3—THE AUTOMOBILE has no record of any satisfactory method of repairing broken celluloid windows. It is easy enough to replace them by simply ripping out the stitching around the windows, put in a new piece of celluloid and stitching in the old seam.

Using Generator for Battery Charging

Editor THE AUTOMOBILE:—Would it be possible for a Wagner lighting and starting generator taken off a Studebaker 35 (the cutout relay being out of order, would have to be done away with), to be used for charging batteries, to be run by a stationary gasoline engine? If this could be done, please give instructions as to controlling charges and at what speed it should be run. Also any other information on the subject which would be of any help.

Sussex, N. B. H. W. S.

—This equipment can be used to charge six-cell lead batteries by closing the relay points permanently and arranging the engine drive so that it will run the generator from 1600 to 1800 r.p.m. The controller should be placed in the generator position and under these conditions the charging rate will be from 8 to 9 amp.

Troubled by Excessive Vibration

Editor THE AUTOMOBILE:—I have a 1910 Cadillac. It runs pretty well still, but has a good deal of vibration. Would aluminum or magnalium in pistons reduce this vibration sufficiently to warrant the expense? I am using a Schebler carbureter and getting but 5 miles per gallon. Can you suggest what can be the trouble? I formerly ran about 12 to 14 before installing the new carbureter.

Hibbing, Minn. B. S. A.

—In the opinion of the Cadillac company the effect of substituting aluminum or aluminum alloy for the standard material would not be such as to warrant the expense of same.

Regarding the mileage it would be well to make sure that

the carbureter is correctly adjusted. If in good repair and adjustment, the results obtained should be very satisfactory and the mileage much higher.

Average Output of Ford Magnetos

Editor THE AUTOMOBILE:—What is the average output of the 1914 and the 1915 Ford magnetos in amperes?

2—What is the frequency in cycles per second of each model at 1000 r.p.m.?

3—Am I right in the assumption that the frequency varies with the speed of the motor or is it independent of this?

4—What is the phase of this current?

5—What is the maximum speed at which perfect synchronism may be obtained from a Bosch magneto of the four-cylinder type? I mean by this, the speed of the magneto armature.

Marysville, Ohio. E. C. P.

—The voltage and the amperage of the model T Ford magneto varies according to the speed of the engine. With the ⅝-in. magneto used previous to October, 1914, the amperage ranges from 3 to 5. With the ¾-in. magneto used since that time, the amperage ranges from 5½ to 8.

2—As there are sixteen magnets and sixteen coil spools in the construction of the magneto assembly, it follows that there are sixteen electrical impulses with each revolution of the crankshaft.

3—This is answered under question 2.

4—This is also answered under question 2.

5—Tests made on the Bosch magneto show that it is possible to obtain synchronous ignition from a four-cylinder type at any and all speeds. Tests have been made on instruments where 15,000 sparks were obtained in a minute.

Description of Gearless Differential

Editor THE AUTOMOBILE:—Please give diagram and detail explanation of the gearless differential. Which cars use it?

Detroit, Mich. M. S.

—A diagram of the gearless differential in the form of a sectional view is given in Fig. 1. The actual assembly varies in different cases; that used on the Argo has the housing and the flanges in one piece while in that for the Ford they are in three pieces. The companies using this gearless differential as standard are the Argo Motor Co., Jackson, Mich., and the Woods Mobilette Co., Chicago, Ill., and also various light car concerns which obtain a complete axle from the Detroit Axle Co. The operation of the gearless differential is as follows:

The left hand differential flange, to which differential driving gear is bolted, the right hand flange, the center ring, and the right and left driving sectors, two at top and two at bottom, are all bolted together, making this whole outer differential housing a unit. The right and left ratchets, which are keyed to their respective axle shafts, are independent and free to rotate inside of housing. The two round members with knobs at ends and center, placed crosswise, are the walking beams, or pawls, and are the interlocking mediums between the driving sectors and ratchets. The illustration shows the right hand end of the top pawl in the tooth of the right hand ratchet and being driven by the contact face of the driving sector.

This drives the ratchet forward through the center of the end of the pawl. In the same manner the left ratchet is driven forward by the lower pawl, which is engaged at its left end. Thus both wheels are driven forward positively and neither can spin, as with the gear differential.

To drive backwards, the differential housing starts to move to the left and pushes the end of the pawl out of ratchet tooth, which throws the opposite end of the pawl down into the tooth of the opposite ratchet. Contact face of reverse driving sector engages and drives the wheel backward. The lower pawl acts in the same manner. In turning a corner, imagine that the car is being driven forward and is to be turned to the left. The right wheel starts to revolve faster than the left and causes the right hand ratchet to move faster than the differential housing, which can only go as fast as inner or slower moving wheel. The ratchet pushes the end of pawl out of its tooth, thus allowing the ratchet to have a free movement forward. As soon as the corner has been made and both wheels are revolving at equal speeds, the spring at the center of the pawl pushes the end of the pawl back into engagement and the drive is again taken up by both wheels.

When the wheels propel through the driveshaft, as in case of coasting or braking through it, both ratchets start to turn faster than housing, and push the engaged ends of pawls out of engagement and the opposite ends into driving position in the opposite ratchet teeth, thus causing the ratchets to propel the driveshaft.

Low and High-Tension Magnetos

Editor THE AUTOMOBILE:—What is the difference between a low- and a high-tension magneto?

2—Give a diagram, if possible, of the magneto and battery wiring on the 1907 Packard, using Eisemann magneto.

3—What is the transmission and rear axle gear ratio on the 1910 Briarcliff model Lozier?

4—Describe the oiling system on the 1910 Lozier. Does the oil passing through the sight feed feed to the cylinders or to the crankcase, and about how many drops of oil must the sight feed show?

5—Why does the fourth cylinder smoke on almost all 1910 Loziers?

6—How can a Remy magneto as used on a 1911 planetary Buick be jumped so as to show a spark when disconnected from the motor and regular wiring?

Bronx, N. Y. A. B.

—The difference betwen the low- and high-tension magnetos is that in the low-tension there is only a primary winding where low-tension current is generated, while in the high-tension magneto there is also included a secondary coil in which a high-tension current is induced, due to the interruption of the primary circuit.

2—A diagram of the magneto and battery wiring of the 1907 Packard Eisemann set is given in Fig. 3.

3—The gear ratio of this model is 2.8 to 1.

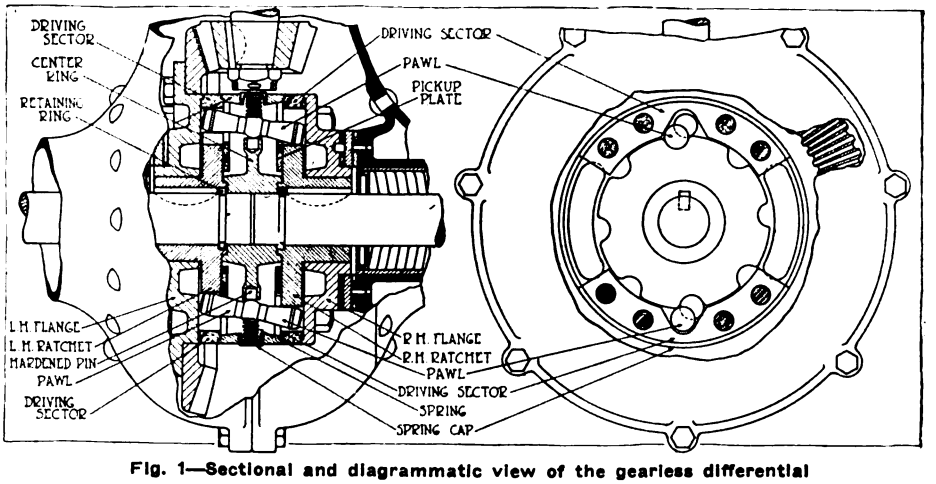


Fig. 1—Sectional and diagrammatic view of the gearless differential

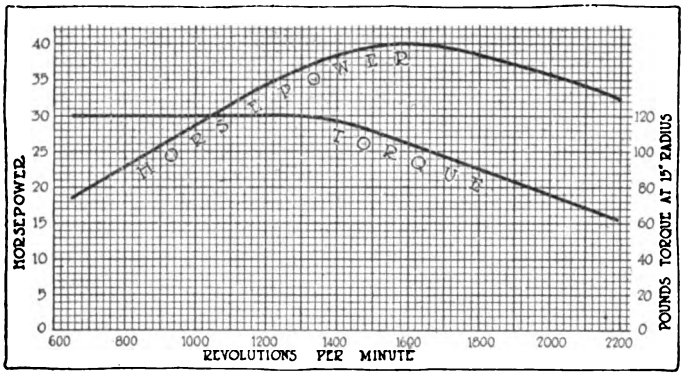


Fig. 2—Horsepower and torque curves of the Continental 4⅛ by 5¼ model C motor

4—The oil is drawn from the auxiliary tank on the side of the engine to the lubricator. It is then distributed by the lubricator to different parts of the motor and direct to the principal bearings. The oil pressure forces the oil back into the lubricator from the sight feed and then indicates that the lubricator is working.

5—So far as THE AUTOMOBILE has record, the statement that the four-cylinder smokes on almost all 1910 Loziers is not strictly correct, although it may be true of a few. If you will press back the tube on the connecting-rod cap to ⅛ in. so that it will not pick up so much oil, it will probably reduce the smoking materially.

6—If you are experimenting with this magneto, it is suggested that you place it in a lathe, using the lathe spindle to drive it, being sure that the magneto is well grounded on the lathe. Also be sure that the spark plugs are grounded to the lathe, that is, the outside of the plugs and not the core.

Wants Parts for Stoddard-Dayton

Editor THE AUTOMOBILE:—Can a set of this year's license plates be transferred from an old to a new car without notifying the license bureau?

2—Who makes the parts for the Stoddard-Dayton car?

3—What motor was used in the 1910, 1911, 1912 and 1913 Hudson?

New York City. J. KING.

—No.

2—Dayton Auto Repair Co., 351 West Fifty-first Street, New York City.

3—Two motors were used in the 1910 Hudson, the Buda and the Atlas. Since then all Hudson engines have been manufactured by the Continental Mfg. Co., Detroit.

Dimensions of Several 1916 Cars

Editor THE AUTOMOBILE:—What is the extreme width and length over all of the following 1916 cars with the top down: Reo four, Reo six, Dodge, Studebaker four and six and Jeffery four?

—The dimensions you request are as follows:

Car	Overall Length	Overall Width
Jeffery four	13 ft. 10 in.	5 ft. 7¾ in.
Studebaker four	13 ft. 8 in.	5 ft. 8 in.
Studebaker six	14 ft. 6 in.	5 ft. 8 in.
Reo four	14 ft. 2½ in.	5 ft. 7 in.
Reo six	15 ft. 6 in.	5 ft. 7 in.
Dodge	13 ft. 0 in.	5 ft. 6 in.

Remedying a Grabbing Clutch

Editor THE AUTOMOBILE:—I have a 1916 Buick model D 45 and find that the clutch grabs very badly. Can you tell me how I can remedy this?

2—I would like to know the price of a Wagner generator which comes on a 1914 Studebaker five-passenger, four-cylinder car. Also, where to look for trouble when it does not generate any electricity?

Troy, N. Y. J. M. S.

—The grabbing clutch is due to insufficient play in the clutch leather expanders which bring the leather out against the inner rim of the flywheel when the clutch is engaged. The difficulty can be easily overcome by removing washers from the ends of expander plunger stems.

2—The price of a new generator is $70. You do not furnish sufficient information to tell you exactly where to look for your trouble, but try the following means of remedying it:

a—Clean generator commutator carefully by using very fine sandpaper (00 grade). Do not use emery cloth.

b—Look for open circuit or loose connections at following points: Generator terminals, back of combination switch and junction box, battery indicator terminals, relay terminals, storage battery terminals.

c—Remove relay cover, start engine, and gently accelerate. If relay contact points close and open automatically as engine is speeded up and down, this indicates that generator is performing properly.

d—Stop engine. Test indicator for reversed connections by switching on headlamp. Indicator should read Discharge. Turn out lights, then start engine, run it at a speed corresponding to about 15 to 20 miles per hour and hold relay contact points closed with the finger. If indicator reads Discharge trouble is in generator. If indicator reads Charging trouble is in relay. If indicator reads Off, trouble is an open circuit.

Horsepower Curve of Continental C

Editor THE AUTOMOBILE:—Please show the power curve of a 4⅛ by 5¼ Studebaker 4-35 model. Also that of a Continental 4⅛ by 5¼ model C four-cylinder motor.

Brooklyn, N. Y. H. E.

—It is against the policy of the Studebaker company to permit the publication of horsepower curves of its motors. The power curve of the model C 4⅛ by 5¼ Continental motor is given in Fig. 2.

Salt Removes Carbon But Rusts Motor

Editor THE AUTOMOBILE:—I have a friend here who drives a Buick and cleans carbon out with salt. He runs his engine 2 or 3 min. to warm up, then removes the spark plugs and puts 1½ normal salt tablets in each cylinder and then runs the car about 15 miles, by which time there is no carbon remaining in engine or valves. I know that this will remove all carbon deposits, but will the chemical action set up by the salt and heat do any damage to the cylinders?

Live Oak, Fla. A. E. W.

—While salt will burn off the carbon by chemical action due to the combination of the salt and carbon into sodium carbonate it is possible that the combination of chlorine with the hydrogen in gasoline would form hydrochloric acid, which would tend to have an intense rusting action on the cylinders.

Lighter Pistons Reduce Vibration

Editor THE AUTOMOBILE:—I have a 1914 Cadillac car and would like to have your opinion as to my making a change on the pistons and connecting-rods. The engine has good power and I think good economy. However, it vibrates a good deal and is not very quiet.

I was thinking that by taking some of the weight off of the pistons and rods that the engine would not vibrate so much and would be more quiet. Also it might increase the power but at the speed I usually run, which is 20 to 25 m.p.h., it might not be noticed. However, if you think it would be a benefit, please tell me what the best method would be in making this change.

Unless the change would be quite an improvement, I hardly think it would warrant my spending very much for it.

Youngstown, Ohio. S. W. G.

—It is probably true that a reduction in the weight of the piston rods in this motor would reduce the vibration somewhat. However, as these pistons and connecting-rods were designed to carry safely only certain loads such as are likely to be imposed upon them, it would be dangerous to weaken them. Practically speaking, it is very much to be doubted if these parts could be made sufficiently lighter than they were originally to reduce the vibration sufficiently to make any perceptible difference.

Cone and Disk Have Even Break

Editor THE AUTOMOBILE:—Please give a discussion of the comparative efficiency of the types of clutches used on modern automobiles—the cone clutch and multiple disk, running in oil and with dry plates. If there is a choice of type of clutch for a particular car, please state which type is the best for which cars. In your opinion, is there an all around best type of clutch?

Brooklyn, N. Y. F. P. BLISS.

—Regarding a general discussion of disk and cone clutches it is very difficult to expound on the advantages and disadvantages of each since they are about equally matched in popularity if the choice of automobile designers in this country can be taken as a criterion. The disk and cone clutches have been hovering on the side of the 50 per cent mark each for the last five years as regards the specifications of American cars. Either type is excellent and will give ample satisfaction.

High Gear Ratio for Buick

Editor THE AUTOMOBILE:—Would there be any advantage in setting the timing gear on the magneto shaft one tooth or two teeth ahead? Would it take up the wear or play caused by two years of running?

What is the gear ratio of the differential in a White Streak Buick? How much higher would you have to gear it to get 10 miles more speed?

Mt. View, Cal. J. C. M.

—The advancing of the magneto gear one or two teeth would not take up back lash caused by wear, but will compensate for lag in the electrical system at high speeds.

The Buick Motor Co. never designated any of its models by the title of White Streak. It is believed, however, that this appellation was applied to some model 10 cars, which were used for racing. These were built with both 3½ to 1 and 3 to 1 rear axles and if you have one in which the gears are marked 48 and 13 you can get more speed by inserting a set of 48 and 15 gears.

Steering Column Is Easily Lowered

Editor THE AUTOMOBILE:—Is there a firm in Missouri manufacturing an automobile signal device for the front and rear of the machine? If so, what is its name and address?

2—Has the Sharon tandem car been used successfully as yet? About how many are in use?

3—Can the steering column of a Studebaker 20 be lowered to any angle without much expense? What must be done to lower it?

4—Does the company which manufactured the Cutting car still exist?

5—Is the silent Knight motor much in demand at the present?

6—What is the horsepower of a Ford?

Seelyville, Ind. L. F.

—It is very possible that the concern which you have in mind is that of A. P. Rothermich, 2915 N. Taylor Avenue, St. Louis, Mo.

2—THE AUTOMOBILE has no record of the performance of these cars.

3—The steering gear on the Studebaker 20 is pivoted to the cross member of the frame, and it can be raised or lowered to certain angles by the installation of a steering post tube and bracket assembly, which can be had by placing your order with the nearest Studebaker dealer. Inasmuch as you do not state the exact angle which you desire, it is impossible to give prices, etc., but the change can be readily made at little expense.

4—No. Parts can be secured from the Puritan Machine Co., Detroit, Mich., or S. C. Erbes, St. Paul, Minn.

5—The Knight motor is being produced in greater quantities this year than ever before.

6—About 20 hp.

Valve Stem Clearance Causes Knock

Editor THE AUTOMOBILE:—Can you tell me what in your opinion would cause a light tap in a Ford motor? This tap is very noticeable at all engine speeds, both when running under load and when idling. It sounds like a too far advanced spark, but this is not the cause. Neither is it caused by the piston striking the cylinder head gasket. The tap is regular and occurs in one cylinder. It is not caused by carbon or connecting-rod trouble.

Washburn, Me. E. M. G.

—From the data you give, it would seem that you are referring to a valve tap which possibly results from worn push rods or valve stems in which case the parts should be replaced and fitted with the proper gap of not more than 1/32 in. and not less than 1/64 in. between the parts. When the gap is too wide between the push rods and valve stems, noise will result.

Knocks which become audible with advanced spark usually originate somewhere in the piston assembly and are probably due to loose pistons, worn piston pin bushings, or to the condition of the bearing at the connecting-rod end. Sometimes it happens that the connecting-rod itself is out of alignment or bent.

Dust Cover Perhaps Too Tight

Editor THE AUTOMOBILE:—Can you help me on this? The high and intermediate gear-shifting fork on my Buick 37 wears out very quickly. I have had to put in three in going 11,000 miles. The machine has been well oiled all of the time. The gears do not cause me any trouble when shifting.

Orono, Me. H. H.

—The cause of the shifter forks wearing on this car is that the control lever binds in its socket. This is caused either by lack of lubrication or else by having the control lever dust cap which fits over the ball socket drawn up too tightly against the side. Make sure the gears mesh fully and do not only half engage.

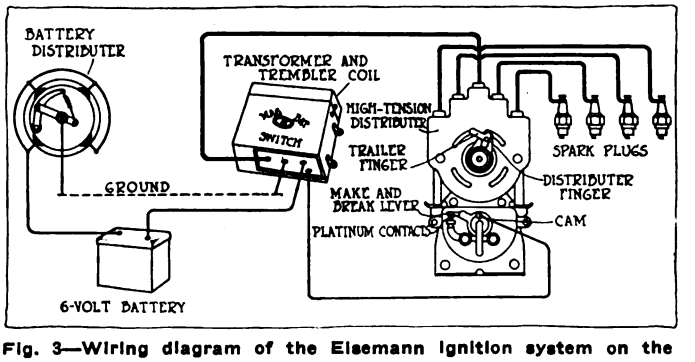
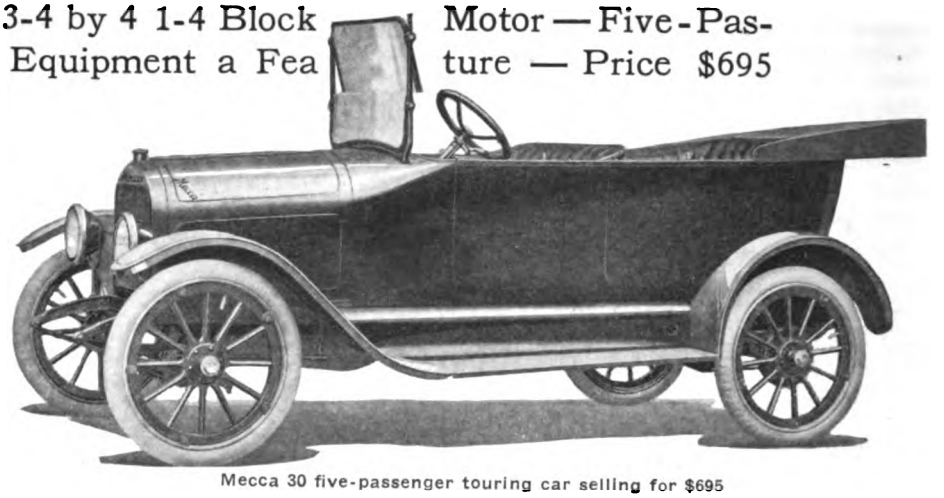


Fig. 3—Wiring diagram of the Eisemann ignition system on the 1907 Packard

Gearless Differential in Mecca 30

Four-Cylinder 3 3-4 by 4 1-4 Block Motor — Five-Passenger Body — Equipment a Feature — Price $695



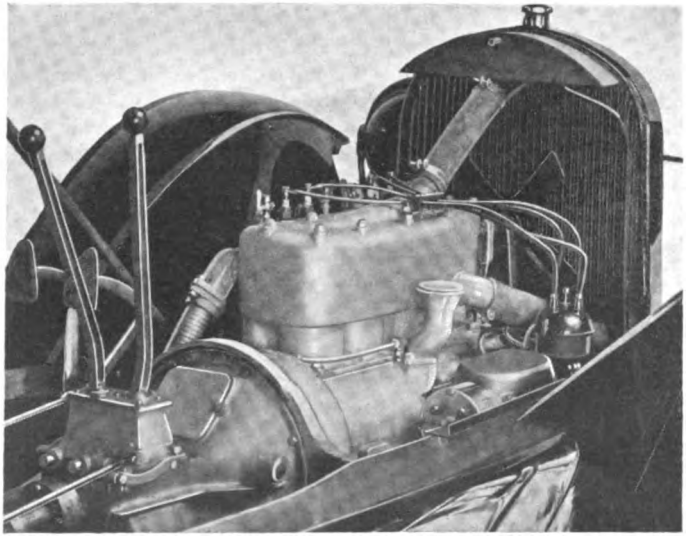
Mecca 30 five-passenger touring car selling for $695

AN assembled car has been put on the market by the Times Square Automobile Co. of New York and Chicago, a concern which has now, in addition to its line of rebuilt and used cars, brought out a product to meet the demands of those desiring a new car at moderate price. The car is made in Detroit and sells for $695 f.o.b. that city.

Standard specifications will be found throughout as the car is assembled from parts made by well-known concerns. The power plant is a four-cylinder Golden, Belknap & Swartz product, having a bore of 3¾ in. with a stroke of 4¼ in. This gives a piston displacement of 187.9 cu. in. This is an L-head design with the cylinders cast in a single block and with a removable top to the cylinders. The motor is of standard construction throughout, the cylinders and pistons being gray iron with light-weight aluminum crankcase and gearset housing bolted together in unit power plant style. The bearings are nickel babbitt and are three in number for the crankshaft. Pounding of the motor at low speeds is guarded against by allowing liberal bearing sizes and a heavy flywheel which keeps the variation in angular velocity at a minimum. The makers claim that with this motor the car is free from vibration up to 40 m.p.h.

Valves Are Large

Cast-iron valves with steel stems are employed. The drive for the valves is through a chain-driven camshaft, thence through the integral cams to positive lifters. The valves have a clear opening of 1⅝ in. in diameter. The outside diameter of the valves is 1 13/16 in. and the lift 7/32 in. The valves are adjustable in the customary manner and are inclosed. The silence features as regards the valve action have been given ample attention as beyond inclosing the valves in removable cover plates the driving chains run in oil and have provision for adjustment to take up any slack.



Unit power plant used in the Mecca 30, showing mounting of the control levers on the top of the gearbox

Ample Factors of Safety

In the selection of materials an ample factor of safety will be found to have been left in all parts under shocking stresses. The connecting-rods are 0.30 to 0.36 carbon steel, drop-forged and heat treated. They are of I-beam section and have ample bearing area both at the oscillating piston pin joint and at the large end bearing on the crankshaft. The bearings in the connecting-rods, as well as those for the crankshaft, are ground to size and the material used in the crankshaft is 0.35 to 0.40 carbon steel. This is, of course, a drop-forging and is heat-treated to produce the rigidity necessary in this class of work.

In the oiling system, which is a pressure feed to the main bearings, the plunger pump is operated directly from the exhaust cam for the number four, or rear cylinder. This pump delivers oil under pressure to a sight feed on the dash whence it passes directly to the motor bearings. In addition to the feed to the bearings the internal parts of the motor are lubricated by the oil mist created by the revolving cranks. This oil vapor pervades the entire crankcase and supplies an ample amount of lubricant to take care of the needs of the pistons and cylinders.

Stewart Vacuum Fuel Feed

A Stewart vacuum system is used for gasoline feed. The carbureter is a Schebler. With this system the gasoline tank, which is of 10-gal. capacity, is hung from the rear of the frame and the auxiliary tank is mounted on the dash. The design of the system is standard and is the same as that employed on a large percentage of American cars this season.

Ignition is by the Splitdorf Dixie model high-tension magneto and the balance of the electric equipment is made up of the Disco units for electric lighting and starting. This is a single unit system connected to the crankshaft by silent chain. The motor generator starts charging the battery at a car speed of about 9 m.p.h. and operates in connection with a Detroit storage battery.

Clutch Runs in Oil

Power is taken from the motor by a single steel drive plate clutch which operates between two wire-woven asbestos friction disks running in oil. The gearset is a selective de-

sign providing three forward speeds. The control is central with the gearshifter lever mounted directly on the cover plate of the gearbox. This clutch and gearbox unit gives a very compact design and one of the features claimed for the clutch is that when once properly set it will never need to be readjusted. According to the maker, with all the parts running in oil to reduce wear and due to the positive action through the series of clamping levers given by the spring pressure, the clutch is never so worn as to need a readjustment. At the time of disengaging the engaging or clamping levers a master ring revolves, positively releasing the disks.

Gearless Differential Used

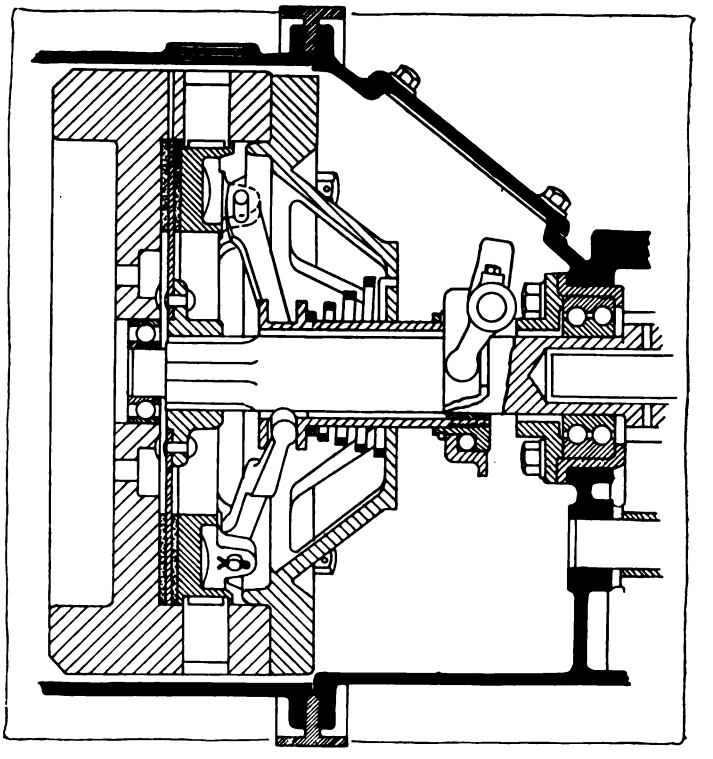
Final drive is through two universals to a semi-floating rear axle. The axle is provided with a gearless differential which is mounted accessibly under a large cover plate. The bearing equipment and the rear axle consist of Hyatt rollers of high-duty type. The frame construction is of pressed channel steel and the springs are semi-elliptic front and three-quarter elliptic rear. The main leaves are of vanadium steel and are guaranteed against breakage for two years. Both sets of brakes are on the rear wheels, the drums are 12 in. in diameter, the wheels are hickory and are equipped with demountable rims taking 30 by 3½ tires. Non-skid tires are furnished in the rear as standard equipment.

3 to 50 Miles per Hour

The chassis length is 104 in. from axle center to axle center and the tread is standard 56 in. providing a road clearance of 10 in. The speed range of the vehicle is from 3 to 50 m.p.h. Steering is by adjustable worm and gear and either left or right drive may be secured as desired.

Five-Passenger Body

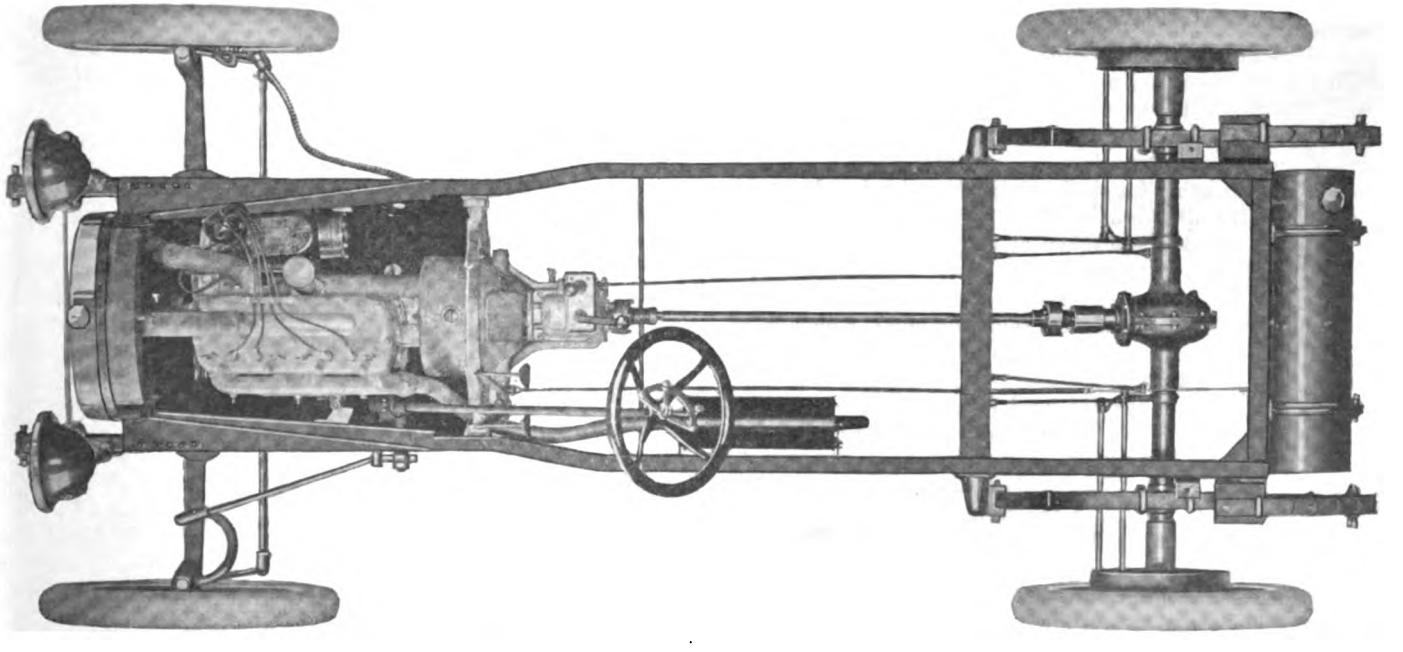
The standard body is a five-passenger touring with streamline design. In addition there is a roadster or raceabout of two-passenger capacity. The cars are finished in what the makers call Mecca blue which is a blue somewhat on the shade of what is commonly known as royal. The car is sold with full equipment including the electric starting and lighting system, two electric headlights equipped with dimmers, electric tail lights, silk mohair one-man top, two-piece rain-vision windshield, number bracket, robe rail, quick-adjustable side curtains, tools, tire holders, extra rim, pump and warning signal.



Section through the clutch used on the Mecca 30 which forms a compact unit with the gearbox. One of the features claimed for this clutch design is that when it is once properly set it will never be necessary to readjust it. All parts run in oil and the action of the spring pressure is positive through the series of clamping levers. At the time of disengaging the clamping levers a master ring revolves, positively releasing the disks.

State Purpose of Sample Invoice

The United Export Bureau of THE AUTOMOBILE has received a report from Jerez de la Frontera, Spain, recommending that where samples are forwarded to prospective customers on memo charge sheets and no actual charge is intended that this should be clearly stated. The report says that recently a merchant in that place was highly indignant on receiving such a memo sheet as he thought he was being charged for the sample. Many such misunderstandings would be avoided by stating the purpose of the invoice.



Plan of Mecca 30 chassis, showing simple but strong construction. This car is assembled from well known units

Use of Optical Indicators for Checking Defects in Functioning of Motors

(*Continued from page 979, last week*)

CONSTRUCTION, adjustment and operation of optical indicators—as practised in Germany—were covered briefly in the first part of this article, which appeared last week. It also gave diagrams illustrating faults related to the admission of gas and to the compression. The closing words referred to Fig. 21 in this issue and faults in the timing of the spark—the subject continued herewith.

Diagrams Showing Faults of Ignition

With only 16 per cent advance, the diagram, *c*, is considerably better, and with 13 per cent advance the best diagram, *f*, is obtained. The correct advance depends of course in each case upon the motor speed and the means used for ignition. A spark that is 5 per cent late gives diagram *e*, and one 10 per cent late diagram *f*. In all these diagrams under Fig. 21 only the changes due to variation in the timing of the spark are shown as they appear. The diagrams in their entirety look somewhat different. The original for diagram *e*, Fig. 21, for example, looks more like Fig. 22. Comparison of the diagram areas under Fig. 21 discloses a serious loss of power efficiency with faulty spark timing. Diagram *e* corresponds to 20 horsepowers and *a* only to 16; *f* to 15. The fuel consumption increases correspondingly with the error in spark adjustment, for any given amount of work to be done.

Misfires are shown in a diagram by an expansion curve almost coinciding with the compression curve, making the diagram look similar to Fig. 17, excepting that the expansion curve lies somewhat above the compression curve because the compression is good and the cylinder wall has imparted some heat to the gas during the compression.

In Figs. 23 and 24, it is plainly shown what influence the position of the spark plug has upon the amount of work done by the motor. With the spark plug over the exhaust valve, one obtains diagrams *a*, *b* and *c* of Fig. 23 at different motor speeds. Diagram *a* represents 640 r.p.m. and shows a maximum pressure of 21.8 atmospheres, while the shape of the diagram remains fairly normal. Raising the speed to 1100 revolutions produces the jagged curve of diagram *b*, and the maximum pressure varies from 14 to 18 atmospheres. If the speed is further increased to 1600 revolutions, the jagged effects in the upper half of the diagram become still more marked and the efficiency lower.

When, on the other hand, the spark plug is placed over the inlet valve, the diagrams of Fig. 24 are obtained. These diagrams, *a*, *b* and *c*, are taken at the same motor speeds as those of Fig. 23, and at the higher speeds there is a notable improvement in the shapes (more easily seen in the original diagrams than in the reduced reproductions) which is explained by the presence of fresh gas mixture in the vicinity of the spark plug terminals.

When two spark plugs are used for one cylinder and they are placed respectively over the exhaust and the inlet valves, the diagrams under Fig. 25 are obtained with the same motor speeds as before. It is seen that in this case the shape of the diagram remains essentially the same at the higher speeds as at the lower, this being due to the more rapid inflammation of the gas mixture when ignited at two places. A simple comparison of the diagram areas—as between *b* and *c* in Figs. 23 and 24 and *b* and *c* of Fig. 25—shows also a considerable increase of the motor power in favor of the double ignition. The incipient jaggedness of the expansion curve of diagram *c*, Fig. 25, shows however that a continued speed as high as 1600 revolutions would not be recommendable for the motor used, the jaggedness indicating a drop in efficiency. These diagrams, as well as some of the following ones, were taken by Professor Watson with a Dalby-Watson indicator.

If a car has both magneto and battery ignition it is easy to compare the merits of the two methods by means of an indicator. Diagrams *a* and *b* in Fig. 26, taken by switching-in respectively the magneto and the coil, in both cases with the gas mixture quite rich, show no important difference in the results obtained from the two methods. But if a poor mixture is used, both maximum and mean pressures during the working strokes are found much more regular with magneto ignition than with coil ignition, the

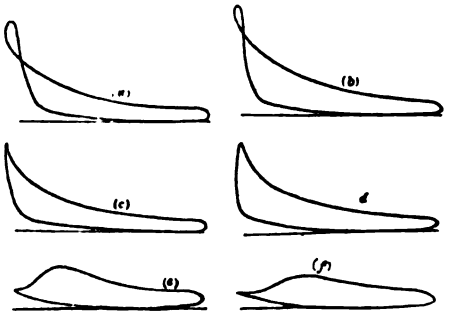


Fig. 21—Faults in spark timing

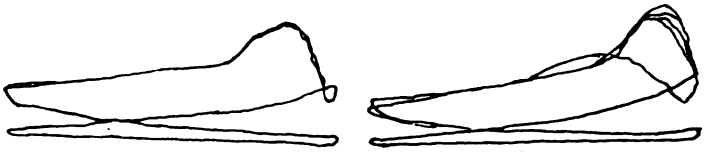


Fig. 22 (left)—Actual diagram of late firing
Fig. 27 (right)—Very poor mixture and late exhaust

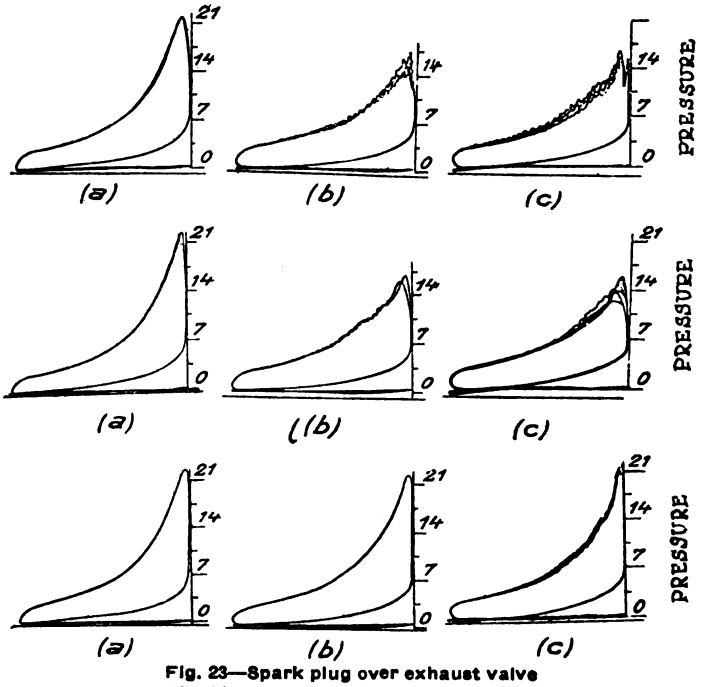


Fig. 23—Spark plug over exhaust valve
Fig. 24—Spark plug over inlet valve
Fig. 25—Spark plugs over both valves
(a) 640 r.p.m. (b) 1100 r.p.m. (c) 1600 r.p.m.

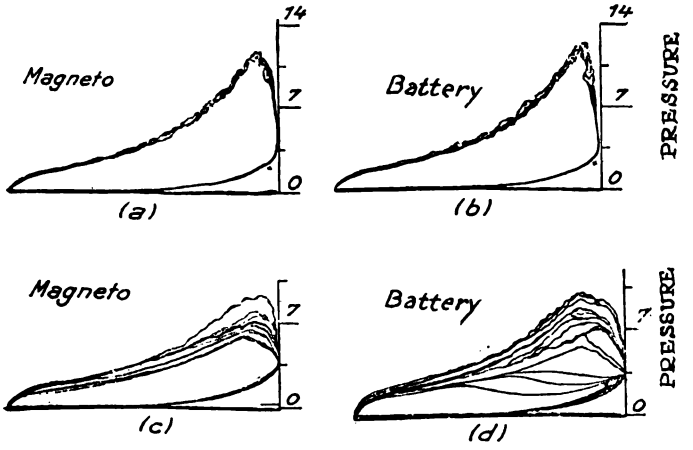


Fig. 26—Comparison of ignition by magneto and by battery and coil—(*a*) and (*b*) with suitable gas mixture; (*c*) and (*d*) with lean mixture

diagrams *c* and *d*, Fig. 26, showing the difference. In some of the cycles, it is noticed, the ignition from the coil progresses so slowly, as in diagram *d*, that the pressure does not reach its highest value till at the end of the work stroke. The small crosses at the compression curves in the diagram of Fig. 26 indicate in each case the point at which the spark was released.

Influence of the Carburetion

That the carburetion, as well as the ignition, has great influence on the power of the explosion and the efficiency of the motor is also demonstrated in detail by means of indicator diagrams. Fig. 27, for example, represents the original diagram of a motor running on a very lean gas mixture. The gas burns with difficulty and has small heating capacity, and the diagram area is therefore greatly reduced. When, on the other hand, the gas throttle is opened completely and the same motor gets a mixture with sufficient gas the diagram of Fig. 28 is obtained. In this diagram it is noticed that the gasoline does not vaporize well or that the carbureter is too cold. Globules of gasoline cause a series of successive small explosions, marked *E* in the diagram, by which the whole volume of the charge becomes subject to vibration. The diagram is a composite of a large number of superimposed photographic diagrams, and the curves are therefore thickened. The first part of the exhaust curve has a strong course, showing that the exhaust valve affords a sufficient opening for driving the gas quickly from *A* toward *B*. By reason of the rapid flow of the gas in the exhaust manifold there arises a slight depression *CD* in the cylinder, lasting through the first part of the suction stroke but disappearing toward the lower dead center *B*.

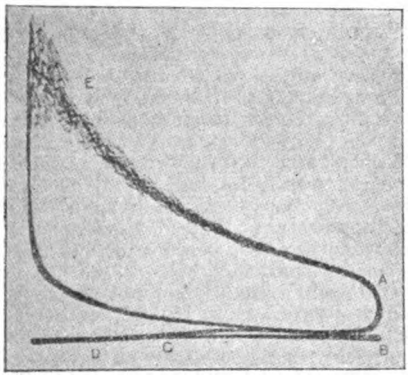


Fig. 28—Composite diagram with gasoline heavy or carbureter cold—Compare Fig. 27

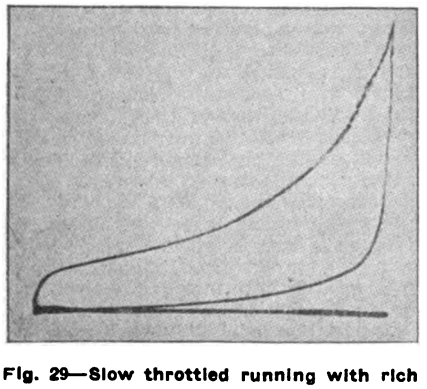


Fig. 29—Slow throttled running with rich mixture

If the same motor is run very slowly but with a rich gas mixture, the diagram of Fig. 29 is obtained, in which the expansion curve is more definite. This effect is due to the necessity of throttling the intake, which favors the vaporization of the gasoline globules, so that the charge is more readily fired. The exhaust begins in this case at the same point as before, but, as the motor runs slowly, atmospheric pressure is reached at dead center *D*. The area is smaller than that of the previous diagram, showing the reduced power of each explosion.

Diagrams of Exhaust and Muffler Action

When the diameter or lift of the exhaust valve is too small or the exhaust pipe is clogged or of too small diameter, the diagram will show an exhaust curve that rises toward the end, such as *ABDC* in Fig. 30, and produces a harmful back-pressure on the piston. The upward arching of the curve at *DE* indicates an extra cause for compression and is due to too-early closing of the exhaust valve. The motor in this instance is also late in opening the exhaust valve, as the expansion curve extends all the way to the dead center before the drop from *A* to *B* begins, while this first part of the exhaust curve should run as *AB* in Fig. 28. Owing to all these defects, the area of the diagram, Fig. 30, is naturally much contracted, indicating reduced motor power.

If the exhaust valve is opened too early, the expansion curve drops suddenly from *A* to *B* as in Fig. 31, and the useful area of the diagram is again reduced.

Indicators may be used to advantage not only to determine the action taking place in the cylinders but also for other organs. By mounting a single indicator on the exhaust pipe, one obtains curves of the exhaust pressure, from which the value of the muffler may be estimated. Figs. 32, 33 and 34 show such exhaust pressure curves for a six-cylinder motor running at 560 r.p.m. Fig. 32 shows the result of using a muffler which gives a rather high back-pressure. The muffler used for Fig. 33 is shown to have been of more suitable design, as here the curve at both ends coincides with the horizontal line representing atmospheric pressure. Fig. 34 represents the curve obtained without using any muffler, and it is noticed that in this case there is a rhythmic succession of pressures and depressions in the exhaust pipe.

The Trade Value of Indicators

As may be judged from the foregoing, most repairmen could learn to use an indicator to advantage for quick diagnosis of motor troubles. Most motors have compression cocks where the indicator may be connected. Its cost is not high. Photographic apparatus may be dispensed with for most purposes, and then a single, rather than a quadruple indicator, will do. The motor need not be dismounted. Improved construction is gradually taking indicators from the laboratory into the trade.

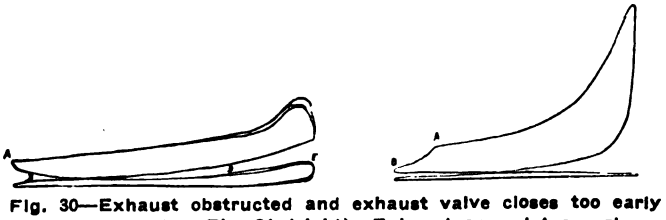
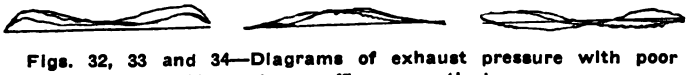


Fig. 30—Exhaust obstructed and exhaust valve closes too early and opens too late. Fig. 31 (right)—Exhaust opened too early



Figs. 32, 33 and 34—Diagrams of exhaust pressure with poor muffler, better muffler and no muffler, respectively

"The Car That Stays Young"

An Incipient Department for Data on Durability

DURABILITY is a homely virtue with small charm. Its light is under a bushel. Its importance is recognized in a general way, of course, but in practice it is a subject for guesswork. The use of alloy steel with anti-fatigue properties is an appreciated feature in construction. Broad plain bearings working under small specific pressures or anti-friction bearings are employed with a view to durability. A reliable lubrication system is understood to be necessary. And the ready exchange of wearing parts is becoming a characteristic of conscientious design. But, apart from these elements in the power plant to which engineers naturally pay close attention, few attempts are made at analyzing the requirements for durability in an automobile or a motor truck into its components, although nearly every portion of an automobile is a working part in the sense of being exposed to severe wear and tear through active and shifting relations to the road, the load, the weather and the traffic. In an article entitled "The Car That Stays Young," which appeared in THE AUTOMOBILE for Sept. 2, 16 and 30, the writer referred to a number of these design features in an automobile which are stationary in relation to the vehicle but become working parts when the vehicle moves over the road, and it was suggested that a great deal might be done for increasing the durability of the automobile as a whole if design and materials for these parts were studied with close consideration for their Durability in its Relation to Cost and Style, in the same manner as durability is studied in the power plant and the transmission mechanism, including the tires.

Real Data Not Obtainable

In the belief that some data on this subject, based on comparative tests, were in the possession of the industry, and that they would interest the automobile-buying public—who without this information drift toward the lowest price consistent with a temporarily attractive appearance—an attempt was made to obtain such data by correspondence with manufacturers' purchasing agents, who are always deliberating questions of quality and price, and from specialty and material makers, but the responses have shown that real data in this large field are either guarded as secrets or have not yet been systematically gathered. Many are willing to admit that their own productions are exceptionally durable and that it would be very desirable to have the public understand that such durability is an excellent reason for high prices. Others are interested in features or materials which look highly promising, being intended to obviate deficiencies in other features or materials so far more generally employed. But nobody seems willing to believe that increased durability often can be attained without increase in the cost of production, solely through a better choice in design or a better knowledge of facts relating to materials. Yet, a durability that costs all it is worth is not so very alluring, and the writer still believes that a great deal of durability goes by default for lack of a SEPARATE study of the subject and SEPARATE publicity for the results of such a study. For the present, however, it seems that the idea of obtaining real data without giving a large amount of time and effort for obtaining them must be abandoned, but there remains the possibility for keeping the study of the subject open on less exacting lines, by means of such contributions as may be received, whether they stick closely to real data or not. In this manner the relation of durability to cost of production and price cannot be brought out sharply, and the ideas on durability will usually be found somewhat interwoven with individual preferences in matters of construction and style or with a too-optimistic faith in promising innovations, but, after all, durability will be kept in the foreground as a subject for inquiry and by degrees will disentangle itself from its complications.

With this modification in tactics, still coupled with the hope that the "stationary working parts" of the automobile may receive their due share of attention, two interesting contributions which show the trend of public opinion, are presented herewith.

An Owner-Driver's Views

Office of The Inspector of Grounds and Buildings — Harvard University

Editor THE AUTOMOBILE:—I have read with much interest the series of articles in your magazine on "The Car That Stays Young." These articles pointed out certain components of the automobile deserving of investigation with a view toward making them more lasting, and indicated the desired results, with suggestions in some cases for their attainment.

One item of the utmost importance which has not yet received attention in this series is that of automatically lubricating all the parts of the chassis now cared for by separate and more or less inaccessible grease-cups, by oil cups and in many cases, such as the springs, by no provision at all.

The average owner who cares for his own car is bound to shirk the filling of grease-cups that are so located as to require a suit of overalls and a subsequent bath for their proper attention. Even when a chauffeur cares for the car, his free time is not always sufficient to give such daily details the best attention.

Owners of medium priced cars who care for them themselves prefer if possible to turn them in each year, rather than be subjected to the annoyance and expense of overhauling made necessary mainly through neglect of lubrication and cleaning. We hear criticisms offered of certain cars, that they are "one year cars," or "10,000 mile cars." This usually means that lubrication is so difficult or badly provided for, that at the end of one year or of 10,000 miles, many parts have worn loose, that the very annoyance of squeaks and rattles drives the owner to turn it in, or else overhaul. These cars have vastly better materials than were used ten years ago. But they wear no better, because dirt and lack of lubricant will wear the best bearing or bushing material made as quickly as the poorest.

If an automobile was so designed that its complete lubrication was a simple, clean and rapid task, and if the lubricated parts were protected from water and dirt, it should be in practically the same running condition after 10,000 miles as after 500.

The present large sales of medium price cars are increasing the number of owner-driven cars in far greater proportion than the number of chauffeur-driven cars. Consequently a development in design which would make it easier for an owner-driver to keep his car at top-notch efficiency, and keep it there a long time, would be an aid rather than a detriment to sales.

Such a car, the "Fergus," has been designed and built in Ireland, and is described in two recent numbers of *The Autocar* of London, England. The editors of that authoritative publication have felt that the production of the "Fergus" is so important that they devoted several pages of editorial to it, as well as a description running in two issues.

I have awaited with interest comment in THE AUTOMOBILE on this car. I hope you are going to say something about it.

Although the design of such a car involves a change in design of many components now standardized, I believe that the time is coming when a car with unlubricated and unprotected springs and steering connections, inaccessible brake parts and a complicated distribution of little, dirty grease-cups in hidden corners; will be as unmarketable as solid bicycle tires.

Cambridge, Mass., Nov. 18, 1915. MAURICE M. OSBORNE.

The subject of convenient lubrication methods as the first and foremost means for making a car stay young has not been overlooked. It was in fact treated by the writer, exactly in this spirit, in an article appearing in *Review of Reviews* in 1906 or 1907. But it was omitted here on account of being complicated by constructional difficulties. It remains to be seen whether these have been overcome in the Fergus car. The builders of this new car have taken the radical and logical step of eliminating watchful waiting from among the duties of the caretaker. Lubricating the car, with their system, is changed from a series of odd jobs to be performed with difficulties and at no particular time—and therefore in practice nearly always after some harm has already been done by neglect—to a filling of reservoirs taking place every six months, for example Jan. 1 and July 1, all the rest being automatic. In the history of American automobiles the Overman steam car furnishes an instance of highly ingenious automaticity, but the automatic features eventually failed unexepectedly by reason of minute cumulative effects in the operation. Some little scepticism may perhaps be entertained as to whether the automatic features in the lubrication of the Fergus car will entirely avoid this danger. The cost of production is another problematic point in this car, since durability can be bought too dearly, especially so long as the ideal of the "one-horse shay" has not been reached in all its components, or finality in its design. Original blueprints of the Fergus car have been secured, however, and readers of THE AUTOMOBILE will be enabled to study its highly interesting construction in a week or two under the expert guidance of Mr. A. Ludlow Clayden.

One Voice from the Industry

The Wayne Works

Editor THE AUTOMOBILE:—We were very glad to note in your circular of the 8th that you are arranging a symposium on the matter of "The Car That Stays Young." It is a point to which more attention should be paid by the public; it is a point to which more attention should be paid by the engineer; it is a point to which more attention should be paid by the heads of motor companies.

The secret of durability is pre-eminently the use of the best material in the right place. Granted, of course, that at least common sense designs are used and that a rational idea of quantity of material is also used. Given two cars of approximately the same weight and power, using approximately the same general dimensions as to parts, the life of the one using inferior material will probably be not over half or two-thirds that of the one using the best material. The use of the very best bearings, the use of alloy steels, the use of testing laboratories, the use of proper heat treating departments, will undoubtedly add to the price of the car. If the American public were willing to pay the difference to gain the car of the best material over the car of mediocre material, the standard of car design and engineering would be very much higher than it is to-day. The fact of the matter is that the public will not pay this price and since the manufacturer has found that his sales are increased by reducing in price either to afford better selling argument for his own car or meet the competition of his rival, to gain this lower price he must inevitably sacrifice quality of material. He, therefore, instructs his engineers to use cheaper bearings, to use cast iron instead of aluminum, to lighten the weight here and there to save stock, to do away with several inserted bushings at various points of wear about the car and probably to continue with an old design modified rather than go to the expense of adopting a new and more modern design. We would all like to make the finest cars that we could, but we can all sell most easily the cheaper car. I use "cheap" in the sense, of course, of not going below a certain standard of engineering and quality of material. A "cheap" car and one that is "cheap" only will not be in the market long, simply because the people will get to know it and it cannot sell at any price. To be sure there have been great economies in factory practice recently. It is much less expensive to manufacture 40,000 crankshafts than 400, but even this does not explain the reason why one car of a certain type, weight and horsepower will sell at $800, while another car of undoubted durability and proved reliability but approximately the same size, weight and horsepower, must sell for $2,500 or $3,000 in order to insure its maker any profit at all. Of course, the American attitude recently has been to buy a car, usually at a reasonable price, use it a year or two and either sell it and buy a new one or trade it in on a new car, not realizing that they must inevitably stand such loss as is also inevitably bound to occur. The buying public properly guided by advance engineering ideas is the final arbiter of automobile design. At present the buying public is decidedly insisting upon low-priced cars. The sort of people who insist on low-priced cars in order to have a car do not get nor expect to get the quality of material and consequent durability and long life of the car that is sold to people to whom first cost is not the prime object and who are accustomed to paying the higher prices in order to obtain the rarer design and the better quality of material. This applies just as well to a suit of clothes as to an automobile. If the buying public insists on buying completely equipped touring cars for $750, touring cars at $750 will be furnished them and the cars will have just exactly $750 worth of value in them and no more. If they want to buy $5,000 cars they will get cars for which, when their durability, comfort, and convenience are considered, the price of $5,000 is not exorbitant, and no rational person can believe for a minute that the $700 car can in any way compete as far as life, comfort and convenience goes, with the $5,000 car. It is most unfortunate that this insistent demand for low priced cars has come about and it is most unfortunate chiefly for the buying public.

Quality of material is, therefore, the first factor to be considered in "the car that stays young." The other point is of course attention and use or, more properly, lack of attention and abuse. A $700 car carefully lubricated, adjusted and handled will give a surprising record as to durability in comparison with a $5,000 car recklessly abused, not lubricated nor attended to in any way.

I hardly agree with the general tone of the third paragraph of your letter for the reason as given above; namely, that reduction of material in either weight or quantity cannot go below a certain point because the natural law of minimum will shortly wipe that car out of existance which does not give at least the service that should reasonably be expected from a car of its list price. In many cases the reduction in the cost of production will result in an increase of durability. For instance, a semi-steel crankcase is probably stronger than an aluminum one. It is at any rate much cheaper but has the disadvantage of increased weight. The modern demand for cars of light weight results in too much material being taken away from the car to a point which, even with the use of modern expensive and durable alloy steels, removes the factor of safety which every car should have. The only way to overcome this disadvantage is to so increase the quantity of production that the economies gained thereby will make up for the additional expense entailed in the use of better material. The reason, to be concrete, why Henry Ford sells so many cars in the course of a year is not the fact that his car sells for $440 which is within the price range of practically anyone, but that it gives even a great deal more service than should reasonably be expected from a car selling at that price. The secret of the efficiency of the car is light weight gained by the use of good material. The secret of the reason that it costs $440 instead of $1440 is that the great economies effected by the quantity production completely absorb the increased expense of better material.

The best way to produce "the car that stays young" is for the man who buys the car to be willing to pay a few hundred dollars more for better material, better design and consequent durability, rather than to pay a few hundred dollars less in order to save money by purchasing a cheaper car; and the only way to gain increased durability by use of high priced material and still keep the car within the range of the purse of the man who does want to buy the car for the few hundred dollars less is by quantity production.

THE WAYNE WORKS.
Per WARREN CLEMENTS,
Wayne, Ind., Oct. 18, 1915. Mgr. Automobile Dept.

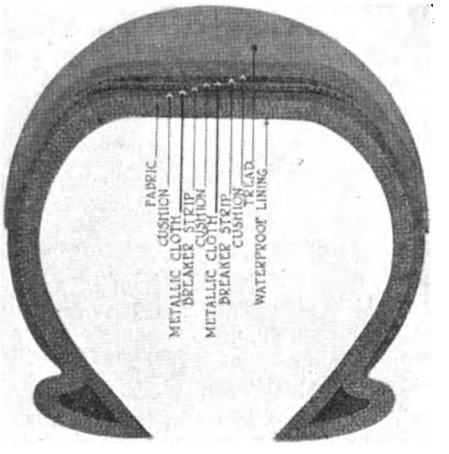
The letter by Mr. Clements represents, in the writer's opinion, the general truth in the situation, as between durability and price, but a truth to which the exceptions are so numerous and important that they deserve to be studied especially. It might even be said that it is for the purpose of studying these exceptions—which individual ability and special knowledge never fail to create in order to take distance from the average standard—that a column is kept open for "The Car That Stays Young." With any other view on the subject it would be necessary to assume, it seems, that all cars of the same price are of about the same durability in every feature.—M. C. K.

ACCESSORIES

Traveller Puncture-Proof Tire

WHILE Traveller tires are no heavier than other pneumatic tires of equal quality the manufacturer guarantees them to be puncture-proof and states that they lessen blowout troubles 50 per cent. Of approved construction throughout, these tires have several distinguishing features. The puncture-proof quality is obtained by the use of two unbroken strips of elastic metallic cloth which completely cover the tread, being vulcanized right into the body of the tire. This metallic cloth is said to be ten times stronger than the best quality fabric. As may be seen in the accompanying illustration, the inside of the casing is covered with a water-proof lining which protects the fabric and body of the tire from the effects of moisture, as well as imparting additional strength. Above this are numerous layers of fabric under a thick rubber cushion as indicated. Above this comes the first strip of metallic cloth, which is first chemically treated and then rubberized, being embodied right in the tire structure, so that while it is completely surrounded by rubber it is flexible and resilient. Above this is the first breaker strip and the second cushion, after which comes the second strip of metallic cloth, which is not quite as wide as the first. The extra breaker strip, another cushion and an unusually thick clear rubber tread complete the tire.

Another distinguishing feature, which may be seen in the illustration, is the square formation inside the tread, which not only permits a much thicker tread section but also prevents straining the fabric at any point. It also prevents the bevel which occurs with the ordinary round tire when not fully inflated, resulting in blowouts. The manufacturer states that these tires do not overheat. They are guaranteed puncture-proof up to 5000 miles, a new tire being given in exchange for one defective in this respect. Traveller tires are made in both plain and non-skid treads.—Traveller Tire & Tube Co., Inc., New York City.

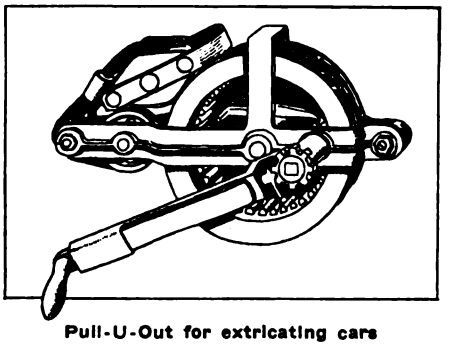


Traveller puncture-proof tire

Pull-U-Out for Extricating Cars

A device to help the motorist when his car becomes stuck in the mud or to be used for any of the thousand-and-one circumstances where it is necessary to exert a strong end pull has been brought out under the name of the Pull-U-Out. It is merely a conveniently arranged set of pulleys with a handle for turning so arranged that the total reduction is 70 to 1. The mechanism is quite simple, consisting of a substantial winding drum with gears inside which engage a small bronze gear on the end of a long ratchet crank. Attached to this there are 40 ft. of steel rope with 5000 lb. capacity, and a pulley with two 7-ft. light-weight chains having hooks on each end to complete the pulling device.

The stakes can be readily driven into the ground, but on a straight pull cannot be removed by fifty men pulling with all their might. When the pressure is released and they are pulled up at the correct angle they come out easily. Some of the purposes for which the Pull-U-Out can be employed are, besides removing a car from the mud or sand, lifting a motor from the chassis, towing a car, for a derrick on the rear end of a truck handling heavy baggage, towing a boat through mud, etc The complete outfit sells for $15.—Pull-U-Out Sales Co., St. Louis, Mo.

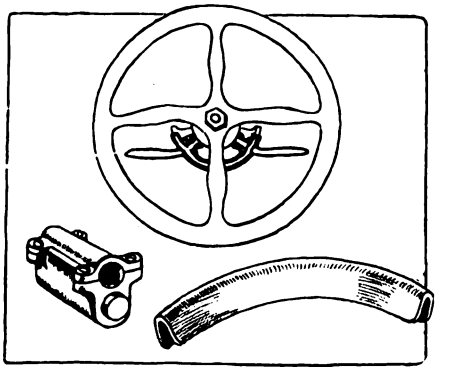


Pull-U-Out for extricating cars

Premo Gas and Spark Sector

The Premo is a neat and easily applied friction sector for the Ford steering wheel to permit a finer regulation of throttle and spark than can be obtained with the original toothed arrangement and also to replace the latter should it be worn.

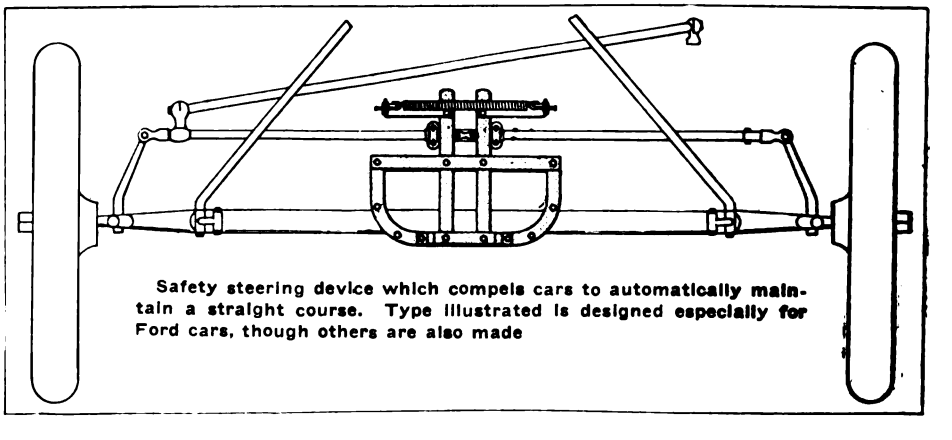
A pressed metal sector slips on over the regular Ford sector and the friction members are attached to the levers, the only tool required being a screwdriver. The device is attractive in appearance and permits the levers to be set at any number of positions. Price, $1.—N. Y. Motor Car Device Co., New York City.



Premo gas and spark sector for Ford cars

Dead Easy Tire Pump

The Dead Easy is a two-stage compression pump operated by a long handle, there being two pairs of cylinders in tandem, each large cylinder having a bore of 3½ in., being surmounted by a small one of 1⅝-in. diameter. A piston rod passing through the dividing head connects the two pistons of each cylinder, the packing in the dividing head acting as a valve in that it allows air to be forced upward from the large cylinder into the small one but prevents its



Safety steering device which compels cars to automatically maintain a straight course. Type illustrated is designed especially for Ford cars, though others are also made

return. A rocker arm is connected with each large piston at the bottom and this is actuated by the handle. The connections are such that the pistons move rapidly at the beginning of the stroke when the pressure is light and slowly toward the end of the stroke when the pressure is greater. Air compressed in the large cylinders is transferred at about 40 lb. to the small ones and thence to the outlet. The pump is 5 by 8½ in. and 9 in. in height and the handle comes in two sections, each 16 in. long. The weight of the device is 13 lb. With cylinders and trimmings nickeled, and other parts black enameled, the pump sells for $15; when the outfit is entirely enameled, $12.50.—Globe Mfg. Co., Battle Creek, Mich.

Safety Steering Devices

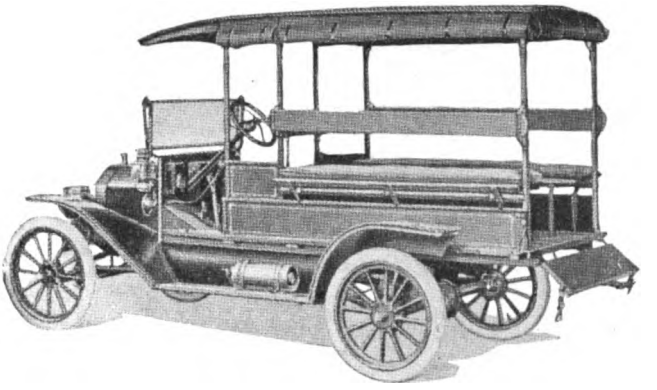
A device to compel cars to automatically maintain a straight course has been devised and is being marketed under the name of the Auto Safety Steering Device. The apparatus is stated to work satisfactorily even when the tie rod has been detached or broken, thereby greatly increasing the safety of the car. A diagram illustrating the principles of the mechanism and its application appears herewith. The device is clamped to the front axle and the cross arm is brought to its central position by a coil spring which acts in either direction. This device is specially designed for Ford cars and can be applied quickly without any machine work.—Safety Steering Device Co., New York City.

Prest-O-Lite Cooking Outfit

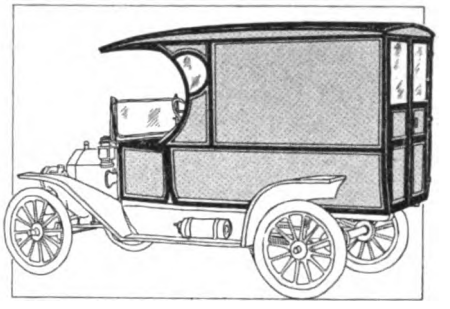
A hot-plate is set on four legs and fitted with a special burner for using acetylene gas from the Prest-O-Lite tank. A rubber tube is slipped over the tank union and the gas turned on and lighted. If the tank is used for lighting on the car the lamp tube is first slipped off. The stove packs into a box measuring 8 by 8 by 5 in. and weighs 6 lb. The makers state that with full flame the gas consumption is 3½ ft. per hour. The full flame will boil a quart of water in 3 min. and is too hot for average cooking. Cost of operation, 8 to 15 cents per hour. The illuminating burner attachment can be used in camp and permits the use of the lighting and cooking feeds separately or together. Tubing is supplied with the stove. Price, stove only, $4.50; stem and illuminating burner, 55 cents; two-way valve for simultaneous cooking and illuminating, 75 cents.—Prest-O-Lite Co., Inc., Indianapolis, Ind.

Henney Bodies for Ford Cars

To meet the demand for an economical delivery car which can be mounted on a chassis of standard design, the Henney bodies have been put out to fit the Ford model T. The complete line comprises seven individual types of bodies: the steel panel in two forms; the general utility with top and flareboards; the general utility with flareboards alone; the steel panel roadster box, which fits behind the regular roadster model; the open flareboard runabout body which also fits behind the roadster driver's seat, and a general utility body with removable side seats and rear steps.

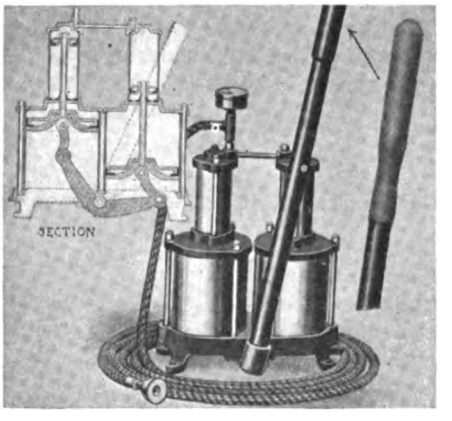


One of Henney Buggy Co.'s open bodies for Ford chassis



A Henney closed type for Fords

This complete line can be varied by different attachments so that all requirements for a light commercial car can be satisfied. The net weight of these bodies varies between 80 lb. and 405 for the steel panel. The prices of the bodies are $99 for the best steel panel, $84 for another model steel panel, $67.50 for a general utility with top and flareboards, $45 for the general utility with flareboards alone, $24 for the steel panel roadster box, $18.75 for the open flareboard runabout body and $90 for the general utility body with removable side seats and rear step.—Henney Buggy Co., Freeport, Ill.



Dead Easy tire pump

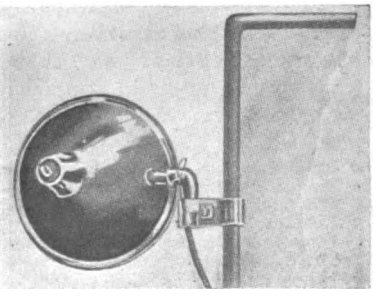
Excelite Spotlight

This convenient spotlight has universal joint provision for mounting on the windshield or dashboard, and is useful for inspecting signs, etc., out of the range of the headlights, while it can also be used to illuminate the motor when repairing or adjusting. A switch and a focus adjustment operated from the outside are located at the back of the lamp. The reflector is 7 in. in diameter. A special type is made for operating on the Ford magneto current and two sizes for truck service, being designed for clamping at the top of the dashboard. The plain type sells for $6 each, while the De Luxe type, with nitrogen bulb and armored cable, is $7. The truck type costs $6 for the 7-in. size and $7.50 for the 9-in.—J. H. Faw, Inc., New York City.

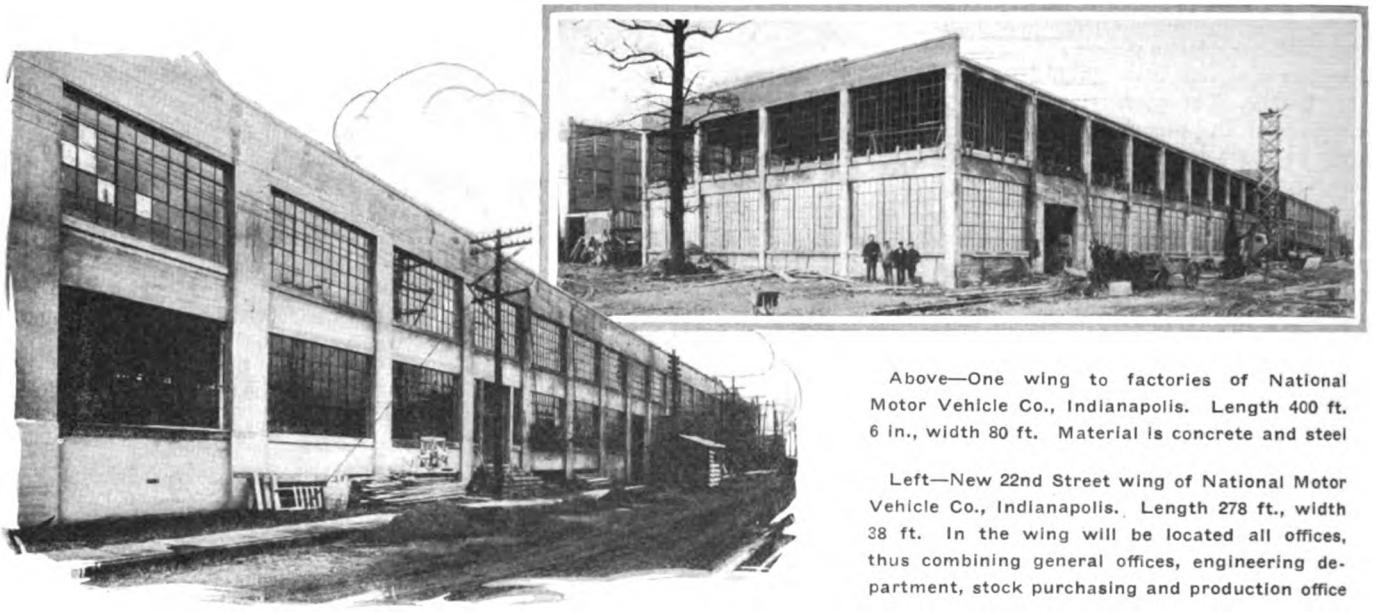
McKinnon Tire Holder

Made in two types, for one and two tires. They attach to running board and fender at right of front seat.—McKinnon Dash Co., Buffalo, N. Y.

Prest-O-Lite cooking and lighting outfit



Excelite swivel lamp on windshield



Above—One wing to factories of National Motor Vehicle Co., Indianapolis. Length 400 ft. 6 in., width 80 ft. Material is concrete and steel

Left—New 22nd Street wing of National Motor Vehicle Co., Indianapolis. Length 278 ft., width 38 ft. In the wing will be located all offices, thus combining general offices, engineering department, stock purchasing and production office

New National Factory Buildings Near Completion

OVER 500 men are working overtime to complete the new factory buildings of the National Motor Vehicle Co., Indianapolis, Ind. The officers of the company hope to be in part of the new buildings in fifteen days and expect to have all of the increased space within thirty days. The new buildings are two stories high and 675 ft. long or approximately two city blocks. One is 38 by 278 ft. and the other 80 by 400 ft. They will cost $100,000. One of the new buildings will include the general offices and in the same building are new quarters for the engineering and production departments.

Geo. M. Dickson, general manager of the company, states that there are three times as many orders on hand than ever before in the fifteen years' existence of the company. He goes on to state that the new buildings will greatly facilitate matters in increasing production to meet the demand and in relieving to great extent the strain on the various departments. They will also reduce the cost of production.

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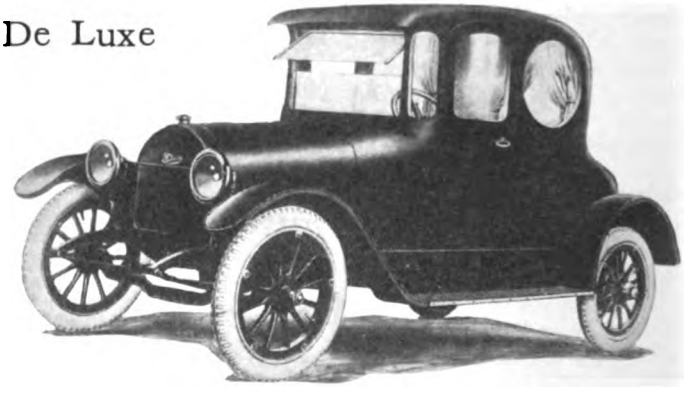
Features of the Pullman Coupé De Luxe

THE Pullman Motor Car Co., of York, Pa., in bringing out its De Luxe coupé has given special attention to the requirements of women automobilists by equipping the car with the C-H magnetic gearshift and by combining city design with all the power necessary for touring. The general effect is of easy flowing lines, even to the rounded corners of the windows. Seats are extra wide with deep cushions and upholstering of broadcloth. The general interior finish is similar to that of an electric, although less attention has been given to the niceties of boudoir equipment such as mirrors, receptacles for toilet articles, etc., than to improving the mechanical features of the car to render it suitable for women's use. The car sells for $990.



Pullman De Luxe coupé which lists at $990

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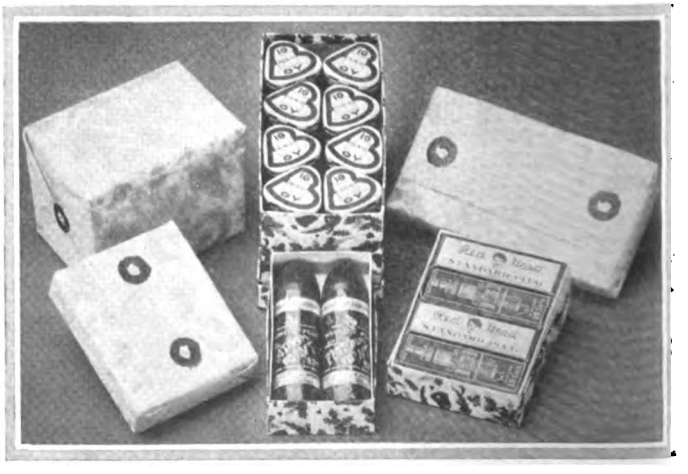
Grossman Xmas Gift Packages

IN keeping with the Christmas spirit the Emil Grossman Mfg. Co., Brooklyn, N. Y., is putting out several gift packages of spark plugs appropriately packed for presentation. These packages may contain an assortment of spark plugs suitable for any particular car and also for motorcycles. Following is a partial list and retail prices of the Red Head gift packages:

8 Big Boy Plugs, ⅞ in.—18 only	$8.00
6 Big Boy Plugs, ⅞ in.—18 only	6.00
4 Standard Plugs, all threads	3.00
6 Standard Plugs, all threads	4.50
4 Priming Plugs, for Ford, all threads	5.00
(One Priming Can Free with each set of four Priming Plugs.)	
2 Platinum Metric Motorcycle Porcelain Plugs	3.00
4 Long Body, for Ford, Overland, Reo, Maxwell and Studebaker	3.00
4 ⅞ in.—18—½ in. extension for Buick and Chalmers	3.00
6 ⅞ in.—18—½ in. extension for Buick and Chalmers	6.50



Christmas gift packages of spark plugs prepared by Emil Grossman Mfg. Co., Brooklyn, N. Y.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, December 2, 1915 No. 23

THE CLASS JOURNAL COMPANY
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SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year 5.00
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Entered at New York N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October 1903, and the Automobile Magazine (monthly), July, 1907.

Body Capacity

MORE than ever before the advertising departments of our manufacturers have exploited the roominess of tonneaus. Sales departments have in more than one case forced the engineer to enlarge the body till its dimensions are the limit the chassis can carry, so that the seven-passenger car has a really very large floor area. Why this demand for more seven-passenger machines? Why the cry for more and more room in bodies of every capacity? A little experience in the use of a number of the new cars shows that many of them are altogether uncomfortably big except when filled to capacity, and even then there is often waste space not occupied. In the heat of summer this is all very well, but for more than six months of the period during which automobiles are most in use draughts are rather to be avoided than to be desired, and an open touring car becomes draughty in proportion to its floor area.

There are thousands of people who only desire a four-seated car, thousands who have not the least desire to carry more passengers than this number, and for such the close-coupled style of body is infinitely preferable. Driver and tonneau passengers get close enough to enable conversation to be carried on, there are few draughts, there is greater comfort, because all passengers come well within the wheelbase and some weight is saved. Thus we wish to enter plea for a type of body which seems to have a great field; to ask manufacturers not to neglect the demand for a body that comes between the big seven-seater and the clover leaf. The demand exists for all classes of automobiles from $500 to $5,000.

Electrical Development

ELECTRICAL automobile equipment is a great deal better on the 1916 cars than it was with the 1915 models; the generators and motors are better, the batteries are better, the wiring and petty details also better. Perfection is still a long way off, however, and electrical equipment cannot be regarded as having yet attained more than a distant approach to the ultimate form because of the infinite variety observable at the present time. Among the numerous machines and types there may be two or three which will be permanent, but it would be foolish to try prediction as to which is the most probable future type.

But, we may chronicle a distinct stage in development; we have reached a point where the engineering quality of the machines is of a high order, and development will be along manufacturing lines rather than those of scientific experiment.

The automobile manufacturer can choose among a great variety of systems with confidence that any will give satisfaction to his customers, so the industry is being freed to give consideration to matters of detail rather than of principle. It will be some years yet before the electric apparatus on the average automobile will be as self-preserving as the magneto, though some parts of it have already attained almost the same degree of reliability. A comparison of reviews of the electrical accessories to-day, last year and the year before is very interesting, as it shows the tendency toward simplification all along the line, and the record of progress in this field is quite as remarkable as any other record in connection with history of the most remarkable trade in the world.

Marking Time

WITH the end of November there are left but a few new models of passenger cars to be announced this year. At the Show there will not be many surprises, the wonderful engineering development which began about September, 1914, has produced a huge crop of new designs, of which announcement has been made month by month since the last New York Show. At the shows just coming we shall see the results of a progress that was exhibited in an early stage only, at the shows of last January. Undoubtedly we would not anticipate many new cars to appear in the early months of 1916.

The designs of 1916 are on trial in the hands of the public; they are largely different from the designs of any previous year and engineers will wait for the public's verdict, and this will hardly be forthcoming till the summer. Thus it seems reasonable to expect 1916 to be a year of consolidation rather than of creation in the engineering field. It would not be reasonable to expect the immense pace of last year's progress to be maintained.

G. E. Buys Interest in Owen Co.

Entz Motor Patents Corp. Is Formed to Control Entz Electric Patents

NEW YORK CITY, Nov. 30—The General Electric Co., Schenectady, N. Y., has secured a substantial interest in the R. M. Owen Co., manufacturer of the Owen magnetic car and controller of the patents of J. B. Entz on electric transmission systems as employed in this car. Co-incident with the appearance of the General Electric Co., in this movement is the organization of the Entz Motor Patents Corp., which will control all of the Entz electric patents and also has a license to use all of the General Electric patents that will be helpful in the Entz electric system. This new corporation is capitalized at $6,000,000, made up of $5,000,000 common and $1,000,000 7 per cent preferred. The stock is not placed on the market.

The General Electric Co., has already begun tooling up its Fort Wayne, Ind., factory for the manufacture of the electric unit for the Owen company, and all other concerns that will be licensed by the Entz Motor Patents Corp., to use the Entz transmission system. The Fort Wayne plant is one of the best ones of the General Electric and is centrally located for the automobile industry, being close to Detroit, Cleveland, Toledo, and all of the large automobile centers in that section.

To Increase Production

Under this new arrangement the R. M. Owen company will continue the manufacture of the Owen magnetic car at its factory where 100 of the cars have already been completed and production has started on a second run of 500. Production will rapidly increase.

R. M. Owen will be president of the Entz Motor Patents Corp., and E. S. Partridge will be sales manager.

It has been known for several months that the General Electric Co., has been deeply interested in the Owen magnetic. Last July the General Electric made a very exhaustive test of two Owen magnetic cars which were driven from New York to their laboratories where tests on the efficiency of the electric transmission system were conducted, these extending over two days. These tests were entirely satisfactory, and after the tests were completed, the Owen cars were given road test under the direction of W. P. Potter, chief engineer of the railroad department, and C. E. Stone, manager of the lighting department, in company with Henry Chatain, who has charge of the gasoline-electric department of the company. In the road test the cars were driven from Schenectady to the General Electric factory at Erie, Pa., and thence to Pittsfield, Mass., thence to Lynn, Mass., and finally back to New York. In the meantime a hill-climbing competition was carried out on Kennedy's Mountain, near Cornwall. This mountain has a grade of 17 per cent for 2000 ft. and 11 per cent for 3000. Here ten of the engineering corps of the General Electric put the Owen cars through their final test. It was as a result of this road performance that the General Electric decided to secure a substantial interest in the Entz patents.

The Carl H. Page Motors Co., 350 North Broad Street, Philadelphia, has taken the agency for the Owen magnetic, and will have a formal opening Dec. 13. R. D. Willard is in charge.

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Elcar Price Raised to $795

ELKHART, IND., Nov. 26—The Elkhart Carriage & Motor Car Co., this city, maker of the Elcar, has raised the price of its 1916 cars from $775 to $795, owing to several changes in construction.

—

Cassidy Leaves Johns-Manville to Head New Selling Co.

NEW YORK CITY, Nov. 27—E. A. Cassidy on Jan. 1 will sever his connection with the H. W. Johns-Manville Co., this city, as general manager of the automobile accessory department to become president of the Edward A. Cassidy Co. The new company will be a selling organization and will market the entire products of several automobile accessory and parts makers. The company will sell solely to jobbers and automobile makers, and will have its headquarters in New York with branch offices in Chicago, Detroit, Boston and San Francisco.

—

Plummer Leaves Locomobile

NEW YORK CITY, Nov. 30—John F. Plummer, manager of the Locomobile branch in this city has resigned to take effect Dec. 1. Mr. Plummer is one of the oldest dealers on the Broadway Row, and has been with the Locomobile company practically sixteen years, starting with them Jan. 1, 1900 when he started work in the factory at Newton, Mass. Later he became a salesman in the New York store; following this he opened the Philadelphia Locomobile business, and made a trip to the Orient. On his return he was manager of the Locomobile branch in Chicago, and Jan. 1, 1903, became manager of the New York branch. Mr. Plummer is one of the best known dealers in this city. It is not known yet what new enterprise Mr. Plummer will follow. His successor has not yet been appointed.

Premier Plant Sold to Syndicate

Offer of $125,000 Accepted—To Continue Manufacture of Premier Cars

INDIANAPOLIS, IND., Dec. 1—The plant of the Premier Motor Mfg. Co. has been sold to a syndicate represented by F. W. Woodruff, banker, of Joliet, Ill., for $125,000, the sale being confirmed by the court here to-day. The bid of the syndicate for the property, which included all the plant except the real estate, was filed with Frank E. Smith, trustee in bankruptcy of the company, who announced on Saturday that the plant had been sold.

The interests represented by Woodruff propose to re-finance and to revamp entirely the Premier organization and to continue the manufacture of the Premier car. It is understood that sufficient capital is back of the organization to make the Premier concern an important factor in the industry.

1 Year in Receivership

The financial difficulties of the Premier company date from December, 1913, when arrangements were first made with the creditors. The receivership which has just terminated with the sale of the property dates from Oct. 15, 1914, at which time Frank E. Smith was appointed receiver. On Dec. 15 Mr. Smith was elected trustee of the organization and has been looking after its welfare ever since.

—

Carload Shipments Gain 100%

DETROIT, MICH., Dec. 1—An important meeting of the directors of the National Automobile Chamber of Commerce is in session here to-day at the Detroit Athletic Club. While complete report of the deliberations cannot yet be obtained, General Manager Alfred Reeves says that the committee has the matter of Safety First under consideration and that a report to the gathering indicated that carload shipments of automobiles have increased 100 per cent over a year ago. It has practically been definitely decided to fix the standard tread at 56 in. for all sections of the country, discontinuing the 60-in. width which has been supplied to Southern trade.

—

Dayton Resigns from New Era

JOLIET, ILL., Nov. 26—W. O. Dayton has resigned as chief engineer of the New Era Engineering Co., this city and has organized a company for the manufacture of light automobile chassis and light worm drive axles for local and export trade.

Tax Coal, Wood, Electricity, Oats, Hay—if You Tax Gasoline

Washington's Proposed Tax of 1 Cent Per Gal. on Gasoline Is Class Legislation—Automobile Organizations to Fight It—General Opposition to Measure

NEW YORK CITY, Dec. 1—The federal government's proposal to raise a part of its extra revenue of $112,000,000 by placing a tax of 1 cent a gallon on gasoline used, and also placing a tax on motor vehicles, according to horsepower, which was first mooted a year ago, has again been voiced by Secretary McAdoo. This amount of additional revenue is claimed to be necessary for the fiscal year ending July, 1917.

825,000,000 Gal. Used

On the present schedule of car production there will be approximately 3,000,000 cars in America July 1, 1916, this figure covering passenger cars only. On a conservative estimate these passenger cars will consume 825,000,000 gal. of gasoline per year, this being based on an average mileage of 5000 per car, and assuming that 1,500,000 cars will average approximately 20 miles per gallon, and that the remainder of the cars will average 15 miles per gallon. This fuel average is too high but makes the figures proportionately conservative. On this basis of calculation passenger cars alone would produce a revenue of $8,250,000.

But a tax of 1 cent a gallon will fall on every commercial motor vehicle and it is impossible to estimate the fuel consumption of these. Further, there are hundreds of thousands of stationary engines using gasoline, these being in grain elevators, on farms, in factories, and hundreds of other places. Further, there are thousands of traction engines employed on farms, and in other vocations using gasoline. Yet again, there are tens of thousands of gasoline farm tractors using this fuel.

Of National Importance

In a nutshell, gasoline is no longer a fuel used for the transportation of the rich but is as essential to-day for the carrying on of the nation's work as kerosene is for lighting purposes, in our farming communities. It is just as unfair to tax gasoline as it would be to tax kerosene. It is practically as unfair to place a tax of this nature on gasoline as it is to place a tax on food supplies.

Why tax the gallon of gasoline and not tax the kilowatt of electricity? Electricity is used to-day for lighting, and for power. There is no difference, at least there should not be any difference between the manufacturer who transports his products to the railway station on an electric truck and that maker who uses a gasoline truck. The government apparently fails to see this and will tax gasoline but not electricity.

There is no difference between the farmer who uses the small electric motor to pump his water, and the other farmer who uses a small gasoline engine for this work.

There is no difference between the farmer who uses a steam engine to thrash his grain and the other farmer who uses a gasoline engine, excepting that the government would tax the use of gasoline for this purpose and let the use of steam go free.

The electric trolley car would go untaxed, the steam railroad train would go untaxed, and yet the up-to-date gasoline railway car and the combination gasoline and electric railway car, which is proving a paying investment to scores of our railroads would be taxed. The gasoline launch would be taxed but the steam launch let go untaxed.

Many Misconceptions

It is to be granted that additional revenue has to be raised but this should not be raised in the form of class legislation of a type that is highly discriminatory. It has been apparently conceived that the automobile industry is a fabulously wealthy industry because excessively large dividends have been declared by three or four companies. It is true that perhaps six or seven companies have declared excessive dividends, but while this is true there are scores of other companies that barely exist. The entire industry should not be estimated by the success of a few companies, but rather on the success of the masses. We have had 400 failures in the industry. These are lost sight of in the success of a few.

Further, it has been argued that practically one State, namely, Michigan, produces all of the cars in the country. This is far from the truth. The automobile industry is not local to Michigan. A horsepower tax will not mean saddling a load on Michigan, rather it will be a tax distributed over all the States, as the buyer will have to pay it.

Cars Overtaxed Already

Vehicles have as much right to pay special taxes for revenue purposes as any other departments of our country, but why discriminate among classes of vehicles? If it is right to tax one type of vehicle then it is equally right to tax all types. The motor vehicle is no longer a vehicle of pleasure or luxury. It is a vehicle of necessity. It is the greatest asset in the present war. It is one of the greatest influences of the present century. Already in many States the motor vehicle is taxed three times: First, there is the State registration; second, comes personal property tax, and third, there is the wheel tax in a few States. To these three would be added two others by the present suggestion, namely, a tax on all gasoline, and also a tax on horsepower.

N. A. C. C. to Fight Measure

Already the National Automobile Chamber of Commerce has been collecting valuable information to present to the government in opposition to this gasoline and horsepower tax. These arguments will be presented in Washington at the proper time. The chamber will endeavor to show how the automobile industry is a national industry and not one local to any State.

Already dealers' organizations in different cities are taking up the fight. The Boston Automobile Dealers' Association has taken the ground that if a horsepower tax were placed on automobiles it would be largely saddled on the dealers who would have a difficult task in passing it along to the consumer. The Boston dealers sent a commission to Washington on the matter a year ago and they are at present ready to send another delegation to the capital when the occasion demands it.

Gretzer Avery Advertising Mgr.

LOUISVILLE, KY., Nov. 27—T. N. Gretzer, former advertising manager of the Hart-Parr Co., Charles City, Iowa, has been appointed advertising manager of B. F. Avery & Sons, tractor manufacturers in Louisville, Ky.

Magneto Makers Settle Suits

Bosch and Splitdorf Companies Effect Amicable Termination to Patent Litigation

NEW YORK CITY, Nov. 30—Magneto patent suits instituted about two years ago between the Bosch Magneto Co. and the Splitdorf Electrical Co. have been amicably terminated. In two suits by Bosch against F. A. Baker, who sold Splitdorf-equipped motorcycles, Splitdorf recognizes the validity of the Bosch patents. In one suit by Splitdorf against Bosch, Bosch recognizes the validity of the Splitdorf patent. It is stated that this ending of the litigation will have no great effect, because both companies some time ago discontinued the use of the alleged infringing constructions.

One suit, Bosch vs. Baker (Splitdorf), was upon Bosch patent No. 974,967, covering magneto ignition in V-type gasoline engines.

The other suit, Bosch vs. Baker (Splitdorf), was upon the Gottlieb Honold patent, No. 900,542, covering a construction which gave a prolonged high-tension spark with a high-tension magneto.

The suit, Splitdorf vs. Bosch, was upon patent No. 1,074,416, covering a means for changing the polarity of the armature to coincide with the polarity of an external current during the time that the primary winding on the armature is coupled with the external source of current. All three suits were in the United States district court in this city.

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Franklin Travels 1046 Miles on 1 Gal. of Oil

NEW YORK CITY, Dec. 1—Reports of a road test on a Franklin car to determine gasoline and oil consumption have been issued by the Technical Committee of the Automobile Club of America. The test was carried out over the roads between New York and Chicago, the car traveling by way of Albany, Utica, Syracuse, Buffalo, Erie, Cleveland and Kendallville. The mileage was checked on the odometer of the car and on accepted route maps.

All sorts of roads and weather were encountered along the way, sunshine, rain and snow being parts of the program. The total net running time was 60 hr. and 18 min. and the elapsed time 67 hr. and 37 min. The running average was 18.9 m.p.h.

During the trip 68.3 gal. of gasoline were consumed making an average of 16.7 miles per gallon. The gravity of the gasoline varied from 58 to 63 deg. Baume. The total oil consumption was 1.09 gal. or 1046 miles per gallon. The oil used is known as Quaker State medium made by Phinney Bros. Oil Co., Oil City, Pa. The car was fitted with a five-passenger sedan body and was stock in every way. All-weather non-skid tires were used and gasoline was fed by the Stewart vacuum feed system.

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Fostoria Light Car Takes Over Storm Buggy Co.

FOSTORIA, OHIO, Nov. 26—The Fostoria Light Car Co., recently incorporated with a capital of $500,000, has taken over the holdings of the Fostoria Storm Buggy Co., capitalized at $100,000.

The company will occupy the entire two-story brick building on South Poplar Street which has been occupied jointly by the two companies and has a 300-ft. frontage on South Poplar Street. The building contains 34,000 sq. ft. of floorspace.

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U. S. Has New Anti-Skid

NEW YORK CITY, Nov. 30—The U. S. Tire Co. has developed a new non-skid tire called the Union tread which will sell at a price approximating that of the plain tread casing.

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Johnson Is Klaxon Factory Equipment Manager

NEWARK, N. J., Nov. 30—Charles Johnson, who has been special representative of the Lovell-McConnell Mfg. Co., in Detroit, has been made factory equipment manager for the entire United States. All factory equipment business will hereafter be transacted through the Detroit branch of the company.

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Griffin a Maxwell Representative

LOS ANGELES, CAL., Nov. 24—J. G. Griffin, formerly a newspaperman of this city, has been appointed special Western factory representative of the Maxwell with headquarters in San Francisco. Mr. Griffin is to cover the entire territory under T. J. Toner, national sales director for the Maxwell in the West. This territory includes Washington, Oregon, California, Utah, Montana, Idaho, Arizona and Nevada.

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Jaffess' Harrison Assets on Block

HARRISON, N. J., Dec. 1—All the assets and effects of Leon Jaffess in this city, a dealer in second-hand rubber, tires, tubes, etc., at 400 North Fifth Street, will be sold at auction on Dec. 10 by the receiver, L. G. Beekman. Mr. Jaffess, who had stores in New York City, Detroit, and Cleveland and a plant in Plainfield, made an assignment for the benefit of creditors last September.

Gasoline Prices Keep Rising

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Selling at 24.5 Cents a Gal. in New Mexico—Further Rises Predicted

NEW YORK CITY, Nov. 30—Gasoline prices are continuing their upward movement with another 1-cent rise, effective in all sections of the country. The latest advance is that of Louisville where the tank wagon price has been raised 2½ cents a gallon to 17 cents. The price to garages in large lots is 16 cents.

Advance in Indiana

Independent oil interests state that the Standard Oil Co. of Indiana will advance gasoline 1 cent this week to a basis of 15½ cents a gallon, tank wagon, and refined oil ½-cent to 7½ cents a gallon.

Higher in Milwaukee

Milwaukee jobbers have advanced the price 1 cent, making an increase of 2 cents within 30 days. The withdrawal of quotations for lots of 100 gal. or more, has had the effect of increasing the price in large lots 3 cents since Oct. 25. In this city, the prices range from 14.6 cents a gallon for the 59 deg. specific gravity, to 22 cents a gallon for the 70 deg. specific gravity.

Highest in New Mexico

In Arizona and New Mexico the tank wagon price at certain points is as follows: Tucson, Ariz., 21.5 cents; Douglas, Ariz., 21 cents, and Santa Fe, N. M., 24.5 cents. Incidentally these prices are about the highest in the country.

21 Cents in New York

Automobile owners in New York City are now paying 21 cents a gallon for their gasoline. The tank wagon price is 19 cents. In New Jersey, the prices range from 19 to 21 cents a gallon.

Fight in St. Louis

The prices in St. Louis vary on account of the fight between the S. O. and the Independents. Last week the Standard Oil Co. raised the price 1 cent to 13.9 cents. The Independents, determined to maintain their 1-cent lead over the Standard, in turn raised their price to 15 cents at filling stations. Independents in that city declare the price of gasoline in Missouri within the next few months and perhaps only weeks will be brought back to where it was before the so-called war between the Standard and the Independents began. A Federal investigation into every branch of the oil industry in Missouri and several States is now in progress.

Louisville owners, who have been buy-

ing their gasoline in 1000-gal. lots, receiving a book of tickets in which each ticket called for a certain number of gallons, are now in a quandary as to whether to buy their books at the now inflated prices or to wait for a slump. Prices took another jump last Saturday when an advance of 2½ cents brought the price up to 20 cents a gallon. The cost per gallon as late as the middle of August was 11 cents.

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International India Rubber Corp. Formed with $1,000,000 Capital

SOUTH BEND, IND., Nov. 26—The International India Rubber Corp., this city, with a capital of $1,000,000, has been granted a charter to manufacture automobile tires. P. E. Studebaker, son of the late Henry Studebaker, is to be president; E. H. Schwab, manufacturer of Bethlehem spark plugs, is to be vice-president; G. W. Odell, formerly with the Toledo Ford Tire Co., Findlay, Ohio, is to be secretary and general manager; J. R. Nobile will be treasurer.

The company has opened temporary offices in the Union Trust building and has taken an option on real estate in South Bend for a factory site, it being the intention of the management to erect its own buildings as needed from time to time.

The $1,000,000 stock is divided equally between the common and the preferred, there being $500,000 of each. The preferred stock is 7 per cent.

The company, aside from the fact that it is to produce tires, has a unique and original selling plan. A part of the 7 per cent cumulative and protected preferred stock will be distributed at par for the purpose of establishing selling branches. These selling branches will be widely distributed and will be devoted to advertising and selling the product. It is the intention of the company to have, by the time its buildings are erected, and its plant is equipped, at least 500 branch establishments.

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Detroit S. A. E. Banquet Dec. 4

DETROIT, MICH., Nov. 29—Chairman George W. Dunham of the Detroit Section of the Society of Automobile Engineers, is sending out invitations to the executive heads, manufacturers and factory managers of all the automobile manufacturers in the United States, to be present at the banquet which the Detroit section will give Dec. 4, and which marks the climax of this year's activities of the society. In addition to the president and council of the Society of Automobile Engineers, members from the New York, Indianapolis, Chicago and Cleveland sections are expected to be present.

The principal speaker at the banquet will be Isaac F. Marcosson, whose subject will be "The War and Business."

$845 Elgin Six in Field

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New Chicago Product Has 3 by 4¼-In. Motor—Two Body Styles

CHICAGO, ILL., Nov. 29—In the Elgin Motor Car Corp., Chicago has its second automobile factory, and the product—the Elgin six at $845—will be at the show here in January. Organized last spring, the Elgin Motor Car Corp., with a capital stock of $1,000,000, one-half of which is subscribed for or pledges made guaranteeing subscription, has brought its plans to a focus in the new six-cylinder car that is about to be placed on the market.

The building that will be used is adjacent to the concern's site in Argo, a suburb of Chicago, having immediate access to two belt lines that connect with all railroads in the city, which will make shipping facilities all that is to be desired.

Personnel of the Company

The official personnel of the corporation includes Frederick L. Brown, of Crandall & Brown, Chicago lumber firm, president; C. S. Rieman, formerly vice-president and general manager of the Service Motor Car Co., vice-president; W. G. Knoedler, president of the Argo State Bank, treasurer; and J. Jerome Kluge, secretary. The directorate includes the president, vice-president and treasurer, together with David Schnitzler, branch manager of the Mutual Life Insurance Co. of New York; J. M. Snitzler, president and treasurer of the Snitzler Advertising Co., Chicago, and Dr. A. L. Tull, Chicago. John A. Schroeder, formerly with the Hyatt Roller Bearing Co. is production manager and Reed & Glaser, Indianapolis, Ind., consulting engineers.

The production plans call for an output of 1000 cars by Aug. 1, 1916, delivery to begin in January and proceed on a graduated scale. It is to be strictly an assembled car.

The power plant embraces a six-cylinder Falls motor with overhead valves, and cylinders having a 3-in. bore and a 4¼-in. stroke, block cast. It is rated at between 30 and 35 hp. The motor has three-point suspension and a combination of force feed and splash is used. Cooling is by thermo-syphon. The ignition distributer and switch is of the Delco make and the starting and lighting is by the Dyneto system.

Two body styles are offered on the one chassis, which measures 114 in. The touring model will accommodate five passengers, and is of the yacht-line design with concealed hinges and flush type door locks. Upholstery is in long grain black leather, with deep backs and slanting cushions. It is equipped with foot and robe rails and is finished in black.

The roadster will be of the clover leaf seating arrangement and aside from the color the finish of this body does not differ from the touring model. The color of the roadster will be Elgin gray with yellow running gear.

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No Change in General Vehicle Co. Management

NEW YORK CITY, Nov. 26—P. D. Wagoner, president of the General Vehicle Co. Inc., Long Island City, N. Y., which, with the Peerless Motor Car Co., Cleveland, Ohio, recently became a subsidiary of the Peerless Truck & Motor Corp., states that the new interests will not in any way change the company's operating management or affect its relations with customers. There will also be no change in the company's manufacture of electrical apparatus and it will continue to devote its energies to the development of the electric vehicle business. The manufacture and marketing of the Mercedes truck will also be continued. The 5-6-ton size is now in production and arrangements are being made for the other sizes to go into production shortly. The company is also planning to actively engage in the manufacture and sale of the Mercedes aeroplane motor.

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3500 Beaver Motors for Sun

MILWAUKEE, WIS., Nov. 26—The Beaver Mfg. Co., this city, has received an order to build 3500 special motors for the Sun light six to be put on the market Jan. 1 by the Sun Motor Car Co.

R. C. Hoffman, designer of the motor, and engineer of the Sun company, stated, "We have incorporated in our motor the latest developments and have obtained what may really be termed the American type high-speed motor.

"For instance, we have eliminated the push rods and the motor can easily run up to 3000 revolutions."

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Several Additions in Detroit

DETROIT, MICH., Nov. 29—While nothing striking has been announced in the way of new plants or additions by local manufacturers during the last few days, reports from building contractors show that quite a number of minor contracts have been awarded. The Cadillac Motor Car Co. is to have a two-story steel frame addition to its plant on Cass Avenue, while a small addition to connect two buildings at its Fort Street plant will be put up there. A one-story frame addition, as a storage building, is to be put up for the Columbia Casting Co., o

Summit Avenue. The Detroit Steel Products Co., has contracted for a one-story steel frame storage building. Bids for an addition to the plant of the C. M. Hall Lamp Co., are being received. A one-story brick addition will be erected for the Detroit Steel Castings Co. The total expenditure for all these additions will be less then $10,000.

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2-Ton Acme Truck, $2000

CADILLAC, MICH., Nov. 26—The Cadillac Auto Truck Co., this city has brought out under the name of Acme a 2-ton truck, which is to be the first of a complete line. This machine uses a type C 4⅛ by 5¼ four-cylinder Continental motor developing 40 brake hp. From the motor the drive is taken through a Warner multiple dry disk clutch and three-speed selective gearset used with heat-treated alloy steel gears of 1-in. face, a two-piece driveshaft with three universals supported in the center on self-aligning ball bearings, giving straight line drive to the Timken-David Brown worm gear rear axle. No radius rods or torque members are used, the top leaf of the springs being special alloy steel to take both torque and thrust. Service and emergency brakes are internal expanding and the Pierce governor is locked and sealed, limiting speed to 1200 r.p.m., or 17 m.p.h. The wheelbase is 148 in. and tread 58½. The chassis is 217½ in. over all and the loading space is 128 in. Front tires are 36 by 4 and rear 36 by 6, dual tires being furnished when desired. Some features of equipment are: Detroit springs, Gemmer steering gear, Eisemann magneto, Rayfield carbureter and Long truck radiator. The wheels are of artillery type.

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Prudden to Double Plant

LANSING, MICH., Nov. 26—It is reported in the city that the W. K. Prudden Co., which is one of the biggest automobile wheel manufacturers in the country will double its plant, and possibly erect an entirely new one. This concern's business has increased steadily during the past twelve months, and it is a necessity with it to enlarge at once as otherwise it will not be possible to take care of the increased business.

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K. C. Tire To Open Feb. 1

KANSAS CITY, MO., Nov. 24—The Kansas City Rubber Tire Corp., which last week purchased the old Riverside Iron Works plant in Kansas City, Mo., announced this week that it will start its plant working by Feb. 1. Present plans contemplate giving employment to 500 persons, including expert tire-makers who will come from the East.

Packard Motors For Aeroplanes

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Twin-Six Type Found Most Suitable After Experiment—For U. S. Defense

DETROIT, MICH., Nov. 26—For about a year, after the European war had been going on for some time and the value of the aeroplane to the armies had been amply demonstrated, Henry B. Joy, president of the Packard Motor Car Co., thought that the time will come when the United States government will need a fleet of aeroplanes.

Tests to Continue

Experimental work was started quietly by the engineers of the Packard company, with Packard motors, and after much testing it was found by them that the twin-six motor was best adapted for aeroplane purposes. Now it is announced by President Joy that the Packard company will build such motors. The tests will continue, however, and full particulars as to the motor will not be given for some time. It might be said, however, that the Packard aeroplane motor will be in general principle similar to the twin-six passenger car motor.

To Help Government

The decision to build motors for aeroplanes was due principally to President Joy, although all the members of the board of directors of the company, when sounded on the subject, were strongly in favor, because the principal object in making such motors is that of helping the United States government in preparing for a fleet of aeroplanes.

In speaking on the subject, President Joy said in part as follows: "It is probably a little out of the ordinary for a corporation to go out of its way to produce such military devices as aeroplane motors, because the demand for them will probably be very uncertain. Yet our directors feel that it is a part of the very important duty of manufacturers in this country to mobilize their facilities into such form that they might be available in time of need. We are inclined to feel that our government is going to find important need of co-operating in the development of what would be the serious wants of our country in time of military trouble, in case such an unfortunate condition should come to pass.

A Manufacturer's Duty

"I feel that I have understated the proposition as to the views which our directors hold of the duties of manufacturers in this country to work in co-operation with the government officials so that we may be ready for any emergency. Our company feels that it is its duty to carry on this work toward the condition of military preparedness which all our directors thoroughly believe is the important necessity of the day.

"We are engaged in seeking to develop aeroplane motors, in the neighborhood of 100 and 200 hp., for light scout aeroplanes and heavier duty aeroplanes."

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Olds Distributors at Factory

LANSING, MICH., Nov. 27—Distributors for the Oldsmobile were guests of the Olds Motor Works during several days at the plant. Many came with their service managers. As in the instance of the branch managers' and road men's convention, prominent parts makers or their representatives came to give talks to the men about parts or equipment.

During the two days the convention lasted the visitors were addressed by Sales Manager J. V. Hall, who made the statement that once the point of saturation is reached in the automobile market, and the supply of cars exceeds the demand, the success of the retail dealer as well as the manufacturer, will depend upon his ability as a merchant. Assistant sales manager N. W. Barton spoke of improved methods in marketing automobiles. Chief Engineer F. Sergardi gave a detailed talk about the Oldsmobile chassis and engine and explained the numerous mechanical improvements adopted within the past year. Advertising manager C. V. McGuire talked about "atmosphere" in advertising. Service manager F. C. Hill talked about the Oldsmobile service. W. H. Mooney, installation engineer of the Dayton Engineering Laboratories, builders of the Delco starting and lighting system, spoke on the subject of multi-cylinder ignition. H. W. Farr, representing the Johnson Carbureter Co., gave a lecture on carburetion.

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Builds 2½-Ton Truck

DULUTH, MINN., Nov. 24—Hugh Miscampbell, owning a machine shop at 304 South First Street, has begun manufacture of a 2½-ton motor truck. It will sell for $2,700. The truck is yet unnamed.

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Ware Truck Plant Under Way

ST. PAUL, MINN., Nov. 24—Construction has begun for the new factory of the Four Wheel Drive Co. of the Twin Cities. The building is to be two stories with basement, foundation being heavy enough for a total of four stories. The present contract is for $51,000. The building will face 200 ft. on University at Pelham Street, two blocks from the new Overland plant, St. Paul. It will be ready by March 1, 1916, for the manufacture of Ware motor trucks.

Two Land Deals in Cleveland

Baker R. & L. To Build New Plant—Rollin White Plans Tractor Factory

CLEVELAND, OHIO, Nov. 30—Two important purchases of land have been made during the past week in this city by local automobile makers. One tract of land at Euclid Avenue and Lamb Avenue, Euclid, consisting of 38.67 acres has been purchased by Rollin H. White, who will erect at once a $200,000 factory in which he will manufacture tractors. The second tract of land, consisting of approximately 104 acres near the National Carbon works at Madison Avenue and West 117th Street, has been bought by the Baker-Rauch & Lang Co.

The White property in Euclid is to be improved with factory buildings which are to be erected in sections. The first section, as was stated, will cost $200,000. The remainder of the buildings are to be erected as rapidly as wanted. All are to be occupied by a company headed by Mr. White for the manufacture of a farm tractor and other power farm machinery invented and patented by Mr. White.

The Baker-Rauch & Lang Co. plans to erect, it is said, a modern factory building, so arranged that the cost of production will be greatly reduced. The American Ball Bearing Co., which now occupies a plant adjoining the Baker factory, will either move to the new site or occupy the Baker plant when vacated, it was reported.

Overland Factory Branch in K. C.

KANSAS CITY, MO., Nov. 26—The Willys-Overland Motor Co. has bought the four-story building occupied by its distributing agency at Twenty-first Street and Grand Avenue and 75 ft. adjoining for the purpose of erecting a factory branch for the Southwest. The company plans to add two stories to the present building and to continue the six-story structure over the entire area. The new factory branch will cost in the neighborhood of $500,000.

Wisconsin Truck Move Completed

SHEBOYGAN, WIS., Nov. 26—The incorporation of the Myers Machine Co. of Sheboygan, Wis., with a capital stock of $50,000, is the final step in the removal of the Wisconsin Motor Truck Co. of Baraboo, Wis., to Sheboygan, Wis. The Baraboo concern was established about three years ago by Louis P. Helm and some time ago Mr. Helm opened negotiations with several of the larger cities of Wisconsin for removal. George P. Myers, who has been operating a large machine shop and works at Sheboygan, Wis., for several years, became interested and upon the conclusion of negotiations, the incorporation of the Myers Machine Co. followed. A large addition will be erected at once to accommodate the Baraboo works. The new building will be 75 by 75 ft., two-story and basement. The Myers company will continue to manufacture woodworking and special machinery under the direction of Mr. Myers, while the motor truck manufacturing department will be conducted by Mr. Helm. Numerous improvements are being made in the design of the truck, chief among which is the adoption of worm drive. Other details of the truck will be made public later.

Sparks-Withington to Add

JACKSON, MICH., Nov. 26—A one-story shipping room, 40 by 90 ft. will be erected by the Sparks-Withington Co., manufacturers of the Sparton warning signals. A two-story building, 40 by 90 ft. is also being erected to be used as washroom and locker room. There are 500 men now on the pay-roll, there being two working shifts. Business is far ahead of last year's and the outlook the best since the company started in business.

Motor Co. for Oshkosh

OSHKOSH, WIS., Nov. 26—The Lake Breeze Motor Co., Chicago, Ill., recently organized to build gasoline engines, has completed arrangements with the Chamber of Commerce of Oshkosh, Wis., to make that city its permanent headquarters. The removal of the shops from Chicago to Oshkosh will be undertaken at once and the new plant be ready for operations about April 15.

Allen Employees Insured

TOLEDO. OHIO, Nov. 27—The Allen Motor Co., Fostoria, Ohio, has insured the life of every employee in its Fostoria and Bucyrus plants.

To Sell Tire Plant

EAST LIVERPOOL, OHIO, Nov. 26—The plant, together with all of the equipment of the Morgan-Marshall Co-operative Rubber Tire Co., in this city, will be offered at public sale by Sheriff Crawford at an early date. It has been appraised at $60,000 and will be sold on the premises.

Makes Sheet Metal Parts

MILWAUKEE, WIS., Nov. 26—The American Brewers & Bottlers' Specialty Co., this city, is manufacturing automobile parts such as fenders, hoods, gasoline tanks, etc.

Ford Plans Eastern Factory

Buys 80-Acre Tract Near Newark—Begin Three More Assembly Plants

NEWARK, N. J., Nov. 26—The Ford Motor Co. has purchased a tract of 80 acres near this city, upon which a large Eastern plant will be established.

Newark has excellent railroad facilities which appealed to Mr. Ford more than anything when he visited that city on an inspection trip last summer. It is stated that Mr. Ford has not been satisfied with the railroad facilities in Detroit and has been desirous of building an Eastern plant where a big savings in freight rates can be made. Added to this the export trade of the company can more easily be taken care of by means of an Eastern plant from which its cars can go direct to the docks.

Begin Work on Three More Ford Assembly Plants

DETROIT, MICH., Nov. 24—Nearly $1,000,000 are being spent by the Ford Motor Co., for the construction of three new assembling plants and service stations, in Milwaukee, Wis., Omaha, Neb., and Oklahoma City, Okla. This brings the number of assembling plants of the company to a total of twenty-eight.

The Milwaukee five-story structure, 120 by 300 ft., will cost $385,000 and will have a production capacity of seventy-five cars a day, with a working force of 400 men. The Omaha plant will be a five-story structure 120 by 284 ft., to cost $375,000. About 400 men are to be employed and seventy-five cars will be assembled a day if necessary. A four-story building, 132 by 275 ft. will be put up in Oklahoma City, having an output capacity of sixty cars a day with a working force of 300 men. The plant will cost $230,000. The Wisconsin plant is to be ready in February, also the one in Omaha. The one in Oklahoma is expected to be opened in May.

In St. Louis the Ford assembling plant is being doubled and in Kansas City the plant is being tripled.

Tire Co. in Eau Claire

EAU CLAIRE, WIS., Nov. 26—The Gillette Safety Tire Co., Chicago, Ill., a corporation capitalized at $1,000,000, has selected the city of Eau Claire, Wis., as the permanent location of its offices and works. The company has purchased, with the aid of the Eau Claire Commercial Club, a site 150 by 300 feet, formerly occupied by the mills of the Northwestern Lumber Co., and will build a modern, fireproof factory at once.

Studebaker Sales $46,851,349

To Sept. 30 Net Earnings Were $7,937,549—Net Profits $7,082,558

NEW YORK CITY, Nov. 30—The income account of the Studebaker Corp. for the nine months ending Sept. 30 shows net sales of $46,851,349, total net earnings of $7,937,549 and net profits carried to surplus of $7,082,558. The total surplus for the twelve months in 1914, after the preferred dividends, was $3,572,916. Earnings for the nine months were equivalent to about 23 per cent on the common, or over 30 per cent for the year, if no increase in net occurred in the December quarter.

The cost of manufacturing and selling and general expenses amounted to $38,857,339 and the reserve for depreciation was $298,471. The net earnings on sales was $7,695,539. Other income amounted to $242,010.

The consolidated balance sheet as of Sept. 30, 1915 follows:

Assets	
Trade name, good-will, patents, etc.	$10,807,276
Plant and property, less reserve for depreciation	12,076,870
Investments in other companies	452,449
Inventories at cost or under	10,493,553
Receivables:	
Accounts	6,034,678
Notes	1,745,626
Less reserves for bad debts and cash discounts	84,065
Cash	7,416,396
Deferred charges to operations	408,948
Total assets	58,351,733
Liabilities	
Preferred stock	$11,758,000
Common stock	27,931,600
Minority stockholders' interest in capital stock of subsidiary company (Studebaker Bros. Co., Northwest)	28,300
5 per cent serial gold notes, dated March 1, 1912, due $400,000 each half-year to March 1, 1922	2,308,500
Accounts payable current	2,835,823
Sundry reserves	1,233,354
Special surplus account	1,636,476
Surplus	10,619,678
Total liabilities	58,351,733

Receiver for Trumbull Car

BRIDGEPORT, CONN., Nov. 26—Upon an application made to Judge William S. Case in the superior court here on Wednesday, Judge Edward K. Nicholson was appointed receiver of the Trumbull Motor Car Co.

The petition to the court was made at the instance of Alexander H. Trumbull, president; Frank S. Trumbull, vice-president; James Trumbull and Robert B. Adams, stockholders.

It was agreed that Judge Nicholson should be receiver, and as there was no opposition he was named. He has been ordered to continue the business until Dec. 10, serving under a bond of $25,000.

Friday, Dec. 3, is the date fixed for a hearing upon the appointment and confirmation of the receiver, and for the naming of appraisers.

The company was organized about two years ago for the purpose of manufacturing small automobiles. The capital stock is $300,000, of which $170,000 has been paid in. There are 3000 shares of the par value of $100 each, of which the petitioners hold a half.

In the petition there is no mention of liabilities, though the assets are fixed at $150,000.

The late Isaac B. Trumbull, who lost his life on the *Lusitania*, was the most active spirit in the enterprise.

Rubber Lower

NEW YORK CITY, Nov. 30—Crude rubber had a sudden drop on Saturday, the decline coming as suddenly and abruptly as the rise a few weeks before. Plantation last week rose to 89½ cents a pound and Fine Up-River Para quoted at 76. Yesterday the Ceylon grade and Para were quoting at 75 and 68 respectively. These figures compare with 60 and 55 cents, the quotations that had prevailed for some time prior to the beginning of the upward movement. The sharp break is attributed to the withdrawal of nearly all substantial buyers.

Few changes occurred in the rest of the markets and prices were fairly steady throughout the week. The metals were especially firm with an extraordinary demand. Electrolytic and Lake coppers held firm at 19¾ cents a pound. There was a heavy demand for lead from domestic consumers with prices steady at $5.25 per 100 lb. Bessemer steel went up $1 a ton on Thursday, closing at $28. Aluminum held steady at 57 cents a pound with a heavy demand. Tin closed at $40 per 100 lb. at a gain of 50 cents.

Daily Market Reports for the Past Week

Material	Tues.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.57	.57	.57	.57	.57	...
Antimony	.38	.38	.38	.38	.38	...
Beams and Channels, 100 lb.	1.77	1.77	1.87	1.87	1.87	+.10
Bessemer Steel, ton	27.00	28.00	28.00	28.00	28.00	+1.00
Copper, Elec., lb.	.19¼	.19¼	.19¼	.19¼	.19¼	...
Copper, Lake, lb.	.19¼	.19¼	.19¼	.19¼	.19¼	...
Cottonseed Oil, bbl.	8.12	8.16	8.30	8.22	8.17	+.05
Cyanide Potash, lb.	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl.	.19	.19	.19	.19	.19	...
Lard Oil, prime	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.25	5.25	5.25	5.25	5.25	...
Linseed Oil	.63	.63	.63	.63	.63	...
Open-Hearth Steel, ton	28.00	28.00	28.00	28.00	28.00	...
Petroleum, bbl., Kansas, crude	1.00	1.00	1.00	1.00	1.00	...
Petroleum, bbl., Pennsylvania, crude	2.00	2.00	2.00	2.00	2.00	...
Rapeseed Oil, refined	.85	.85	.85	.85	.85	...
Rubber, Fine Up-River, Para	.76	.73	.70	.69½	.68	—.08
Silk, raw, Italian	...	5.05	...	...	5.10	+.05
Silk, raw, Japan	...	4.95	...	...	4.90	—.05
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	39.50	39.50	40.00	40.00	40.00	+.50
Tire Scrap	.05	.05¼	.05¼	.05¼	.05¼	+.00¼

Consolidated Capital Now $500,000

DETROIT, MICH., Nov. 30—The Consolidated Car Co., which was organized in January and took over the business of the old Abbott-Detroit company, has increased its capital stock to $500,000. Its original capital was $100,000 which was later increased to $250,000. The company contemplates increasing its manufacturing facilities.

Change in Bell Personnel

YORK, PA., Nov. 27—At a meeting of the board of directors of the Bell Motor Car Co. on Nov. 19, a slight change was made in the personnel of the officers of the company which is now as follows: H. M. Stauffer, president and business manager; H. W. Posey, vice-president and general manager; B. F. Posey, secretary and treasurer; E. T. Gilliard, designer and chief engineer; H. W. Conrad, assistant general manager and sales manager.

Kelly-Springfield Reduces Common Par Value to $25

NEW YORK CITY, Dec. 1—At a special meeting of the stockholders of the Kelly-Springfield Tire Co., in Jersey City, the proposed reduction in the par value of the common shares from $100 to $25 was authorized. Common stockholders were also given the voting privilege of one vote for each share of a par value of $25, while the preferred stockholders, to equalize the voting power of both classes of stock were given the right of four votes for each share of preferred stock held by them.

Receiver for Dreadnaught Tire

BALTIMORE, MD., Nov. 27—Eli Frank has been appointed receiver for the Dreadnaught Tire Co., this city upon application by the Manhassett Mills Co., New York, a creditor to the extent of $20,000. The Dreadnaught company consented to the appointment. The attorney for the company says the assets are about $200,000 and the liabilities about $150,000 and the appointment of a receiver is only for the purpose of refinancing the concern.

Kennedy Represents Hammond Steel

DETROIT, MICH., Nov. 30—Don F. Kennedy, manufacturer's agent of Detroit, has arranged to take over the sales in the Western part of the country of the Hammond Steel & Forging Co., Inc.,

Syracuse, N. Y., manufacturer of hammered tool steel bars, die blocks and special forgings, which arrangement will become effective Dec. 1. The present office of the company in the Dime Bank Bldg. here, will be discontinued. Mr. Kennedy also handles the accounts of the T. R. Almond Mfg. Co., and the Sawyer Tool Mfg. Co., Ashburnham, Mass.

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Simplex Capital Now $5,000,000

WILMINGTON, DEL., Nov. 25—The Simplex Automobile Co. has filed a certificate to corporate amendment in Delaware to increase its capital stock from $1,500,000 to $5,000,000.

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Gerlinger Co. Doubles Capital

SEATTLE, WASH., Nov. 26—The Gerlinger Motor Car Co., of Seattle and Portland, manufacturer of the Gersix truck, has increased its capital stock from $50,000 to $100,000, of which $51,000 already is paid in.

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Dividends Declared

Yale & Towne Mfg. Co. quarterly of 1¾ per cent and an extra dividend of 5 per cent. Regular payable Jan. 3 to holders of record Dec. 22, and extra payable on Dec. 23 to holders of record Dec. 8.

Packard Motor Car Co. quarterly of 1¾ per cent on preferred, payable Dec. 15, to holders of record Nov. 30.

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Sta-Tite Now Keys Piston Ring Co.

ST. LOUIS, MO., Nov. 26—The Sta-Tite Packing Ring Co. has changed its name to the Keys Piston Ring Co., and the name of its product to the K-P ring.

Automobile Stocks Are Dull

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General Motors Soars to 463 and Paige Reaches High Mark of 700

NEW YORK CITY, Dec. 1—Automobile stocks were dull but firm last week. A majority of the issues remained unchanged. However, there were a few, such as General Motors, Paige-Detroit, Maxwell, Willys-Overland, Studebaker and Packard, which showed substantial rises.

General Motors soared to a new high price yesterday when it sold for 463, almost 400 points higher than the quotation a year ago. At the present prices trading in this stock is a luxury few can indulge in. Odd lot houses refuse to take orders in the issue at all except for cash. Paige-Detroit stock, which showed a 110-point rise last week kept up its skyward movement by reaching the 700 mark with a 40-point gain. Packard common, after a 1-point decline last week, went up 10 points, closing on Saturday at 140. Maxwell common rose 2½ points. The two preferred were dull during the first part of last week but picked up at the closing on Saturday. Willys-Overland closed at 240 yesterday, nearly 170 points higher than last year's quotation. On Saturday this stock was quoting at 230. Studebaker showed a gain of 3 points. This stock fluctuated throughout the week, hovering around the 154-point mark.

General Motors and Paige featured the Detroit active stocks. The first stock gained 35 closing at 440 while the second reached the 700 mark with a 25-point gain. There were a few 1-point declines and most of the gains ranged from 1 to 5 points.

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Chase Names Directors

SYRACUSE, N. Y., Nov. 16—Close on the heels of the recent meeting at the Chase Motor Truck Co.'s plant here, comes the announcement of the election of the directors to serve for the next year. They are as follows: A. M. Chase, president and general manager of the company; Col. A. C. Chase; L. O. Bucklin, president Little Falls National Bank, Little Falls, N. Y.; E. C. Witherby, general manager, Semet-Solvay Co., Syracuse, N. Y. and H. P. Bellinger, general manager Caustic Dept., Solvay Process Co., Solvay, N. Y.

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Poor Resigns from S. K. F.

NEW YORK CITY, Nov. 16—F. H. Poor, who has been general manager for the S. K. F. Ball Bearing Co. of New York since 1909, has resigned that position and opened an office at 30 Church Street. This resignation, however, is merely a formal one, as the new S. K. F. Ball Bearing Co. of Connecticut is planning to absorb the old New York importing company, when it is expected that Mr. Poor will take another contract with the S. K. F. interests.

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Hupp Co. Chartered in Virginia

RICHMOND, VA., Nov. 24—The Hupp Motor Car Corp. was chartered to-day under the laws of this State, with an authorized capital of $8,000,000. A. D. Christian of Richmond, is president, and H. H. Chalkley of Richmond, secretary.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co., com	250	..	350	450	..
Ajax-Grieb Rubber Co., pfd	100	..	101	110	..
Aluminum Castings, pfd	..	..	..	..	..
J. I. Case, preferred	..	..	88	90	..
Chalmers Motor Company, com	..	97	145	160	..
Chalmers Motor Company, pfd	..	93½	102	106	..
Chevrolet Motor Co	..	..	..	126	..
Electric Storage Battery Co	..	..	65⅞	66⅛	..
Firestone Tire & Rubber Co., com	320	325	700	725	..
Firestone Tire & Rubber Co., pfd	105	111	112	..	..
General Motors Company, com	67	69	455	458	+36
General Motors Company, pfd	84	87	113	115	—1½
B. F. Goodrich Company, com	23	25	71¼	71¾	+1¼
B. F. Goodrich Company, pfd	88	..	111	113	..
Goodyear Tire & Rubber Co., com	175	185	338	342	..
Goodyear Tire & Rubber Co., pfd	97	100	111	113	..
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co., com	..	..	33	38	—2
International Motor Co., pfd	..	..	50	58	—5
†Kelly-Springfield Tire Co., com	61	64	300	305	+3
Kelly-Springfield Tire Co., 1st pfd	75	78	74	76	—1
Kelly-Springfield Tire Co., 2nd pfd	90	95	93	96	..
Maxwell Motor Company, com	14½	14¾	75¼	75¾	+2½
Maxwell Motor Company, 1st pfd	43	45	99¼	99½	+¼
Maxwell Motor Company, 2nd pfd	17	19	56⅝	57	+⅝
Miller Rubber Company, com	..	..	248	250	..
Miller Rubber Company, pfd	..	..	109	111	—½
New Departure Mfg. Co., com	..	..	..	..	..
New Departure Mfg. Co., pfd	..	..	..	..	..
Packard Motor Car Company, com	..	100	140	145	+10
Packard Motor Car Company, pfd	89	..	100	104	+1
Paige-Detroit Motor Car	..	..	700	..	+40
Peerless Motor Car Co	..	..	32	50	—4
Portage Rubber Co., com	..	..	65	75	..
Portage Rubber Co., pfd	..	..	98	100	..
Regal Motor Co., pfd	..	..	17	24	..
*Reo Motor Truck Company	10½	11½	23	24	+2
*Reo Motor Car Company	21½	22½	54	54½	..
Splitdorf Electric Co., pfd	..	..	..	..	..

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Stewart-Warner Speed. Corp., com	47	48	89½	90½	+1½
Stewart-Warner Speed. Corp., pfd	97	99	107	..	+1
Studebaker Corporation, com	34	36	154	155	+3
Studebaker Corporation, pfd	85	..	112	113	+1
Swinehart Tire & Rubber Co	..	..	..	90	..
Texas Company	..	..	212½	215	..
U. S. Rubber Co., com	44	45	53½	54½	+½
U. S. Rubber Co., pfd	94	96	107	108	..
Vacuum Oil Company	202	..	228	231	..
White Company, preferred	..	..	110	..	..
Willys-Overland Co., com	76	80	230	240	+2
Willys-Overland Co., pfd	88	92	113	114	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co., com	..	97	..	161	—1
Chalmers Motor Co., pfd	..	93½	101	104	..
Continental Motor Co., com	155	180	240	252	—3
Continental Motor Co., pfd	..	75	90½	..	..
General Motors Co., com	68	70	440	460	+35
General Motors Co., pfd	85½	87	114	116	..
Maxwell Motor Co., com	14	15	74	77	..
Maxwell Motor Co., 1st pfd	43	45	98	101	—1
Maxwell Motor Co., 2nd pfd	17	18½	55	57½	+1
Packard Motor Car Co., com	..	100	136	..	+2
Packard Motor Car Co., pfd	89	..	100	..	..
Paige-Detroit Motor Car Co	..	..	700	..	+25
*Reo Motor Car Co	21¾	22½	53½	54½	..
*Reo Motor Truck Co	10½	11¼	..	24½	+2¼
Studebaker Corp. com	..	..	153	157	+3
Studebaker Corp. pfd	..	..	109	114	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2000	2750	..
Kelsey Wheel Co	185	..	225	..	+5
*W. K. Prudden Co	..	20½	25¼	25½	+1
Regal Motor Car Co. pfd	..	25	18	24	..

*Par value $10. †1914 quotations are on the old stock.

Race Results Surprise Europeans

Endorse Engineering of Victorious Stutz Cars in Sheepshead Bay Contest

PARIS, Nov. 5—Results of the Sheepshead Bay race, which were not known in Paris until the arrival of THE AUTOMOBILE, have created more surprise than disappointment. Engineers and race drivers have some difficulty in understanding the failure of any European car to finish the race—for Limberg's Delage is thought to be Thomas's reconstructed machine and is no longer looked upon as a French car. No such failure has ever been known in a European race.

While giving full credit to Stutz for a fine performance, all French engineers point out that the motor of the winning cars are built up of many ideas gathered from Peugeot, Delage, Sunbeam and Mercedes racing cars. One racing engineer states that the motor can be described as a Franco-British-German design. "The train of spur gears driving the camshaft is a copy of the Peugeot; the crankshaft is a copy of Peugeot and Delage; the valves, camshaft, and rocker arms are Mercedes; the piston is Sunbeam, and the form of the combustion chamber is Mercedes. It would be childish to deny the value of the motor, for it embodies all the best features of European cars, and the result of the race shows that workmanship was of the best.

All the evidence shows that the European motors, despite their smaller capacity, delivered more power than the American motors. The fastest time for 20 miles was made by Aitkin on Peugeot in 11 min. Resta did 11.02, 11.06, and 11.10. The fastest time made by Stutz was 11.25, while De Palma's Stutz never did better than 11.40. Thus between the best Stutz and the best Peugeot performance there is a difference of 3.08 miles an hour in favor of the Peugeot, although the French car had 22 cu. in. less than the American motor.

Metals Worked Near Limits

"To maintain that the fact of the European cars having run in previous races is a guarantee that they are O.K. is to display a lack of knowledge of racing conditions, at any rate as we know them in Europe. The advantage in this respect was with the Stutz, which had not been raced before, and not with the European cars, all of which had been in one big race and some in several. Metals are worked so near their extreme limits that nobody can say when they will fail. We never run a car in more than two long-distance races, and they are never considered good for more than one season. It is a mistake to suppose that our cars start in a race after having done thousands of miles at highest speed. All the gruelling is taken by a special car, which is not started in the race, or is merely allowed to compete as a runner-up. The real racing cars have taken advantage of any experience gained in the try-out of the test car, but they have not done any more running than is necessary to put them in condition without straining them.

Approach Power Limit

"The statement that we are approaching the limit of power is quite correct. Unless some entirely new type of motor is evolved it is difficult to see how we can get more power and more speed. At the present time we are very close to the highest theoretical pressures, and future races will depend more than ever on good workmanship, details, and scientific preparation. Future races will be keener and the element of chance will be more important. It is worth while considering if it is not advisable to reduce the cubic capacity of racing motors. Just before war broke out Peugeot had on the road a set of racing cars of only 153 cu. in. These averaged 96.5 m.p.h. on the open road.

René Thomas, winner of the 1914 race at Indianapolis, considers that much of the responsibility for the failure of European cars to finish in American races lies with the American drivers. "It has to be noted," says Thomas, "that Resta can win races with Peugeot cars, while no American has proved himself capable of doing so. This seems to point the conclusion that it is not the fault of the car, but of the man who is handling it. American drivers have all the dash and vim that is necessary for winning races, but with a few rare exceptions they do not seem to possess the necessary mechanical ability to get their cars into the best condition for a race, and to keep them in the best condition while the race is on. Cars have been sent over and given to men who have had no previous experience with that particular make. They have no opportunity of getting the right gear ratio for the track on which they are to drive, they do not know at what speed that particular motor ought to be run, and in some cases they run without a revolution counter. It seems to me that American drivers run their cars in far too many races and do not do enough work on them between races. They also appear to expect racing cars to remain in racing condition much longer than is reasonable. Judging from their insuccess in the last two or three races, I should imagine that Resta's Peugeot and De Palma's Mercedes have finished their active career. This is not at all surprising. In Europe we consider that a racing car is good for one season, during which it will run in two long distance events and a few hill climbs and short distance races. After that it is sold to an amateur, or it can be used for sprints on a track.

"On this side the driver lives with the car from the time it is put on the drawing board to the moment it finishes its race. He goes through all the bench tests with the engineers and possesses all data concerning the motor. He knows at what speed it can run and at what speed it ought to be run in a race, and he would no more think of starting without a revolution counter than without water in the radiator. He may spend several weeks, or sometimes months tuning up, trying various gear ratios, carbureter and ignition adjustments, steering column positions, shock absorbers, springs, etc., so that when he starts he knows exactly what he can do and what the car can do in the race.

"Compare this with the system under which a driver is given a car a few days in advance and told to do his best. He may be a first class driver, but he cannot possess the knowledge necessary to get satisfactory results out of the car."

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Autocar Men Hold Sales Conference

NEW YORK CITY, Nov. 30—The Autocar Co.'s sales conference opened on Nov. 26 in this city when ninety representatives of the company attended a dinner. The conference, which was called to map out means and methods of disposing of an increased production of Autocars next season, held a business meeting on the next day. The business of 1915 is said to have been 70 per cent greater than the year previous.

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Schwartzkopf Joins Longuemare

NEW YORK CITY, Nov. 27—E. E. Schwartzkopf, former sales manager of Gray & Davis, Boston, has joined the Longuemare Carbureter Co., New York City, in a sales capacity.

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New Distributor for Gray & Davis

NEW YORK CITY, Nov. 24—The New York branch of Gray & Davis has been discontinued, and the P. J. Durham Co., Inc., has been made distributor of all Gray & Davis products for the Metropolitan district. H. B. Shonts, formerly with the C. T. Silver Co. has gone into the Durham company and will have charge of the sales end of the business.

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100 Dodge Cars in Parade

BOSTON, MASS., Nov. 29—The best parade of motor cars ever witnessed in New England took place this morning when 100 Dodge Bros. cars were driven through the principal streets of the city. It was the first time that so many cars of one make were in a parade here, and

the features brought out by the owners produced some unique designs. The cars started from the salesrooms of the Henshaw Motor Co.

The decorative features were unique. One car was a duplicate of a submarine. Another was decorated with holly and ferns and carried Santa Claus with a lot of toys that he threw to children. Uncle Sam was in another car decorated with flags and bunting.

Others were covered with flowers to represent various seasons. More cars had occupants in military, hunters', football, harvest and opera costumes. One machine towed a buggy bearing signs "Gone, but not forgotten," and "Times have changed."

Three handsome silver cups each worth $100 were awarded to the owners of the best featured cars.

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New Stock for Blood Men

ALLEGAN, MICH., Nov. 20—Stockholders of the Blood Bros. Machine Co. have received a circular from the managers of the company asking them to surrender certificates of stock to Earl W. Delano as trustee and acceptance of new stock for but 17½ per cent of their investment. It means that the balance or 82½ per cent represents a loss to the subscribers of the original stock. It is thought probable that the stockholders will agree to these terms and thus prevent a total loss. It is reported that the company has orders on hand for $80,000 worth of universal joints which will keep the factory busy for the next four or five months. About 100 men are now employed.

Setback for U. S. Cars in France

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Agency Negotiations Affected by 33 to 45% Duty To Be Imposed

PARIS, Nov. 4—Negotiations for the French agencies of American cars have received a setback since it became known that the manufacturers here were assured of getting a substantial protective tariff. It is expected that the tariff is likely to be between 33 and 45 per cent. A meeting of the manufacturers' association a few days ago considered this question, but no decisions were allowed to leak out. As it is obvious that there will be a big demand for certain types of cars as soon as the end of the war is in view, and as it is equally certain that the home manufacturers will not be able to meet that demand for a time, enterprising dealers have been trying to connect with American firms. In view of the threat of a high import duty these negotiations have been suspended.

The only American firm doing a really important business in France is Ford, and if the threatened boycott can be warded off, this make of car should continue to sell well. Overland is making a bid for French custom, and the Buick line is now in the hands of a live agent. There are about a score of other American manufacturers who have, or had, agents in France, but the condition of their stores at present is not a credit to the home factories. All these stores are closed and only the name serves to show where American cars were once sold. Packard keeps open house and is going to unveil the twin-six to Parisians during the present month.

One of the best French dealers, who has financial backing from a millionaire manufacturer, had completed nearly all arrangements for marketing a cheap American car, and had purchased sample cars when news of the proposed duty leaked out. Immediately the backer withdrew all support and the scheme has been dropped. All dealers are now sitting tight awaiting the government move. It may be possible to do some business under a 33 per cent duty, but admittedly the situation will be difficult and only the best propositions handled by the most experienced agents can succeed.

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12 Cars Imported in Sept.

WASHINGTON, D. C., Nov. 30—Twelve cars, valued at $17,198 were imported into the United States in September, 1915. During the nine months ending September, 1915, a total of 171 automobiles, valued at $265,936 were imported. During September, 1914, the imports amounted to sixty-two automobiles valued at $95,170 and during the nine months ending September, 1914, 388 automobiles valued at $293,610 were imported. The table appears herewith.

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Murden Leaves Knickerbocker Truck

NEW YORK CITY, Nov. 26—H. H. Murden general manager and engineer of the Knickerbocker Motor Truck Mfg. Co., this city, has resigned, effective Dec. 31.

Imports of Automobiles and Parts for September and Eight Preceding Months

IMPORTS

	September				Nine Months Ending September			
	1914		1915		1914		1915	
Automobiles ..... No. dut..	62	95,170	12	17,198	388	293,610	171	265,936
Imported from—								
France	7	24,650	7	13,943	143	116,367	52	104,709
Germany	...	.....	...	.....	77	16,556	...	.....
Italy	40	42,496	...	.....	68	74,380	22	28,526
United Kingdom	9	19,537	1	1,605	37	51,033	26	54,811
Other countries	6	8,487	4	1,650	63	35,274	71	77,890
Parts of (except tires) ..... dut..	...	64.573	...	19,883	...	698,624	...	443,456
India rubber, etc, and substitutes for, manufactures of:								
Unmanufactured—								
Balata ..... lbs..free..	315,215	149,758	73,885	29,457	.....	561,048	1,580,668	596,088
Guayula gum ..... lbs..free..	413,474	137,584	415,714	110,530	.....	440,262	4,866,086	1,347,506
Gutta-joolatong ..... lbs..free..	1,268,165	72,492	4,215,627	158,321	.....	777,838	15,759,092	748,869
Gutta-percha ..... lbs..free..	102,453	16,908	545,823	57,450	.....	307,003	1,732,126	203,527
India rubber ..... lbs..free..	14,087,980	6,736,616	19,671,360	9,846,576	.....	53,980,082	160,416,636	79,903,994
Imported from—								
Belgium	467,045	207,755	.....	.....	.....	5,028,504	.....	.....
France	157,822	79,575	.....	.....	.....	843,881	220,032	100,742
Germany	.....	.....	.....	.....	.....	2,336,218	6,987	843
Portugal	221,011	62,955	130,475	42,382	.....	274,058	3,764,580	1,349,497
United Kingdom	7,676,310	4,080,920	5,337,322	3,065,502	.....	22,872,342	69,719,803	37,407,760
Central American States and British Honduras	63,650	31,052	106,994	48,857	.....	186,754	971,942	437,801
Mexico	46,621	24,603	316,027	106,215	.....	247,440	1,429,000	541,455
Brazil	3,789,136	1,421,237	4,581,341	1,647,791	.....	12,239,873	38,172,743	16,165,002
Other South America	229,596	122,984	256.230	114,689	.....	727,275	4,384,007	1,894,496
East Indies	1,342,702	676,104	8,938,271	4,819,260	.....	8,289,899	36,709,657	19,190,659
Other countries	94,087	29,431	4,700	1,880	.....	933,838	5,037,885	2,815,739
India rubber scrap or refuse, fit only for remanufacture ..... lbs..free..	797,245	55,822	1,286,356	98,951	.....	1,190,961	8,807,171	613,164
Total unmanufactured	.....	7,169,180	.....	10,301,285	.....	57,257,194	.....	83,413,148
Antifriction balls and bearings ..... dut..	.....	155,132	.....	96,263	.....	1,276,446	.....	1,073,875

Indianapolis Race 300 Miles

To Cut Purse to $30,000—Entrance Fee To Be $100

INDIANAPOLIS, IND., Nov. 27—At a meeting of the board of directors of the Indianapolis motor speedway, held this week, it was decided to reduce the distance of the May 30 race from 500 to 300 miles and to cut the purse from $50,000 to $30,000, the prize money to be divided in ten parts. The entrance fee will be $100, which will be refunded to the entrant if his car starts. The 1916 race will start at 1:30 p. m.

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Saurer Truck Climbs Mt. Wilson

MOUNT WILSON OBSERVATORY, CAL., Nov. 14—The Mount Wilson toll road, which climbs to 6000 ft. elevation in 9 miles, has been conquered by a Saurer truck, weighing 7300 lb., and built to carry a 6½-ton load, carrying a load of 22,235 lb. from the freight yards of the Carnegie Institute in Pasadena to the summit of Mount Wilson, where the new solar observatory is being constructed.

The 11-ton load consisted of a steel casting which will be used as a section of the pedestal on which a 100-in. telescope of the new observatory will rest.

The weight on the wheels of the truck represented approximately 15 tons. In the yard of the Carnegie Institute at Pasadena the wheels sank 3 in. into the roadway. It required 6 hr. and 20 min. to make the climb from the toll gate at Altadena to the observatory at the summit.

A crowd of a hundred or more spectators witnessed the feat.

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Seventh Edition of Used Car Market Report Out

CHICAGO, ILL., Nov. 30—The seventh edition of the National Used Car Market Report has just been issued by the Chicago Automobile Trade Association. As is evident must be the case with the progress of the industry, this volume is a little larger than the sixth, due to the addition of the 1916 models of many of the cars. In cases where it has not been possible to get authentic figures on 1916 used cars they are not added.

The gasoline car statistics in the sixth edition ended on page 113; in the seventh edition there is a page more. There also are quite a few additions of later models in the electric classification, causing the complete book to end on page 124 instead of 122.

There have been no additions in the list of cars represented. As in the sixth edition, there are 154 gasoline cars and fourteen electrics listed.

Greater co-operation is, however, being secured from associations of dealers. The sixth edition listed twenty-eight as subscribing to the service. In the seventh edition these are added: Ohio State Automobile Association, Cleveland; Iowa Automobile Business Association, Des Moines; Hartford Automobile Dealers Association, Hartford, Conn.; St. Louis Automobile Mfgs. and Dealers Association, St. Louis; Troy Automobile Dealers Association, Troy, N. Y. This makes a total of thirty-three.

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White To Exhibit at Salon

NEW YORK CITY, Nov. 26—The Automobile Salon, which will be held at the Hotel Astor Jan. 3 to 8, will have more exhibitors than any of its predecessors. The representation of American cars will be increased from three to ten or more. Among these will be the White, Simplex, F. R. P., Singer, Owen Magnetic, Brewster, Daniels and Baker. The foreign makes will include the Rolls-Royce, Lancia, Delauney-Belleville and Isotta-Fraschini. The body makers already represented are Holbrook, Healey, Brewster and Bender & Robinson.

All space has been taken at the show which will be purely an invitation affair as last year. It has not as yet been decided whether a banquet will be held during the salon.

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Resta Sails for Europe

NEW YORK CITY, Nov. 26—Dario Resta, hero of the 1915 speedway season, sailed yesterday for England. He will go to France for new parts for his Peugeot. He also plans to buy another car from the Peugeot makers if there is one for sale.

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Kissel Branch for San Diego

SAN DIEGO, CAL., Nov. 24—The Pacific Kissel branch has announced that a branch will be opened in San Diego within the next few days. The company is now fitting out quarters in the San Diego Hotel building where the Kissel and Briscoe will be handled in this territory.

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Car-Buyers' Finance Co. Formed

SPOKANE, WASH., Nov. 24—The Washington Motor Car Finance Co., capitalized for 250,000 shares at $1 each, has been organized in Spokane, Wash. The incorporators are Samuel Glasgow, J. M. Watkins, H. T. Irvine, S. A. Mitchell, and others. J. A. McKee and Charles A. Bradley have been named vice-presidents of the corporation, and S. A. Mitchell, secretary.

The purpose of the corporation is to finance the purchase of automobiles, either by dealers or individuals. Money will be loaned on new cars where from 33 1/3 to 50 per cent of the purchase price is paid by the owner. The company will take a mortgage on the vehicle or purchase it outright and lease it to the buyer, to protect itself for the money advanced.

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Maxwell in Non-Stop Run

LOS ANGELES, CAL., Nov. 23—A stock Maxwell 25 is making an attempt to establish a new world's non-stop record in and around Los Angeles. The car started yesterday and at the end of 36 hr. had covered 797 miles or at an average speed of 22 m.p.h. The car is averaging 26 miles to the gallon of gasoline. The machine is registered with the A. A. A. as a stock model, the sanction number being 888. Earl Cooper, the racing driver is acting as temporary A. A. A. representative in this territory and before leaving for San Francisco yesterday, appointed three official observers who are riding in the car 8 hr. per day. Three employees of the Lord Motor Car Co., Maxwell distributors, are driving.

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All National Show Space Sold

NEW YORK CITY, Dec. 1—No more space is left for car exhibits at either of the National shows, a condition which has never existed before at so early a date. To date only five accessory spaces can be had and these have been applied for.

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Knox Tractor Does Well in Cincinnati Haulage Test

CINCINNATI, OHIO, Nov. 26—This city recently held a test of gasoline tractors for municipal hauling, to test among other things just how much tractors could haul, whether several trailers could be handled conveniently, whether the tractor engine was equal to the task of hauling tonnage up an 8 per cent grade and whether the combined weight of several heavily loaded trailers down that grade could be held back. A Knox tractor was chosen for the experiment and six trailers, the ordinary municipal type dumping wagons, were used.

With the trailers loaded with mud weighing 38,550 lb., the tractor hauled the train up a hill 7000 ft. long with a mean grade of 6.2 per cent and a maximum grade of 8.3 per cent. The surface of the street was granite block.

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Plan Race for Los Angeles

LOS ANGELES, CAL., Nov. 23—Plans are under way for a track race in this city, Dec. 10, in which Barney Oldfield will meet Earl Cooper, and Teddy Tetzlaff is also expected to appear.

Laying Out Chain Camshaft Drives

(*Concluded from page* 1009)

is used for the small wheels, a good gray or piston iron for the large. One set of wheels will wear as long or longer than the chain, and generally the chain is the only part to be replaced. The record mileage, as far as our product goes, with no adjustment, is 32,200 car miles, and I confidently predict a car mileage in the hands of the public, with adjustment for the chain, of from 50,000 to 100,000 car miles, and during this mileage there will be that softer, less harsh feeling than with gearing, and no objectionable noise. Permit me to say that I am here referring to commercial gearing, not special hand fitted, where the cost of the gear drive is probably far in excess of a chain drive, and cannot be produced in the large quantities as commonly manufactured in this country.

Is Chain Makers' Problem

In laying out chain drives for use on the engine, I know I will be serving the manufacturers and users of the car best by advising that the problem be turned over to the chain makers as early as possible, when slight modifications may be made that in no way will impose restrictive limitations on the general design, but will sometimes make the difference between a successful and unsuccessful drive. I also feel that such advice will be little heeded, although I am pleased to say that some manufacturers are co-operating in this way with most satisfactory results.

The information that has appeared from time to time in print has in a general way been correct, and a summary of the recommendations of the various chain makers, as well as Mr. Ricker's observations, will be found in the paper before referred to, which was printed in Part I of the 1912 Proceedings of your Society. I have slightly modified some of the statements therein found, not, please understand, because I think I know more than others in this line of business, but because I think I know the action of our product.

To Prevent Whipping

There is one statement that has been made, and from my experience it is generally accepted as true, viz., that with adjustment whipping can be prevented with the resultant lesser wear and a quiet running drive. This, I believe, is an error, and a most serious one. As far as my experience goes, there is no tension within the capacity of the bearings that will prevent a whip if it is present in the drive. It will reduce the amplitude of the whip, but the destructive force will still exist, and under tension it will never give that smooth running feeling that is always present in a properly designed chain drive. The destructive whip, which occurs when the rate of chain vibration synchronizes with some impulse given off by the engine, must be overcome by changing the critical rate of vibration of the chain, and this is the problem that should be solved when designing, if chain driving is going to be the success warranted by its peculiarly favorable characteristics for this type of drive.

Rules for Design

It is most difficult to give specific instructions for a proper design, and I am not sure that a design for the Morse chain, for instance, will be correct for the other makes, but in general we advise (1) the triangular drive as cheaper and taking less room; (2) shortest centers possible between crank and camshaft; (3) drive from crankshaft to camshaft, and then to accessory shaft, not to camshaft through the accessory shaft; (4) chain wrap should be not less than five teeth; (5) provide adjustment, generally easiest on the accessory shaft; (6) use an odd number of links in the chain, and an odd number of teeth in the crankshaft and accessory sprocket when possible; (7) provide an oil lead from the general oiling system leading to the inside of the chain; (8) design the chain case so that the chain can be made endless, and when on the wheels can be put in place; (9) if adjustment is provided without taking off the gearcase, provide a convenient means of feeling the chain to adjust to the right tension.

Generator Drives

I have made no specific reference to the starter-generator application, as this is an entirely different drive from the cam and accessory shafts, and requires different treatment. The centers almost of necessity are such as to bring the chain within the danger zone of vibration, and so far no weight of chain throughout the full range of elasticity that we have been able to provide has produced what we consider a satisfactory drive. Many of the cars equipped with chains are very noisy at some critical speed, when the strain upon the chain is far in excess of that under which it can be safely run. To correct this trouble necessitates, we believe, the use of a flexible or slipping sprocket wheel, and we have developed such a wheel, which gives a fair promise of success. In the very nature of the case, however, the critical speed or tendency to whip being so markedly different with different engines, we are not entirely satisfied that the device on which we are experimenting will meet all of the conditions, but it has characteristics which permit of a wide range of application, and we are hopeful that it can be made so as to give a quiet and durable drive for this class of work.

Discussion Is Good

IN commenting on his paper, Mr. Morse said that there is a certain point of adjustment in every motor car engine for the tension of the silent chain layouts at which they run the quietest.

Howard Marmon asked how much trouble Mr. Morse is experiencing in getting the co-operation of the car makers in the laying out of chain drives.

Mr. Morse replied that it has not been easy to get any of the automobile engineers to co-operate early enough in the design to permit him to select the center distances he would like, but wherever the engineers have done so, a drive has been furnished that is free of vibration throughout the whole range of engine speed. In his first experience with automobile work, he could get nothing from the engineer of the company that was taking the chain. He considered a chain drive the same as a belt, and thought a belt could be put on to drive anything, notwithstanding some experiments of the Brown & Sharpe Co. that prove there is no period in a belt. This engineer thought the chain simply a makeshift for a belt—merely a belt taking two centers. He took out the gears and put on the chain. Almost always when this was done they got into trouble with the critical center distances. In such cases all kinds of vibrations were set up, and it was necessary to either change the elasticity of the chain by cutting the arc higher, or not so high, or to change the weight or tension of the chain. Such working was decidedly at a disadvantage, because the problem in each case is different and the rate of vibration and period are local to each installation.

Mr. Morse said that he would like to have standard chains that would fit any installation, but the contrary has been true. Chains that seem to be the same to the engineer are radically different in their elasticity. So far as the Morse chain is concerned, they are oftentimes also different in weight and critical speed.

Mr. Morse believes that the solution of the silent chain drive for automobiles has been found, for with the experience the chain makers now have, after going through all sorts of troubles, it seems to him that while sometimes an engine

is built for which the chain makers cannot lay out a drive, if the automobile engineer will permit any chain maker to lay out the drive as he (the chain man) would like to have it, within the chain limitations he knows exist, Mr. Morse believes the chain man can furnish a drive that will be most satisfactory.

Asked as regards chain drives for fours as compared with engines of more cylinders, Mr. Morse said that it is very difficult to make a satisfactory chain drive for a four-cylinder engine. It has to be handled with gloves, and in the Morse chain, for instance, he said there is a maximum range of adjustment of only ⅜ in., without getting into trouble. In the old fours, the crankshafts were often found wanting. The impulses set up by the explosions would produce a vibration which was substantially due to a twisting of the crankshaft a good many degrees when the forward cylinder exploded. When the rear cylinder fired, there was a practically true angular velocity between the cranks, but when the first cylinder fired there was a spring in the shaft which almost always set up a vibration in the chain.

Adjustment Essential

In a chain drive, Mr. Morse explained, it is almost essential that some means of adjustment be provided. You can either move the shaft, or adjust by an idler against the chain, providing that idler is doing work. Mr. Morse does not think you can satisfactorily put an idler against the outside or the inside of a chain unless it does work, for the reason that the chain must run loose. While the chain in the diagram is shown in the conventional way by straight lines between the two wheels, it should at least sag ⅜ to ½ in. on the slack side when it is running, and for that reason no support would be desirable unless it be simply a means of shortening the distance the slack side would be dropped, bringing a node point.

There is a vibration wave that passes through the wheels and comes out on the slack side, but it originates on the tight side. In running, a chain must throw out at a tangent from the wheel, and if it does not when running, it will be noisy, and under no conditions will it operate satisfactorily. If you try to hold it in close to the wheel, it will take a path different from that which it wishes to follow, and it becomes noisy immediately.

Speaking of vertical drives, Mr. Morse said that he would not recommend a vertical chain drive without an adjustment. One prominent car manufacturer is using it without adjustment, therefore Mr. Morse explained that he has no right to say it is absolutely necessary, but he thinks this manufacturer could get a longer mileage out of the chain by using an adjustment, although whether the expense of putting one in would be warranted he leaves to the manufacturer to decide.

W. G. Wall asked as to the amount of wear on the sprockets as compared with the chain, and also if anything has been devised in the way of a balance or indicating device that will indicate to the assembler when putting the chain on that the tension is right.

Wear All on Chain

Mr. Morse said that the wear seems to be almost entirely on the chains, this being especially true of the crankshaft sprocket. He has seen one, he said, after a chain had run 72,000 car miles, and the sprocket was only polished nicely. The camshaft sprocket was also good for many more miles without change. There was probably 1/64 in. wear on the sprocket above referred to, and that was the longest mileage he has had an opportunity to observe.

However, Mr. Morse pointed out, if something goes wrong—if the manufacturer fails in making the chain correctly, or gets in the wrong kind of a link or gets it in backward, as will sometimes happen—the defective point will be a source of steady grinding and will take off every tooth on the sprocket. But under normal conditions, Mr. Morse claimed, there is nothing in the life of the ordinary automobile that will compare with the wear that an ordinary chain transmission will undergo. Tests have been made for over 3000 hr. at a speed of 1700 r.p.m., which would represent hundreds of thousands of car miles, and there is practically no wear shown on the sprockets.

The Proper Tension

In regard to the tension in the chain when assembling, Mr. Morse said that he has tried to get close to the engineers on this, and has recommended putting the chain on with a finger lift of ¼ in. each side of the center. However, this brings in the human element so strongly, and the definition of finger lift is so varied that he says some surer method must be devised, such as using a spring pressure of predetermined amount lifting the chain a certain distance.

Howard Marmon asked whether it is necessary to make provision in the chain housing to allow for breakage.

Mr. Morse said that his company has broken a number of chains to find this out, and they found no damage ever followed so long as the distance from the top of the teeth to the housing is greater than the depth of the chain. The chains have a limited angular motion, and so long as they cannot bend square around, they tend to pile up. If it breaks it will probably be on the tight side, and the sprocket would keep running and the chain pile up in the lowest point of the housing. Mr. Morse suggests a clearance between drive and housing of slightly more than the depth of the chain around the wheels. The housing should allow 1½ in. beyond the chain on the slack side.

Chester Ricker asked if the driving of a camshaft, due to the somewhat intermittent load, tended to periodicity in the chain, and also what the difference was in eights or twelves.

Mr. Morse gave the opinion that it is immaterial whether we drive a camshaft or other device that has fairly uniform resistance, there will always be a vibration set up in a gas engine. He added that with an increasing number of cylinders there is less liability to chain whip, but the chain designer has always to take into consideration that the twelve is a twelve only part of the time. It will miss and skip, and do other things which make it necessary to lay out the drive for bad working conditions as well as good. It must be laid out so that no unexpected condition will set up a critical vibration that will break the chain or destroy the wheels. That periodicity must be avoided if a cylinder is missing continuously. If two are missing, you get poor compression on two cylinders. An indication of whipping is secured on almost any chain drive but a point must be attained where that whip is not destructive. Mr. Morse cited a case where he had installed a 60-hp. drive, but it took 90 hp. to drive it. He later shortened the centers from 41½ to 39½ in. and that slight change remedied the whipping that had consumed 30 hp. and made the chain run noisily.

The point was raised by Mr. Bull that, in his experience, the use of chains tended to increase the volumetric efficiency of an engine, due to the removal of chatter and the flexibility of valve opening and closure.

Mr. Morse said that he confessed to the fact that the opening of the valves when driven by a chain is retarded materially, and accelerated in closing on account of the elasticity and backlash of the chain as compared with gearing. If a high efficiency has been obtained by the use of chains, he thought it due to the fact that the valves open slower and not to other causes named.

He also thought chains will remove valve chatter, and though a gear is more positive in its driving than a chain ever is, for whenever any change of stress comes on the chain, through the fact that the chain is driven by frictional contact with the wheels, there is still a material retardation.

He therefore thought if better results have been obtained by the use of chains, it is one of those happy circumstances that is not due to any inherent characteristic or steadier angular velocity.

Factory Miscellany

Wheel Co. Adds—The Auto Wheel Co., Lansing, Mich., is constructing an addition to its hub house, costing $20,000.

Specialties Co. to Add—The Motor Specialties Co., Muskegon, Mich., has contracted to build two additions which will cost about $6,000.

Hurlburt Truck in New Plant—The Hurlburt Motor Truck Co., New York City, has moved into its new plant at Third Avenue and the Harlem River.

Newark Co. to Build Bodies—The G. S. Jephsen Co., Newark, N. J., will establish a plant on Central Avenue, for the manufacture of automobile bodies.

Brown Carriage Co. to Build—The Brown Carriage and Auto Co., Cleveland, Ohio, has awarded the contract for the construction of a plant, the estimated cost of which is $10,000.

Republic Truck Adding—A one-story addition is being added to the plant of the Republic Motor Truck Co., Alma, Mich., and will add about 50,000 sq. ft. of floor-space to the plant.

To Make Automobile Specialties—The Autocoil Co., Jersey City, N. J., will establish a factory at Provost and Seventh Streets, Jersey City, N. J., for the manufacture of automobile specialties.

Cleveland Co. to Add—The Hydraulic Pressed Steel Co., maker of automobile frames and pressed steel stampings, will construct additions to its factory at 3152 East Sixty-first Street, Cleveland, Ohio, the estimated cost being $50,000.

Ford to Build in Grand Rapids—A committee representing the Association of Commerce of Grand Rapids, has been appointed to visit the Ford Motor Co., Detroit, in view of the proposed erection of a Ford assembling plant in Grand Rapids.

To Make Windshield Cloth—The Central Agency Co., Kansas City, Mo., has purchased the exclusive right to manufacture and sell a compound called Windshield Cloth, which when applied to a windshield absorbs moisture and prevents rain, snow, sleet or mist from sticking to the glass.

Housel & Bair Adds—The firm of Housel & Bair of Williamsport, engaged in the manufacture of automobile clutches, took out a permit this week for the erection of a factory near its present quarters on First Street. The building will be a one-story brick structure and will cost approximately $5,000. The company has enough orders to keep it busy for a year and a half.

Milwaukee Co. Makes Parts—The Wisconsin Machinery & Manufacturing Co., Fifty-first Avenue and Burnham Street, Milwaukee, is devoting most of its shop capacity at this time to the manufacture of parts and devices for the motor and automobile building industries. The concern is making a specialty of pistons. Machine work is also being done on large quantities of aluminum, cast iron and steel parts of various kinds.

Luther Grinder Co. Busy—The Luther Grinder Mfg. Co., 285 South Water Street, Milwaukee, is making large shipments of tool grinders and similar specialties for export to South Africa, India and South America. The domestic demand is the best the company has ever experienced, and the six-story factory is working night and day. The combination garage grinder is being produced in large quantities to meet the demand from jobbers.

Dodge Has 100 Carloads of Freight Daily—An average of 100 carloads of freight forms the daily incoming freight now at the Dodge Bros., Detroit, Mich., plant. This freight includes generally 400 tons of coal for the steam boilers, 15,000 gal. of fuel oil for the heat treating plants, 225,000 lb. of steel for parts, 30,000 lb. of brass for the brass foundry, 10,000 lb. of aluminum for the aluminum foundry, 55 tons of pig iron for the gray iron foundry and 6 tons of sand for the foundries.

The Automobile Calendar

Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 5.....Worcester, Mass., American Road Builders' Assn. Day.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 7-10.....New York City, American Society of Mechanical Engineers Convention.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

1916

Jan. 1.....Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.
Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13.....Milwaukee, Wis., Show, Auditorium.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 14-22.....Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.
Jan. 10-15.....New Bedford, Mass., Show, State Armory.
Jan. 15-22.....Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22.....Rochester, N. Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22.....Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 9-12.....Peoria, Ill., Show, Coliseum. Peoria Automobile and Accessory Assn.
Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
March 21-25.....Deadwood, S. D., Show, Auditorium, Deadwood Business Club.
Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Bunnell Paige Rep.—Marc Bunnell, formerly with the Chalmers company, has assumed the duties of Southern Cal. factory representative of the Paige-Detroit Motor Car Co.

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Dealers

Studebaker Opens in Bronx—Reed & Reed, Inc., have taken the Studebaker agency for Bronx County, New York, and have moved into a showroom at 361 East 149th Street. The building measures 30 by 90 ft. A service station has also been opened.

Foster Opens Denver Supply House—The Foster Auto Supply Co. is the name under which a new accessory business will be opened in December at 138 Sixteenth Street, Denver, by J. W. Foster, formerly manager of the Denver Auto Goods Co.

To Distribute Spranger Wheel—The P. M. Lewis Co., with headquarters at 423 Grand River Avenue, Detroit, has been organized and has been appointed distributor for the Spranger Rim & Wheel Co. The members of the company are P. M. Lewis, E. A. Tomes, F. V. Haddas and George Gagnier.

Late Baltimore Trade Items—W. A. Marburg of A, 32 South Street, Baltimore, Md., has taken the agency of the Fox shock absorber for Maryland and the northern part of Virginia.

The Baltimore Buggy Top Co., 107 to 113 West Mount Royal Avenue, Baltimore, which handles automobile supplies and does automobile repairing, will build a 76 by 124 by 49 ft. addition to its present plant. It will be a one-story structure of brick.

The Service Co., Bank and Fifth Streets, Highlandtown, Md., distributor of Goodyear truck tires, has moved to 1209 Lovegrove alley, Baltimore.

H. C. Clark and Frank Hodinott, who comprise the Motorcar Accessory Co., 1201 North Charles Street, Baltimore, has taken the agency for a safeguard valve device for automobiles turned out by the Fire Prevention Co., Providence, R. I.

The Tire Mart, 1419 North Charles Street, Baltimore, of which F. M. Boyd is manager, has been appointed State distributor of the Jovo tire seal.

The Gilson Sales Co., Cathedral Street, near Chase Street, Baltimore, is now the distributor of Kor Ker, the new puncture cure manufactured by the Alcemo Co., Newark, N. J.

Motor Men in New Roles

Hurst Makes Change—C. F. Hurst, who has been district representative for Dodge Bros., with headquarters at Omaha, is now with the King Motor Car Co. in the same position and territory.

Cooke Joins National Rubber—E. W. Cooke, until recently sales manager of the American Tire and Rubber Co., Akron, Ohio, has joined the National Rubber Co., Pottstown, Pa., as assistant sales manager.

Carter Resigns—L. J. Carter, until recently in charge of retail sales for the Studebaker company in Saginaw, Mich., has resigned to become sales manager for the Peck Auto Sales Co., Studebaker dealer in Grand Rapids, Mich.

Baird Joins N. Y. Saxon—F. S. Baird has become retail sales manager of the Saxon Motor Co. of New York. He was formerly with the Chevrolet Motor Co. in the sales department. H. C. Turner has also joined the New York branch, coming from the Saxon factory.

Case Goes to Scripps-Booth—Julian C. Case, until recently assistant advertising manager of the Paige-Detroit Motor Car Co., Detroit, Mich., has resigned to become assistant advertising manager of the Scripps-Booth Co., manufacturer of the Scripps-Booth automobiles.

Cartmell Kelly-Springfield Tire Mgr.—R. P. Cartmell, Los Angeles, Cal., has been appointed manager of the Southern California branch of the Kelly-Springfield Tire Co., to succeed C. A. Jessup, who goes to Cleveland to become manager of the Kelly-Springfield branch there, which controls Buffalo, Indianapolis, Columbus and Toronto.

Franklin Detroit King Mgr.—As a result of a meeting of the directors and stockholders of the A. A. Crumley Co., Detroit, the name of the concern is to be changed to the King-Dort Sales Co. A. A. Crumley, president and general manager of the A. A. Crumley Co. is not connected with the new company. G. W. Franklin, who was sales manager of the Crumley company, becomes general manager of the new company.

Cochran Frisco Cole Mgr.—W. B. Cochran has re-entered the automobile field and will distribute the Cole through northern California. The new company is headed by A. B. Emanuel, while Mr. Cochran is vice-president and general manager. The firm will be known as the Cole-Pacific Motor Co. and has headquarters in San Francisco, which formerly were occupied by the Rauch & Lang dealer.

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Dealer

Minneapolis Companies Build—The Pence Automobile Co., Minneapolis, Minn., will erect a new building for the Buick car extending on Tenth Street from Hennepin to Hawthorn Avenue and to cost $250,000. The present eight-story Pence-Buick building will be leased for a department store. The new building will be 308 ft. long and four stories. It will be an accessory store center in space not occupied by the owner company.

The Willard Storage Battery Co., Plymouth building, has arranged to erect a two-story building, 60 by 150 ft., to be ready in 3 months. It will be headquarters for N. G. Wolf, managing the Dokotas, Montana, Minnesota and Northwestern Canada. H. S. Greiner will be local manager. Temporary quarters were opened Nov. 20 at 1301 Nicollet Avenue.

The Northwest Automobile Co. has been formed to wholesale Hupmobile cars in Minnesota, North Dakota, Eastern Montana and Western Wisconsin, S. D. Briggs, formerly with the Pence Automobile Co., is manager. Headquarters are at 620 Third Street S. The local agency for the Hupmobile is the Zolle Co., 220 Sixth Street S., which has given up the Pathfinder agency to the John P. Snyder Co., 407 Tenth Street S.

Recent Philadelphia Trade Items—The Stoever-Hannold Co., Philadelphia, Pa., distributer of the Jackson, has removed from 833 North Broad Street to larger quarters at 923 North Broad Street.

The Prest-O-Lite Co. has opened a service station for the charging and repairing of storage batteries at its local branch, 1418 Race Street.

The agency for the National car, in the Metropolitan Building, Philadelphia, has come into new ownership, Raymond Hawley of Riverton, N. J., taking complete charge. Associated with Mr. Hawley will be W. L. Conner, who will assume charge of the sales and service departments. The agency will cover this State, New Jersey and Delaware.

A complete stock of automobile accessories has been added to the sporting goods business of Moskowitz & Herbach, 430 Market Street, Philadelphia.

VOL. XXXIII NEW YORK—THURSDAY, DECEMBER 9, 1915—CHICAGO NO. 24

The AUTOMOBILE

Ignition Systems Improved in Detail

More Cylinders and Higher Speeds Require Faster Breaker Mechanisms and Coils—Better Mounting and Neater Switches This Year

By J. Edward Schipper

WITH the standard of efficiency year by year reaching a higher mark in motor design, it is but natural that the motor auxiliaries are also compelled to advance in order to give a harmonious record of progress. Scanning the field of accessories there is none in which the demand for the highest grade of results has been so keenly felt as that of ignition. Better motors are only possible with better ignition. Higher motor speeds can only be attained with faster action in the sparking device. More cylinders coupled with higher rotative speeds are interpreted to the ignition manufacturer in terms of more sparks to the minute, and this is the keynote of progress in the ignition field during the past year.

Up to 3000 r.p.m.

It is a different proposition to supply the ignition for a four-cylinder motor turning at the rate of 1200 r.p.m. and a twelve-cylinder motor turning at 3000 r.p.m. The difference is that in the first instance, 2400 sparks are required per minute, while in the latter, 18,000 sparks are needed in a minute. It is just as essential for every one of the 18,000 to be a good substantial hot flame as it is for the individual sparks in the smaller number. Between these two extreme conditions is the field of the up-to-date ignition system, but, requirements are closer to the upper than to the lower limit.

In a word, progress in the ignition field can be summed up in the statement that sparking systems can operate more rapidly than ever before. Secondly, the sparks furnished are more intense and hotter throughout the upper and lower ranges of speed. Synchronism, that quality which causes the spark to occur always at the same relative part of the stroke, at all speeds is now possessed by ignition systems to a greater extent than ever before. The use of automatic advance is another growing tendency and leaving the electrical and entering the mechanical phase of development, the systems of to-day are more compact accessible, and ingeniously mounted than formerly.

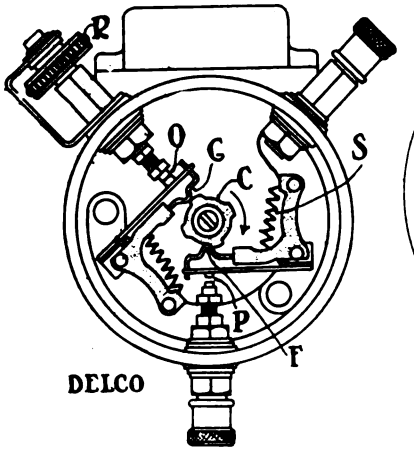
Progress

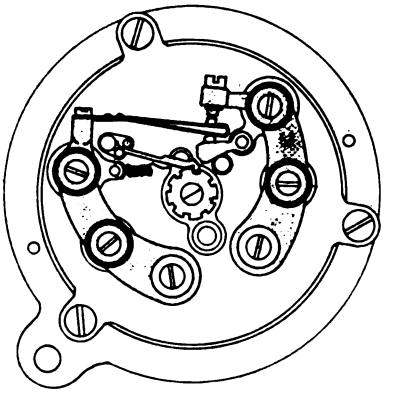
Faster Breaker Mechanism
More Rapid Coil Action
Better Timer Mounting
Ignition Adapted to 12's
Perfected Synchronism
Short High Tension Leads
Neater Dash Switches
Automatic Advance Featured
Improved Contact Points
Water-Proof Coverings

Inertia is the great foe to speed in mechanical appliances. It has to be overcome particularly in the breaker mechanism of a high-tension ignition system. Upon the rapidity of separation of the breaker points of the primary circuit, depends the heat of the spark. It is for this reason that the attention of ignition manufacturers has been very carefully concentrated upon improvements in the breaker mechanism ever since the high-speed motor began to be a factor. This year has been no exception, and the ingenious manner in which the ignition makers have met the demands for eight and twelve cylinder motors is one of the features.

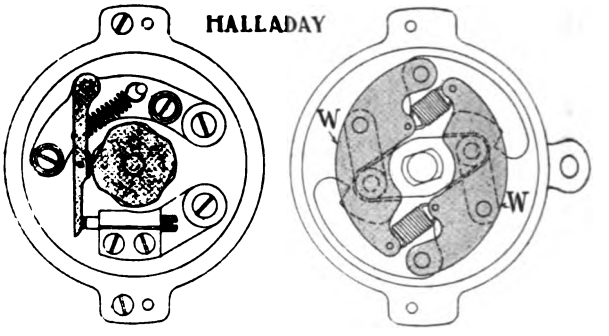
Double Breakers for Twelves

As a general feature it may be stated that the breaker box mechanism has not been altered in principle but rather in the mechanical application where the multi-cylinder V-type engine has been taken care of. Many manufacturers have used the same system but have installed a double breaker acting alternately when twelve cylinder demands have had to be met. In such designs, the breaker box merely consists of a double set of single breakers operating from the same cam but so arranged that the proper timing synchronism is maintained.





Breaker mechanisms of the Delco and Atwater Kent systems



Halladay MacNish 1916 breaker mechanism showing the method of separating the contact points in breaking the primary circuit and the weights W which actuate the automatic advance by centrifugal force

In the breaker mechanism for battery ignition there are two broad classifications based upon the method of operation. These two systems can be classified as the open circuit and the closed circuit. The open circuit keeps the primary broken until, at the time of firing, a brief make and break occurs. With the closed circuit the primary is complete except at the instant of firing when the circuit is broken and then immediately remade. The open circuit advocates claim the advantage of economy as the primary is closed for only a short period. The closed circuit advocates claim the advantage of perfect synchronism, due to the elimination of electrical and mechanical lag and a hot spark due to complete saturation of the primary.

Two Battery Systems

This broad classification of the breaker mechanisms divides into two groups all the battery ignition systems which are on the market. With both of these types of systems, it is necessary to provide some means for preventing the current from circulating through the primary should the switch be left in the on position inadvertently when the motor is not running. This necessity gives rise to ingenious contact breaking arrangements and is another feature by which the different makes can be distinguished. The three most popular methods of preventing the short circuiting of the accumulator in battery systems are the automatic throw-off switch, the latch release systems and the automatic resistance coil, which are used by the representative concerns in this field.

These three methods which will be described later are typical of the classes of systems to which they are applied. The throw-off switch which is operated by a thermostat is used on the closed circuit design while the latch release and resistance coil are parts of the action of the open circuit breaker mechanism.

Regarding synchronism the open and closed circuit arrangements also cause a difference in the principles by which this quality is obtained. The elimination of lag in the closed circuit method gives the desired constancy in spark timing while with the open circuit it is attained by representative manufacturers through the means of automatic spark advance which is designed always to keep the spark in its proper relationship to the position of the piston regardless of variation of the motor speeds. The lightening of breaker parts is also a factor in attaining synchronism as the relative lag with heavier parts would be greater at higher speeds than at low speeds.

Advantage to Driver Claimed

With reference to automatic advance there are practically no battery ignition manufacturers who do not believe that its use is an advantage to the driver. Many applications on 1916 cars use both hand and automatic, the automatic fully taking care of the speed variations while the hand advance can be used for further adjusting the spark if the driver believes it necessary. It is the contention of most ignition experts that automatic advance can regulate the spark to better advantage than the average driver. There have been tests made on this and the theory has been borne out. In fact, even with fixed spark on magnetos the hotter spark at higher speed has often more than compensated for the lack of advance and produced results which are at least equivalent to those obtained by the average driver with manual advance.

As regards the actual installation of ignition systems on cars, some very clever work has been done this year. In the V-motors particularly, it has been necessary to give an accessible mounting with efficient drive and at the same time keep the leads from the distributor to the spark plug as short as possible. With the high-tension current, even a small percentage of leak can seriously cut into the heat value of the spark and thereby impair the rapidity of explosion and reduce the initial pressure which, of course, should be kept at a maximum. The resistance interposed in the high-tension circuit also increases with the length of high-tension lead and there is therefore a two-fold reason for keeping the distributer as close to the plugs as possible. For this reason the timer-distributer unit has been generally mounted between the V blocks on eight and twelve-cylinder motors. Another typical installation is at the front end of the V just behind the fan. With four and six-cylinder motors the coupling of the distributer unit with the generator, giving an approach to magneto compactness, has been one of the developments of the year.

The magneto for eight and twelve-cylinder cars is an ignition feat which has taxed the ingenuity of the electrical engineer to the utmost. The demand has been sucessfully met, however, and even with the high speeds and rapid spark demands of this type of power plant the magneto has been found to be adaptable.

Atwater Kent Adapted to V's

Probably the most important development this year in the Atwater Kent system is the production for V-type motors of the standard system with a few detailed changes to render possible the greater number of primary breaks. The eight-cylinder instrument is so arranged that the automatic advance mechanism advances only the notched camshaft of the instrument, the high-tension distributer being carried on a central shaft which connects below the governor so that the distributer block is not moved by the automatic advance mechanism. This permits of a wide range of spark advance without affecting the synchronism.

The change in the arrangement of the advance mechanism is the most important on this device as with the eight-cylinder unit a single pair of contact points and a single distributer are employed. For the twelve-cylinder unit a double breaker mechanism is fitted, but on the eight it has been found that the critical speed of the instrument is in excess of the motor speeds yet attained.

Owing to the necessity for cutting eight notches on a single timer shaft it has been found necessary to alter the shape of the notch so as to secure equal

spacing around the shaft without cutting away too much material.

It has also been necessary to alter the shape of the lifter which is operated by the notches in the shaft to meet the requirements of the new shape of notch and these two forms of notch and lifter are shown in the accompanying illustration.

Time Element, .0033 Sec.

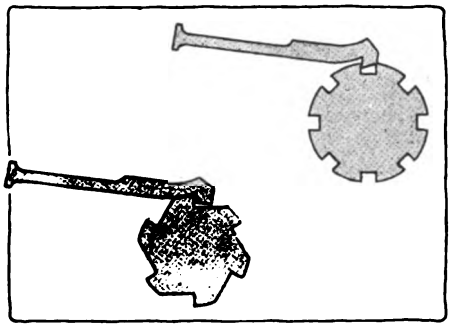
Regarding the necessity for meeting the speed requirements of the latest developments in motors of a great number of r.p.m., it has not been found necessary to make any alterations. Although working on the closed circuit ignition system which is necessarily limited in critical speed, if not by the time element in the contact maker by that in the coil, the method employed has been found suitable for use above the speeds which are now used in power plants. The time element in the Atwater Kent system is about 0.0033 seconds for the duration of the primary contact. Oscillograph curves show this clearly as illustrated. To operate at this speed requires a very rapid coil and the curve itself indicates that such is the case.

No changes of any sort have been made during the year on the standard four and six-cylinder ignition systems which have been frequently described. The only differences between the eight and twelve, and the four and six are those which have been outlined above.

The present limit to which the standard centrifugal automatic advance mechanism operates in the Atwater Kent system is 2400 r.p.m. Above this speed the supplementary hand control is used and this two-fold control has been adopted because in the belief of the Atwater Kent concern the big value of the automatic advance is chiefly in the matter of rapid acceleration and at low speeds.

With the automatic advance device the maximum advance is 45 deg. at 2400 r.p.m. in terms of crankshaft travel.

Regarding the speed under which the ignition system will operate satisfactorily, it is stated by the Atwater Kent company that its six-cylinder system will fire with undiminished efficiency up to speeds exceeding 4000 r.p.m. Tests on the maximum speeds of the eight are not as yet available. The automatic advance will take care of the earlier range in attaining the high speed and the hand advance of the upper ranges.



Illustrating difference between six and eight-cylinder breaker mechanism parts in Atwater Kent system

Advantages of Automatic Advance

Regarding the advantages of automatic spark advance the claims made for it are as follows:

1—Automatic spark advance compensates for the time element or lag and therefore, in the open circuit system compensates for the period of time elapsing in making and breaking the primary contact and generating the high-tension spark.
2.—Smooth acceleration due to the regular advance of the spark in proportion to the increasing speed.
3—Better fuel economy.
4—Less nervous strain on driver.
5—Renders car more easily handled in traffic.
6—Eliminates a point which the new driver must learn in handling his car.
7—Avoids the wear and tear due to spark knock.
8—Insures safe starting due to the retarded position of the spark.

Waterproofing the timer-distributer has been regarded as important by all the manufacturers. In the Atwater Kent system the condition has been obtained by allowing the insulated secondary terminal to come well up over the secondary wire and the distributer cap is so shaped as to shed water readily. As the position of the distributer is generally quite high, the dangers of flooding this part of the mechanism are practically nil.

At the present time, the Atwater Kent ignition system is made in three models, type K-2 with automatic spark advance made in two, four, six, eight and twelve-cylinder sizes; type H, for manual control only, made for twos and fours; type C, for single and two-cylinder opposed motors. In addition there is a special outfit for Ford cars which is complete with fitting, and for other cars, previously fitted with high-tension magnetos, a standard magneto replacement mounting is provided. This magneto mounting is made with the shaft projecting at both ends so that it will take the place of both clockwise and counter-clockwise magnetos.

All these systems are designed for 6 and 12-volt standards. The majority of the outfits turned out are for 6-volt batteries, but either may be secured.

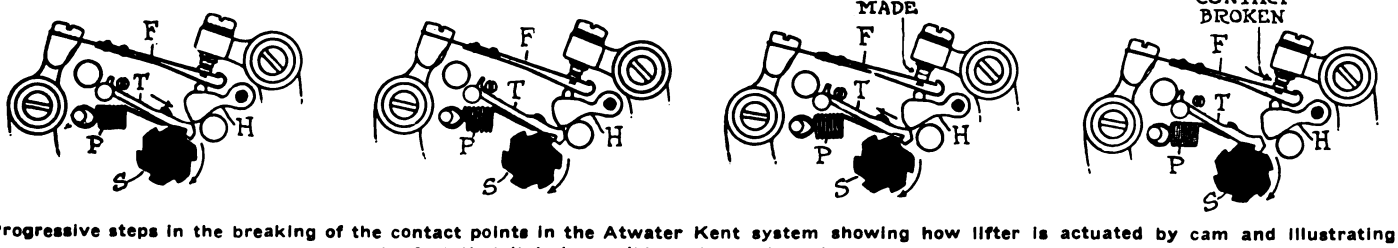
Centrifugal Governor

The current consumption of the Atwater Kent system is very low. It is stated, in fact, that the battery may be exhausted to the point where it will not start the motor, or even blow the horn, yet there will be ample current for several hundred miles of ignition service.

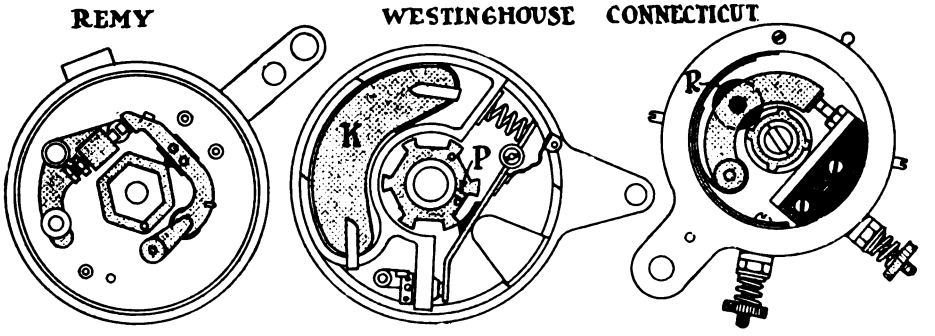
The Atwater Kent system comprises a coil, a combined breaker-distributer mechanism and a control switch. In the breaker-distributer mechanism on the K-2 model is incorporated the centrifugal governor. With this system, a single spark is delivered at the plug and the mechanism is such that the duration of current flow to the primary winding of the coil remains constant regardless of engine speed.

The circuit breaker normally has its contact breakers held apart and the closing and opening of the circuit is so rapid that it is impossible for the eye to follow the movement of the breaker points. Referring to the acompanying illustration, the shaft *S* which is the rotating portion of the breaker-distributing mechanism has four, six or eight notches in accordance with the number of cylinders. The lifter *T* catches in these notches and is drawn around with the shaft a minute distance. When it escapes from the notch, it rides up slightly on the round surface of the shaft and jumps back to its normal position by the tension of the coil spring *P*. As the lifter *T* jumps back it strikes the hammer *H*, which in turn transmits the blow to the flat spring *F*, bringing the contact points together for a minute period of time. This gives the contact and breaks it in such a short space of time that the eye cannot follow the closing of the circuit.

All of the parts which are subject to contact are made of hardened steel, the contact points themselves being made of tungsten, and one of the features of the system is that these points are protected by the switch which reverses the direction of the current flow every time it is turned on. The adjustment of the con-



Progressive steps in the breaking of the contact points in the Atwater Kent system showing how lifter is actuated by cam and illustrating the fact that it is impossible to leave the primary circuit closed



Remy, Westinghouse and Connecticut primary circuit breakers which are fast enough for the highest commercial speeds

tact points is made by the removal of shims from beneath the head of the adjusting screw which carries one of the points. It is impossible for the points to remain together and therefore impossible for the battery to be exhausted should the switch be left in the on position.

Connecticut Uses Closed Circuit

Electrically, the Connecticut battery ignition system operates on entirely different principles than does the Atwater Kent. The Connecticut is the exemplification of the closed circuit system, whereas the Atwater Kent uses the open circuit.

The Connecticut outfit comprises an interrupter and distributer unit, a high-tension coil and a very ingenious switch. All these units are unique and distinctive and represent the embodiment of principles which have been carried to a high degree of perfection to meet the rigid demands of the up-to-date, high-speed motor.

Operating on the closed circuit system, the primary circuit is broken only at the contact points when it is necessary to generate the ignition spark. The advantage claimed for this, is that the primary circuit of the coil is allowed to become completely saturated before the breaking point is reached and therefore, a spark of maximum intensity is produced when the circuit is interrupted.

Another great advantage which is claimed for this system is that both electrical and mechanical lag are eliminated throughout the entire range of motor speed, and the makers state that the eight-cylinder igniter will fire perfectly at a motor speed of 3000 r.p.m. with the single breaker arm. This means that the igniter is producing satisfactorily 12,000 sparks per minute, or 200 sparks every second.

All Lag Eliminated

The reason that the claim is advanced that in this system both electrical and mechanical lag are eliminated is that the instant after the spark has been made by the interruption of the primary circuit the contact is again made and all during the time which elapses between sparks the current from the battery is allowed to flow through the primary of the coil. Since the current is flowing, contact does not have to be made, and therefore there is no possibility of electrical lag. Owing to the velocity of an electrical current this speed is far above the requirements of automobile motors, and for all practical purposes electrical lag in this system does not exist.

Mechanical lag is eliminated for much the same reason, whereas, on the open circuit principle, contact has to be made and broken; on the closed circuit it merely has to be broken, as it has been remade immediately after the previous break.

That the extremely simple action of breaking contact can be performed by means of a cam without noticeable mechanical lag, and is one of the features claimed by the manufacturers of the Connecticut system.

This elimination of lag results in the attainment of almost perfect synchronism. Photographs exposed for 5 min. on a dial representing a complete circle and calibrated to show degrees of crankshaft travel bring out the fact that there is less than a degree variation in the position of the spark anywhere between 100 and 3000 r.p.m. In other words, for any given position of the spark lever, the spark will occur in the same position as regards piston travel at any engine speed.

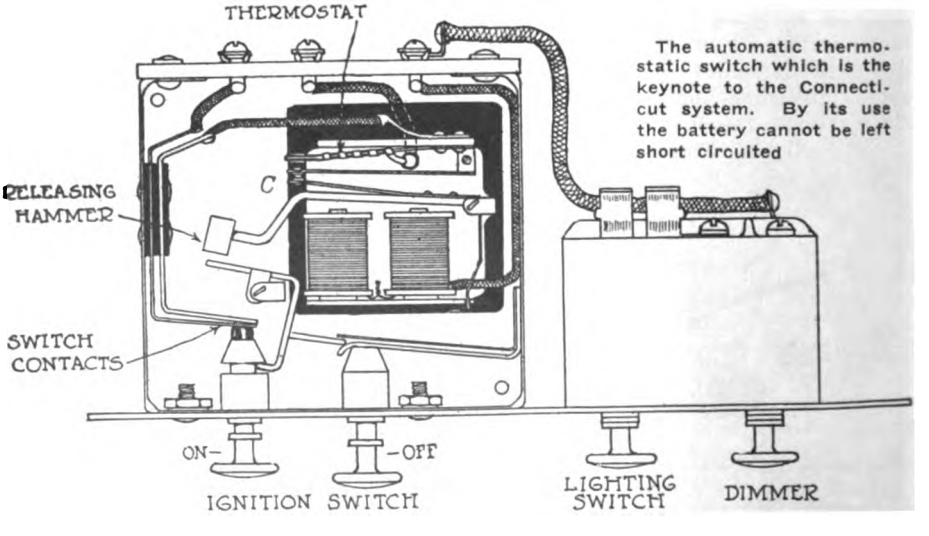
The mechanism of the breaker consists of an arm *A* carrying one contact piece, the stationary block *B* carrying the other contact, an insulated roller *R*, which is carried by the arm *A* and the cam *C*, which is mounted upon the driving shaft in the center. Upon the cam *C* there are as many points or high spots as there are cylinders on the motor. Normally the two contact points are held together by the action of a light spring upon the arm *A*. When one of the high spots corresponding to the firing point in one of the cylinders lifts the roller the circuit is broken and a spark produced. For a four-cylinder motor, the cam high spots are 90 deg. apart; for a six they are 60 deg., and for an eight they are 45 deg.

Has Automatic Switch

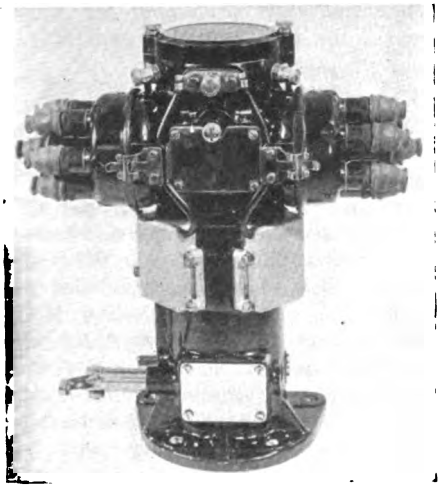
The Connecticut switch is very distinctive in the employment of a thermostatic circuit breaking arrangement which prevents the battery from being exhausted should the driver accidentally leave the switch in the on position when he leaves the car. It is an electro-mechanical device so arranged that the battery switch button is thrown back into the off position if the switch is left on by accident. During the year a lower-priced switch has been brought out which houses the thermostatic device in a square casing instead of the cylindrical one of the older model. The principle, however, is exactly the same.

The method of operation is by utilizing the properties of the thermostat, which becomes warm from the current of the battery and bends downward, making contact with the point. This completes an electric circuit which energizes the magnets in the solenoid coil, causing the arm to operate like a bell hammer or buzzer. This arm drives against a plate, which in turn releases the button in the switch, which is depressed. This breaks the battery circuit and prevents exhaustion.

The distributer unit is of conventional design, but the contact between the distributer rotating member and the distributer points may be either by brush as in a wiping contact or a gap which



The automatic thermostatic switch which is the keynote to the Connecticut system. By its use the battery cannot be left short circuited



Delco breaker mechanism applied to the Packard twin-six

the high tension current jumps may be used. This is optional.

Delco Combined with Generator

Although the Delco installations vary on every car upon which they are furnished, the underlying principles are very much the same. In a great majority of the Delco systems the single unit machine—that is, combined motor-generator for starting and lighting, is used, and with this is provided an igniter unit. In many cases the igniter unit is not included, and in still other installations separate ignition units are furnished either in, or not in, combination with separate motor and generator. This gives a very broad line, and one which of necessity causes slightly different designs to meet the needs of the case.

The Delco breaker mechanism operates on the open circuit system, that is, the primary circuit is broken at the points except during the brief interval in which contact is made at the time the spark is required. The breaker mechanism is operated by a cam on the central shaft, this cam having as many points as there are cylinders on the motor. The spring which holds the contact points apart, during the operation of the motor between sparks, holds the follower against the cam and also acts as the operating unit in separating the points on the break.

With this breaker mechanism it will rarely happen that the motor comes to rest with the follower on one of the points of the cam, but should it do so this would leave the primary circuit complete and would cause current to flow from the battery. Were some means not provided to check this current the battery would be exhausted. The means taken is an automatic resistance unit which is cut into the circuit should the cam follower come to rest upon a point of the cam leaving the primary circuit complete.

The resistance unit is a coil of high resistance wire wound on a porcelain spool and generally mounted on the distributer housing. Under ordinary conditions it remains cool and offers little resistance to the passage of the current. However, if for any reason the primary circuit remains closed for any considerable length of time the current passing through the coil heats the resistance wire to a point where little current can pass, thus insuring against a waste of current from the battery and damage to the ignition coil and timer contacts.

Delco Breaker

Referring to the illustration, the operation of the breaker mechanism is readily understood. As the cam rotates, it lifts at each of the high spots the follower, bringing together the points. After passing the high spot the points are separated by the action of the coil spring. The follower is so arranged that the circuit through the points will be broken when that at the points is complete, thus throwing into circuit the resistance unit when it is needed. In another form of breaker used the resistance unit is directly in connection with the one set of points, and comes into action when the flow through the resistance coil becomes constant instead of intermittent.

The ignition coil on the Delco system is mounted in various positions on different cars, and the switch also varies according to the installation.

Remy Principles Unchanged

The Remy battery systems are the same that this concern has been making for the past three years, although in detail a few changes have been made to meet the changing requirements in motor design. For the eight-cylinder V-type motor a single breaker arm with an eight-pointed cam is employed, and for the twelve-cylinder V-motor a distributer which has two breaker arms is used. Both of the breaker arms on the twelve are positively actuated by the same chrome nickel steel cam, the breaker arms are superimposed so that any looseness in the bearing of the distributer will not affect its synchronism and but one coil is used in connection with the twelve-cylinder distributer.

In order to secure maximum speed in the breaker mechanism the weight of the breaker arm has been decreased by making it of pressed steel, and in order to secure a very fast but smooth break a rebound spring has been added. The pressed steel arm was used in a few of the 1915 distributers.

The Remy is another example where the details of design vary with practically every installation. The range of advance is a good example of this. For instance, on the Chalmers 35 the distributer has a 50-deg. advance. On the Oakland 32 a 40-deg. advance, on the Reo 4 a 44-deg. advance, and on the Reo 6 an advance of as much as 60 deg.

The advance in motor speeds has not caused any change in the principles of breaker mechanism on this system, as on road and block tests the limit of efficient spark production has not been reached in practice. The cam faces are ground and inasmuch as a spark occurs at the opening of the points, synchronism is maintained, regardless of engine speed. This system operates entirely on the closed-circuit principle, the points being knocked apart by the cams which rotate at half engine speed.

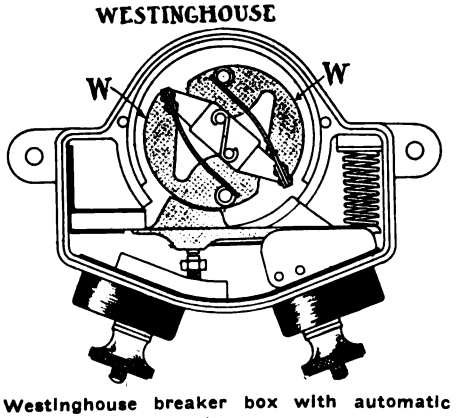
The Remy battery ignition system differs from others in that the advance and retard mechanism is entirely separate from the distributer cover. When the timing lever is moved the cover remains stationary, obviating the necessity for moving the wires and avoiding the possibility of chasing the insulation.

Westinghouse Has Automatic Advance

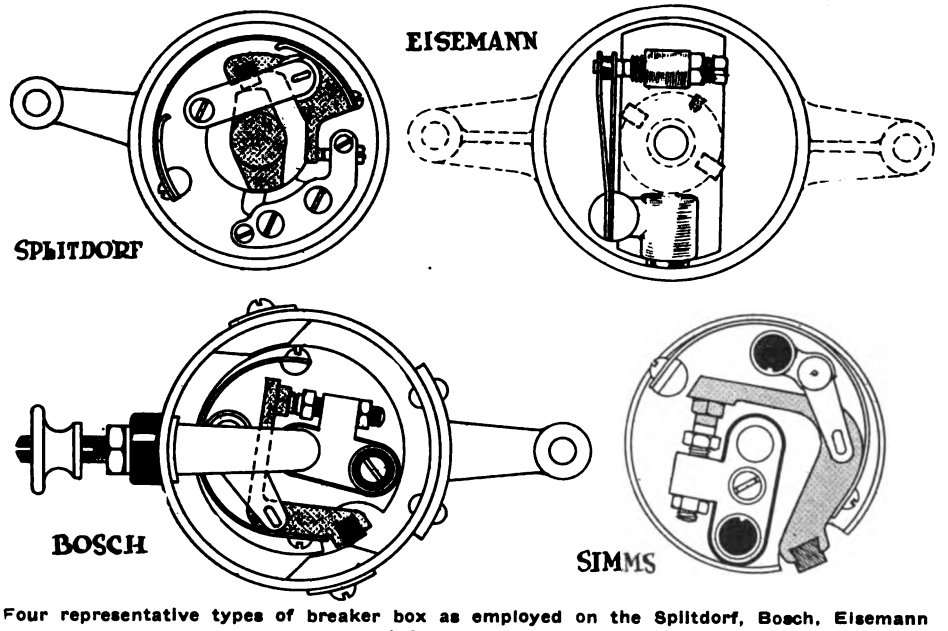
Automatic spark advance is one of the features of Westinghouse ignition. This automatic advance operates over a range of 45 deg., but provision is also made for manual operation. The spark lever, however, need not be touched when running if it is not desired.

The principle upon which the system operates is the closed circuit, and the centrifugal weights are a factor in the interruption, the operation of the ignition system beginning with the making of the primary circuit of the coil when the centrifugal weights governing the automatic advance push down the fibre part known as the bumper, allowing the interrupter contacts to close. This sends the primary circuit through the core of the coil. At the time the spark is desired the contact points are suddenly released under the influence of the bumper spring and the spark is made.

As the speed of the engine increases the weights are thrown out from the center and automatically advance the time of closing or opening the interrupter contacts and hence advance the spark. At the same time, due to their shape, they keep the contacts closed during a greater part of the revolution when running at high speed, thus making the time period



Westinghouse breaker box with automatic advance



Four representative types of breaker box as employed on the Splitdorf, Bosch, Eisemann and Simms magnetos

of contact practically the same for all speeds and preventing the spark voltage from falling off at the higher rate. This in a way combines the advantages of both the open and closed circuits.

Detachable Distributor

A separate ignition system is also marketed for systems that do not contain timing, distributing and high-tension parts. It has the same type of circuit breaker as that just described except that there is no automatic spark advance feature. The interrupter on this is equally efficient running in either direction.

The Westinghouse distributing mechanism is of the usual flat-faced type, but is specially designed so that the detachable distributer plate can be readily placed in position without interfering with the contact brushes and without the use of tools.

In many of the installations the ignition coil is made an integral part of the generator, giving an arrangement which is very similar in compactness to that of a magneto. The coil is solidly embedded in the insulating material of the distributer plate and all connections are made automatically by putting on the distributer plate and inserting the holding screws without the use of tools. In this way no wiring is required between the generator and coil.

There are several types of ignition switch which are standard. The one most used is the snap type, combining in the same face plate the ignition and two lighting switches. The direction of current through the interrupter contact is reversed every time the switch is turned on, which reduces the wear on these points.

MacNish for Eights

L. P. Halladay Co. is making a special design of the MacNish ignition system for the eight-cylinder high-speed engine, this being an innovation this season. The breaker lever in this eight-cylinder design is faster than former models and the coil is especially wound to give the rapid action necessary for the multi-cylinder motor when it is running at very high speed.

In principle the eight-cylinder design does not differ materially from the six or the four. The same scheme of current regulation, which is mechanical and requires no adjustment, and the same positive breaker action are employed. Both hand and automatic advance is supplied on this system, and the machines for eight-cylinder cars are guaranteed to work perfectly at 3500 r.p.m., or in general at speeds higher than are reached by the commercial eight-cylinder engine, either on the race track or on the testing stand.

The Halladay system operates on the open circuit and the position of this concern on this matter is that the excess current drawn in operating other types of apparatus is an important factor. The statement is made that the actual waste in some instances is large. The greatest amount of waste occurs at low speeds, it is stated, exactly in that part of the speed range where the generator is working at the smallest electrical advantage.

The 1916 MacNish models are made for four and six-cylinder cars with automatic advance, with four and six-cylinder cars with hand advance and eight-cylinder with automatic. There is also a special fitting for the Ford, and the machine may of course be adapted to a large number of cars having vertical timer shafts. The coil is regularly wound for 6 volts, and may be used with dry cells. It is possible also to operate this system from the generator if the battery fails. The coil is cylindrical and is adapted for attachment to the dash, engine or generator.

Bosch Line Complete

Magneto design has been fairly well standardized for the past few years, and only the introduction of new types of distributer and breaker mechanism to meet the demands of eights and twelves has caused any innovations in the field.

The Bosch line for automobiles now comprises principally the N-U 4, D-U 4 and the Z-U 4. For heavy duty work there are the Z R and Z types, for the six-cylinder cars the same line is used only known as D-U 6, etc.; besides these there is the Bosch vibrating duplex outfit, which has become standard on several makes of cars for this year.

With this complete line every zone of motor design is covered, the smaller four can be taken care of by the N-U 4 magneto which was brought out about one year ago, and is fitted regularly on some of the smaller displacement fours. For intermediate fours the D-U 4 and Z-U 4 are used, the letter Z in Bosch nomenclature standing for waterproof construction and in general a Z magneto has replaced a D of the same general design, except that it was not waterproof.

The N-U 4 is a distinctive small car design, in which the aim has been to reduce weight while at the same time providing an efficient and hot spark. The lightness has been secured by the elimination of the distributer as an independent part and the work of the distributer has been turned over to the slip ring, which in this design is double, instead of single, and which has two grooves into which bear four brushes in sets of two. Each groove has two brushes at a distance of 180 deg. apart. Into these grooves are imbedded two metal segments, each at 180 deg. apart, taking the place of the distributer and passing the high-tension current to the brushes, from which it is taken directly to the plugs.

With this arrangement two sparks are provided for a revolution, and since the magneto is driven at crankshaft speed there is an ineffective spark one revolution behind the effective spark, so that in timing care has to be taken that the inlet valve is not open when this spark occurs, and preferably that the exhaust is still open.

The Bosch vibrating duplex ignition system offers a simple and positive method to permit easy starting. It is recognized that in the magneto the armature shaft must reach a certain speed before the magneto output is up to normal. At this time, also, the effects of inferior gas mixtures due to low grade fuel renders necessary a good spark. With the vibrating duplex system a low-tension vibrating duplex coil is thrown into connection with the primary winding of the regular high-tension magneto, pro-

viding a hot vibrating spark at the low speed. When running at the normal speeds, the vibrating coil is thrown out and ignition is provided by the magneto.

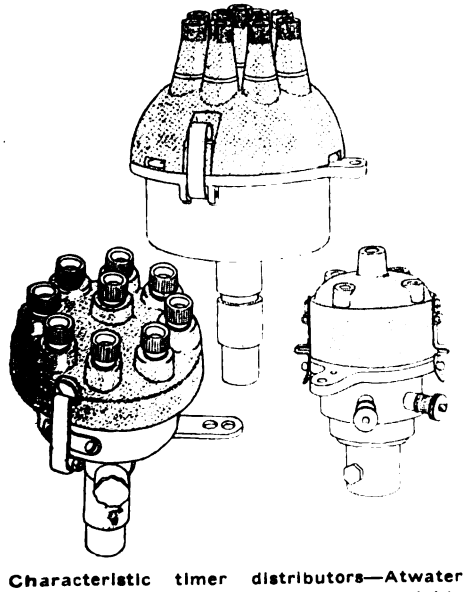
Vibrating Duplex

The principle of operation is that the battery current, upon reaching the coil terminal with which the coil winding is connected, passes through the winding to the iron core, thence to a flat vibrator spring with its contact, then to the adjustable vibrator screw and finally out of the coil by means of the second terminal. When the complete battery circuit is established the coil winding acts as an electro magnet giving a vibrator action, causing the intermittent spark. The switch permits of an off position, in which the battery circuit is interrupted and the magneto is grounded, next a battery position in which the switch connection between the magneto and ground terminals is interrupted, affording the battery current a direct path to the grounding terminal of the magneto. Besides, there is a magneto and a coil and magneto point. This permits of starting with the vibrating duplex system and then switching to the magneto.

The other Bosch magnetos are straight high-tension designs with the Bosch breaker and distributer plates which have been used for some time past.

Remy Uses Shuttle Armature

Remy magnetos are marketed under the model names of P, 30, 31 and 32. These instruments are all of the shuttle or H-shape armature type, which are designed to produce a dynamic spark at low armature speeds. The Remy model P is designed for ordinary automobile use, and 31 is also for passenger car service, while models 30 and 32 are for trucks and tractors. The model P is a single distributer instrument and the 31 has a double distributer.



Characteristic timer distributors—Atwater Kent six, Connecticut four and Remy eight

The armature of the Remy magneto carries only the low-tension winding. The coils for producing the high-tension current are separate and are generally mounted behind the dash. The switch is in a unit with the coil and in general practice projects through the instrument board. In the construction of these magnetos, the armature is made up of layers of soft Norway iron to secure maximum magnetic permeability. The armature heads are made from hard bronze and the shaft is cast integrally with the head, providing a rigid construction with the two different metals joined to provide minimum weight.

Waterproofness is secured by the use of a new design of Bakelite cover plate which also excluded the dust from the distributer parts. The terminals which are fastened to the outside of the cover plate, give an exceptionally accessible layout. Timing is simple on this magneto as by means of a timing button, the circuit breaker can be brought to the proper position to indicate the break in the primary circuit. In timing, the engine is turned over until No. 1 cylinder is on top center on the compression stroke. At this time, the button at the top of the distributer is pressed and the magneto shaft is turned until the plunger of the timing button drops into the recess of the distributer gear. In this position the magneto is coupled to the motor and the timing is complete.

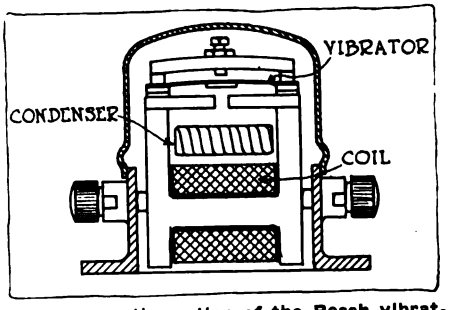
Eisemann Markets Nine Models

No changes have been made in the Eisemann instrument during the past year, although a new flexible magneto coupling has been introduced during the interval. The increase in motor speeds during the year have not caused any changes to be made in the design of the breaker or distributer mechanism as these have been found to be fast enough to take care of the increased demands.

The Eisemann magnetos were modeled after the German make of the same name and since these magnetos were supplying current for the European designs which are of high-speed characteristics, no new problems have been introduced by the increased speed in this country. The timing range of advance on these magnetos is 35 deg. on the crankshaft with the manual spark control. On the automatic advance type, however, there is a range of 60 deg. advance. These magnetos are guaranteed for 2500 r.p.m. on four-cylinder motors and 3500 r.p.m. for sixes.

Waterproof Designs

The present magnetos are waterproofed by having the magnets covered and by fitting a patented distributer plate which prevents water, dust or oil from reaching the high-tension terminal. The make and break mechanism is likewise protected by a waterproof cover. The models made are now designated as follows: G4, fixed spark or manual control for four-cylinder motors; GN6, manual spark control for six-cylinder motors; GA4, automatic spark control for four-cylinder motors; GNA6, automatic control for sixes; EMR4, dual ignition for fours; EME6, manual control, dual ignition for sixes; EMAR4, dual with automatic spark control for fours; EMAR6, dual with automatic spark control for sixes; and G1, G2 and G3, single ignition with manual control or fixed spark for one, two or three-cylinder motors.



Diagrammatic section of the Bosch vibrating duplex coil showing housing of coil and condenser with vibrator mechanism

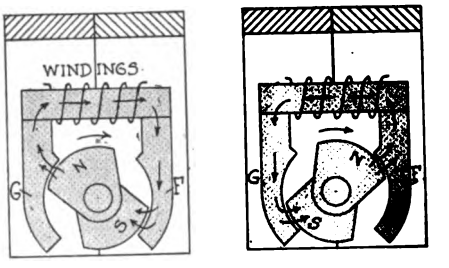


Diagram showing how the direction of the lines of force in the Dixie magneto is changed twice in each revolution

For any of these models, the Eisemann impulse starter can be fitted which facilitates starting in very heavy motors or motors with very high compression, a special fitting for Fords is also made consisting of an attachment which can be easily fitted to that car to provide it with Eisemann magneto ignition.

One of the features of the Eisemann magneto which is distinguishing is that at no time is the armature separated from the magnetic field. In this way the armature acts as a keeper and permits the magnets to retain their magnetism.

Splitdorf Dixie for Twelves

The feature of the Splitdorf announcements for 1916 is the addition of a twelve-cylinder model to the Dixie line. This new magneto operates on the same principle as the other Dixie model, having stationary winding and no armature in the general sense of the word. The four automobile models are designated as 40, 60, 80 and 120 for four, six, eight and twelve-cylinder engines.

(*Continued on page* 1081)

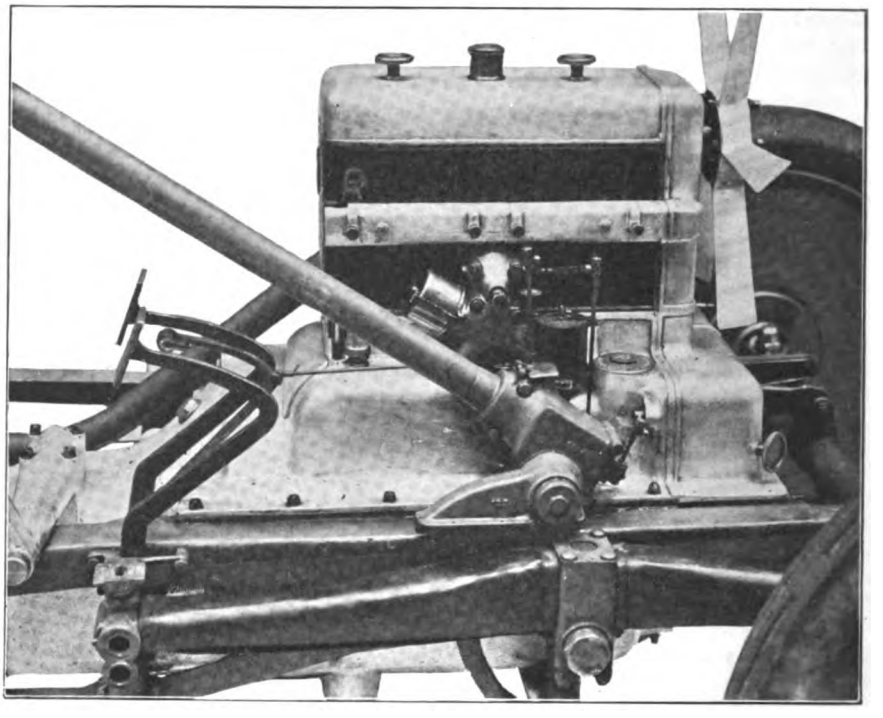
Irish Car Is Self-Lubricating

British Design in Which Every Portion of the Chassis is Lubricated Automatically—Europe's Chief Contribution to Engineering Progress of the Year

IN a time of engineering stagnation, such as is the present time in Europe, it is possible to chronicle the appearance of one new car which is more utterly new than anything that has been seen for a good many years. While engineers have been working along certain lines of motor development the creator of this new car has turned to other matters and has accomplished something that ought to give the engineers seriously to think. The main idea of the new chassis is that beyond filling up the gas tank and putting oil into the motor nothing else whatever need be done to it throughout a season's use. There is not a greaser nor an oil cap which need be touched save at intervals of many months.

About the main parts of the car there is nothing radically new, it is a sane design in its principal details, combining much of British, French, Italian, and American practice; it is in the detail that the work of its designer mainly lies.

At first reading the impression will certainly be gained by most engineers that the chassis is not practical, that it is commercially impossible. Studied attention to the detail, however, shows that this first impression may not be right. Probably the principles could not be applied to a cheap car, but they could be applied where a moderate price is obtainable and the owner who once had the advantages offered him by this self-lubricating system would never want to return to the conventional type of car.



The four-cylinder 3⅛-in. bore motor is 16¼ in. long over all. This view shows the side of the crankcase which has the reserve oil reservoir, and the cap thereof. The leather inclosure of the automatically lubricated spring is also shown. Observe that the spark plugs are protected by a cover which has cut-out buttons

The new car is not yet being manufactured, though a few are being built by the designer, J. B. Ferguson, owner of a repair shop and garage in Belfast, Ireland. Mr. Ferguson has been in the repair business for many years and has slowly developed the design of his car, always with the thought of overcoming difficulties with ordinary designs which his daily work revealed. The generalities, the four-cylinder engine for example, may not be suitable outside Europe, but the detail has world-wide application, in fact the rougher the country the greater the advantage of the car's self-lubricating power.

Main Layout Ingenious

However, the main ideas of the design apart from detail are too unusual to pass over without mention. For details of the engine the drawings are almost sufficient. The overhead camshaft is driven by skew gears on a vertical shaft and the exhaust valves seat direct in the cylinder heads. The inlet valves are in cages, and by taking out a cage the exhaust valve can then be extracted. An American engineer would prefer to use a detachable cylinder head but the Ferguson design is certainly lighter. A special tool is provided with which carbon deposit can be scraped out without removing the cylinders. The small holes shown are for the purpose of carrying water completely around the cylinders, and are drilled after the casting is made, not cored in, the advantage of this elaborate operation being that several inches of length are saved.

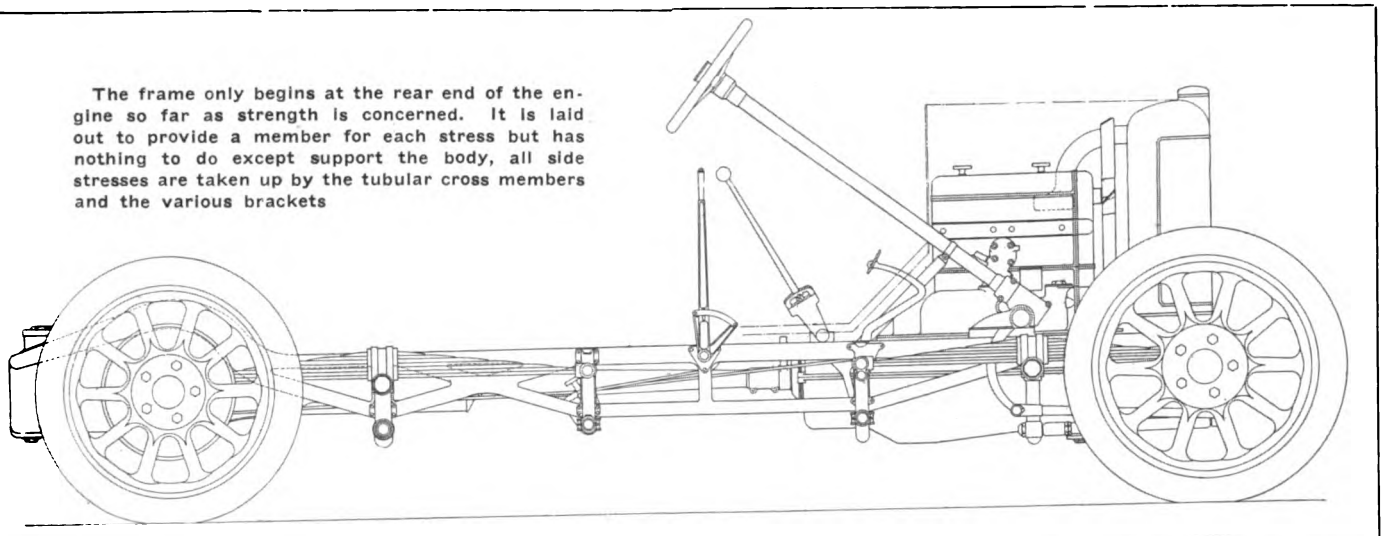
However, to come quickly to the lubrication, the engine has a complete pressure supply, even the piston pins being fed through small aluminum tubes which are carried up the connecting-rods. The ingenious feature of the engine oiling system is that an auxiliary tank holds about 1½ gal., this being cast integral with the crankcase. Oil poured into the filler first charges this auxiliary tank and then overflow supplies the crank chamber. Afterwards, when the level in the engine gets low, pressure on a knob on the side of the crankcase sends some of the reserve into the main part of the crankcase. The effect is that a supply of cold oil is always available.

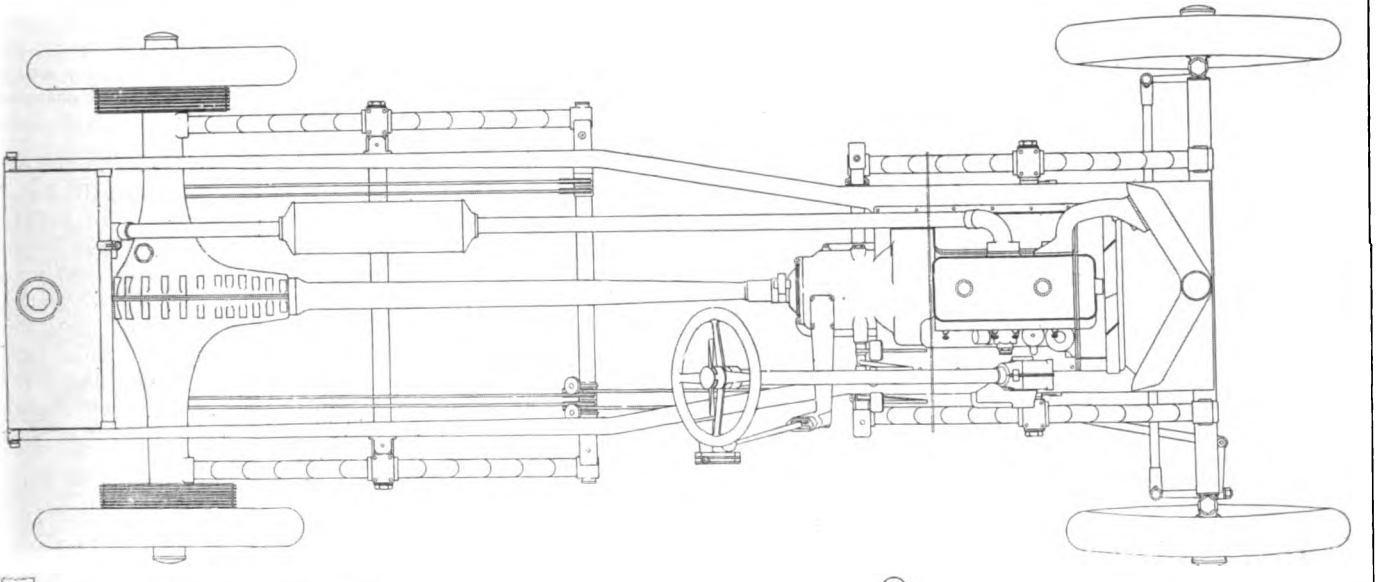
The oil supply to the cylinders is controlled by the throttle so as to proportion the oil supply to the work the engine is doing. The control consists of deflector guards which are arched over the crank webs and catch the oil flung off. As the carbureter throttle is opened these guards are drawn back and more oil thus allowed to pass into the cylinders.

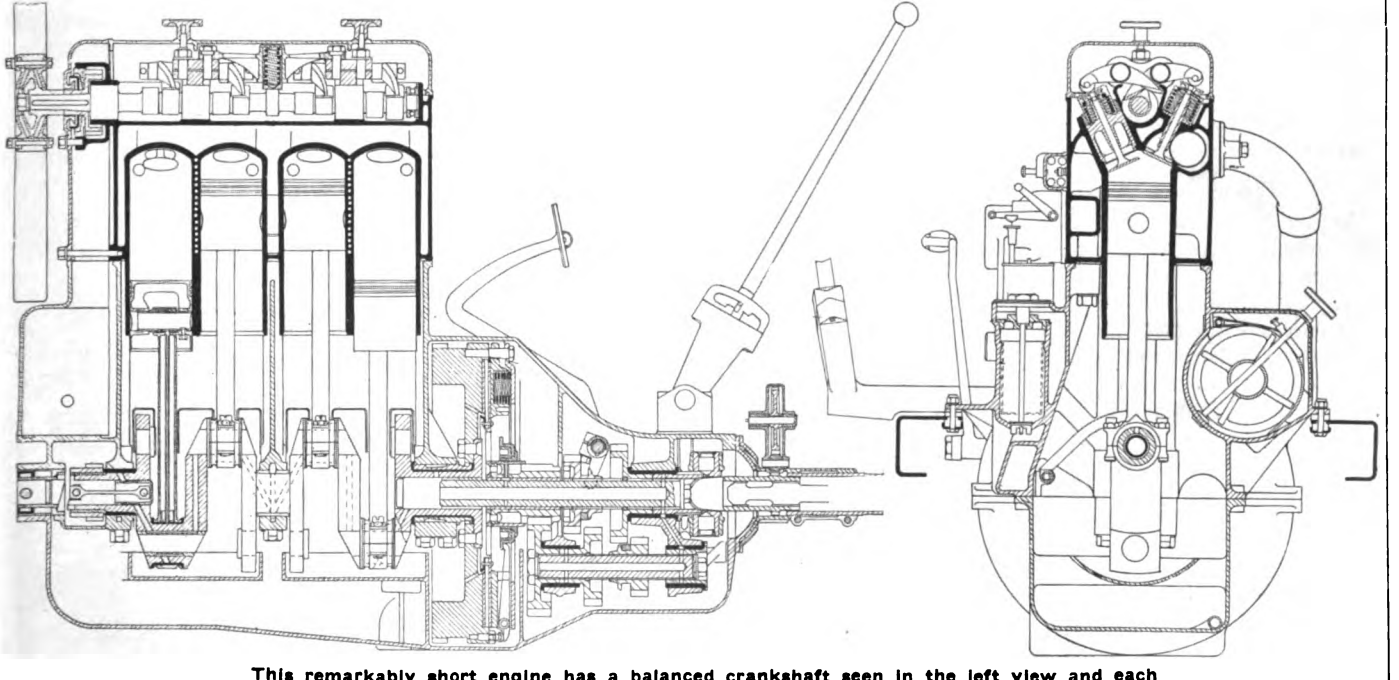
Oil Fed to Gearset

It will be noticed in the drawings that the crankshaft has the end of the hollow main shaft of the gearset spigoted into it, so the oil that is fed to the interior of the crankshaft by the engine pump also passes into the gearbox and lubricates

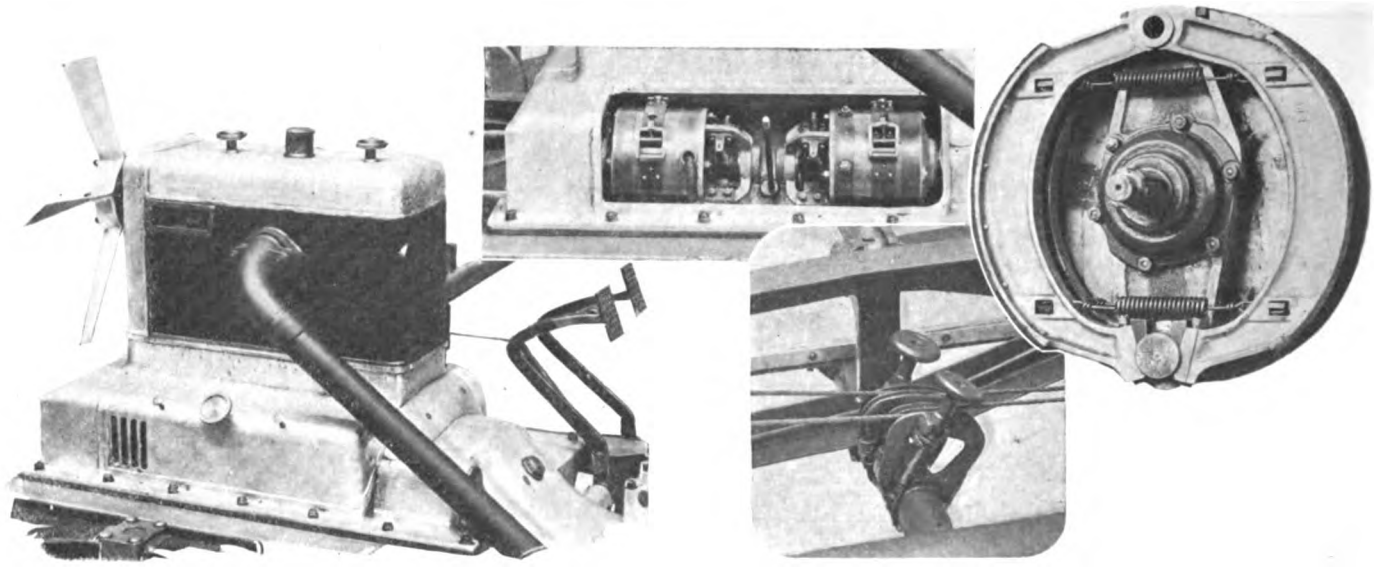
The frame only begins at the rear end of the engine so far as strength is concerned. It is laid out to provide a member for each stress but has nothing to do except support the body, all side stresses are taken up by the tubular cross members and the various brackets







This remarkably short engine has a balanced crankshaft seen in the left view and each crank web has a guard above it made of sheet steel. The guards are linked to the throttle lever and move with the throttle, so regulating the oil supply to the cylinders. The gearset is shown larger on the next page. In the transverse view the generator is seen in its case on the right of the cylinder and the reserve oil tank on the left



Left—Electric equipment side of motor with cover in place. Above—Inset, the cover taken off, disclosing the generator and starting motor. The carbureter draws its air through this compartment via the slots seen in the cover. Right—Brake shoes with taper wedges screw operated, for taking up wear. Below—The intermediate brake shaft with quick adjustment for contracting the brake operating wire cables

each of the plain bearings therein, under pressure. A supply is taken from the tail bearing in the gearset to the corresponding countershaft bush and then returns to the front bearing through the countershaft. Plain bearings are, of course, used for quietness, and their permanent good condition is insured by the force fed oil. The clutch is also fed with oil and to prevent this accumulating in the flywheel housing, gutters are cast on the sides of the casing. These catch any oil that may be flung off from the flywheel and conduct it back to the gearbox. A very clever feature of the clutch is that the central member, which is a single disk covered with an asbestos fabric, is fixed rigidly to a sleeve, which sleeve is an extension of the constant mesh pinion. Thus the pinion slides a little every time the clutch is operated, the teeth being made a little wider than usual to allow this sliding to take place without affecting the meshing of the pinions. The idea eliminates a sliding joint and is a true simplification.

In the gearset it may be noticed that unusual shortness is obtained by making one of the countershaft gears to slide. The sliding gear on the upper shaft gives high and intermediate while that on the lower shaft gives low and reverse.

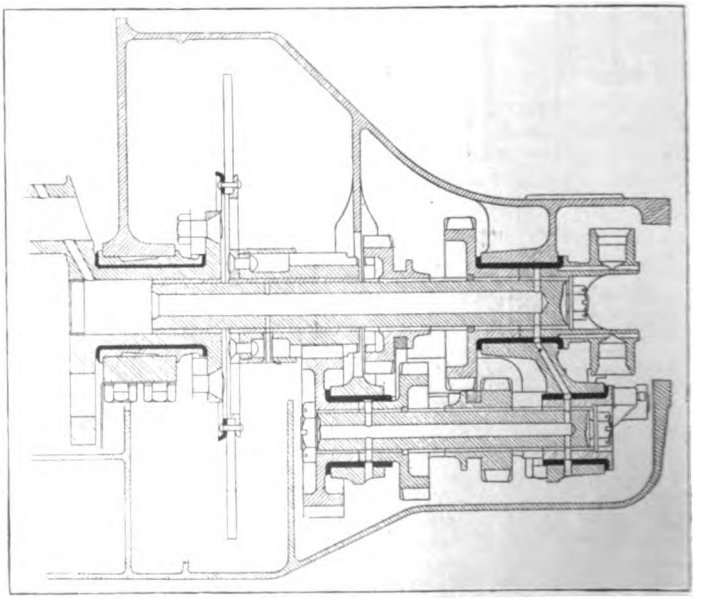
How the Springs Are Oiled

Returning to the lubrication of the chassis, from the engine pump a lead is taken right around the whole chassis, returning to the engine crankcase after completing the circuit. From this pipe every part of the chassis except the rear axle and the steering gear is lubricated. The oil in this main supply pipe is not at high pressure, since there is nothing to retard its flow to the crankcase except the friction due to the bore of the pipe. Also it should be pointed out that the oil supply is not liable to vary very greatly with the weather, since the oil starts on the circuit hot from the engine.

The springs are cantilevers, both front and rear, and oil goes to the fulcrum pins at the center of each spring. Thence oil goes up the hole in the center of the spring and down small grooves cut on each spring leaf. To prevent rusting and exclude dirt each spring is inclosed in a leather case which also covers the slides at either end of the spring, for slides are used instead of shackles. For the front axle radius rods are necessary, and the ball joints at either end of these are lubricated from the springs by taking the overflow through a small pipe to the interior of the hollow radius rod. With respect to the spring leaf lubrication, it should be explained that the oil groove in each leaf is covered by the leaf above it so that oil starting on its journey at the center of the top leaf descends by a series of steps till finally it reaches the extremities of the bottom leaf. To prevent the springs receiving too generous a supply, the hole joining the inside of the hollow spring pivot pin with its bearing is drilled so that it points downwards. To get to the vertical hole in the spring plates and so to the leaves, oil must first pass through the pivot pin bearing, and the hole being downward the weight of the car effectually closes the orifice when the car is standing still. The amount of oil allowed to reach the spring leaves depends upon the amount of work the spring is doing.

Excess oil from the rear end of the rear springs is taken to the brake actuating shafts on the rear axle, excess from the front end of the rear springs going to the equalizing shaft on the chassis, while the oil that seeps from the rear end of the front spring goes to lubricate the pedal shaft. It may be added that oil from the brake actuating shafts on the rear axle finally goes to the axle interior, maintaining the level therein.

The steering gear is not lubricated from the engine but holds within itself enough grease for six months' service.



Detail of gearset and clutch plate shown to a larger scale than in the engine illustration on the previous page

This is usual, but the tie rod and the drag link also hold six months' supply or more, for the ball joints at either end of these rods are fed with oil contained within the tube. On the tie rod near the middle is a screw cap and another is located on the drag link. Removing these allows the tubes to be filled with oil, and this gets to the ball joints through small holes. The cups that grip the balls are held up by strong springs, so the oil cannot leak out, it is merely allowed to seep over the balls and cups when the latter are moving. Throughout this elaborate lubricating system the detail is designed with covers and caps to prevent the escape of oil, and these also serve to prevent the ingress of grit with complete effectiveness.

Not a Question of Expense

The most remarkable thing of all, however, is the fact that all these oil channels, caps and covers are so simple and cheap to make, that the extra cost of the circulating oil supply to springs, etc., is not excessive. It could not be done on a $750 car perhaps, but there is no reason why it should not be part of the scheme of any car costing over $1,500. So far nothing has been said about the lubrication of the hinder end of the transmission. The universal joint gets its oil from the gearbox and is contained inside a ball housing, which takes torque and drive, being the head of a steel tube bolted and clamped to the aluminum axle case. From the universal a small amount of oil is allowed to escape down the torque tube, so reaching the rear axle. Therein it is continuously conducted to the interior of the differential by a fast pitch thread, cut on one of the drive shafts, and from the differential centrifugal force drives the oil to all the bearings. The ring gear picks up the oil in the bottom of the case and a scoop is arranged near the top of the case which catches this oil and leads it back to the thread on the drive shaft, so the axle has an independent oil circulating system peculiar to itself.

On the back of the casing is a dirt trap and a level cock which, it is claimed needs only to be operated every six months, ample precaution being taken to prevent too great a supply of oil reaching the axle.

A Trouble-Eliminating Design

The lubrication system of this remarkable car is not by any means its only feature of particular interest as there are many points besides. It would, perhaps, be well to again point out that the design is based upon twelve years and more of repair shop experience and is entirely colored by that. It is a trouble eliminating design before everything else.

Take, for example the fitting of the starting motor, which engages the flywheel in the customary manner, and of the generator. These are British made units incidentally, and are contained within a casing integral with the crankcase on the left side, corresponding in position to the reserve oil tank on the right side. Over them fits a cover that is detachable like a valve cover plate, and to keep the compartment cool the air for the carbureter is drawn through the casing. Thus the electrical units are completely protected and yet ventilated. Even the spark plugs are covered by a ventilated aluminum case which would prevent water or dirt from reaching the plugs; and a neat detail is that the case has a cut out button opposite each plug terminal so the firing can be tested in a moment by the pressure of a finger without tools and without any risk of shock. Again, the cost of this cover is very small.

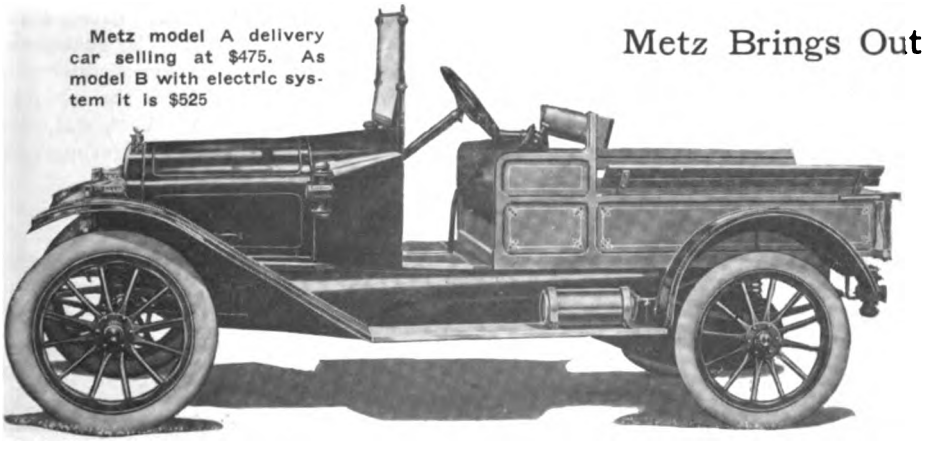
Then take the frame: this is rigid for the length of the motor, in fact the motor is a solid block rearwards from which the frame projects and it has nothing to do except to support the body and the brake countershaft. To give rigidity the section is very deep and is cut out in panels so that it becomes the equivalent of a bridge girder with a member for each stress. It is credited with a rigidity equaled only by the Brush frame, and is at least as light, while there should not be very much difference in the cost. The engine carries the radiator on an extension of the crankcase and the whole power plant sits upon rubber strips, so making a vibration insulating connection with the frame sides.

For fuel supply from the rear end tank a novel system is employed, there being no suction feed and no air pressure. Instead, the exhaust pipe end in a casting of wide, flat section, and this is carried down the back and across the bottom of the tank. The vapor from the gasoline thus created, has sufficient pressure to raise the fuel, once a few strokes of the hand pump have started the flow.

Not a Freak Design

A careful study of the drawings and photographs will disclose many other details of equal originality, but the great importance of the chassis, for it does possess a very great importance, is that it is altogether out of the rut. It is not a freak design as it follows quite ordinary European practice, perhaps it is best described as a good car such as could have been and has been produced by many a European engineer, taken in the rough state and finished off. It is expected of a good car that it will run for years without trouble *if it has proper attention.* Mr. Ferguson has aimed to eliminate that attention. His car can be driven all day and every day for six months without anything whatever being done save pour in gasoline and fill the engine with oil. Not only does nothing else *need* to be done, *but there would be nothing whatever gained in service or performance by doing anything more.*

The idea is so novel that it needs a little mental effort to grasp it, but there is not an automobile driver or user in the world who would not appreciate such freedom from labor. Even the six-monthly task of filling up the steering parts charging the front hubs and testing the oil level in the axle would occupy less time than is taken *every day* by a careful user in going over the grease cups on the spring shackles.



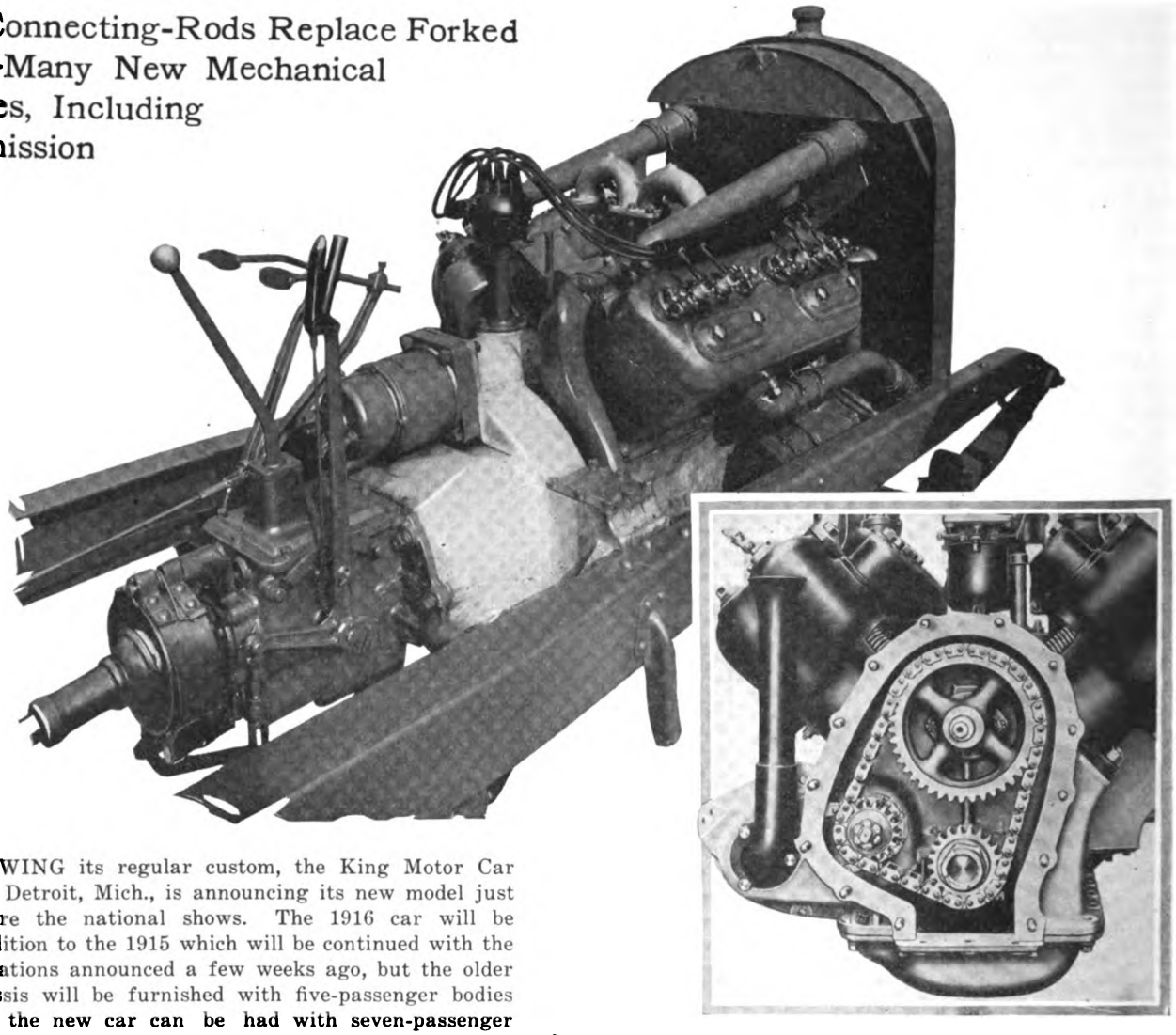
Metz model A delivery car selling at $475. As model B with electric system it is $525

Metz Brings Out Three Delivery Cars

THE Metz Co., Waltham, Mass., has placed on the market three types of delivery cars in addition to its roadster and touring car. All are on a 25-hp. chassis, model A, having an express body selling for $475, with Prest-O-Lite tank and oil side and tail lamps Model B is the same except that it has Gray & Davis starting and lighting and sells for $525. Models C and D correspond to models A and B, respectively, except that they have roll side curtains, model C listing at $525 and model D at $575. Model E uses the Gray & Davis electric system and has a closed delivery type body. It sells at $600.

New King Eight Is Seven-Passenger

Plain Connecting-Rods Replace Forked Type—Many New Mechanical Features, Including Transmission Brake



FOLLOWING its regular custom, the King Motor Car Co., Detroit, Mich., is announcing its new model just before the national shows. The 1916 car will be built in addition to the 1915 which will be continued with the slight alterations announced a few weeks ago, but the older design chassis will be furnished with five-passenger bodies only, while the new car can be had with seven-passenger touring body, five-passenger roadster or sedan equipment. The price will be $1,350, the wheelbase is 120 in. and tires 34 by 4 in.; equipment, of course, being of the fullest possible kind.

A rearrangement of the springs has permitted the body to be lowered a little and this, in conjunction with most happily chosen body lines, has produced a car of very distinctive appearance. There is a sense of luxury given by the look of the car which is impossible to describe.

Power Plant Is Clean Design

The new motor is 3 by 5 in., giving 282.7 cu. in. piston displacement and is essentially a high-speed type, being geared but a little above 5 to 1 on high. Only a slight amount of stagger has sufficed to permit the use of side by side connecting-rods, these having adjustable bearings of the usual kind. Pistons are Lynite aluminum alloy cast in permanent molds and the wristpins are arranged to rock direct in the pistons. Very special pains have been taken with the design of these pistons so as to render smoking practically impossible and the results are exceedingly satisfactory.

There are three main crankshaft bearings and all oil is forced from the pump through the crankshaft, to the connecting-rod bearings, the pump being situated at the rear end of the crankcase driven off the bottom of a vertical shaft. This shaft has the Atwater Kent distributer with automatic spark advance mounted at the upper end and the driving gears for it are on the extreme rear end of the camshaft, so the distributer comes just in front of the dashboard, in a very accessible position.

The front end has a silent chain drive, with adjustment on an idler with eccentric bushing between the generator and the crankshaft, this giving a triangular main drive with separate chains for camshaft and generator. The generator lies snugly beside the crankcase where it cannot interfere with the accessibility of any other part. With the generator in this location and the distributer at the back end, the valve alley is clear of everything except the carbureter, which, by the way, is a special King design.

Combined Intake and Exhaust Manifolds

A very neat idea in connection with carburetion is the combination of intake and exhaust manifolds, these being cast in one, as shown in the halftone illustrations. The compound manifold provides the necessary warmth for the gasoline without the complication of a water-warmed manifold or a carbureter jacket.

Another feature which is unusual and also makes greatly

for accessibility is the position of the starting motor, this being mounted on top of the clutch housing, meshing with a flywheel ring gear in the usual way. Both the generator and motor are made under Ward Leonard patents and the battery is a Willard.

For cooling, the thermo-syphon system is employed, this being particularly efficient in V-motors, owing to the low position of the cylinders relative to the radiator, and it is noteworthy that the exit pipes from the cylinder blocks are so arranged that the water has a particularly free circulation around the valves.

Tire Pump on Gearset

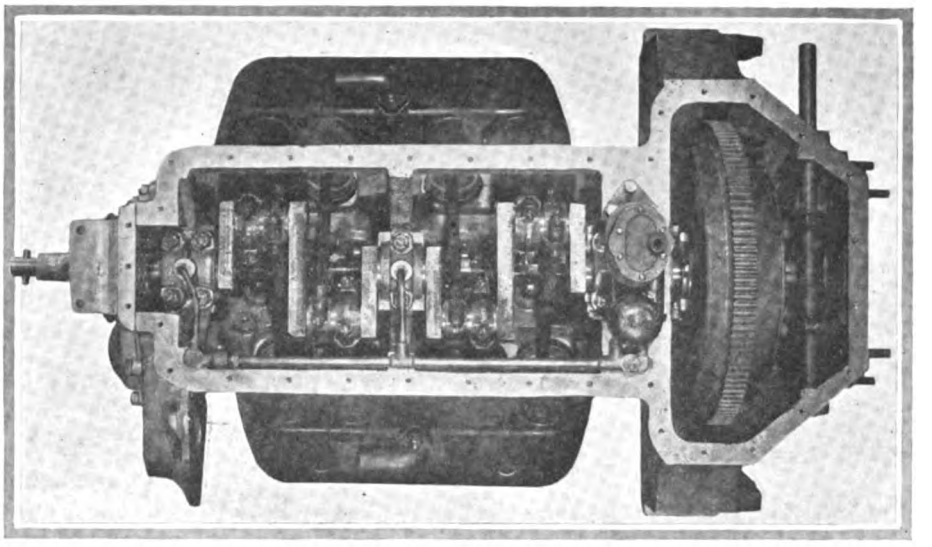
On the side of the three-speed gearset the tire pump is mounted, this having a sliding gear that meshes with one of the countershaft transmission gears when the pump is in use. In this place the tire pump is out of the way and cannot interfere with any engine accessory, while it is just as convenient for use.

Transmission Brake Used

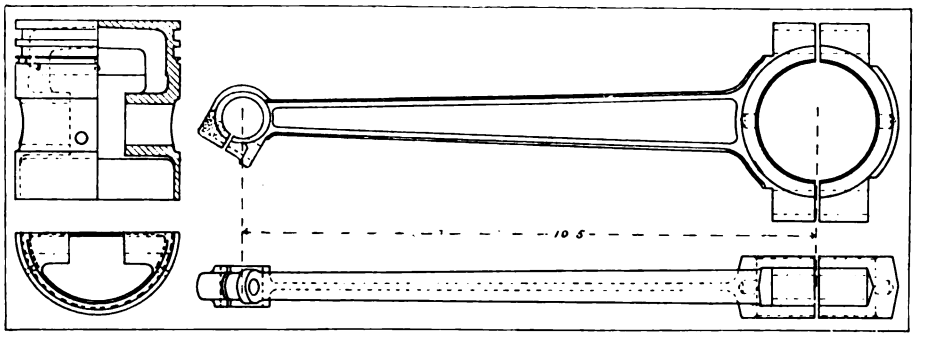
Behind the gearset, mounted on the tail end of the main shaft and embracing the universal, is the transmission brake, which is linked to the emergency lever and has abnormal power. It is a simple type of band brake with toggle actuation needing very few links between the brake and the lever, while the release springs are arranged in such a way that dragging on the drum is impossible. A substantial casting which bolts to the back of the gearbox carries the fulcrum pin of the brake. Aft of the brake is an open propeller shaft with a universal at each end, there being a short torque stay arranged to divide the angular bend equally between the two joints, according to the proper principles of universal joint layout explained by C. W. Spicer in his recent S. A. E. paper. The driveshaft is tubular and so long that the joints have but little work to do.

Rear Axle Light

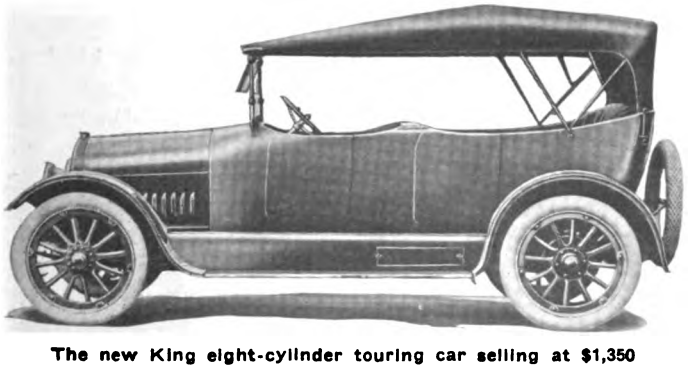
Owing to the use of a transmission brake, the rear axle is particularly light and neat, having no brake rods on it as the contracting service brakes are operated by direct pull rods from the cross-shaft. The latter has no balance beam, but the natural elasticity of the rod gives an equalizing effect. Spiral bevel drive is employed and the axle is a full-floating type. The long cantilever springs are clipped beneath the axle and transmit the drive to the swivel brackets, the front ends of the springs being shackled. For the frame a very strong section has been selected of unusual depth, and the principal cross-member is made of the crankcase arms at the rear of the motor; in front there is a dropped cross piece which supports the front end of the power plant and the radiator.



Bottom of crankcase of the new King, showing details of the crankshaft and connecting-rod mountings. Note lubrication to main bearings. Also silent chain front end drive



Details of piston and connecting-rod design in the new King. The pistons are Lynite aluminum alloy cast in permanent molds. The wristpins rock direct in the pistons. This is the short piston of hourglass type credited as being proof against smoking



The new King eight-cylinder touring car selling at $1,350

Luxurious Bodies

Internally, the body is in keeping with the luxurious appearance already mentioned. It is finished in the best possible style and upholstered with a lavish use of stuffing and leather. A detail of equipment immediately noticed by anyone acquainted with other King models is the absence of the folding steering wheel, but a trial soon shows that the new body gives so much room that the largest driver could easily enter from his own side. In the tonneau, the folding seats vanish into the back of the front seat, when folded, and when unfolded, are found to be upholstered as well as the other seats and large enough for real comfort.

Acceleration Is Good

A short trial over good and bad roads close to the factory showed the car to be exceptionally well sprung, and that the acceleration on high gear was entirely up to the modern high standard. The engine is noticeably free from vibration and runs very sweetly indeed, being practically soundless except for a not unpleasing exhaust hum.

It is noteworthy that the controls are all arranged conveniently to the steering wheel and that the steering is light in action.

The History of the American Automobile Industry—7

Bullard's Steam Automobile the First Steam Vehicle to Have Automatic Control of Its Essential Functions—Very Light—Wire Wheels Used —R. E. Olds Begins Work on Steam Cars

By David Beecroft

SECOND to Lucius D. Copeland as a pioneer developer of steam motor vehicles came James H. Bullard of Springfield, Mass., who began the construction of his first steam automobile in that city in 1885. Mr. Bullard first designed a cylindrical boiler with fire tubes through it lengthwise and charcoal or anthracite fuel. At first intended to be inclined, this boiler was later sketched vertical with the engine mounted directly upon the boiler shell and driving the wheels by means of a pinion on the crankshaft meshing with the gear on the driving axle at its center. This engine mounting is interesting because used by a number of later constructors, but this design was not built by Mr. Bullard, who gave preference to a horizontal engine mounted over a horizontal boiler and placed at the rear of the driving axle. The engine had two cylinders and the driving axle was the forward one, the driver's seat being practically over this driving axle and there being two small steering wheels at the rear. The construction was begun in 1885 and continued throughout that year and most of 1886. The cylinders were slightly under 3 in. bore by about 4½ in. stroke with cranks at 90 deg. The valves were of the oscillating type and with no provision for reversing. A bevel gear differential was used and a clutch provided around this differential so that the vehicle could coast without turning the engine.

Wire Wheels Used

The driving wheels were of the wire spoked type used in bicycles at that time and about 50 in. in diameter. The rear steering wheels were also bicycle wheels of about 14-in. diameter, all fitted with solid rubber tires. The wheelbase was about 4 ft. and the gage 2½ ft. A handlebar steering controlled these rear wheels which were provided with such steering arms to make them track properly when turning corners. To avoid twisting the mechanism, the steering axle was provided with a horizontal king bolt which permitted one end of the axle to rise and fall without twisting the frame, a device that found much favor with the early inventors, who were as likely to overestimate difficulties in their inexperience as to underestimate them.

The hand wheel of the throttle valve was brought forward under the seat to a point where the operator could reach it and the brake shoes bearing on the rubber tires were applied by pedal. The seat was wide enough for a single person only.

The first experiments indicated the unsuitability of the cylindrical boiler and solid fuel so experiments were begun to develop a faster steamer and some form of liquid fuel burner. A flash boiler arranged to be kept hot by kerosene wick lamps and to instantly convert water into steam when the pump supplied the water was next tried, but without reasonable success. He next tried a porcupine type of tubular boiler holding about 1½ gal. of water, which worked well when sufficient heat was provided. The wick fire could not be forced sufficiently, so many experiments were made in the attempt to burn kerosene without smoke. Bullard persisted, however, deviating only once to try alcohol in a surface burner, but this did not give sufficient heat and the whole device caught fire. Finally the idea of atomizing the oil was tried with a small atomizer, which showed that a very hot flame free from smoke and consuming a large quantity of oil could be produced in a very small space. This discovery was followed by many weeks of experiments devoted to working out details of tanks, burners and regulating devices to the end that the supply of oil, the compressed air, the supply of water and similar necessities should be automatic, leaving the operator free to devote his attention to the road. The steam pressure regulated the amount of fire, shutting it off entirely when a certain maximum was reached, a pilot fire burning constantly being ready to light it up again when the steam fell below a certain minimum.

Automatic Control Features

This was the first steam vehicle of any kind to have automatic control of its essential functions, and patents were secured covering all the novel features. This vehicle was successfully operated in Massachusetts during the summer of 1886. The runs were all short and generally took place early in the morning in order to avoid interference with other traffic and to prevent accident, due to frightened horses. The complete vehicle was very light, being easily lifted by two men. Its maximum speed and power were not taken but it would easily

go as fast as any one cared to ride on ordinary roads of that time.

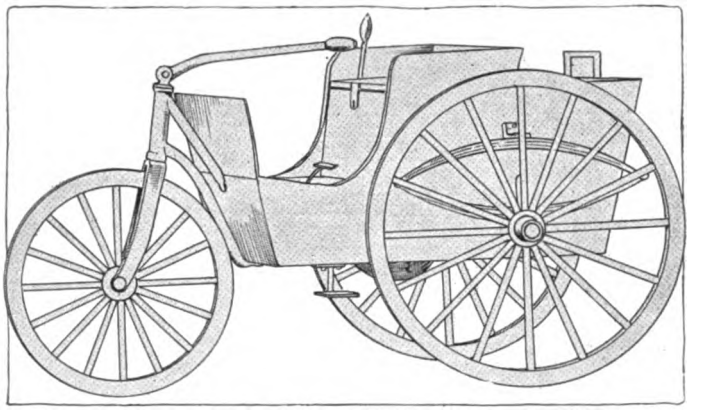
Mr. Bullard's process of burning oil was found to be adaptable to many other lines of business in which a perfectly clean fire of high temperature was necessary, and a flourishing business grew out of the method of atomizing oil by air pressure and burning it under steam boilers and in furnaces for forging, welding and melting metals in brick and pottery kilns and in glassworks, all with highly satisfactory results as to quality of product and economy of operation. Bullard took up the steam vehicle again in 1898 in connection with A. H. Overman of bicycle fame, but this later effort will be considered in a later issue.

The James H. Bullard motor vehicle patent shows a two-cylinder, horizontal steam engine, although it is not known that Bullard was aware of Copeland's work, but probably he was. The H. B. Smith vehicle, patented Feb. 26, 1889, which patent was filed about six weeks after Copeland's patent was issued, undoubtedly reflected Copeland's enthusiasm because the Smith Machine Co. were makers of the Star bicycle to which Copeland first successfully applied his motor. It is claimed that the Smith machine was completed in 1885, the patent being filed within 2 years after its completion. This machine much resembled the one shown in Copeland's patent in that it had two large rear wheels and a single front with the boiler mounted on the reach but this reach was at the side, making a two-track vehicle instead of a three-track one, as was Copeland's. No pedals were provided, which Copeland's patent showed. Both two and three-track tricycles were common in those days, so this choice has no significance.

The Smith vehicle used 48-in. rear wheels, a then common size, with 1¾-in. cushion tires and probably weighed 500 to 600 lb. The boiler was tubular and of copper, heated by fuel oil carried in the hollow frame and sprayed through a burner. The gears provided two rates of speed of 4 and 12 m.p.h., respectively, and the single-cylinder engine was able to drive the vehicle at the higher speed even on the Jersey roads which were heavy and sandy.

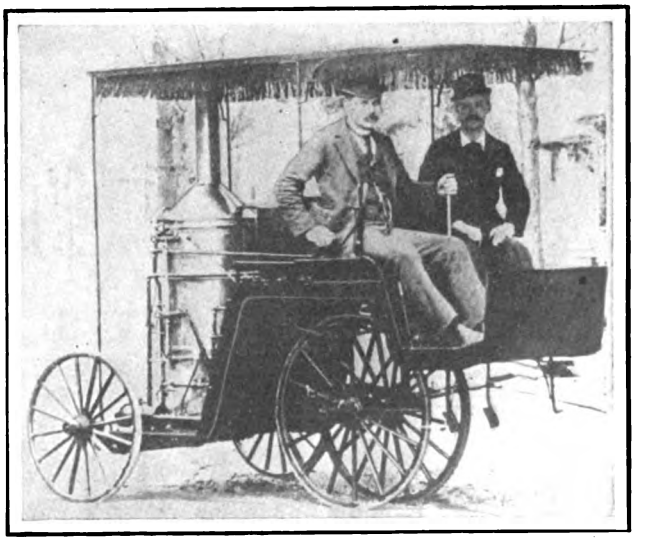
R. E. Olds Begins Experiments

Ransom E. Olds' introduction to mechanical life came at the shop in Lansing, Mich., where, with his father, he was engaged in building small portable steam engines, having started in 1880, under the name of P. A. Olds & Son. Like many others, he had the idea that the power-propelled vehicle could be a success and about 1886 or 1887 began a small three-wheel buggy driven by a little steam engine and boiler completely inclosed in the enlarged buggy box on the front part of which the seat was perched. The single front wheel was carried in forks like a bicycle wheel and steered by a tiller lever. The only picture extant is probably a drawing produced from memory and does not give essential details. As first made, the variable lever and ratchet drive was employed but as this transmits the power by a series of very disagreeable jerks, it was abandoned and later chains and gears were tried. The wheels were steel tired and about 4 ft. in diameter which was the usual carriage size. As rebuilt, a clutch was provided to disconnect the engine from the wheels, the seat was wide enough for three and the weight about 1500 lb., or somewhat heavier than the little steamers so common 15 years later. It could run as much as 10 m.p.h., but was quite noisy and was usually operated on the streets of Lansing in the latter part of 1887 about 3 or 4 o'clock in the morning before other street users were about, to avoid frightening horses. So little promise did this machine hold forth that it was dismantled and the matter dropped for several years.



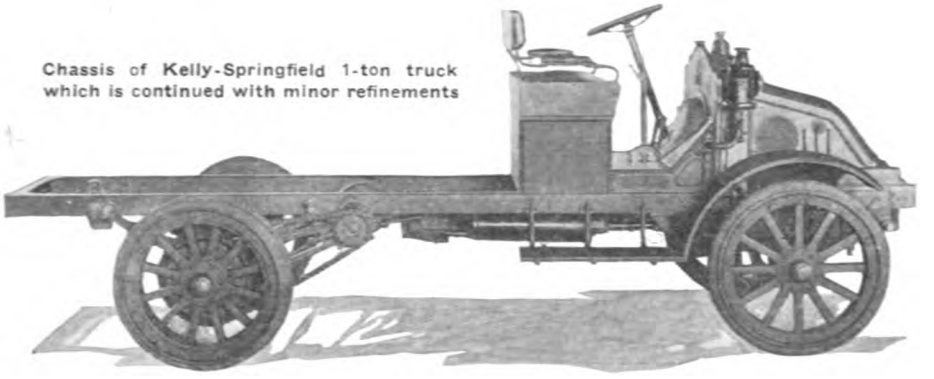
Three-wheel steam buggy designed and built by R. E. Olds in 1886 or 1887. The engine and boiler were inclosed in the buggy box on the front of which the seat is located

About 1890, using the former rear wheels and axle, Olds again attacked the problem. This attempt was actually running before May, 1892. It had a vertical boiler, carried on a low, rear platform so as to not project too high, while the passengers were seated in front of the boiler and over the front wheels, which were double but placed so close together as to steer like a single wheel. This vehicle, evidently, was the subject of considerable changing and experimenting and was eventually sold to go to Bombay, India.



R. E. Olds in his second steam car built about 1890. Note the double front wheel steer. The same rear wheels and axle were used in his first design

Kelly Line Increased To Seven



Chassis of Kelly-Springfield 1-ton truck which is continued with minor refinements

Models Added Have Capacities of 1½, 2, 4 and 6 Tons— Minor Refinements Also Made

SEVEN models make up the 1916 line of Kelly motor trucks manufactured by the Kelly-Springfield Motor Truck Co., of Springfield, Ohio. These trucks are known as K-30, K-31, K-35, K-40, K-45, K-50 and K-60. Of these, K-31, K-35, K-45 and K-60 are new. With the exception of the additions no marked changes have been made in the policy of this concern for this season. At the same time, a number of improvements and refinements of a minor nature have been incorporated.

Two Motors Used

Following the practice of a year ago, two motors are used. A smaller size known as the K-30 is used in the 1, 1½ and 2-ton models which are known respectively as K-30, K-31 and K-35. The larger model is known as the K-40 and is used in the 3½, 4, 5 and 6-ton chassis which are named in accordance with the respective lettering given above.

The improvements include a new carbureter which is now the latest Rayfield, in place of the design formerly used. Another improvement in the motor consists of the lower half of the crankcase being cast in two seperate pieces with the bottom part forming an oil reservoir of 2.75 gal. capacity. This is covered entirely with a screen which allows a straining area of approximately 2500 in. Beyond these, no noticeable alterations in mechanical features have been made.

The small motor known as the K-30 is a 3¾ by 5¼, L-head block design, with the valves on the right side and inclosed. The larger motor is a T-head design cast in pairs with a bore and stroke of 4½ to 6½, with a nominal rating of 40 hp. The S. A. E. ratings of the two motors are respectively 22.5 and 32.4 horsepower.

Oil System Partly Revamped

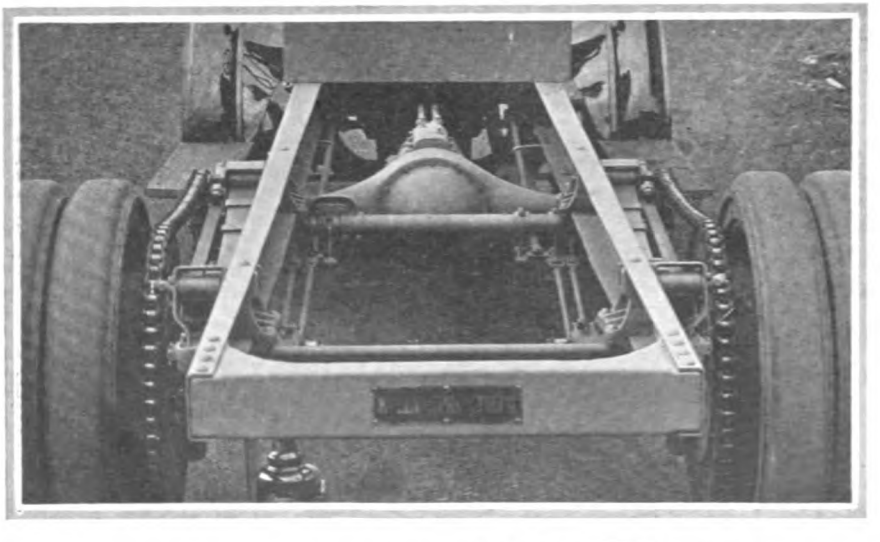
While part of the oiling system of these motors has been revamped, as explained it is still practice to keep the oil pump in the bottom of the reservoir in such a location as to secure only strained oil. The crankshaft of the motor is hollow as it was last year and the oil is forced through this to the lower connecting-rod bearings.

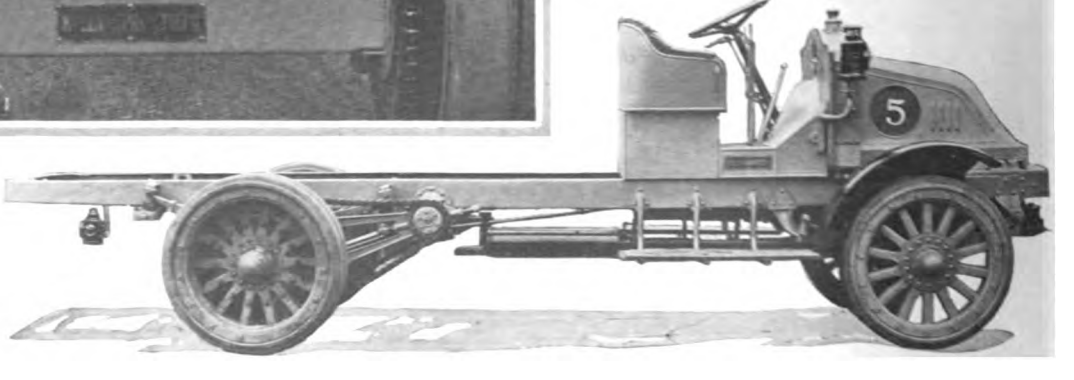
Final Drive by Chain

Power is taken from the motor by a cone clutch to a three-speed selective gearbox located amidship. Final drive is by double chain to the rear wheels. The springs are semi-elliptic, front and rear. The lower end of the drop-forged radius rod is forged to the brake spider, the forward end being held by means of an adjustable radius-rod block to the ball end of the jackshaft housing. With this construction the braking strain is thrown upon the radius rod which is especially designed to take up the strain of braking torque. With this system of construction there are no rigid cross members, the frame being allowed to absorb the strains and shocks.

Radiator Mounted on Springs

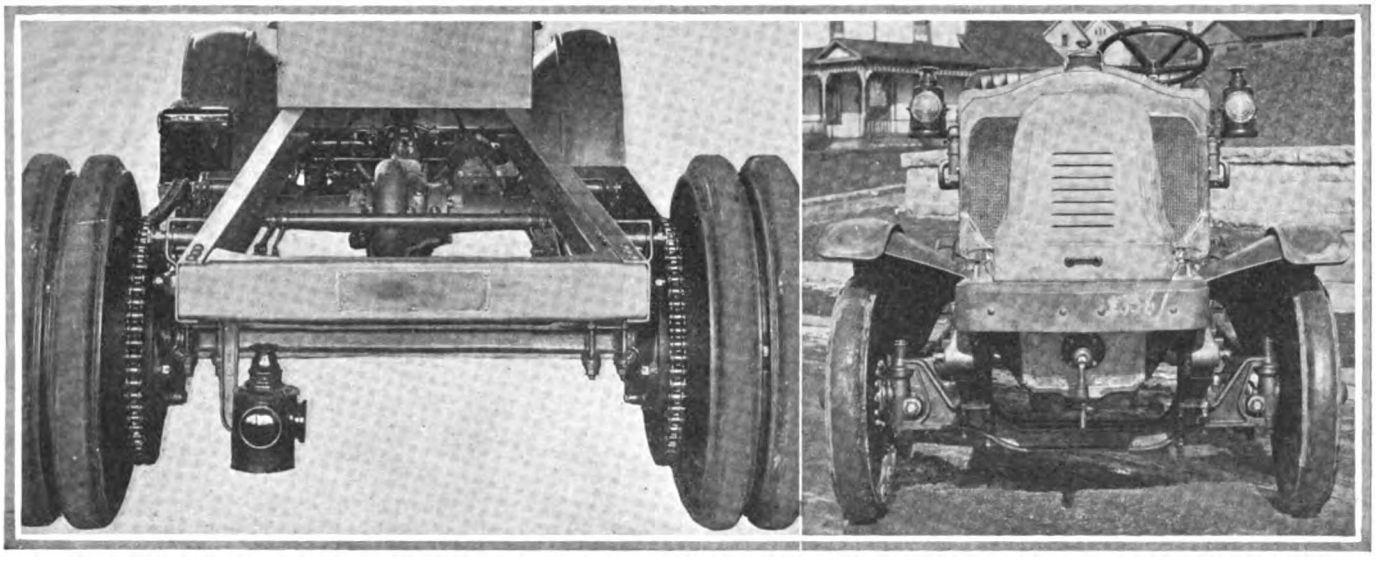
One of the distinctive features of the Kelly truck is in the mounting of the radiator which is behind the motor and in front of the dash, although independent of the dash. It is carried on four sets of springs which are allowed full freedom of





Above — Rear of the Kelly-Springfield 5-ton truck showing the drive and suspension units

Right—Chassis of Kelly Springfield 5-ton truck



Left—New K-35 2-ton Kelly-Springfield chassis which has been added to the line this year. Right—Front view of Kelly-Springfield chassis showing typical bonnet and radiator appearance

movement and absorbs the road shocks before they reach the radiator. The prices of the seven trucks are as follows: K-30, 1-ton, $2,000; K-31, 1½-ton, -2,050; K-35, 2-ton, $2,750; K-40, 3½-ton, $3,400; K-45, 4-ton, $3,600; K-50, 5-ton, $4,250, and K-60, 6-ton, $4,500.

Different types of bodies are interchangeable on the same chassis size, thereby rendering it possible for the owner of one of these trucks to have a vehicle suitable for many different kinds of work. The body equipment is as complete as on the models on the market for the past year.

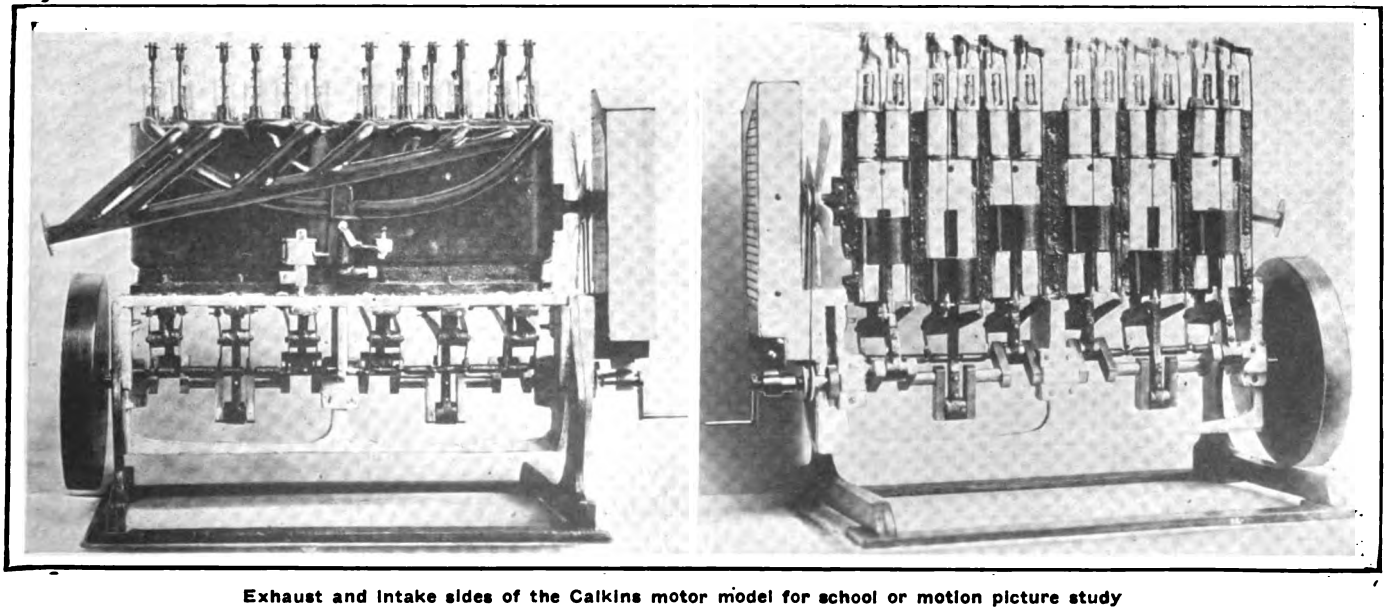
Model for School or Motion Picture Study

IN order to provide an instructor's model at low cost, A. B. Calkins, a mechanical engineer of New York City, has brought out a series of longitudinal motor section models made of low-priced materials such as wood, etc. This series of models, while light, are of sufficient sturdiness to withstand the ordinary usage of the classroom and at the same time can be operated by a small hand crank in such a manner as to show the operation and functioning of the various elements of the motor.

It is common practice in most of the motor schools to employ cut models showing the working parts of different types of motors. To cut these models from the materials used in actual motor manufacture is an expensive undertaking, and hence the use of the model has been more or less restricted. With the Calkins model the objection of great expenditure is overcome and at the same time it is quite feasible to make all the working parts of the motor visible by using a complete cut longitudinal section.

The accompanying illustration shows a model of this description which is to be put on the market especially for automobile schools. The particular model shown is a six-cylinder, four-cycle design with overhead valves. A magneto timing gear is furnished with this model and along with the model is a short treatise on power calculations.

Another use for models of this type is the taking of motion picture films, and it is one of the inventor's ideas that technical schools can be supplied with reels suitable for the lecture room for any discussion of the action of a motor.



Exhaust and intake sides of the Calkins motor model for school or motion picture study

Protecting Finish Prolongs Car Life

Good Paint and Varnish Essential—Must Be Skillfully Applied—Good Materials and Workmanship Real Economy—Getting a High Polish—The Dull Finish

By M. C. Hillick

WORKING in co-operation with steel, aluminum, wood and such other things as are usually squeezed into the make-up of the automobile, good paint and varnish confer the lion's share of benefit upon the vehicle. The metal may be rough, and in its undressed state far from a thing of beauty, but under the magical effect of paint and varnish it becomes transformed into something good to see. While the appearance of the car is rounded out, and the grace of the fashion of it emphasized by the application of suitable colors, and the employment of a mirror-like finish, the real mission of the painter's work is to furnish the last full measure of protection to the surface of the car.

The extent of that protection, then, rests primarily upon the quality of the materials entering into the finish. By whatever margin the protection falls short of what it, in all fairness, ought to be, by that margin the quality of the paint and varnish mediums fails to meet a right standard of requirements. In this quality—this superior brand of excellence—the car owner, first of all, should have a deep-rooted interest.

Economy to Pay for Good Materials

It is economy to pay for the use of such materials for at least two reasons. First, they wear enough longer, and furnish the needed protection while wearing, to more than equalize the difference in cost between superior and inferior stock. Second, the car is shopped less frequently, thus furnishing more protracted and more efficient service, and less overhead expense, due to idleness in the shop.

Then there is the additional advantage—shall we not say additional profit?—derived from the finer appearance, the more luxurious appointments, which are part and parcel of the practice of using a class of paint and varnish stock strictly above suspicion. A high grade of material is not all, however. United with it—an indivisible part of it, in fact—must be an equally high grade of workmanship. The finest paint or varnish to be found anywhere counts little if applied by an incompetent workman. All the value combined in its make-up by the most scientifically adjusted methods of manufacture go for naught when the craft muddlers lay unskilled hands upon it.

Up to the Car Owner

It is, of course, the business of the painter to see, among other matters, that good materials and workmanship are furnished. Nevertheless, this is not always done—or, at any rate, not nearly so well done—unless the car owner evinces an interest in, and a knowledge of, the painting system employed and its possibilities for furnishing a finish for which no apologies will be required.

In the purchase of clothes and of motoring necessities in general the average car owner is both fastidious and exacting. Why not in buying what the painter has to sell insist upon an article of uniform excellence?

It adds substantially to your motoring pleasure and comfort. Moreover, it adds to the life of the car and thus indirectly serves your bank account a good turn. A recent article in THE AUTOMOBILE has stated, in effect, that the improvements which have lately been made in the manufacture of sheet steel are of such a nature that the metal is more subject to corrosion than formerly. This condition, therefore, makes the need of regular, systematic painting and varnishing, performed decently and in order, increasingly urgent.

Lacking the necessary protection the parts of the car often most in need of it become exposed to the weather, and corrosion immediately begins to gnaw at the vitals of the finish.

Rust Ruins Many Cars

A well-known automobile engineer has said that more cars are every day going to the scrap heap through destruction by rust and corrosion than from any other cause. The weakness and decay of metal through the action of rust and corrosion are becoming widely recognized.

To such an extent is the damage resulting from these agencies feared by railroads which within recent years have become large owners of steel passenger cars that special instructions have been issued to keep every fraction of metal well coated with paint specially adapted to steel protective purposes.

Clean and Varnish Twice a Year

The automobile in regular use should be cleaned up and varnished at least twice a year.

The word varnish does not exactly convey the meaning of the labor involved. Before applying the varnish the car will need to be cleaned up carefully, both body and chassis. Remove all grease and lightly rub the surface of the car body with pumice stone, flour and water. This practice gets away with any lingering traces of grease or foreign substances, and puts the film of old varnish in a receptive condition. Next, all defects in the finish, all blemishes of the color, and surface disfigurements in general, need to be touched over lightly and thoroughly with color matched to meet that upon the car.

This work calls for skillful brush use and good judgment. The match color under the most favorable conditions, and produced by a colorist of the best type, will fail possibly a trifle in being precisely the same shade as the old, for which reason the least used the better. In touching up, the painter may well be admonished to cover no surface beyond the actual defect. This touching up had best be done with a small lettering or striping pencil so that not only a very small quantity of color is used but that rough, coarse edges may be avoided.

Varnish Will Not Conceal Splotches

Thick splotches of color cannot be successfully concealed under one or two coats of varnish, or for that matter, under any number of coats, so the essential thing to do is to apply

the color sparingly and with a satiny smoothness. All this makes for the best possible sort of finish.

A New Coat of Color

Frequently the finish is in comparatively good condition but with the color showing such a faded, disfigured condition that the only means of restoration consists in giving the entire surface a coat of color, running the ornamental lines over this, and then in due time applying the coat of finishing varnish. In many cases this process is practically as quick as the touching-up method, and scarcely more expensive. In the matter of appearance and finish it is in every way superior to the touch up and varnish practice, this latter feature being the one that, above all others, really commends itself to the car owner. There are many things connected with this touch up and varnish, or the one coat color and one coat varnish job, which the car owner should not let the painter forget.

Radiator Needs New Paint

The radiator, for example, should always get a fresh smear of paint. A thin, tough coat of paint—one that under heat holds its luster and shines on with the tenacity of a new moon. The fenders need to be finished with a hard drying finishing varnish. All defects, and parts which do not compare favorably with their surroundings, or with the finish in general, should be touched up with the proper color, or with varnish color, in a way to enhance the finish and balance the appearance of the car up to something approximating that given the best class of work.

Clean the Natural Wood

Not a few automobiles are being let out of the shop with the natural wood finish on the inside of the cars soiled and darkened to a condition detrimental to the appearance of the interior appointments. Wherever the finish is thus found the varnish should be taken off either with paste varnish remover or with steel scrapers, completing the operation by sandpapering with No. 1 sandpaper. Then apply a solution of oxalic acid which in the course of a few minutes will bleach the wood and restore its original color effects. Then rinse off with clean water and follow the evaporation of the moisture by a thorough sandpapering. Next proceed to fill the wood with a good mineral filler colored to meet surface requirements. Let the filler, after application, dry for 24 hr., and then apply two coats of orange gum shellac, sandpapering each coat carefully. A couple of coats of rubbing varnish, and one coat of finishing varnish, will then restore the natural wood finish to its proper sphere in the general finish of the car interior.

Some parts of the interior of the car, if not all, had best be given a rubbed and slightly polished finish. Door casings, door edges, stiles, and such other parts as are subject to considerable handling, will present a much finer appearance if so finished. All these parts are to be brought through with the necessary coats of rubbing varnish. The final coat should be a good grade of polishing varnish, freely applied.

Finishing Up the Surface

In due time rub this coat with pulverized pumice stone and water, then with rotten stone and sweet or crude oil, after which go over the surface with the palm of the hand, rubbing smartly until under the friction so generated a moderate polish is developed.

For a Higher Polish

In the event of a higher, brighter polish being desired, the surface after rubbing with oil and rotten stone may be polished by using a tuft of cotton or tow dipped in some approved make of varnish polish. The polish is a result of friction and this friction can best be developed by holding the tow or cotton in one shape until it becomes matted down and saturated with the polishing material to such an extent that in working it back and forth across the surface a sharp creaking sound is made.

A surface finished with this class of polish can be handled with impunity, and without leaving any visible signs of being "mussed up." For the closed cars in which it is desired to create an effect of real elegance coupled with creature comforts, with such effects to be maintained at their best at a minimum cost, the rubbed and polished finish offers advantages quite out of the ordinary.

The Interior Finish

More attention is being paid to the finish on the interior of the car, and to all interior appointments, than ever before. The rubbed finish either in the popular dull effect, or in the full polish luster, furnishes a maximum of value at a minimum maintenance cost, and confers the luxury of the drawing room upon the interior of the car.

The Dull Finish

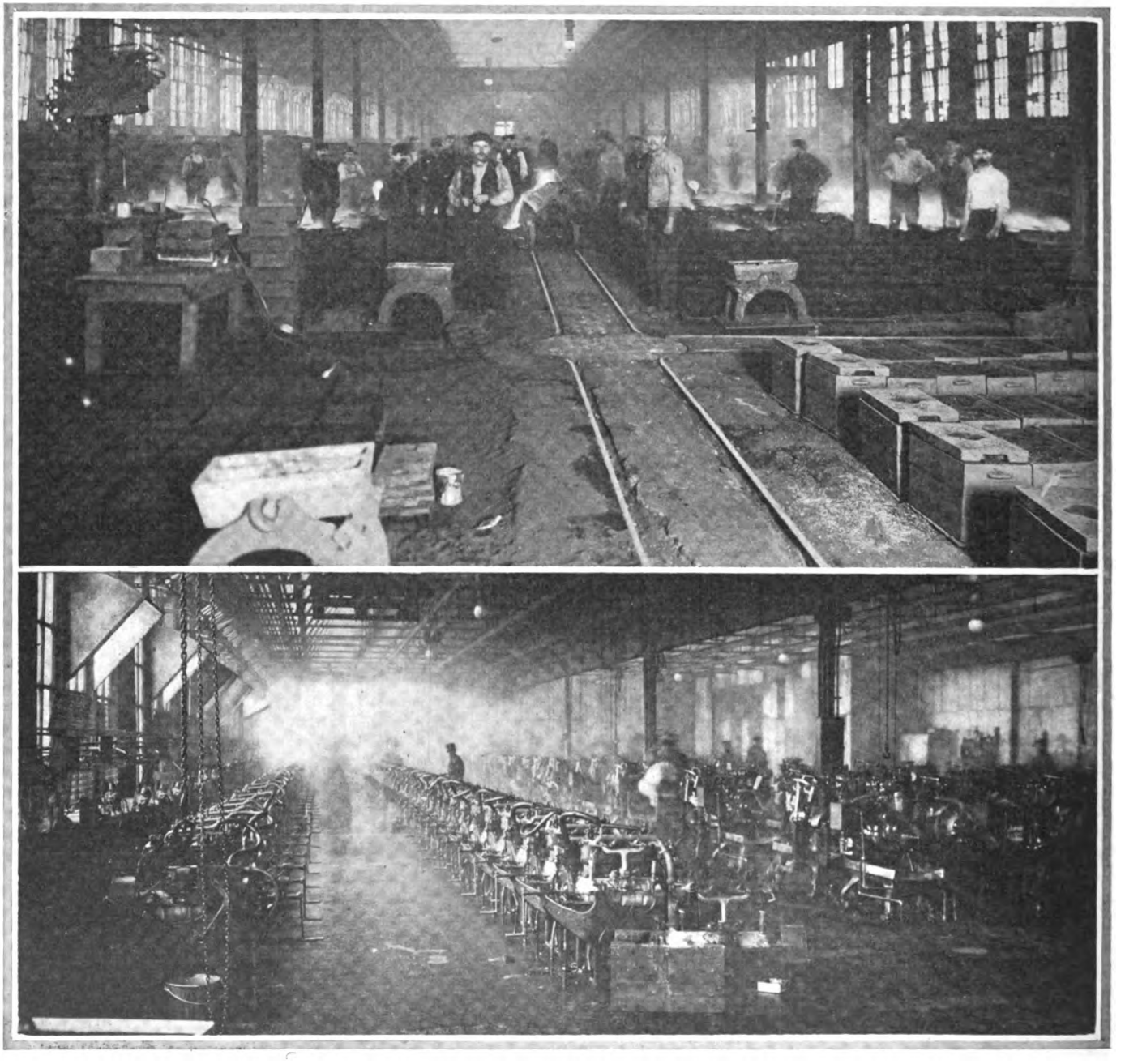
What has been stated with reference to the dull finish for the car finish applies also to the exterior. Everywhere the dull or "no-luster" finish is being exploited. This finish is being in some cases—in many cases, perhaps we should say—developed through the employment of enamel or flat drying paints. The best and most durable dull finish, however, is produced by bringing the exterior body surface up with the usual quota of varnish coats, and then rubbing the finishing coat to a dead, or an eggshell gloss effect.

Dart Makes Special Jitney Body

A SPECIALLY designed jitney bus body has been mounted on the Dart model C 144-in. wheelbase chassis. The chassis alone lists at $1,800 and a body 140 in. long at $750. The body is richly upholstered throughout and has push buttons as signals for the driver and dome lights. It is lighted from a Westinghouse generator and storage battery. The motor used on this car is a Buda 4⅛ by 5½ four-cylinder.

Another jitney bus built as a ten-passenger body fitted for any of the Dart chassis is shown herewith. This is known as model A and has the seats running lengthwise and the machine equipped with top and curtains for bad weather. This style car sells for $1,000 on the model A chassis, model B fourteen-passenger, sells for $1,633 and model C, eighteen passenger $2,105. The seats may be removed and the cars transformed into livery rigs in 5 min.

First and Last Stages in the Building of Buick Motors



THE factories of the Buick Motor Car Co., in Flint, Mich., are ever a source of interest to the visitor. In the views above are illustrated two vistas in the big factories, the upper showing metal being poured into the waiting moulds in the foundry department, and the lower giving some idea of what it means to test enough motors to take care of a 42,000 automobile output.

The motor casting part of the Buick factories is a building 526 feet by 80 feet, making an available floorspace of 1 1-2 acres. Nine million dollars is the sum annually expended in the payroll of the casting department which employs between 325 and 350 men in the making of all sorts of castings which go into the makeup of the car. The work of the department is not confined to iron castings, as it also makes aluminum gearcases, crankcases, etc., as well as iron cylinders, pistons and the like.

The motor testing department is always an interesting feature of an automobile factory. It impresses tne observer as being peculiarly indicative of the feverish activity of the whole plant. Here is concentrated all the power which many other departments are storing up, so to speak, as they add each part to the embryo motors. The Buick motor test room contains 200 test stands and there are complete facilities for putting each engine through its paces to the satisfaction of the inspectors. All adjustments are made and the power plant tuned up to its maximum productive pitch before it passes inspection and goes out into the world to rely upon its own powers.

The motor plant is 782 feet long by 360 feet wide, and is said to be the largest in the world devoted exclusively to construction of automobile engines. It covers 6.46 acres and in it the engines grow from a miscellaneous collection of parts to the finished state ready for transference to another building where they meet the chassis. The motor machine shop in this building contains 683 machine tools, representing an outlay of $800,000, and employs an average of 1,400 men. It can turn out 250 motors a day.

Data on Mixed Motor Fuels of Interest for American Export Trade

¶ *Under this title the first portion of Baron Von Loew's road tests with fuels composed mainly of benzol and alcohol in different proportions was printed in* THE AUTOMOBILE *of Oct. 14, and the importance of these tests for the American industry was explained. The following additional report amplifies these data, and a third report is still to come in which the author will account for the improved acceleration obtained with pure alcohol or fuels very rich in alcohol by narrowing the air channel around the jet of the carbureter.*

Other data very closely connected with the same subject were furnished in THE AUTOMOBILE *of Aug. 12 under the title:* "Car and Carbureter Design Suitable for Driving with Any Fuel" *and in the issues of July 29 and Aug. 5 under the title:* "Analysis and Valuation of Motor Fuels—14 Methods of Examining Them."

No material of equal value to the automobile industry and automobile owners on the subject of motor fuels in its relation to motor design has been collected anywhere else. It gives clues to a desirable independence of the petroleum supply not only in a hazy future but at almost any time when technical and active organization for that purpose is undertaken, and it opens extensive possibilities for a larger trade in automobiles in all those tropical regions of the earth which are now developing so fast industrially but where gasoline can never be as desirable a fuel as hydrocarbons of lesser volatility provided these are made suitable for use on equal terms of efficiency and convenience. Careful reading of the articles referred to will disclose their relations to American business and business prospects with such detail, precision and anticipation of objections as cannot be conveyed in a few general words. The problems still involved have advenced toward their final solution in a much more definite and practical manner than those relating to the application of the Diesel system to motors of light weight—which represents the only competing possibility in sight for gaining independence of the petroleum market and of the very considerable fluctuations in the composition of the available crude petroleums. The exclusion of Mexican wells from the market supply, for example, is even at this moment held accountable for a rise in gasoline prices, less by reason of the quantity excluded than on account of the less suitable composition for gasoline distillation of other raw materials, just as Russian petroleum has so far been effectually barred by its large hydrogen content. While not yet as pressing as in Germany, the interests to which these data relate in the United States do not, therefore, belong to a remote future but may at any time assume the greatest practical importance. Motors suitable for being operated with any fuel from pure gasoline to pure alcohol or kerosene may be in strong demand in two or three years not only for export but even for the domestic automobile trade.—M. C. K.

Please correct typographical error on page 711, issue of October 14. Under Table 10 read: "Hill-climbing trial-runs with ½ liter of fuel" instead of: "Hill-climbing trial-runs with ⅓ liter of fuel."

Driving Tests with Benzol-Alcohol Mixtures by Baron Von Loew—II

IN tables presented in the first parts of this report the capacity of the test car for acceleration and for sustained pulling with different fuels and with the motor developing its maximum of power has been shown for two different road formations and in the variations to which it is subject. Similar speed trials and comparisons have been made in numerous other places, and some of them throw special light on the fuel values. Details are given in the following.

For many tests it is of special interest to have them carried through with the motor working at the limit of its power. With my test car (Horch car, Audi works, 4 cylinders, 90 millimeter bore and 140 millimeter stroke, weight 1356 kilograms) this condition cannot be realized in practice except on a very steep road with little traffic, as on ordinary grades it easily reaches speeds which interfere with the traffic and therefore cannot be sustained. For this reason, as already mentioned in the previous account, the longest and most decisive tests at maximum motor power were made only on the steep road from Wiesbaden to Hohe Wurzel, the profile of which is given in the accompany illustration. As also mentioned, the first trials were made with 1 liter of fuel and began at kilometer-stone 3.9, while the later trials were made with only ½ liter of fuel and began at kilometer-stone 5.5. The most suitable places for comparing the speeds obtained under different fuel conditions are at kilometer-stone 6.5, the shortly before kilometer-stone 6.8, the exact place corresponding to about 6.75. On account of the gentler gradient after the 6.3 stone the speedometer registers highest at stone 6.5, and thereafter it drops at once rapidly, until shortly before stone 6.8 it is at its lowest. After this point the grade of the road is easier and the speedometer hand rises again. At the ½-liter trials previously mentioned the fuel often gave out before point 6.75 was reached, and any publication of the speed figures obtained could therefore only have been fragmentary. Other trials were therefore made, on Aug. 9 and 10, which began higher up. Those on Aug. 9 began at stone 6 and those on Aug. 10 at stone 5.8. The reason for going back from 6 to 5.8 illustrates the compromises that must be made for tests of this kind in practice. It was as follows: When starting at stone 6 the stronger fuel mixtures would carry the car far beyond stone 7, and here the road is much less steep than further below, which would make the comparisons of fuel consumption appear more favorable for the stronger mixtures than it really is. To avoid this flat upper stretch, which was reached only by the very strongest fuels, the start of the runs was thus laid back, not to 5.5 but to 5.8. The perfectly ideal test road can of course never be found, and in comparing the figures obtained one will always have to make some allowances for the peculiarities in the conditions.

Table 1 shows the results of the runs made on Aug. 9. They were made on a warm and bright day between 11.30 a. m. and 1.30 p. m., the thermometer registering about 25 deg. C. The runs shown in Table 2 are those made on Aug. 10, when it was still warm but cloudy with occasional

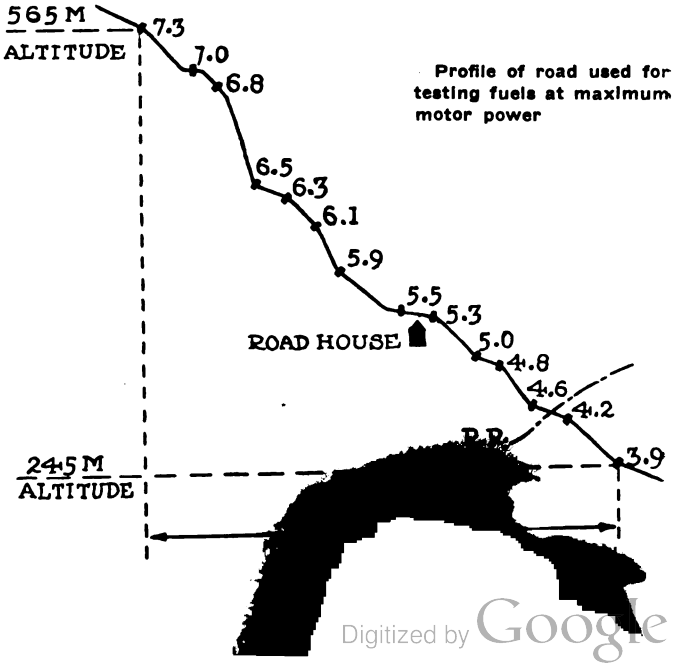


TABLE 1

Fuel, ½ liter	*Km.-stone* From To	*High Speed* Kw.-hr.	*Low Speed* Kw.-hr.
1 benzol + 5 alcohol	6.0 — 7.115	28 III	22 II
1 " + 3 "	6.0 — 7.27	34 III	24 II
1 " + 1 "	6.0 — 7.41	40 III	24 III
1 benz. + 1 kero. + 1 alc.	6.0 — 7.475	42 III	28 III
1 b. + 2 kero. + 1½ alc.	6.0 — 7.43	43 III	29 III

The Roman figure after the car speeds indicates the gear used when the car speed was recorded.

TABLE 2

Fuel, ½ liter	*Km.-stone* From To	*High Speed* Kw.-hr.	*Low Speed* Kw.-hr.
1 benzol + 5 alcohol	5.8 — 6.83	30 III	24 II
1 " + 4 "	5.8 — 6.86	30 III	25 II
1 " + 3 "	5.8 — 6.99	35 III	28 II
1 " + 2 "	5.8 — 7.15	38 III	5 III
1 " + 1 "	5.8 — 7.27	40 III	22 III
Pure benzol	5.8 — 7.26	40 III	24 III
Pure gasoline	5.8 — 7.15	40 III	24 III
1 benz. + 1 kero. + 1 alc.	5.8 — 7.12	40 III	17 III

light rain. In Table 2 the equal mixture of benzol and alcohol appears again more favorable than benzol alone, as on many previous occasions. In the column for lowest speeds in Table 2 it is interesting to note that the speeds reached on second gear as a rule are higher than those reached on third gear, and this is explained by the fact that at this steepest place in the road the motor speed became quite low on the third gear, in order to avoid a gear change. With the more alcoholic mixtures the change from third to second speed became necessary long before the steepest spot was reached. With the 1-to-2 mixture it was very questionable whether the third speed would have pulled through, as the speedometer had fallen to 5 kilometers per hour causing me to change and drive the last 20 meters on the second. The ability to drive on the third gear at such a low speed in this place, where the gradient is about 1 to 8, is characteristic of the sustained pull obtained with the alcohol and benzol fuels. With gasoline a similar drop of the car speed would be entirely out of the question; there would be first considerable clicking and knocking of the mechanism and, unless the gear were changed, the car would soon jerk a little and stop. German drivers have now become accustomed to this excellent quality of benzol and alcohol and accept it unthinkingly as a matter of course. But, if we were to return to gasoline, we would often be astonished at the motor's ready tendency to knocking, which has now almost been forgotten. [The author is speaking of the modern European motor with long stroke and a speed of about 3000 r.p.m., and it is only for motors of this type that his data on the efficiency of the fuel mixtures hold good.]

The runs made on August 10 and represented in Table 2 mark the close for the present of my tests of benzol-alcohol mixtures with a carbureter adjusted for gasoline and with the particular car employed. This car has during one year been driven about 3000 kilometers with benzol-alcohol mixtures. No injurious influences were experienced. The mixed fuels were found cheaper, for a given amount of road work, than unmixed ones, at the prevailing prices. As shown in numerous tables, the power efficiency of the mixed fuels was not always inferior, comparing volumes or weights, and where inferiority was shown it was usually slight. With the strongly alcoholic mixtures the difficulty arose on cool days that it was inadvisable to load the motor down suddenly; on approaching a rise in the road gradient the throttle had to be opened gradually in order to keep the motor warm enough. But it may be said at once that this difficulty can be almost overcome, as the motor worked well with unheated mixtures rich in alcohol and with clear alcohol after the area of the air channel around the jet in the carbureter had been contracted. The trials made with the carbureter modified in this manner remain to be accounted for, but they have not yet been quite brought to a close. I have already reached the viewpoint, however, that it is more than a mere trade puff when some makers of motors and of carbureters contend that their productions work just as well with alcohol as with gasoline. On the very first run of my own series of trials with a contracted carbureter I attained almost exactly the same power efficiency as previously with gasoline and a carbureter of normal section. The fuel consumption is also much more moderate than assumed at most automobile factories. It is regrettable that evidently very few know what an excellent fuel alcohol is for motor vehicles. The smaller heat value of alcohol is balanced, so far as power efficiency is concerned, by its smaller need of air for combustion, which permits us to burn a much larger quantity of alcohol in a given time in our automobile motors than we can burn of gasoline or benzol.

The principal trouble with alcohol as an automobile fuel arises through the rapid variations of the motor load. On long trips over level roads the motor becomes so cold that it is hard to make it pull for a hill, but numerous expedients are at disposal (see THE AUTOMOBILE for August 12, page 289) for heating the intake channel and completely overcoming this drawback.

Facts About Rust and Its Formation

WHILE everybody knows considerable about rust, few know enough for practical purposes, and some of the facts which have been observed in connection with the formation of rust under unusual circumstances are still only partly explained by science. To enable owners of automobiles to protect their vehicles against the inroads of rust with a better understanding of the task than that usually possessed outside of the chemical profession, Dr. P. Martell gives in *Auto-Technik* a line of information on this subject which covers the ground in a practical manner and which is reproduced in part in the following.

Chemically, rust is a combination of metallic iron with oxygen and water. In 100 grams of dried iron rust the proportion is about 52.3 grams of iron, 22 grams of oxygen and 25.7 grams of water. The water is chemically combined, not free. It is permissible to conclude from this composition of rust that is can only be formed when iron comes in contact with both oxygen and water. And practice confirms this conclusion, showing that, if either oxygen or water is absent, no rust is formed. Iron remains free from rust, for example, in water which contains no oxygen. Also, steel and iron can be protected almost completely, if there is placed in the room where the metal is kept a quantity of chloride of calcium, which draws all water out of the air in the room.

Oxygen alone, as said, does not attack iron at ordinary temperatures. Fine steel instruments can be easily protected by taking advantage of this fact. To this end a layer of dry chloride of calcium is placed in the bottom of a glass vessel which can be closed by an airtight cover and the instruments are placed upon, or suspended from, an intermediate and perforated wood or cardboard cover plate secured in the vessel, after first dipping the instruments in alcohol to remove traces of water. Ordinary atmospheric air, containing free oxygen and usually a considerable admixture of water vapors, is of course strongly rust-forming, and the same applies to all organic and inorganic acids, even the weakest, to all chlorides of metals and alkalies and to all salts which

are hygroscopic or rich in water. Spring, well and rain water cause rust quickly, but if it is boiled first, so as to drive out the oxygen it contains, iron immersed in it will not begin to rust until the water gets a chance of absorb oxygen from the atmosphere again.

Cold water causes rust more easily than hot, because it contains more oxygen. Rain water is particularly injurious because it has absorbed a great deal of oxygen while passing through the atmosphere. The active agent in rust formation may be said to be a solution of oxygen in water. But carbonic acid also plays a certain part, being constantly produced as the rusting process continues. One of the main questions is now: How and why does rust go on forming after a layer of it has once appeared? In the case of zinc and lead, when it is exposed to air, a thin skin of metallic oxide is formed which remains unchanged and protects the metal under it against all further change. The first layer of iron rust, on the other hand, forms a porous mass which continues to admit oxygen, while it attracts liquids, especially water, by precipitation as well as by capillary action. For this reason the contention that rust produces rust is justified. To be sure, it is not truly the rust which produces more rust, but its porous nature supplies the condition for additional formation. If old or new rust is kept free from water no increase takes place.

A notable phenomenon in iron which is rusting is the marked increase of volume. This is sometimes of special importance, as the expansion takes place with considerable force and has been known, for example, to drive big building stones apart which had been set with iron clamps in mortar. It might similarly, through rust formation between spring leaves, cause the stripping of spring clip nuts in an automobile. Plaster of Paris also has an unfavorable rust-forming effect on iron inclosed therein. Pure cement, on the contrary, furnishes an active protection, even when used as a mere paint.

Science has not yet given sufficient explanation for the fact that the rust formation on an iron surface takes place in unequal degree, though the atmospheric conditions are the same for the whole surface. It is ascribed to the variations in the metallographic structure of the iron, porous spots being most exposed, and this agrees with the observation that the vicinity of fissures is always most strongly attacked, and also with the comparative immunity of the dense alloys of iron formed with nickel and chromium.

Muriatic acid and common salt generate rust quickly by contact, and if sheet iron shows small almost invisible holes this effect can with certainty be ascribed to acids. Paper, as used for wrapping purposes, usually affords an excellent rust protection.

The coloring of rust varies greatly. Fresh rust is usually a bright yellow, changing with age into brown and almost to black, but the change of color does not always take place. When rust occurs as a fine powder it is mostly yellowish-red, like the iron oxide found in nature. The porous character of rust renders it possible to soften it by making it absorb kerosene, whereafter it can be rubbed off with sandpaper, pumice or emery.

In practice the means for keeping rust away are more important than those for removing it. These means may be intended to be temporary or permanent and are classified accordingly. Reference to the permanent means—enameling, galvanizing and electroplating, chemical browning and blacking, etc.—may here be entirely omitted, but a few facts may be mentioned with regard to temporary protection, these being applicable to a considerable extent when a car is laid up for the winter months or longer. To protect small iron objects for some length of time, a quick-drying solution of rosin, an alcoholic lacquer or a solution of celluloid is much more effective than mere oiling or coating with graphite, which however are sufficient for short periods if the atmosphere is kept dry with chloride of calcium.

Where oil paint can be used it is well worth remembering that its protecting effect is much more lasting if the paint is dried artificially at a temperature of 50 to 60 deg. C. Before any painting is applied all previously existing rust should be removed, as no means has been found for preventing a rust spot from spreading and deepening under a coating. The more varnish a paint contains the more protection against rust does it afford. If a coating of oil is first removed from an iron surface, as it always should be, before a more permanent coating is applied, great care must be taken that this removal is complete, as otherwise the more permanent coating will adhere and cover only very imperfectly.

Utility Tractor Is Four-Wheel-Drive Design

Utility Steel Tractor brought out by the company of the same name in Antigo, Wis., recently. It is a four-wheel drive arrangement steering with both axles. The engine used is a four-cylinder heavy-duty governor type which has three speeds forward and one reverse. The gearset is so designed that when the engine is working under load, such as pulling four or five plows, it is direct-connected. The power is not transmitted at this time to any intermediate gears. From this condition there is a step up in speed and also a step down as well, providing either more power or more speed as desired. In the way of material, all the castings are of steel, the gears of alloy steel with hardened and ground teeth, and the bearings are Timken rollers. The wheelbase is 8 ft. and the overall length 12 ft. 6 in., the width being 6 ft. 6 in.

Two sizes of tractors are built, the large one weighing 7500 lb. and the smaller 5500. The large size is capable of pulling four or five 14-in. plows and the small size three or four 14-in. plows.

The Rostrum

Heat a Factor in Valve Clearance

EDITOR THE AUTOMOBILE:—Please publish proper clearance between valve stem and valve stem guides on a T-head motor and whether or not the clearance on the exhaust and intake sides should be the same.

My car has developed hard starting and constant missing at low speed. Upon investigation we find abnormal clearance between valve stem and valve stem guide on intake side, and expect to ream the guides to fit new valves. Will this overcome our difficulty?

Bridgeport, Conn. S. L. B.

—The amount of clearance between your valve stems and valve guides will depend upon how efficacious the cooling system is. A car which is amply cooled requires less clearance in parts likely to expand than one which is inadequately cooled. A clearance of 0.004 in. will not be too much where the parts are subjected to high temperatures. It might be best to try a clearance of 0.002 in. and gradually enlarge it if necessary by lapping in the valve stems.

New Motor Will Give Higher Speed

Editor THE AUTOMOBILE:—I desire to refinish and repaint my car and am thinking of finishing the wheels in natural wood color, artillery type. Is this simply a varnish over the natural wood after the present paint has been scraped and sandpapered off?

2—I also intend to install a model C 3¾ by 5 Wisconsin engine in place of the four-cylinder 4 by 4 engine I have at present. The car has a racing type body, 32 by 3½ tires, weighs 2400 lb., is geared 56 by 17 on direct drive. What speed should this engine give me? The present one will not give much better than 40 m.p.h.

Suffern, N. Y. H. S. V.

—Yes.

2—It is quite difficult to guarantee a car speed as there are so many things which must be taken into consideration. The Wisconsin Co. states that its 3¾ by 5-in. motor has driven a 2200-lb. car 60 m.p.h. It is necessary to have an easy-running chassis in order to attain this speed. With a fairly good design you should have no trouble getting 50 m.p.h.

Magnalium Is a German Product

Editor THE AUTOMOBILE:—What foundries in the United States make magnalium?

2—What is its formula?

3—What are its physical properties?

4—How does it compare with aluminum in strength, etc.?

5—How does it compare with bronze in strength, etc.?

6—What acids, if any, affect it?

7—Is it difficult to machine?

Chicago, Ill. H. E. L.

—There is no foundry in the United States which makes magnalium. Magnalium is the name of a German metal and was imported into this country before the European war broke out and made into castings by the Walker M. Levett Co., New York City. There is no magnalium in the United States to speak of at the present time, and it is doubtful if same is being manufactured in Germany at this time. The Walker M. Levett Co. undertook to produce a metal similar to magnalium when the supply was cut off in August, 1914, and, securing the proper formula and process of manufacture, succeeded in producing the alloy known as magnalite, and this metal has been used since for piston purposes.

2—The formula is not known to any other than the makers.

3—Their physical properties are:

Magnalite	*Magnalium*
Specific gravity—2.59	The same but showing a tensile strength of 4000 lb. per sq. in. less than magnalite.
Weight—161.5 lb. per cu. ft.	
Thermal conductivity—92.0	
Tensile strength 25,400 lb. per sq. in.	
Coefficient of expansion —0.000025.	
Elastic limit—16,800 lb. per sq. in.	
Compression strength—128,000 lb. per sq. in.	

4—This depends entirely upon what is meant by the word aluminum. If pure aluminum is referred to, the table below will give the desired information.

	Magnalite	Magnalium	Aluminum 99 %	Cast Iron
Tensile strength, lb. per sq. in.	25,400	21,400	14,000	16,500
Compression strength, lb. per sq. in.	128,000	128,000	12,000	*90,000

*Average.

However, pure aluminum is not used for commercial purposes without being alloyed; it is therefore necessary to state the alloy before this question may be answered intelligently.

5—There exist many kinds of bronze. The word "bronze" itself means little unless the kind is stated. Certain bronzes show as high a tensile strength as 80,000 lb. per sq. in. and others less than No. 12 aluminum alloy. It is consequently impossible to answer this question with the incomplete data on hand.

6—Concentrated sulphuric acid acts only very slowly on the metal, although the sulphuric acid of commerce usually contains an amount of hydrochloric acid sufficient to rapidly act on the metal.

Nitric acid, either concentrated or dilute, has very little action on magnalite when cold; when heated it acts very slowly.

Sulphur has no action at a temperature less than a red heat.

Magnalite is found to withstand the action of organic secretions better than silver, and is receiving large use for dental plates and surgical instruments, and in places where subjected to carbolic acid or other antiseptic solutions. Magnalite is little acted upon by salt water. Solutions of salt and vinegar, such as it is apt to be subjected to in ordinary culinary operations, do not injure the metal. Magnalite is little acted upon by mineral waters, and withstands the action of sea water better than iron, steel or copper.

Magnalite is not acted upon by carbonic acid, carbonic oxide, or sulphretted hydrogen; but on being melted, will

absorb these gases, quite a portion of which is again excluded on the metal cooling.

7—It is not difficult to machine. It differs in this respect very considerably from aluminum, inasmuch as the chips are emitted very readily without the tendency to bind between the tool and the work. It may be run at very high speed in turning, and an extremely high finish may be obtained on same without grinding. This latter operation is dispensed with entirely in piston finishing.

Cannot Use Battery on Magneto Side

Editor THE AUTOMOBILE:—I have a 1910 Cadillac, which has two separate ignition systems, one for batteries and one for magneto with two sets of plugs. I have taken off the battery system and have been using the magneto system through the summer, and had no trouble in starting, but since the fall has set in, I have considerable trouble in getting the car started on the magneto.

I would like to know if I can arrange the magneto so that I can send the battery current through the distributer and use the one set of plugs.

Martinsburg, W. Va. R. N. S.

—It would be impossible to obtain proper ignition by connecting a battery on the magneto side of the 1910 ignition system. Try closing the spark plug points a little.

Putting Ammeter on 1915 Hupmobile

Editor THE AUTOMOBILE:—Kindly furnish me with the necessary instructions to install a charging and discharging ammeter on the 1915 Hupmobile.

Maysville, Ky. K. B.

—The accompanying illustration, Fig. 1, gives you the connections of the battery, motor, generator, etc., and indicates where the ammeter is to be connected.

Turbines Too Large for Steam Cars

Editor THE AUTOMOBILE:—Explain the operation of the Diesel and Oil-Pull oil engines. By whom and where are they made? If foreign made, who is the agent in this country? I understand that these engines use a crude oil for fuel and that it is fed into the cylinders under about 500 lb. of pressure. Is this correct? If so, explain fully. Why does it carbonize in the cylinders? What ignition and oiling system do they use? What kind of valves? When will their patents become invalid?

2—Could a steam turbine be used in the Stanley steam car to furnish the motive power? If not, why?

3—How many cylinders has the Gnome rotary type motor? How is it attached to the crankcase? How cast, in pairs, fours or single? How many revolutions per minute will it make? How is the gas fed to the cylinders? What oiling system does it use? What kind of valves does it use? What is the greatest fault of this motor?

4—What is the hydraulic brake like?

5—Were the timing gears on the 1913 Lozier light six made of cloth? If so, explain the process by which they were made? Could transmission gears be made this way? If not, why?

6—What is meant by candlepower and volts in electric lamps?

7—Who makes the following parts for the Woods Mobilette, and what is its piston displacement?—Motor, axle, frame, body and steering gear?

8—Will you allow a reader space in each issue or answer a contribution otherwise?

Cooper, N. C. S. T.

—In a Diesel engine the piston on the first down stroke draws in pure air. This is compressed to a very high pressure on the up stroke and as it descends again, oil is blown in through a nozzle in the cylinder head by means of air under a pressure of 1000 lb. per square in. or more. High compression of the air in the cylinder makes it hot enough to ignite the oil which is blown in. The last stroke is a plain exhaust stroke as in a gasoline motor. The Diesel engines are made by many firms in many parts of the world. It would be impossible to publish a list of them here. The valves used are usually poppet valves. The basic patents have long since expired, but the success of the Diesel engine depends mainly upon patented details.

2—No, because it has not so far been possible to make a steam turbine in small sizes.

3—Either seven or fourteen. The cylinders are not cast, but are cut from solid blocks of steel. It makes about 800 to 1100 revolutions. Gasoline is fed through the crankcase and then through valves in the piston heads. Oil is fed with the gasoline. Concerning the motor's greatest fault, would refer you to article by W. F. Bradley in THE AUTOMOBILE for Oct. 21.

4—Brakes which are operated by a fluid medium.

5—Compressed cloth gears have been used for crankshaft drives for many cars. They are made by various processes in which very heavy hydraulic pressure is used to compress the material. The gears cannot be used for transmissions, because they would not stand the jar of engagement consequent upon frequent shifting.

6—Candlepower is the way of measuring the amount of light given by the naked electric bulb without a lens or mirror. Candlepower is a scientific unit of measurement of light. The voltage shows the nature of the current to which the lamp is suited.

7—The parts you mention are not stock parts and are made specially for the car. The piston displacement of the Woods Mobilette is 86.4 cu. in.

8—Whether we publish a letter or not depends upon our estimate of its interest to readers generally. We are always willing to answer any number of letters from readers through the mails.

Wants Hp. Rating of Two Sixes

Editor THE AUTOMOBILE:—Will you please send me the formula rating of horsepower on the Velie light six automobile engine of 1916?

2—Also the rating of the Buick light six of 1916.

Sugar Grove, Ill. J. S.

—The formula rating of both cars is 25.35 hp.

Oldfield's Christie Holds No Records

Editor THE AUTOMOBILE:—Kindly give me the records held by Barney Oldfield's Christie car.

Philadelphia, Pa. B. U. G.

—At the present time Barney Oldfield does not hold any A. A. A. record with a Christie car.

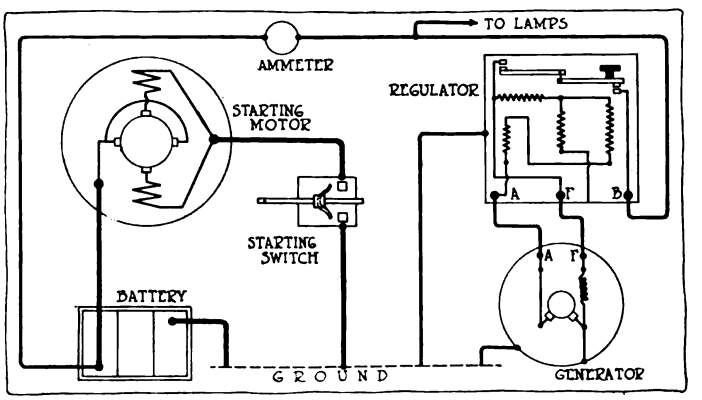
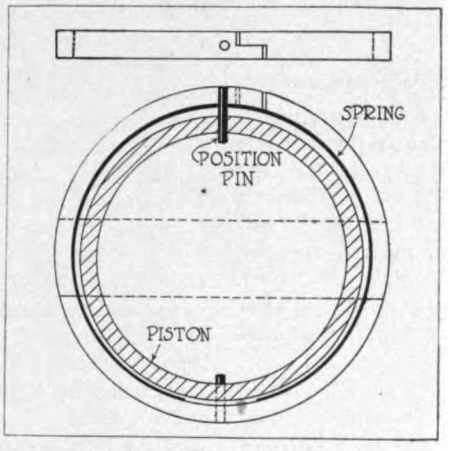


Fig. 5—Wiring diagram for installing ammeter on 1915 Hupmobile

ACCESSORIES

Peerless Simplex Piston Ring

AS shown in the accompanying illustration, this is a lap joint ring within which is a special heat-proof steel spring for preventing leaks at the lap joint. Two or more of these rings per piston should be used, there being a pin in the piston to hold each ring and spring in position, the pin shown in dotted lines in the illustration being that of the adjacent ring, which in each case is diametrically opposite. The rings should be lapped in on worn cylinders if not bearing properly in the same position as pinned on the piston. To place the steel springs in position the rings are placed partly over the grooves and the springs are inserted beneath the rings which are then forced over them and into the grooves. These rings are designed to save oil and to prevent loss of power due to leaky and inefficient piston rings. Prices run from 45 cents each for the 2½ to 3½-in. diameter sizes, the width being 3/16 to ¼ in., to 65 cents each for the 5⅝ to 6-in. diameter with widths of ¼ to 5/16 in.—Peerless Piston Ring Co., Newark, N. J.



Peerless Simplex piston ring

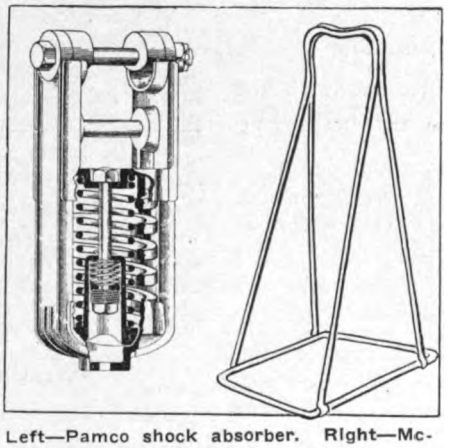
McKinnon Tire Storage Stand

This stand is designed to hold tires off the ground and is made in two sizes, one for Fords and other small cars and the other for larger cars. The small sizes are 15¼ in. high and the other 17 in., the bases being 7 by 8 in. in each case. A set of four of the small sizes weighs 10¼ lb.; and of the large size 11 lb. The stands are made of electrically-welded steel.—McKinnon Dash Co., Buffalo, N. Y.

Pamco Shock Absorber

The Pamco shock absorber is a device intended to replace the ordinary spring shackle and at the same time afford an absorbing device which will compensate for the action of rough roads. The entire device, which is illustrated in section, consists of a triple spring arrangement mounted in a malleable steel yoke forging. The main member is a vanadium steel shock absorbing spring which takes direct loads and acts as a medium between the axle and the regular leaf spring. The shock absorbing spring is a coil and has within it another coil spring which is a self-adjusting load spring and which automatically takes on the proper degree of compression by conforming itself to the weight placed upon it by the car. Through the center of these springs is an equalizing bolt upon which the spring rebound housing travels and at the end of this bolt is a vanadium steel rebound absorbing spring.

The self-adjusting load spring is connected with one shackle bolt while the other shackle bolt connects with the other end of the absorbing device, giving a floating medium which is the shock absorber, between the two shackle bolts. The device sells for $15.—Auto Devices Co., St. Louis, Mo.

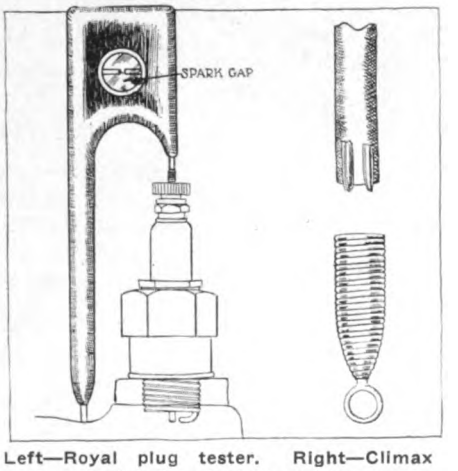

Left—Pamco shock absorber. Right—McKinnon storage stand

Royal Plug Tester

Instead of using a screwdriver or other tool to test a spark plug by grounding it to the cylinder, the Royal tester is used. It is made of an insulating composition and a brass wire runs through it, one end being exposed for application to the plug and the other end exposed for application to the cylinder. A spark gap is placed in the body of the tester with a mica window on each side; this takes the place of the gap made between the end of the screwdriver and the cylinder and is safer because it does not strain the insulation of the coil or magneto by forcing the spark to jump too wide a gap. The tester sells for $1.—Royal Tester Co., Pittsburgh, Pa.

Climax Spring Terminal

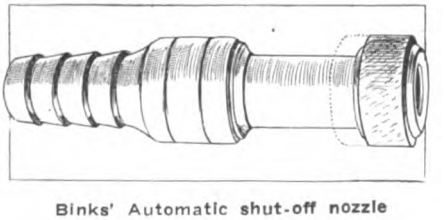
In the Climax terminal, spring steel wire is coiled into the form of a tapered tube with a loop for the spark-plug terminal at the small end and the other end is left open. The insulation of the cable is stripped off for about ⅝ in. and the stranded wires separated and folded back on the cable, which is then inserted in the open end of the terminal with a twisting motion. This provides contact but does not place any strain on the wire of the cable. The makers state that it is impossible for the terminal to work off. Various sizes are made for cable of all outside diameters. A special brass terminal is made for primary batteries.—Climax Motor Devices, Cleveland, Ohio.

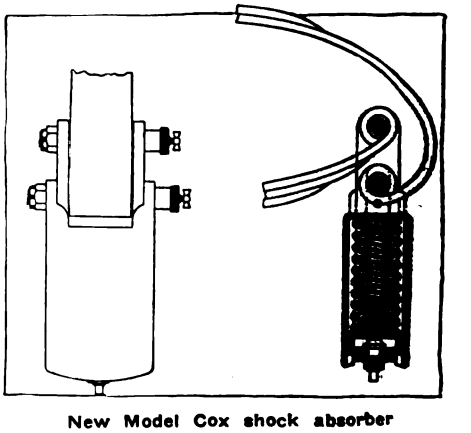


Left—Royal plug tester. Right—Climax spring terminal for cables

Cox Shock Absorber

This shock absorber is still made with three coiled springs nested and adjustable from the bottom by means of a threaded rod with a locking nut to hold it in position. The head and cylinder are now


Binks' Automatic shut-off nozzle


New Model Cox shock absorber

made in one piece to avoid the possibility of weakening at joints. All the bearings have machine fits and the sliding rods are fitted with fiber bushings to make them quiet. The slide bearings have been increased in length to 5½ in. The piston or plunger is 2 by ¾ in. Fittings are made for spring widths of 1¾, 2, 2¼ and 2½ in., and shackle bolts, which are drilled and fitted with grease cups, are made in various sizes. Five different spring weights are made, so that the combination best suited to any particular car can be used; charts are supplied to dealers showing plainly what combinations of springs to use under given conditions. Price, $10 per set.—Cox Brass Mfg. Co., Albany, N. Y

Binks Water Valve

The Binks valve for car washing has an automatic shutoff which stops the flow of water the moment the operator releases his hold on the nozzle, a pressure of the thumb being sufficient to keep the valve open. The nozzle is nickel-plated brass with a rubber bumper to prevent damaging the paint. It is made for ¾-in. hose and sells for $1.—Star Brass Works, Chicago, Ill.

New-Type Lamps for Fords

This is a set of lamps designed to take the places of the standard Ford side and tail lamps; they can be attached by bending the original brackets. The set includes, in addition to the lamps, all wiring, connectors, body bushings and switch on each lamp. Lenses are of the semaphore type. Bulbs are supplied in voltage as ordered. The set comes neatly boxed, ready for installation, and sells for $5.—Wood Mfg. Co., Fairfield, Conn.

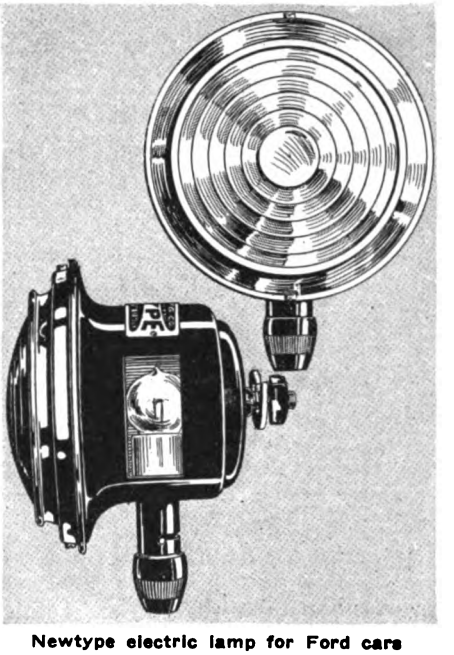
Affa Spindle Adjuster

The Affa spindle adjuster for Ford cars consists of a strong flat steel spring fitting inside the steering rod yoke and pressing against the spindle arm, the pressure automatically taking up wear and preventing rattle from looseness. The adjusters sell for 50 cents per pair. —W. S. Graffam, Northampton, Mass.

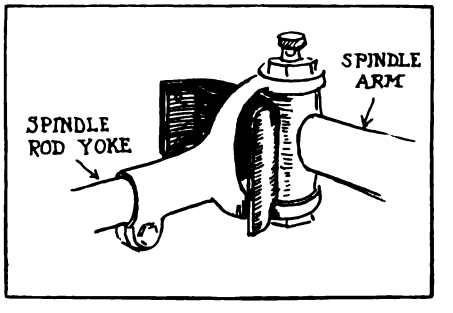
Burners for Gas Lamps

Users of acetylene lighting will be interested in the Brilliant type of burner which is claimed to increase the intensity of the light three times without increasing the cost of operation. That is, while the common acetylene burner gives 20 candle power, according to the makers, the Brilliant burner will give 60 without using any more gas. The burner is interchangeable with the ordinary burner, and its principle depends upon the use of the small incandescent button ⅞ in. diameter. An acetylene jet is projected against this button and the upper part of the burner is turned so that the face of the button is toward the reflector, as shown in the illustration.

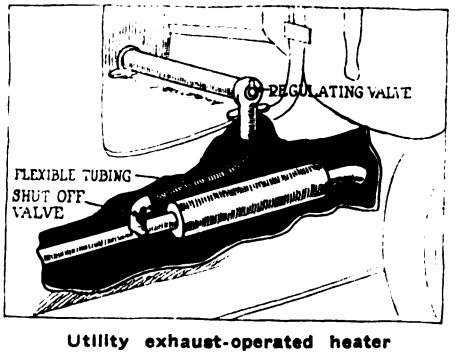
This is the position of the button for ordinary driving. To produce a diffused or spreading light it is only necessary to turn the white face of the button away from the reflector, which will immediately cut out the reflector and dim the light. The price is $3 per set, consisting of two burners complete and one extra button. Extra buttons sell for 70 cents per pair. —Monosmith Bros., Spencer, Ohio.



Newtype electric lamp for Ford cars



Affa steering spindle adjuster



Utility exhaust-operated heater

Utility Exhaust Heater

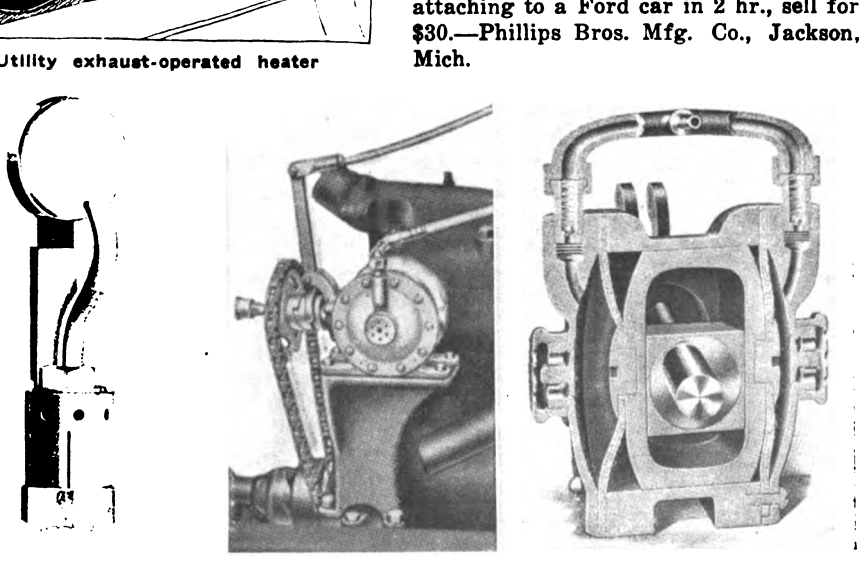
This heater consists of a tubular footrest through which part of the exhaust is allowed to pass, after which it escapes into the air. A small pipe is tapped into the exhaust pipe ahead of the muffler and is led to one end of the heater-footrest; a regulating valve is inserted at the junction. The waste pipe at the other end of the heater completes the equipment. The boring of two small holes in the floorboard with the drilling and tapping of the exhaust pipe and the screwing of the heater to the floor are the only operations required for installation. It lists at $15.—Hill Pump Valve Co., Chicago, Ill.

Champion Duplex Tire Pump

It is claimed that the Champion duplex diaphragm pump will fill a 3-in. tire up to 60 lb. in less than 40 sec., it being possible to run it at 800 r.p.m. for an hour without trouble. As shown in the illustrations, there is an eccentric driver and two diaphragms so that there are two pumping operations at every revolution. One of the points of design is that the pump is so constructed that it is impossible to pump oil into the tire, an exceedingly valuable feature inasmuch as oil is very injurious to the rubber of the inner tube. The principle of operation is shown in the sectional illustration. These pumps sell for $20 each.—Champion Auto Equipment Co., Chicago, Ill.

Phillips Elliptic Springs for Fords

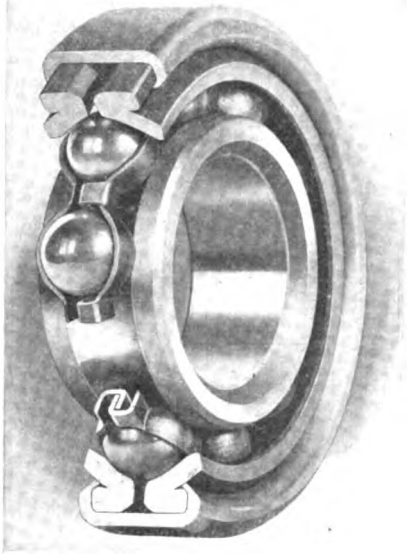
Four elliptic springs and all parts for attaching to a Ford car in 2 hr., sell for $30.—Phillips Bros. Mfg. Co., Jackson, Mich.

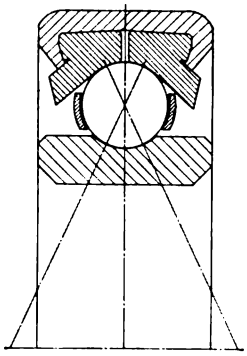


Left—Monosmith Brilliant burner for acetylene lamps. Center—Champion duplex diaphragm tire pump, showing mounting. Right—In section

Schatz Annular Bearing Takes Thrust

Sustains 50 Per Cent of Rated Radial Load in Either Direction Without Adjustment





Above — Diagram showing ball support in Schatz annular bearing

Left — Cutaway section of Schatz bearing, showing assembly

AN annular ball bearing capable of sustaining a thrust load of 50 per cent of the rated radial load in either direction and without adjustment, has been brought out by the Schatz Mfg. Co. of Poughkeepsie, N. Y. The bearing which is known as the Schatz Universal annular ball bearing gains its ability to withstand end thrusts due to the arrangement of the outer race which provides two points of contact instead of one as in the conventional type of bearing. Thus the balls have three points of contact, two points in the outer race rings and the third located in the inner race ring.

The Two-Point Contact

Referring to the assembly view, it will be noted that the outer race is in two parts each of which have a curved recess generated on their inner periphery forming a raceway for the balls. It is here that the two-point contact is secured. A curved ball track is generated on the outside of the cone or inner race ring and is designed to allow precise co-axial rotation. The curvatures of the raceways in the outer race rings and in the cone are 4 per cent greater than that of the ball therefore giving, theoretically, point contact, although under load providing a contact area large enough to support a high thrust load.

The two-point contact of the outer race is so arranged that the points are located at a given angle on either side of the center line of the bearing while the center line passes through the third point of contact at the inner race. Diagrammatically the three-point contact gives a triangular support which gives a resultant action that permits the high end thrusts to be endured.

Large Thrust Overload Permissible

While the bearing cannot be called a thrust design, the large thrust overload permissible in many cases would obviate the necessity for an additional thrust bearing and would consequently lessen the cost of the installation as a general rule in such instances. It is also claimed for the bearing that the three-point contact increases the load capacity since with this arrangement the shock is not transmitted through the centerline of the ball. Broken balls are practically always due to a shock through the center and with the three-point contact, the area affected is so much greater that the unit stresses are smaller.

The actual construction of the bearing is shown in the accompanying illustrations and the triangular layout of the support is also shown. The cup rings are a press fit in the outer case and after assembling the case is closed over the cups thus permanently fixing the inter-relationship between the various parts of the bearing.

Maximum Number of Balls Used

The ball separator, which is also shown, is of pressed steel and is a self-locking design without rivets. The principle upon which the separator is constructed allows the maximum number of balls to be used and also supports them upon their axis of rotation or at the points of least friction and wear.

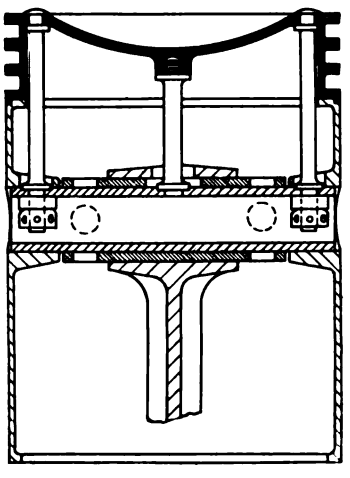
The accuracy of the balls is checked to 0.0001 in. and the surface finish is also carefully checked to insure smooth and quiet running.

All Parts Heat-Treated

High quality materials are used throughout in manufacture; all parts being high carbon chrome alloy steel except the case and ball separator. All the steels are made to a definite analysis and must conform to the required physical standards. As a check on the materials, each heat is analyzed to determine the chemical constituents of the steel. All the parts are heat treated in the furnaces of the Schatz company, which are carefully checked by delicate electrical pyrometers.

The dimensions of the bearings, as regards diameter, width and bore are in accordance with the international standards covering these points which renders the bearing interchangeable with those of other makes. S. A. E. standards are used throughout.

New Steel Piston Design



C. Y. Knight's steel piston

THE accompanying cut shows a built-up steel piston recently the subject of a patent granted to C. Y. Knight. The idea is, of course, to combine lightness and strength for purposes where cost of production is a secondary matter. The method for supporting the wristpin directly from the head permits the pin to have a very long bearing in the connecting-rod, and the piston should be a far better manufacturing proposition than a steel piston cut from the bar in one piece.

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, December 9, 1915 No. 24

THE CLASS JOURNAL COMPANY

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

More Class Legislation

THE proposal in the President's message to Congress to tax automobiles 50 cents per horsepower and also to impose a tax of 1 cent per gallon on gasoline can only be looked upon as a double taxation on progress. It is class taxation of a highly discriminatory character and a movement that will meet with country-wide opposition, not because the people do not want to carry their just share of the burden of taxation for national defense or other legitimate measures, but, because the present plan is diametrically opposed to the spirit of equality defined in the constitution.

In meeting emergencies, such as Congress is today confronted with, the equitable plan is to tax all forms of business on a uniform basis, rather than the highly unfair method of selecting certain businesses that may be more in the public eye than others and placing the burden on them. The American citizen is fully cognizant of the necessities of taxation, he or she does not desire to shirk responsibilities to the nation, but asks for a just division of them.

Automobilists are in accord with any effective, just program, and hundreds of thousands of them stand ready to place their cars at government disposal for national defense if emergencies arise, but these hundreds of thousands should determinedly combat this latest form of class taxation.

Progress in Ignition

DURING no period of the history of the automobile industry has the demand for the most efficient ignition been so great as at present. The requirements are more severe upon this part of the motor functioning than ever before and it is but natural that developments have been made in the ignition field and are even now in progress.

Higher speeds and more cylinders are translated to the ignition manufacturer in terms of more sparks per minute. This means faster breaker mechanisms, faster coils and the elimination of inefficiencies due to lag in the current and due to losses of time in the mechanical actuating mechanism. The methods by which the difficulties have been overcome show that, highly ingenious as the ignition system of to-day is, its limit and capacity have not even nearly been reached.

Perhaps the most significant feature of the ignition development is that in no case has it been necessary to abandon the elementary principle upon which a system operates. Where makers have made improvements it has been merely in the way of lightening breaker parts to overcome inertia, increasing the speed of the coil by improved manufacture and simplifying and rendering more efficient the switches controlling the circuit and the mounting of the unit on the motor.

Ignition for eights and twelves running at high rotative speeds has not puzzled to any alarming extent ignition manufacturers, and where twelve-cylinder motors have been brought out, makers have not been put to any difficulty in securing suitable ignition for them. Improvements, however, are under way even now in the multi-cylinder field and there is no doubt that important ignition progress will be noted within the next few months.

Lubrication in Extenso

THE European car described on page 1 is not being manufactured yet, as manufacturing is understood even in Europe, but even though it is no factor on the markets of the world, even though it may never be manufactured in its present form exactly, it marks a milestone in automobile development. It is reputed to perform well, but did it lack power; did the main frame design prove wrong, the axles weak, the motor inefficient, it would make no difference. A car which needs no attention whatever more often than twice a year is so important an advance in idea upon the conventional principles of automobile engineering that it cannot ever again be forgotten.

This car demonstrates that complete automatic lubrication for every part, however small, is a practical possibility, and that its cost would not be prohibitive. The application to a more conventional type of chassis is a mere matter of detail work, it is the main principle that is so impressive. In a year of enormous development in America and of equally great stagnation in Europe, the latter hemisphere has to its credit at least this achievement.

S. A. E. Winter Session Program

Standards Committee Meets Jan. 4 and Whole Body on Jan. 5 and 6

NEW YORK CITY, Dec. 7—The program for the winter activities of the Society of Automobile Engineers which will extend over Wednesday and Thursday, Jan. 5 and 6 as regards the meeting of the whole body, and Jan. 4 for the Standards committee has been tentatively announced. The meeting will be held at the Engineering Societies Bldg., at 29 West Thirty-ninth Street, and the dinner on Thursday, Jan. 6, at Hotel Plaza at 8 p. m.

Details of the tentative program are given in the November Bulletin of the society as follows:

Wednesday, Jan. 5, 9.30 a. m., Engineering Societies Building, Business Session, Treasurer's Report, Reports of Tellers of Election of Officers, Report of Membership Committee and New Business.

Standards Committee Reports:—Report of Electrical Equipment Division, A. L. Riker, vice-president and chief engineer of the Locomobile Co. of America; Report of Engine and Transmission Division, Prof. W. T. Fishleigh, Engineering School, University of Michigan; Report of Electric Vehicle Division, A. J. Slade, consulting engineer; Report of Iron and Steel Division, K. W. Zimmerschied, metallurgist, General Motors Co.; C. H. Loutrel, Report of Lock Washer Division, C. H. Loutrel, assistant factory manager, National Lock Washer Co.; Report of Miscellaneous Division, John G. Utz, consulting engineer, Perfection Spring Co.; Report of Research Division, David L. Gallup, professor, gas engineering and consulting engineer, Worcester Polytechnic Institute; Report of Springs Division, C. W. McKinley, chief engineer, Willys-Overland Co.; Report of Truck Standards Division, W. P. Kennedy, consulting engineer.

Professional Sessions

Thursday, Jan. 6, 9.30 a. m., Auditorium of the Engineering Societies Building, Professional Session; President's Address, Wm. H. Van Dervoort, president and general manager, Moline Automobile Co.; Address of President-Elect; Effect of Sulphur Content in Steel, Dr. J. S. Unger; Electric Bulbs for Automobiles, Henry Schroeder.

Thursday, Jan. 6, 2 p. m., Professional Session, Battery versus Magneto Ignition; Alexander Churchward, vice-president, Gray & Davis Co., Frank Conrad, electrical engineer, Westinghouse Electric & Mfg. Co., Dr. R. H. Cunningham, chief electrical ignition engineer, Splitdorf Electrical Co., E. Gassman, technical director and secretary. Eisemann Magneto Co. and Electric Lighting and Starting, Joseph Bijur, president, Bijur Motor Lighting Co.

—

Mid-West Section S. A. E. Elects Officers

CHICAGO, ILL., Dec. 2—Formal organization of the new Mid-West section of the Society of Automobile Engineers with headquarters at Chicago was completed at a meeting of members of the Society from Illinois, Indiana, Wisconsin, Minnesota, Iowa, and northern Indiana at the Chicago Automobile Club last night. This is the outgrowth of a movement among members of the S. A. E. in this territory which took shape Oct. 14 at the time of the meeting of the Standards Committee of the general society in the organization of a temporary section and election of temporary officers, with W. H. Vandervoort of the Moline company, President of the Society, as chairman.

Permanent officers were elected last night as follows: Chairman, F. S. Place, vice-president, the Buda company; vice-chairman, J. W. DeCou, factory manager, Thos. B. Jeffery Co.; treasurer, Charles W. Steiger, president Stromberg Motor Devices Co.; secretary, Darwin S. Hatch, Editor *Motor Age;* assistant to secretary, H. W. Connell, Central Continuation School, Milwaukee. The governing board consists of the above officers with addition of Daniel Rosch, assistant professor of Experimental Engineering, Armour Institute of Technology.

Headquarters have been established at the Chicago Automobile Club. There are between fifty and sixty members of the Society in Chicago and 200 in the territory embraced by the new section.

—

Three New Jones Models

WICHITA, KAN., Dec. 3—The Jones Motor Car Co., this city, is bringing out three new models, two of which will appear on a six-cylinder chassis with 122-in. wheelbase as a seven-passenger touring car and a roadster, the third model being a five-passenger touring car on a 110-in. wheelbase chassis and using a small six motor.

W. A. King is production manager and chief engineer of the company and N. A. Wise has been appointed chief engineer and assistant production manager.

—

Detroit S. A. E. Fund Is $2,900

DETROIT, MICH., Nov. 30—The Eclipse Machine Co., has been added to the list of contributors to the maintenance fund of the Detroit Section of the Society of Automobile Engineers. The total contributed to Nov. 15 is $2,900.

231,713 Registered in New York

Divided into 171,698 Cars and 22,949 Trucks—2194 Dealers

ALBANY, N. Y., Dec. 8—Over 36 per cent increase in the number of automobiles registered in New York State since Feb. 1, is revealed in the statement issued to-day by Secretary of State Hugo. The latest figures show that up to Dec. 4 there were 231,713 owners registered and 79,899 chauffeurs. The majority of cars registered, according to the records, are under 25 hp., the exact number being 112,373, while of the remainder, 70,426 are under 35 hp.; 21,790 under 50 hp. and 1224 of 50 hp. or more, or seventy-four less than the total in 1914. In comparison with the State Census figures, taken in June, the count shows that there are about forty inhabitants to each car registered, or 122 persons for each chauffeur licensed.

22,949 Trucks

The total of 231,713 cars registered so far includes 171,698 passenger cars; 22,949 trucks, while there are 2194 dealers registered, each having from one to twenty-five cars in stock, although these machines prior to their sale are not usually registered separately. There were 6807 duplicate sets of plates issued to these dealers. The figures for the same period last year were 169,280, 150,501, 17,037 and 1742, respectively. Of the chauffeurs licensed so far, 58,179 were renewed from last year, when the total number licensed was 65,773, while 21,720 are new.

—

Standard in Small Truck Field

DETROIT, MICH., Dec. 3—The Standard Motor Truck Co., this city, has added a 2-ton worm-drive truck, selling at $2,000, to its present list of 3- and 5-ton models.

The company will later add a 1- and 1½-ton model. In order to take care of the manufacture of its new models, the company will make additions to its plant.

—

Bieling Joins Nordyke & Marmon

INDIANAPOLIS, IND., Dec. 7—W. M. Bieling has resigned as sales manager of the Premier Motor Mfg. Co., this city, and joined the sales organization of the Nordyke & Marmon Co.

—

De Palma Joins Packard

DETROIT, MICH., Dec. 4—Ralph De Palma has joined the Packard Motor Car Co., this city, as a member of the engineering testing department.

Goodyear Earns 5½% on Common

Sales $36,490,652—Net Income $5,137,082—Assets $14,500,000

AKRON, OHIO, Dec. 7—The earnings of the Goodyear Tire & Rubber Co. for the year ended Oct. 31, after all charges were deducted, were approximately 5½ per cent on the common stock. The company's sales were $36,490,652, against $31,056,128 in the previous twelve months. Its net income was $5,137,082. Its current assets are $14,500,000 and its current liabilities $1,944,000.

The balance sheet as of Oct. 31 follows:

ASSETS	1915	1914
Real estate and bldgs...	$3,883,946	$3,606,537
Machinery and fixtures.	3,962,260	3,208,107
Patents, trade m'ks, etc.	1	1
Securities owned	809,326	777,649
Pfd. stock purchased...	258,459	343,593
Notes receivable of officers, employees, capital stock	1,045,816	805,283
Inventory	7,763,189	4,567,460
Accts. and notes receiv.	4,759,246	3,328,693
Advances to agents, etc.	278,070	280,655
Cash on deposit	1,766,352	2,862,706
Advances to Goodyear Imp. Co. and Goodyear Heights Realty Co....	1,047,661	885,315
Suspended assets	334,067	440,438
Prepaid rentals, etc.....	371,529	352,893
Total	$26,279,927	$21,459,335
LIABILITIES		
Preferred stock	$6,650,000	$7,000,000
Common stock	8,377,200	7,991,110
Purchase accts. payable.	1,565,705	410,575
Sundry accts. payable...	378,894	257,509
Res. for doubtful accts..	558,956	564,327
Depreciation of plant...	1,717,230	1,183,418
Surplus	7,031,940	4,052,395
Total	$26,279,927	$21,459,335

Mercer Uses Aluminum Pistons

TRENTON. N. J., Dec. 6—The announcement of the line of cars made by the Mercer Automobile Co., of this city, shows that only minor refinements have been made for 1916, especially as regards the chassis lengths and in the body work.

The new series is known as the 22-72 model and in general design the new models adhere closely to the previous 22-70. Four different body styles are offered, a six-passenger, four-passenger, runabout and raceabout. The six-passenger touring is adapted to family use while the four is a sporting model. Both of these cars have 132-in. wheelbase. The runabout and raceabout are built on a chassis of 115-in. wheelbase. The raceabout is a special speed car with a guaranteed speed of 1 mile in 48 sec., or 75 m.p.h.

While in general the bodies have the same distinctive appearance as those of a year ago, the interior has been improved; for instance, the auxiliary seat compartment of the six-passenger is finished in black walnut paneling. Doors that roll out of sight like the cover of a roll-top desk hide the extra seats. A complete set of tools is carried in a special compartment built into the right front door.

Under the center cowl of the sporting model are three separate compartments for carrying Thermos bottles and miscellaneous items. The middle compartment is sufficiently large to carry a suit case.

Power plant is the same four-cylinder L-head design, 3¾ by 6¾ in. giving an S. A. E. rating of 22 hp. although the makers claim 72 on the block. The piston displacement is 298.2 cu. in. Very light reciprocating parts are used, the connecting-rod weighing with four bolts, 3 lb. 5 oz. These are drop forgings from special high tensile steel. The pistons are aluminum and the only attachment to the exterior of the motor is the Zenith carbureter, the manifold being cast integrally with the cylinders.

The prices are $3,000 for the touring and sporting models, $2,900 for the runabout and $2,750 for the raceabout.

Franklin to Increase Common to $2,000,000

SYRACUSE, N. Y., Dec. 4—Stockholders of the H. H. Franklin Mfg. Co. on Dec. 8, vote to increase the common stock from $900,000 to $2,000,000. The preferred stock, amounting to $600,000, is all in the treasury of the company.

Sparks-Withington Buys Cleveland Radiator Co.

JACKSON, MICH., Dec. 4—The Sparks-Withington Co., this city, manufacturer of automobile signals, radiator fans, etc., has completed arrangements for the purchase of the factory, equipment, and commercial good will of the Cleveland Radiator Co., Cleveland, Ohio, which has manufactured honeycomb radiators for the trade. The complete equipment of the Cleveland factory will be moved to this city and installed in the old Sparks-Withington plant where the manufacture of honeycomb radiators will be started. Quantity production will be under way by Feb. 1. The Sparks-Withington company will soon break ground for a large addition to its plant.

Elliott of United Truck to Sail

GRAND RAPIDS, MICH., Dec. 7—E. M. Elliott of the United Motor Truck Co., will sail Dec. 11 for Europe to observe United trucks in action in England and on the Continent.

G. P. Sweet has been made general manager to succeed Elliott. Mr. Sweet returns from Detroit, where he has been engaged for several years in the manufacturing business.

Another appointment is that of George H. Duck as general sales, advertising and factory manager of the United Truck Co. Mr. Duck has been with the company since September.

Pouvailsmith Corp. Formed

Buys Essex Rubber Condensite Dept.—Warm Hand Steering Wheel Corp. Absorbed

POUGHKEEPSIE, N. Y., Dec. 4—The Pouvailsmith Corp., capitalized at $2,500,000, has been organized here and has purchased the condensite department of the Essex Rubber Co., Trenton, N. J. Condensite is a chemical product of formaldehyde and carbolic acid and makes one of the best non-conductors known, also having a highly polished surface. It is used extensively in the manufacture of steering wheels, accessories and many other products. In connection with the taking over of the condensite department of the Essex company the Pouvailsmith Corp. will absorb the Warm Hand Steering Wheel Corp. of this city.

Of the $2,500,000 capital of the new corporation $500,000 is preferred and $2,000,000 common. There is no stock for sale. The officers of the company are Grant E. Smith, Elias C. Vail, vice-president, J. Wilson Poucher, treasurer and Henry S. Morgan, secretary. Mr. Morgan has been factory manager for the Essex Rubber Co. since the beginning of its condensite business and will be director and factory manager of the Pouvailsmith corporation.

For factory purposes the Pouvailsmith Corp. has purchased 5 acres of land fronting on Smith Street and extending east along the Central New England railroad tracks, where three buildings, having a total length of 340 ft. and a width of 60 ft., will be erected immediately. The railroad will provide a spur for the factory. The new plant will begin operations with about 100 employees. Until this is ready the Pouvailsmith Corp. will operate the condensite department of the Essex company in Trenton, of which it is now in possession.

Puritan Buys Cartercar Parts

DETROIT, MICH., Dec. 8—The Puritan Machine Co., this city, has bought outright the Cartercar parts business. The contract with the General Motors Co. as executed by the Puritan company, provides that service for the Cartercar is secured complete in every detail as long as the life of the car.

Webber Joins Haynes-Ionia Co.

IONIA, MICH., Dec. 4—H. B. Webber, president of the National Bank of Ionia, and several manufacturing concerns, has accepted the position of general manager of the Haynes-Ionia Co., one of the biggest manufacturers of automobile bodies, and sheet metal parts in the country.

English Automobile Engineers Are Not Neglecting Development, Despite War

Water-Cooled Rotary Engine and Gas Turbine Under Way—Work on Sleeve-Valve Eight and Several Small Cars—A New Rear System

LONDON, ENG., Nov. 25—The great advance made by American automobile engineers during the course of the last two years has been obvious to the automobile world at large. There were many who prophesied at the outbreak of war, that, until its close, ordinary commercial progress would be largely stagnated. The automobile progress made in America has given the lie direct to such assertions. Even in Europe it has been commented on several times in English, French and German journals. The country most concerned, however, is certainly Great Britain.

While the actual causes of recent tariff on imported automobiles are undoubtedly cumulative, it is nevertheless an open secret that the advance made by American manufacturers in design, materials and workmanship was a potent factor in the deliberation of British manufacturers when they decided to approach the government for legislative protection. Had not American cars improved in the way they have, the British manufacturing trade would not have been so perturbed. It is admitted that so far as general specification goes, the American product is very far in advance of the British automobile speaking in terms of average—as it was known at the outbreak of war. One is led, therefore, to wonder what automobile manufacturing in England is doing. Is it sitting down calmly under fate, with hands tied by the force of circumstances, merely watching American progress in design? Is it able, while chiefly concerned with the production of munitions in its motor car factories, to give attention to the all-important question of automobile progress? A knowledge of the facts will come as a surprise to many people. Automobile England is very wide awake.

Study Engine Designs

A number of British manufacturers are deep in the study of engine design so far as the question of the number of cylinders is concerned. When the eight movement started in America it was not taken very seriously by the leading British manufacturers. Now, however, things are quite different. Not only is the eight being worked upon by several leading manufacturers, but in one case of importance at least, the twin six is engaging the serious consideration of the designing and experimental staff. Two experiments, they are no more as yet, go even in advance of American ideas, as in one case a water-cooled rotary engine is now being tried out experimentally by its inventor for a large manufacturer, and in another a new form of gas turbine is being finished off on paper. Of these two propositions the former is promising, though considerable trouble has been encountered in making the rotating flapper pistons gas tight.

In regard to the question of the eight and the twin six, however, matters are on a more substantial basis. A number of firms are working along these lines, and the results so far obtained are very good.

The chief engineer of a large firm is loud in praise of eight possibilities.

An Electric Gearshift

There is a very ingenious new electrically-controlled gearbox, which is finding much favor. To be able to make a perfect change by merely pressing a button on the steering wheel is undoubtedly an ideal method. It has already been proved possible and it now only remains to prove whether or not the invention is practicable as a manufacturing proposition and whether it will prove sufficiently reliable not to require the usual lever control as an emergency standby.

A Sleeve-Valve Eight

Then again, there is a sleeve-valve eight under way. Just before the outbreak of war, Minerva in Belgium was also busy with the design of a sleeve-valve eight. As this firm has proved the high efficiency of this type of engine in the racing world, its eight, if it sees the light of day, shall prove a very interesting proposition.

British manufacturers are studying the refinement of these new engines very carefully. Such things as the permanency of tappet adjustment, the elimination of vibration and the reduction of skin friction for the passage of the inlet and exhaust gases are studied just as carefully as detail units of design, as the whole proposition is as an engine. In a word, the British manufacturer who puts an eight on the market after the war is expecting to take a place right in the front with the new development. In just the same way as the Britisher has claimed superiority for his product on account of its excellence in material and workmanship in the past, so will he in the future on the new engine. If close application and careful experimenting are not behind their usual value, the eights to be marketed in the future by several leading British firms will undoubtedly be of a very high grade.

New Car Models

Even in England, the majority of motorists picture their own car factories as entirely engaged on the production of munitions. Speaking broadly, they are, but nevertheless a number of firms are still able to make cars, and a few are still being made and sold to the ordinary public. After the panic of the early days of war, British manufacturers naturally began to think of their future in the happy days when piping peace reigns once more. In most of the chief factories it has been found possible to do something in regard to new models, or redesigning the pre-war existing ones to bring them up to date. A number of actual new cars are on the road for test at the present time. It is, however, more important to know that the quality of the firms is first rate. Among such cases are several of the leading firms in Britain, though as the new cars are commercial secrets we cannot refer to them by name. A famous firm has an entirely new design of small car, like a Ford, so far as the idea of providing the maximum for a minimum outlay is concerned. It will probably be sold at a good deal less than half the cost of the cheapest car previously sold by the firm in question. The car itself is not only interesting as a designing proposition, but is a good performer. Acceleration and hill climbing are both markedly good characteristics, and the initial cost and upkeep are both low.

Two firms whose racing records are well known have also produced entirely new models. In one case it is a small car, much smaller and cheaper than the firm has previously produced and in the other case it is a much larger and more luxurious car. Then there is another firm that specialized on one model only, and a very popular one, before the war, that has brought out an improved form of the same general design, but larger and more commodious, and with a number of improvements. This firm is also carefully maturing plans for a quick continuation of its ordinary business routine so soon as the war is over, and its expectations of a large sale for the new model will in all probability be fully realized.

A New Rear System

One more case as indicative of the general trend in England may be cited and it is an important new entrant into the field of car production. A large firm of accessory manufacturers has the first chassis of its new venture on the

road, and the preliminary trials have been quite satisfactory. It is a small car largely on conventional lines, but with a new system of rear suspension which prevents the chassis from being on orthodox lines. It is early yet to prophecy either success or failure for this new venture, as it has only just seen the light of day so far as road trial is concerned.

It will be seen from the preceding information, that the idea so prevalent that England is not, and cannot, do anything to keep pace with automobile progress, is far removed from fact.

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Hercules Motor Mfg. Co. Formed with $500,000 Capital

CANTON, OHIO, Dec. 4—The Hercules Motor Mfg. Co. has been incorporated in this city with a capital of $500,000 by backers of the Ohio Motor Mfg. Co., which will soon build a large plant in the Aultman group.

The incorporators of the company are H. E. Black, E. A. Nist, J. M. Baer, H. L. Alexander and I. M. Chandler. The charter of the company authorizes it to manufacture, buy, sell and deal with motors and motor devices and internal combustion engines for use in automobiles, trucks, tractors and all self-propelled vehicles.

It has been decided to build in the Aultman group a plant 65 by 400 ft., two stories, at an estimated cost of $50,000. Work on the building will start at once. One hundred and fifty men will be employed. Under the direction of Charles Ballough, consulting engineer and designer, an organization is now at work at Springfield turning out sample motors, etc.

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Saxon Builds 19,036 Cars

DETROIT, MICH., Dec. 6—With the production for December estimated at 1500 cars, the total output of the Saxon Motor Car Co., for 1915, is estimated to be 19,063 cars, or 11,740 more than in 1914 when 7323 cars were made. The production for 1916 is planned to be for 30,000 cars or more. Figures for 1914 and 1915 are:

Month	Year 1915	1914	Increase
January	706	....	706
February	844	13	831
March	1,041	470	571
April	1,738	762	976
May	2,024	1,255	769
June	2,710	1,787	923
July	1,658	618	1,040
August	1,799	876	923
September	1,158	641	517
October	1,935	460	1,475
November	1,950	175	1,775
December	**1,500	266	1,234
Total	19,063	7,323	11,740

**Estimate only.

By acquiring the four-story brick plant formerly occupied by the Studebaker Corp. on Franklin Street, the Saxon company has added nearly 60,000 sq. ft. of floor space to its plant which now has more than 120,000 sq. ft.

Business Booms in Southwest

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Car and Accessory Dealers Find Oil, Wheat and Cotton Boost Sales

KANSAS CITY, MO., Dec. 4—The month just ended brought a tremendous volume of business to the car and accessory dealers who supply the Southwest trade from here. With bank clearings in Kansas City making high record marks every year, with the wheat beginning to move from Kansas to the markets, with oil on the jump in Oklahoma after a big crop year, and with unusually open weather throughout the entire district, heavy sales have resulted and dealers expect their branches will enter the new year with practically no unsold cars on hand.

Record Bank Clearings

The bank clearings are, of course, the best barometer of the district. Three records were broken in the month of October, and in November the same story was repeated with a total for the thirty days of $394,019,925—the banner month in the history of the local clearing house association. The clearings for the entire year of 1914 were $3,015,811,567, but with the close of November this year has broken that high figure by $442,000,000. Bankers confidently expect the year's total to approximate $4,000,000,000.

The largest volume of local business comes, of course, from Kansas where the farmers have been blessed with a big wheat crop that commands unusually high prices and, because of the record yield of a year ago, have fewer mortgages and notes to pay off than in previous seasons. The 1914 crop cleaned up old debts that had been hanging over; the 1915 wheat will go largely into the purchase of automobiles, pianos, etc.

Oklahoma Doing Well

Oklahoma is doing well. The cotton crop was large, so was corn and wheat, and prices on all three products are high. Some sections of the State are experiencing their first good season in three years. They are buying cars heavily.

But of more importance to Oklahoma is the present oil boom that has steadily raised the value of the crude product at the well until now it is selling at $1 a barrel, with additional royalties being paid by some companies in order to meet their demands. Boom stories of new fields opened, of men suddenly rising to wealth, of scraggly land on which poor farmers have been scratching for a living for years turning into big production centers, and of persons holding old leases cashing them in for big profits and easy money.

Missouri has not been so fortunate, however. Rains throughout the summer cut down the grain crops somewhat but business conditions throughout the State are sound. The mining districts of the southwestern section of the State are producing heavily to meet the war-time prices.

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Prosperity Hits the South

LOUISVILLE, KY., Dec. 8—Southern automobile dealers, branch managers, factory representatives and manufacturers are elated over the remarkable business expansion in the South, which is one of the outstanding features of the prosperity now sweeping the country. This means an increase in the sale of automobiles, it is predicted.

Optimism is in evidence everywhere, and those in close touch with the automobile trade in the South declare that 1916 will be the biggest year in the history of the industry below the Mason and Dixon line. A conservative estimate, based on interviews with leading dealers, points to an increase of about 50 per cent in the sales during the past four weeks over the same period last year. Some say they have sold twice as many cars.

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Willemin Resigns from Hupp

DETROIT, MICH., Dec. 4—A. B. Willemin, who was assistant general manager of the Hupp Motor Car Co., has resigned.

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Jarman with Canadian Briscoe

JACKSON, MICH., Dec. 4—Walter G. Jarman has been appointed treasurer and general manager of the Canadian Briscoe Motor Co., and will locate in Brockville, Ont. Mr. Jarman has been assistant sales manager of the Briscoe company here

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Lewis Joins Campbell-Ewald Agency

DETROIT, MICH., Dec. 4—E. St. Elmo Lewis, one of the best known advertising and sales executives in the country, has joined the Campbell-Ewald Co., advertising agency, as advertising and sales counsel.

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Revoke Drawbacks to Members of Old A. L. A. M.

WASHINGTON, D. C., Dec. 6—Secretary of the Treasury has informed the collector of customs at New York that in view of the fact that treasury decision of Dec. 19, 1908, providing for the payment of drawback on automobiles manufactured by members of the A. L. A. M. with the use of imported materials, has become inoperative as to a large number

of the members of said association and that conditions of manufacturing have changed to a great extent since the promulgation of said decision, the same has been revoked, the revocation to become effective as to all shipments exported on and after Dec. 24. The department has advised all members of the revocation and that an application for a new rate of drawback must be made by each member to cover shipments after Dec. 24.

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Price Advanced 1 Cent on Gasoline for Export

NEW YORK CITY, Dec. 6—The Standard Oil Co. of New York has advanced the export price of gasoline 1 cent a gallon, covering all grades and all packages, to take effect at once.

Unprecedented demand, it seems, instead of reducing the price of gasoline has had an opposite effect. One effect of the high cost of gasoline is the inability of the Standard Oil Co. to supply the demand.

An unforeseen shortage in Oklahoma is the main factor in the present high prices. Last year the fields in that State produced between 300,000 and 400,000 barrels of crude oil per day and it was expected that the production would be kept up for at least two years. Suddenly the fields seemed to peter out and the production at present is about 100,000 barrels per day.

Added to the large domestic demand is that of Europe, which is using more gasoline than it was in time of peace and producing very little. Its importation is almost entirely from the United States, the quantity obtained from Canada being very small. What is being produced in Russia and Galicia is not known.

With this large European demand on hand, the Standard Oil Co. has been hampered by the scarcity of ships. England has taken out of the market 115 ships that were available for use. This company uses tank steamers or carriers to transport much of the crude from Texas, Mexico and South America and there is danger of confiscation by the belligerents. The company was paying $3.50 per day per ton on chartered boats but the scarcity has brought the price up to $42.

In Georgia gasoline has been advanced in price on the tank wagon basis, 1 cent a gallon, at all stations in Georgia and Alabama. The price at Atlanta is now 21 cents and at Savannah 19 cents.

The Atlantic Refining Co. has advanced the price 1 cent to 19 cents a gallon in Pittsburgh.

The price of gasoline advanced another cent throughout Southern California to-day, now selling for 15 cents in Los Angeles where it sold for 11 cents but a few weeks ago.

Export Shipments Tied Up

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Freight Congested—Use of Open Cars Advised to Alleviate Conditions

NEW YORK CITY, Dec. 7—The congestion of freight at this and other export shipping cities along the Atlantic Coast has caused much concern to the automobile traffic managers in Detroit and other cities. It is estimated that 65,000 cars are tied up at or near New York City alone.

On account of the present condition of affairs the traffic department of the National Automobile Chamber of Commerce has given its advice on how to alleviate this and to expedite shipments. By the shipment of automobiles in open cars instead of in the now much scarce closed cars, it is advised that the present scarcity of automobile equipment, will at least be relieved. It is stated that automobiles, passengers or freight, for export, can safely be shipped on open cars, and in fact a considerable proportion of the shipments have been made on such cars.

Another suggestion is made in the way shipments are made. Railroad officials have stated that many of the automobile factories are loading for export mixed carloads of automobiles containing machines for different countries and which have to be lightered to two or more steamship lines. This has resulted in delay to cars in which part of the lading is left over, and this has happened even when the same factory a few days later shipped a similar mixed lot. In other words, straight carload lots containing machines all for the same country or steamship line, should be planned.

The free time allowed on export shipments will be reduced from thirty to fifteen days by tariff publication effective Jan. 1, 1916. Automobile shippers should therefore forward only shipments for which ocean space is positively booked and assured.

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$2,627,000 in Cars and Trucks from N. Y.

NEW YORK CITY, Dec. 6—Exports of automobiles, trucks, tires and parts during the week ending Nov. 20, from this city to the belligerent countries amounted to $2,627,000, divided as follows: Trucks, $1,479,000; automobiles, $574,000, and automobile parts and tires, $574,000.

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Annual Tax for District of Columbia?

WASHINGTON, D. C., Dec. 6—An entire change in the method of assessments for taxation and operation of automobiles in the District of Columbia is proposed by the Commissioners in their report to Congress made to-day. The commissioners desire that instead of assessing automobiles as personal property and issuing a license tag that is good indefinitely, an annual license for the operation of such machines shall be charged in lieu of the personal tax. The proposed new legislation provides that on and after Dec. 31, 1916, all licenses, including identification tags and registrations for motor vehicles heretofore granted shall become void and on and after Jan. 1, 1917, there shall be charged annually for the licensing and registration of motor vehicles a sum to be fixed by the District Commissioners.

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New Law for New York?

NEW YORK CITY, Dec. 8—As the result of a conference between Police Commissioner Wood, Secretary of State Hugo and Chief Magistrate McAdoo, a bill for regulating automobile traffic has been prepared for presentation to the Legislature.

It provides that all operators and owners of automobiles must obtain licenses from the secretary of state, who will have a corps of examiners. The secretary of state is given power to revoke licenses for violations of the traffic regulations, after a hearing, except in cities of the first class, where the power of revocation will rest with the police commissioner.

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Iowa Owners Must Register Cars by April 1

DES MOINES, IOWA, Dec. 4—W. S. Allen, Secretary of State in Iowa, rules that only owners of automobiles who will not use their cars in 1916 will be relieved of the necessity of registering their machines before April 1. Penalties will be assessed for failure to register by that date. Under the old law automobile owners who did not intend to use their cars before June or July were not required to register their machines before that time but the new law requires registration before April 1 if the car is to be used at any time during the year.

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Truck Speed Limit in Maryland

BALTIMORE, MD., Dec. 4—Harry A. Roe, motor vehicle commissioner for Maryland, has taken a decided stand against motor trucks and jitney buses. He has made an investigation and has found that the heavy trucks are going too fast and that the jitneys are being overcrowded. He has sounded a warning.

The speed limit for trucks weighing from 4 to 8 tons has been fixed at 15 miles an hour as the maximum, and those weighing over this amount at 12 miles an hour.

Bay State Bars Speed Runs

Dealers' Licenses Suspended for 1 and 2 Weeks—Highway Com. Issues Warning

BOSTON, MASS., Dec. 4—The license of the Donovan Motor Car Co., agent for Studebaker cars in Boston and vicinity, was to-day suspended for one week, and the licenses of Edward P. Sheehan, Boston, and Milton W. Reed, Lynn, Mass., were suspended for two weeks as an aftermath of the recent 1000-mile reliability run of the Studebaker car here. It is the first time that the license of any dealer has been suspended, and this drastic action is taken so that other dealers may be warned against holding such tests in the future.

The Highway Commission has served warning that hereafter any participants in reliability runs in which speed is a factor will be dealt with very severely. The action was a surprise to the Boston dealers, and it will be very amazing to others throughout the State. While the present motor vehicle law does not put a limit on the speed of a driver, merely saying that he must drive at a speed reasonable and proper, according to traffic conditions, there is another section that has a bearing on the case. This section has a clause reading:

"Whoever . . . operates a motor vehicle for the purpose of making a record and thereby violates any provisions of sections 16 and 17 of this act, etc., shall be punished by a fine of not more than $200 or by imprisonment for a term of not less than two weeks nor more than two years, or by both such fine and imprisonment."

To Stop Speed Tests

Sections 16 and 17 refer to speed regulations. While neither of the drivers was in court, the Highway Commission has the authority to deal with cases like theirs, and as the feat of the car got such wide publicity the members of the commission decided it was time to call a halt on future tests. The commission received a number of letters about the run and so it summoned the drivers and Mr. Donovan before it for an investigation before it acted. The commission issued the following statement:

"The Massachusetts Highway Commission to-day suspended for a period of two weeks the licenses of Edward P. Sheehan of Boston, and Milton W. Reed of Lynn because they operated an automobile for the purpose of making a record; and it also suspended for a period of one week the dealer's registration certificate of the Donovan Motor Car Co., Boston, the owner or concern in control of the automobile in question.

"It appeared from newspaper accounts that on Nov. 10, 1915, a Studebaker car was operated upon the highways of Massachusetts and adjoining States at an extremely high rate of speed. A hearing was given by the commission today, at which it appeared from the testimony that the car was operated under orders of the manager of the Studebaker company for the purpose of making an endurance record, and that an average speed of more than 30 miles an hour was maintained for the greater part of the distance.

Contrary to Law

"Such use of the highway is contrary to law, which prohibits the operation of automobiles on the highways for the purpose of making a record; and the commission desired to take this occasion to call the attention of all automobile agents and operators of motor vehicles to the fact that no automobile tests, records or races will be permitted on the highways of this commonwealth.

"As this is the first case of this kind that has been called to the attention of the commission, it has made short suspensions, because the parties were somewhat ignorant of the law and of their rights in the premises, and the commission feels that the parent corporation was more responsible than the operators or agent, who were acting under orders of the parent company.

Warning for Future

"The commission hopes that the newspapers will give this case full publicity, so that the public will have full notice of it, and of the fact that future cases of this kind will not be dealt with as leniently."

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Booth Resigns from Chalmers

DETROIT, MICH., Dec. 7—C. H. Booth, who was a district sales manager for the Chalmers Motor Co. has resigned. No successor has as yet been named. The territory of Mr. Booth included the States of Michigan, Ohio, Indiana, Kentucky.

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Link Joins Wilson Truck

DETROIT, MICH., Dec. 4.—Vincent Link has been appointed designing engineer of the J. C. Wilson Co., this city, manufacturer of Wilson trucks. He was formerly with the Packard Motor Car Co.

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Keller a Maxwell Supervisor

DETROIT, MICH., Dec. 7—W. H. Keller has been appointed supervisor of zone "C" by the Maxwell Motor Sales Corp. His headquarters will be located in Pittsburgh.

Full Measure in Bay State

To Prosecute Makers and Dealers Where Liquid Containers are Under Size

BOSTON, MASS., Dec. 4—Thure Hanson, commissioner of weights and measures for Massachusetts, has started out to make dealers in oils and other liquids used in the motor industry give full capacity to their customers. He has been investigating quietly for some time into all kinds of oils and liquids used in cleaning and preserving parts of automobiles. His investigators have found discrepancies in the weighing and measuring which can be traced back to the manufacturers.

A large portion of the cans tested were short by from 1 to 4 fluid ounces. These discrepancies make considerable difference in the cost of the material and the loss to the buyer in some instances was as high as 14 cents a can. So Commissioner Hanson declared that he has decided to follow up this line of investigation and make prosecutions. He does not intend to prosecute the retail dealer at first, but will notify him not to sell under weight products.

The manufacturer will be notified to give full measure or he will be prohibited from selling his goods in Massachusetts. The commissioner says that he estimates that the buyers lose from $25,000 to $50,000 a year on these underweight products. Notifications have been sent to some producers already.

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L. P. C. May Pay All Debts

RACINE, WIS., Dec. 4—Under an arrangement effected by creditors of the L. P. C. Motor Co., Racine, Wis., which made a voluntary assignment some time ago, it is believed that all debts will be paid in full and the business rehabilitated without the loss of a cent to creditors. As was announced at the time of the assignment, the company practically closed a large contract for cars and similar material. The Corliss Steel Co. of Racine has been organized by F. Lee Norton, the assignee; Capt. William Mitchell Lewis, president, L. P. C. Motor Co., and Herbert F. Johnson, to handle this contract as well as take over the business of the L. P. C. and assume the liabilities. It is proposed to use a large part of the former plant of the defunct Wisconsin Engine Co. at Corliss, Racine County, to which location the L. P. C. shops will be moved within a short time. The Corliss Steel Co. is licensed to do business on a broad scale in cars, tractors, machinery, etc.

Reliance Takes Over Seager Works

Engineering Co., Controlled by Lansing Men, to Make Automobile Parts

LANSING, MICH., Dec. 2.—The merger of the Seager Engine Works and the Reliance Engineering Co. is now an accomplished fact. Negotiations had been pending for several weeks, as was briefly reported in THE AUTOMOBILE for Nov. 11. The deal just completed, whereby the Reliance company takes over the Seager works, also means that the Rumely Co. ceases to have any connection with the new organization.

The officers of the Reliance company now are: C. P. Downey, president; Fred. L. Smith, vice-president; E. C. Shields, secretary; J. H. Wilford, treasurer. These officers and Henry Russell, John M. Stalker and B. F. Davis, form the board of directors. Lansing men now control the company.

Besides continuing to make gas engines, the reorganized company is expected to make ultimately the manufacturing of automobile parts its principal business. The machinery of the Reliance company is being removed to the Seager plant which covers about 18 acres of ground and whose tangible assets were estimated at $1,500,000. It will take some time yet to readjust all matters so that production will be at its maximum, but men are being added as fast as it is possible to get skilled workers.

Burd Ring in New Plant

ROCKFORD, ILL., Dec. 4—The Burd High Compression Ring Co. has moved into its new factory at Twenty-third Avenue and Tenth Street, this city. The new plant is 190 by 129 ft., having 19,000 sq. ft. available for manufacturing purposes. It is capable of turning out 25,000 piston rings per day and of employing 250 men.

New Plant for Gile Tractor

LUDINGTON, MICH., Dec. 1—The Gile Tractor & Engine Co. is to have a new plant, a one-story building, 200 by 40 ft., which will be connected with the present plant by a 20-ft. driveway. There are eighty men now on the company's payroll. When the new plant is ready at least 200 men are to be added.

McLaughlin to Double Output

OSHAWA, ONT., Dec. 3—At the annual meeting of the McLaughlin Motor Co., R. S. McLaughlin was elected president. Vice-president is C. Hezzelwood, treasurer G. W. McLaughlin and secretary G. W. Hezzelwood. Directors are: R. McLaughlin, Charles W. Nash and Thomas Neal. The action of the directors in selling the stock of carriage parts to the Canada Carriage Co. of Brockville was confirmed, as was also the building of a large addition to the plant.

It was decided that the output of the plant should be more than doubled during 1916 to keep pace with the increased demands.

Mason Plant Nearly Finished—1000 More Men

FLINT, MICH., Dec. 3—The new plant of the Mason Motor Co., which makes the motors for the Chevrolet Motor Co. of Michigan, and is controlled by it, is nearly completed and that part of it will be operated within a few days.

Men are being added as fast as it is possible to accommodate them, and by next April at least 1000 will be added to the force at the Mason plant alone. At the Chevrolet car plant it is expected to add 500 or more, and this would be done at once if enough houses were available in the city.

Pending the construction work of the new factory buildings the Chevrolet company has been using parts of the plant of the Monroe Motor Co., also the plant of the old Standard Rule Co. Arrangements have been made whereby the occupancy of these premises or parts of them will be continued idefinitely.

It was also announced to-day that William C. Durant is now president of the Chevrolet Motor Co. of Delaware, recently incorporated. The officers of the three Chevrolet companies are now as follows:

Chevrolet Motor Co. of Delaware—holding company, capitalized at $20,000,000: William C. Durant, president; A. B. C. Hardy, first vice-president; E. R. Campbell, second vice-president; W. C. Sills, treasurer; J. T. Smith, secretary. Board of directors, R. L. Higgins, chairman; L. G. Kaufman, H. M. Barksdale, N. Hofheimer, J. W. Prentiss, B. Lockwood and the officers of the company. Mr. Kaufman is chairman of the finance committee.

Chevrolet Motor Co. of Michigan: C. M. Begole, president; William C. Durant, first vice-president; A. B. C. Hardy, second vice-president; W. S. Ballinger, treasurer; C. R. Hathaway, secretary. Directors—the officers and A. G. Bishop and E. R. Campbell.

Chevrolet Motor Co. of New York: William C. Durant, president; W. C. Sills, vice-president; E. R. Campbell, secretary-treasurer.

Grinnell Electrics Discontinued

DETROIT, MICH., Dec. 1—The Grinnell Electric Car Co., which started in business in 1910 and made the Grinnell electric, has discontinued its manufacture.

Chevrolet Factory for K. C.

Assembling and Storage Plant To Be Built—Another in St. Paul

ST. LOUIS, MO., Dec. 2—Reports from Kansas City, Mo., that the Chevrolet Motor Co. plans to erect an assembling plant in that city were confirmed here to-day by Russel E. Gardner, Jr., vice-president of the St. Louis Chevrolet Co. Mr. Gardner added, however, that while the Kansas City branch will supply only the trade in the Kansas City district, the St. Louis factory will be the center of Chevrolet activities in the Middle West.

Chevrolet Plant for St. Paul

ST. PAUL, MINN., Dec. 4—The Chevrolet Motor Car Co. will erect a four-story steel and brick storage and assembling plant to cost $500,000 at University and Emerald Avenues, near the Minneapolis boundary line. The site is near those of the Overland and Twin City Four Wheel Drive plants. It has a frontage of 264.14 ft. and a depth of 503 ft.

Republic Brass Co. Organized

PONTIAC, MICH., Dec. 2—The Republic Brass & Bronze Co. has been formed here. It has a capital stock of $25,000, of which $13,000 has been paid in cash. The plant of the Pontiac Motor Castings Co. has been purchased by the new company. Under the supervision of general manager A. C. Sheerer, the plant is being repaired and remodeled. All kinds of brass, bronze and aluminum castings will be made.

Exhaust Heater Co. Formed

GRAND RAPIDS, MICH., Dec. 3—The Auto Exhaust Heater Co. has been organized to make a device to be used for heating automobiles in cold weather. Those interested in the new concern are: Don McAfee, Frank Veit, T. Johnson, Frank Mathison and Neil Kunst.

Ford's Son in Charge

DETROIT, MICH., Dec. 3—A young man of 22 is to-day at the head of two automobile manufacturing concerns, whose total business during their 1915 fiscal year aggregated over $100,000,000. This young man is Edsel B. Ford, son of Henry Ford.

Young Mr. Ford has been given full power of attorney by his father and during the latter's absence, which will be from five to six weeks, it is said, he will be the president of the Ford Motor Co., Detroit, the Ford Motor Co. Ltd. of Canada and the new firm, Henry Ford & Son, Dearborn, Mich., which is to build the tractors.

At the close of the business day yesterday the Ford company had orders on its books for immediate delivery for 105,289 cars, which, however, does not include cars to be shipped this month. In other words, this represents the number of cars ordered but for which the company is behind on deliveries. Since the beginning of the 1916 fiscal year, or since Aug. 2, approximately 140,000 Fords have been made and shipped. This represents the production and shipments from all the assembling plants throughout the country in addition to the activities of the parent plant here.

Ford Buys Brooklyn Land

DETROIT, MICH., Dec. 4—The Ford Motor Co. has purchased a plot of ground on the Eastern Parkway, near Bedford Avenue, Brooklyn, N. Y., where a new service station and assembling plant will be erected to take place of the service station and branch now located at 1476 Bedford Avenue. The new building will be of irregular shape, three stories high, with basement.

In Scranton, Pa., the Ford company will put up a new branch. The three-story structure will be 175 by 90 ft.

Myers Machine Co. Adds

SHEBOYGAN, WIS., Dec. 4—The Myers Machine Co., Sheboygan, Wis., which has been reincorporated and capitalized at $50,000 to include the plant and business of the Wisconsin Motor Truck Co., Baraboo, Wis., has awarded contracts for the erection of a 75 by 75 ft. shop addition to accommodate the truck shop. The line will consist of 1500-lb., 1-ton and 2-ton worm driven trucks. Police and fire cars will be made to order. The Myers company is now buying the new equipment needed.

Gillette Tire Starts Factory

EAU CLAIRE, WIS., Dec. 4—Work has been started by the Gillette Safety Tire Co., formerly of Grand Rapids, Mich., on the first unit of its permanent factory and offices here. The building will be of reinforced concrete construction, 60 by 250 ft., located on a tract 150 by 300 ft. and placed so that wings may be constructed as needed. The initial output will be 100 tires daily, and the concern is engaging seventy-five tiremakers and twenty-five apprentices. The company is capitalized at $1,000,000 and has been in existence two years.

Jaeschke Foundry To Expand

MILWAUKEE, WIS., Dec. 4—The Jaeschke Bros. Foundry Co., 3026 Locust Street, Milwaukee, is building a new foundry and pattern shop at Cawker Place, Thirtieth Street and the Milwaukee road tracks. It will be of brick, one-story, 120 by 150 ft., of modern design throughout, and will cost $20,000.

Niles Co. To Build Trucks

Interurban Car Manufacturer Will Turn Out General Delivery Type

NILES, OHIO, Dec. 4—The Niles Car & Mfg. Co., which has been confining its attention to the manufacture of interurban cars, will soon turn out motor trucks for general delivery purposes, according to an announcement made recently. The matter had been under advisement for some time by the directors of the company and because of the fact that an amendment must be made in the charter of the corporation, a stockholders' meeting has been called.

Packard to Build 12,000 Cars

ST. LOUIS, MO., Dec. 7—The Packard output for 1916 will be 12,000, an increase of 4500 or 60 per cent over 1915, according to H. H. Hills, general sales manager of the parent company, at a meeting of Middle West dealers here to-day. Dealers from twenty-four leading cities met the factory officials and exchanged views as to delivery, output and service possibilities for 1916.

Moline Plow Buys Cultiplow

COLUMBUS, OHIO, Dec. 7—The Moline Plow Co. has purchased the manufacturing rights for the Universal Cultiplow heretofore produced by the Universal Tractor Mfg. Co., though it has not taken over this company. The Universal company will discontinue. F. B. Funk is engineer and factory manager of the tractor department of the Moline Plow Co., and S. C. Turkenkoph will be assistant to the sales manager of all departments and the company's tractor expert. The Moline company will build trctors on a much larger scale than possible by the Universal Tractor Mfg. Co.

Firestone Plans More Additions

AKRON, OHIO, Dec. 4—Permits have been taken out by the Firestone Tire & Rubber company for four new buildings to enlarge its plant. Two of the buildings will be five stories high and the others one story. The cost of the structures is estimated at $75,000.

Midland Supply Succeeds Positive

DAVENPORT, IOWA, Dec. 4—The Positive Supply Co., this city, has been dissolved and the business will be continued under the name of the Midland Supply Co. with which it has been consolidated. In the consolidation W. G. Sanford, formerly president of the Positive company becomes vice-president of the Midland organization, J. Reed Lane, president and Maurice Hemsing, secretary and treasurer.

The consolidation does not affect the sales force, business policies or contracts now in force of the Positive Supply Co., which has been marketing a steam vulcanizer for several years, together with several accessories.

356 Studebakers in 1 Day

DETROIT, MICH., Dec. 6—The Studebaker Corp. broke its one day production record Nov. 27, when 356 cars were made or nine more than the former high mark.

DETROIT, MICH., Dec. 4—The plant of the Studebaker Corp. at West Jefferson and Clark Avenues, will be greatly enlarged, and a first permit for a steel frame and concrete addition, to cost $35,000 has been secured from the building department.

Jeffery Adds Two Buildings

KENOSHA, WIS., Dec. 4—The Thomas B. Jeffery Co., Kenosha, Wis., has started work on two large factory buildings, each three stories high, to provide much-needed production facilities in both passenger and commercial car departments. The company has been working night and day for many months and is at this time employing 2500 men, compared with 1300 on the payroll a year ago.

Vim Starts New Plant

PHILADELPHIA, PA., Dec. 4—The Vim Motor Truck Co. has started work on its new six-story concrete factory building at Twenty-third and Market Streets. The building will cost about $750,000. It will be completed in the spring, covers a lot 200 by 400 ft. and will contain 64,000 sq. ft. on each floor.

General Tire Moves to Akron

KANSAS CITY, MO., Dec. 3.—The Western Tire & Rubber Co., formerly of this city, has moved its plant to Akron, Ohio, where it is incorporated under the name of the General Tire & Rubber Co., with a paid-up capital stock of $200,000. The personnel of the company will remain the same. Equipment is being installed in the new 60 by 160 ft. plant.

Knox Strike Settled

SPRINGFIELD, MASS., Dec. 7—The machinists strike at the plant of the Knox Motors Co., this city, which lasted for a few days, has been settled to the satisfaction of both the Labor Union and the company.

Kundtz Strike Ended

CLEVELAND, OHIO, Dec. 4—The strike of 1800 workmen at the plant of Theodore Kundtz, maker of automobile bodies and parts, was settled to-day, having lasted over a month.

Commerce Truck Gains 150%

To Double Capital—1915 Earning May be $70,000—Stock Dividends Probable

DETROIT, MICH., Dec. 4.—At a meeting of the board of directors of the Commerce Motor Car Co., manufacturer of the Commerce trucks, it was decided to increase the capital stock of the company from $100,000 to $200,000. A meeting of the stockholders will be held Dec. 14, at which they will be asked to decide whether a stock dividend of 50 per cent, as recommended by the directors, be paid to stockholders of record Dec. 15. The earnings of the company are expected to total about $70,000 this year, which is 70 per cent of the former capital stock. It is not likely that cash dividends will be paid for some time, but, it is possible that another stock dividend of 33 1/3 per cent will be paid early next year.

The Commerce Motor Car Co. started in business in 1910 and has been making trucks only. This year its business has been exceptionally good. According to the officers of the company its sales have been 150 per cent better than during any previous year.

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Denby to Increase Stock $500,000 to $750,000

DETROIT, MICH., Dec. 4—The Denby Motor Truck Co., has decided to increase its capital stock from $250,000 to $750,000, of which $500,000 will be common and the balance of $250,000 will be preferred. The present capital is all common. None of the new stock is to be placed on the market, and, it is said that it is being subscribed for directly at par, while a common stock bonus estimated at 65 or 70 per cent is being given with the sale of all preferred. The entire matter in connection with this increase of capital of the Denby company has been done quietly and it is said that the greater part of the new stock has been subscribed for by the present stockholders, President Garvin Denby and his brother Edwin, who is treasurer of the company, having it is said, a majority of the stock.

The Denby company started in business in July, 1914, and its business has been gradually increasing until it has become necessary to increase the capital stock and provide for greater production facilities. The plans for the contemplated increased activities of the company are not completed.

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Sales Record for Jeffery Quad

KENOSHA, WIS., Dec. 6—The Thomas B. Jeffery Co. made a record in sales and production when it was announced that over 2000 Jeffery Quads of 2 tons or over, were built, bought and delivered.

The company has set aside the month of December as Quad Month. During this month demonstrations are being carried on by its dealers in practically every part of the world.

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Aluminum Lower

NEW YORK CITY, Dec. 7—Market prices this week were subject to many changes. A number of the metals were lower, especially copper, tin and aluminum. Rubber, after an 8-cent drop last week, fluctuated throughout the week, but managed to hold at the 70-cent mark, 2 cents higher than the opening price on Tuesday. The copper market was quiet with prices prevailing at 19½ cents a pound. Tin weakened in price on account of the arrival of a large shipment of that metal from London. Quotations prevailed at $38 per 100 lb., or $1.75 lower. Aluminum has dropped to 56 cents with an easy market. Lead is now quoting at $5.22½ per 100 lb. Rubber from Ceylon is quoting at 85 cents with a light inquiry from the manufacturers. Bessemer steel and open-hearth steel rose $1 and $2, respectively per ton or to $29 and $30 per ton, respectively.

Pennsylvania crude petroleum rose to $2.10 a barrel on Friday. Rapeseed oil rose to 87 cents; linseed oil dropped 1 cent to 62 and cottonseed oil rose 25 cents to $8.34 a barrel. Cyanide potash rose 5 cents to 28 a pound. The rest of the oils and lubricants remained unchanged.

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Federal Business Gains 25%

DETROIT, MICH., Nov. 27—While this time of the year was always dull with the Federal Motor Truck Co., this year business has been uninterruptedly good and there has been no sign of a dull season. The output for 1916 will go at least 25 per cent better than double the 1915 output. Work on the additions to the plant is progressing rapidly. Federal dealers and distributors have been sending in most optimistic reports as to their business outlook. The company will help its dealers more than ever and has appropriated more money than heretofore for advertising purposes.

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Briscoe and Argo Buy Jackson Motor Parts Co.

DETROIT, MICH., Dec. 8—*Special Telegram*—The Briscoe Motor Co. and its affiliated concern, the Argo Co., have purchased the Jackson Motor Parts Co., which is a machine shop to do work for both Briscoe and Argo concerns. The machinery which was in the plant formerly occupied by the defunct Mason Motor Co. at Waterloo, Iowa, has also been purchased and is now in the plant of the Jackson Motor Parts Co. This deal gave rise to report that Briscoe intended operating a plant at Waterloo. Frank Briscoe confirmed the report that the Swift interests of Chicago some time ago secured a large interest in the Briscoe and Argo companies, but he refused to give details.

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Moore with Service Truck

WABASH, IND., Dec. 4—Paul Moore has been appointed advertising manager of the Service Motor Truck Co., Wabash, Ind. He comes from the advertising department of the Weis Fibre Container Corp., Monroe, Mich., and was formerly connected for three years with the advertising department of the National Cash Register Co.

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Hupp Re-Financing Approved

DETROIT, MICH., Dec. 3—The stockholders of the Hupp Motor Car Co. have approved the plan of refinancing and extension, which was reported in THE AUTOMOBILE for Nov. 25, whereby the assets and business of the Hupp company are taken over by the Hupp Motor Car Corp., incorporated under the laws of Virginia.

Daily Market Reports for the Past Week

	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum	.57	.57	.57	.56	.56	.56	— .01
Antimony	.38	.38	.38	.38	.38	.38½	+ .00½
Beams and Channels, 100 lb	1.87	1.97	1.97	1.97	1.97	1.97	+ .10
Bessemer Steel, ton	28.00	28.00	29.00	29.00	29.00	29.00	+1.00
Copper, Elec., lb	.19¾	.19¾	.19¾	.19½	.19½	.19½	— .00¼
Copper, Lake, lb	.19¾	.19¾	.19¾	.19½	.19½	.19½	— .00¼
Cottonseed Oil, bbl	8.09	8.24	8.19	8.23	8.29	8.34	+ .25
Cyanide Potash, lb	.23	.23	.23	.23	.28	.28	+ .05
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl	.19	.19	.19	.19	.19	.19	...
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb	5.25	5.25	5.22½	5.22½	5.22½	5.22½	— .02½
Linseed Oil	.63	.63	.63	.63	.63	.63	— .01
Open-Hearth Steel, ton	28.00	28.00	30.00	30.00	30.00	30.00	+2.00
Petroleum, bbl, Kansas, crude	1.00	1.00	1.00	1.00	1.00	1.00	...
Petroleum, bbl., Pennsylvania, crude	2.00	2.00	2.00	2.10	2.10	2.10	+ .10
Rapeseed Oil, refined	86	.86	.86	.86	.87	.87	+ .01
Rubber, Fine Up-River, Para	.68	.67½	.70	.72	.70	.70	+ .02
Silk, raw, Italian	...	...	5.25	...	...	5.25	...
Silk, raw, Japan	...	...	4.80	...	...	4.90	+ .10
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb	39.75	39.00	38.50	39.00	39.00	38.00	—1.75
Tire Scrap	.05¼	.05½	.05¼	.05¾	.05¾	.05¾	+ .00½

The control of the organization has been obtained by the old stockholders, and the officers of the corporation are: J. Walter Drake, president; Joseph R. Drake, vice-president and secretary and Edwin Denby, treasurer.

The capital stock of the corporation is $8,000,000, of which $5,000,000 is common and $1,500,000 preferred. The balance of authorized stock or $1,500,000 was made necessary by the fact that the preferred stock is convertible into common stock at par and as long as the preferred stock is out an equal amount of common stock must be in the treasury. Thus, while the total capitalization is $8,000,000 the working capital is $6,500,000.

S. T. Davis Estate $261,645.33

BRIDGEPORT, CONN., Dec. 4—Samuel T. Davis, Jr., late president of the Locomobile Co. of America, had an estate worth $261,645.33 according to a report filed by appraisers appointed by the court.

The greater portion of the estate consists of Locomobile stock, 1165 shares of preferred worth $58,250 and 5115 shares of common worth $51,160. The other large amount contained in the report is a life insurance policy worth $103,024.61.

Dividends Declared

Rubber Goods Mfg. Co.; quarterly of 1¾ per cent on preferred, payable Dec. 15 to stock of record Dec. 10.

American Can Co.; quarterly of 1¾ per cent on preferred, payable Jan. 1 to stock of record Dec. 16.

Kelly-Springfield Tire Co.; quarterly of 1½ per cent on 7 per cent second preferred, payable Jan. 3 to holders of record Dec. 15.

Automobile Securities Firm

General Motors Reaches High Mark of 530—Ajax-Grieb Common Goes Up 25

NEW YORK CITY, Dec. 8—Automobile stocks were yesterday under pressure owing to the direct application of some feature of the President's taxation proposals to them. The proposed tax of 1 cent per gallon on gasoline and naphtha is calculated to affect the profits of automobile companies. In the same way the tax of 50 cents per horsepower will add to the cost of these articles. The net effect of the message was to lower General Motors 9 points for the day. Maxwell Motors, on the other hand, finished at a net gain of ½ point from Monday's final quotation, though at a loss of 2½ points from the high figure of the day. Willys-Overland was an exception. It ended at 246, the high figure, representing a net gain of 6½ points for the day.

General Motors made a new high mark of 530, Monday, gaining 37½ points for the day. The preferred closed at 123½, over 6 points higher than Saturday's quotations. Goodrich was a strong feature Monday at 75½. Some activity was also shown in U. S. Rubber to the accompaniment of reports that both companies had laid in a large supply of crude rubber prior to the advance in the price of that commodity.

Ajax-Grieb common closed on Saturday at 375, or 25 points higher. Chalmers common made a 5-point gain, closing at 150. Electric Storage Battery, which has shown little activity, came to the fore last week with a 1⅛ point rise. Packard common, which has been showing much activity, rose 5 points, while its preferred went up 1 point. Peerless Corp. stock rose 2½ points.

A number of drops occurred in the tire issues. Firestone common, which has been holding strong at 700, declined 10 points. Goodyear common and preferred went down 8 and 1 point, respectively.

The Detroit quotations were featured by a 17½ point rise in General Motors which reached the 460 mark. With the exception of a 9-point rise in Packard common, the rest of the stocks showed small changes.

Clifton Guest at N. A. C. C. Lunch

DETROIT, MICH., Nov. 30—At to-day's luncheon of the Board of Commerce, Charles Clifton, president of the National Automobile Chamber of Commerce, Inc., and treasurer of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., was the honored guest and speaker. About 250 prominent men in the automobile industry, not only from this city, but from other States, listened to Mr. Clifton's talk on Co-operative Competition.

Pa. Chauffeurs Are Domestics

PHILADELPHIA, PA., Dec. 4—At a recent meeting of the Workmen's Compensation Board, which will carry out the provisions of the new Pennsylvania act, it was ruled that ordinary private chauffeurs are engaged in domestic service and therefore do not come within the meaning of the act.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	250	..	375	420	+25
Ajax-Grieb Rubber Co. pfd	100	..	101	110	..
Aluminum Castings pfd	..	..	..	..	..
J. I. Case pfd	..	..	88	90	..
Chalmers Motor Co. com	..	94	150	160	+5
Chalmers Motor Co. pfd	..	97	102	104	..
Chevrolet Motor Co	..	..	130	132	..
Electric Storage Battery Co	48	49	67	69	+1⅛
Firestone Tire & Rubber Co. com	235	240	690	705	—10
Firestone Tire & Rubber Co. pfd	109	112	112	..	..
General Motors Co. com	75	77	490	495	+35
General Motors Co. pfd	85	87½	116	116½	+3
B. F. Goodrich Co. com	26	27	72	73	+ ¾
B. F. Goodrich Co. pfd	88	..	111	112	..
Goodyear Tire & Rubber Co. com	180	185	330	335	—8
Goodyear Tire & Rubber Co. pfd	98½	100	110	112½	—1
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	..	..	34	35	+1
International Motor Co. pfd	..	..	60	65	+10
†Kelly-Springfield Tire Co. com	..	..	295	298	—5
	..	..	74½	75	+½
Kelly-Springfield Tire Co. 1st pfd	75	80	97	98	+ ½
Kelly-Springfield Tire Co. 2d pfd	90	95	74¾	75	+4
Maxwell Motor Co. com	13¾	14¼	74½	76	+ ¾
Maxwell Motor Co. 1st pfd	43	44	99	101	— ¼
Maxwell Motor Co. 2d pfd	16½	17½	55	56	—1⅝
Miller Rubber Co. com	..	..	240	245	—8
Miller Rubber Co. pfd	..	..	111	113	+2
New Departure Mfg. Co. com	..	..	..	..	..
New Departure Mfg. Co. pfd	..	..	..	..	..
Packard Motor Car Co. com	..	100	145	148	+5
Packard Motor Car Co. pfd	89	..	101	104	+1
Paige-Detroit Motor Car	..	..	700	..	..
Peerless Motor Truck Corp	..	..	34½	34¾	+2½
Portage Rubber Co. com	..	..	60	65	—5
Portage Rubber Co. pfd	..	..	99	100	+1
Regal Motor Co. pfd	..	..	18	24	+1
*Reo Motor Truck Co	10½	11½	23	25	..
*Reo Motor Car Co	21½	22½	54	55½	..
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	47	49	86	88	—3½
Stewart-Warner Speed. Corp. pfd	97	100	108	..	+1
Studebaker Corporation com	35	37	152	153½	—2
Studebaker Corporation pfd	86	88	110½	111½	— ½
Swinehart Tire & Rubber Co	82	85	88	92	..
Texas Company	..	..	210	213	—2¼
U. S. Rubber Co. com	45	47	54	56	+ ½
U. S. Rubber Co. 1st pfd	95	97	107	109	..
Vacuum Oil Co	202	..	226	230	—2
White Co. pfd	..	..	110	..	..
Willys-Overland Co. com	77	78	230	250	..
Willys-Overland Co. pfd	88	92	113	114	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	97	..	161	..
Chalmers Motor Co. pfd	..	93½	101	104	..
Continental Motor Co. com	155	180	245	255	+4
Continental Motor Co. pfd	..	75	91	..	+ ½
General Motors Co. com	68	70	460	475	+17½
General Motors Co. pfd	85½	87	113	115	—1
Maxwell Motor Co. com	14	15	73	74½	—1¾
Maxwell Motor Co. 1st pfd	43	45	98	100	—1
Maxwell Motor Co. 2d pfd	17	18½	52½	55½	—2¼
Packard Motor Car Co. com	..	100	145	150	+9
Packard Motor Car Co. pfd	89	..	98½	100	—1½
Paige-Detroit Motor Car Co	..	..	700	..	..
*Reo Motor Car Co	21¼	22⅛	54⅝	55½	+1
*Reo Motor Truck Co	10½	11⅛	23	24¼	— ¼
Studebaker Corporation com	..	..	150	153	—3½
Studebaker Corporation pfd	..	..	112	115	+2

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2000	2750	..
Kelsey Wheel Co	185	..	220	..	—5
*W. K. Prudden Co	..	20½	24⅛	..	—1⅛
Regal Motor Car Co. pfd	..	25	18	24	..

*Par value $10. †Upper quotation is old stock; 2d pfd. is new.

France Opens Tractor School

To Instruct Farm Workers in Handling and Caring for Motor Implements

PARIS, Nov. 24—France inaugurated its first agricultural motor school this week at Herblay, about 20 miles to the north of Paris. Since the outbreak of war there has been a radical change in French agricultural methods, the shortage of horse, the lack of men, and the destruction in certain regions of all agricultural instruments having decided farmers everywhere to change from horse to mechanical traction. This movement has been accentuated by the government scheme under which substantial subsidies are offered toward the purchase of agricultural tractors and motors, and the assurance that by 1917 denaturized alcohol will be a cheap national motor fuel. The end of the war will find the whole of the farms in the north and northeast of France in a devastated condition. As the State will provide funds for reconstruction, it is obvious that farmers will be open to take the most modern equipment.

The school just established seeks to instruct farmers and farm workers in the handling and maintenance of various types of agricultural tractors. A large amount of land is available for practical work in the fields, but great importance is attached to repairs and general workshop instruction. The usual farm buildings have been converted into workshops equipped with forge, drill press, lathe, grinding machine, and a good collection of tools. It is intended that the farmer who goes through the course shall be capable of carrying out all mechanical repairs in the maintenance of a fleet of tractors.

The demonstration machines are all of American construction. They comprise a twin-cylinder three-wheel Bull tractor; the Twin-City three-wheel tractor; the twin-cylinder Bijou; the four-cylinder Bullock caterpillar tractor, and the Aultmann & Taylor 60 hp. tractor. The first four machines were demonstrated on the inauguration day, and all of them being suited to local conditions attracted favorable comment. The fifth machine has not the same general application on French farms and was not brought out.

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Plan Tractor Demonstration

MADISON, WIS., Dec. 4—A demonstration and exposition of farm tractors will be conducted on the farm of the college of agriculture of the University of Wisconsin near Madison during the summer of 1916. It will be the first event of the kind to be held in Wisconsin. The promoters include the college of agriculture; Madison Chamber of Commerce; the agricultural newspapers of the State; the country newspapers of Wisconsin, and the association of farm tractor manufacturers. Rules and regulations to govern the demonstration are now being formulated by the Society of American Agricultural Engineers, of which F. M. White, Madison, is secretary. It is expected that at least thirty-five tractor builders will participate in the tests.

Fined $500 for Speeding

ST. LOUIS, MO., Dec. 2—The police and court campaign against speeders and careless automobile drivers reached a climax here to-day when one police judge fined Wallace M. Allison, a nineteen-year old service car driver, $500 for speeding and another jurist fined Edwin Bolles $250 for running down and injuring a passenger alighting from a street car.

About the same time a warrant charging violation of the State law against careless driving was issued against John Hagen, another service car driver.

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Electric Makes Hartford-Washington Trip in 3 Days

HARTFORD, CONN., Dec. 4—A. E. Parsons, general manager of the Detroit Electric Car Co. of Connecticut delivered on Wednesday of this week to Congressman and Mrs. P. Davis Oakey of Hartford, Conn., a Detroit electric brougham at Washington, D. C. Mr. Parsons made the trip from Hartford to Washington unaccompanied, a total distance of 372½ miles, in three days or 21½ hr. of actual running time. He started from *The Times* office in Hartford, where he was checked out at 8.55 Monday morning.

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Sue Detroit Speedway

DETROIT, MICH., Dec. 7—A suit was filed to-day in the Wayne county circuit court against the Detroit Motor Speedway by Butler & Toy, representing sixty workmen employed by the latest contractor to build the speedway. The men assert that over $3,000 is coming to them, having received only 2 weeks' pay.

In the bill of complaint the following officers, directors, contractors and parties to the purchase of land have been named by the claimants:

John B. Whelan, president; Selden D. Maddux, vice-president; Robert B. Swart, secretary; Albert Hartenstein, treasurer; William L. Wild, Albert Pudrith, Ralph M. Tate, Philip Breitmeyer, directors. Frank G. Smith, George F. W. Reid and Samuel Vreeland are named as parties to the land purchases of the company. Michael J. McCarthy, Denny Bush, John Hagerty, Wilfred F. Raymond and Wilfred Rackemann, alias John Doe, are named as principals in contracts for construction of the speedway.

New Gasoline Rules in Minn.

67 Inspectors Are Instructed to See That Dealers State Gravity of Fuel

ST. PAUL, MINN., Dec. 4—New rules have been put out by the State fire marshal for use, handling, storage and sale of gasoline in Minnesota. Gasoline must be kept in 60-gal. cans, when kept outside a building, under fireproof cover; in 200-gal. lots if within a building utilized for no other purpose; and in 600-gal. lots if in a metal tank of not less than 14-gage galvanized steel. Sealed portable filling tanks of not more than 60 gal. capacity may be used inside garages, but these tanks must be of not less than 7-gage steel supported on wheels. The body of the tank is not to be less than 6 in. from the floor and must be provided with an approved pump.

Sixty-seven assistants of the Minnesota oil inspector have been instructed to see that dealers in gasoline state the gravity of the liquid on placards in full view of customers.

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New Setting for Palace Show

NEW YORK CITY, Dec. 6—An original setting, quite different from that of other years has been conceived for the 1916 national show, which opens in the Grand Central Palace on New Year's Eve. Manager S. A. Miles says the interior of the building is to be "The Palace of Motoria."

Motoria is the goddess who watches over the automobile industry and who, visualized in statuary, has graced a number of automobile shows in the past. She stands aloft with hands outstretched upon the steering wheel, her draperies blown by the breeze.

In general aspect the interior will be a combination of 25,000 yd. of maroon velvet festooned in deep blue and gold with the marble Corinthian and Doric Columns. Illumination will be from large electroliers, each of which has eighteen balls of fire inclosed in frozen glass with glass of other hues to give a touch of color. On the main floor tubular electric signs will be used to show the name of each car, as at last year's show.

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Dodge Contract for Van Speedometer

ELGIN, ILL., Dec. 6—Contracts for supplying 100,000 speedometers for the 1916 output of the Dodge Bros. automobile plant, have been signed by the Van Sicklen Speedometer Co., this city. This contract in addition to others made with

the Mercer and New Era company, will necessitate doubling the production. It is planned to turn out 750 speedometers per day during the coming year. Fourteen different companies are now being supplied with speedometers for their cars. At present 225 persons are employed. This number will be doubled. Because of the extensive manufacture of war material in this country, the company is meeting with difficulty in securing tools.

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387 Dealers Celebrate Harry Newman Day in Milwaukee

MILWAUKEE, WIS., Dec. 4—The most elaborate introduction of a new agent or distributor to the Wisconsin territory was the celebration of Harry Newman Day here on Friday, Dec. 3, when Harry Newman, Inc., Chicago, Ill., formally made his bow to Wisconsin, Upper Michigan, Southern Minnesota and Eastern Iowa as representative of the Chalmers Motor Co., Detroit, and succeeded in placing the allotment of 1250 Chalmers cars.

Visitors were taken in hand as soon as they stepped from the trains. New Chalmers sixes whisked them up Grand Avenue to the Newman garage at Seventh Street. The registration of dealers at the garage was 387.

Friday evening Mr. Newman gave a banquet at the Hotel Pfister to the visiting dealers, members of the Milwaukee Automobile Dealers, Inc., prominent city and State officials and members of the press. The guest of honor was Hugh Chalmers, who came from Detroit with Frank C. Willys, assistant manager of sales, for the occasion.

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Large Sales at El Paso Automobile Week

EL PASO, TEX., Dec. 4—Visitors to El Paso from all parts of the Southwest, the home people, the dealers and everyone else are delighted with the entertainment and success that attended the carrying out of the idea of devoting a week to show-room displays of automobiles, trucks and accessories. It was known as El Paso Automobile Week, and the program was brought to a close Nov. 27. Instead of concentrating the exhibits in a single showroom, it was decided to have each dealer make an individual display at his regular place of business. The plan met with favor and brought about a spirit of rivalry between the different dealers that probably produced better results from a display standpoint than had all of the exhibits been thrown together under one roof. Throngs of people visited the city during the course of the week for the special purpose of viewing the exhibits and dealers report a large business as a result of the unusual attractions that they had to offer the callers. Nearly forty-five dealers in automobiles and accessories were represented.

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Army Wants 27 Trucks

WASHINGTON, D. C., Dec. 4—In the estimates that will be submitted to Congress at this session by the War Department will be one for the purchase of twenty-seven motor trucks and one supply truck for an army motor truck company. This truck company will be assigned to a division and will be operated largely on good roads along lines of communication between the troops and the base of supplies. The motor truck of 80,000 lb. against 75,000 lb. for divisional wagon trains.

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Apelco Electrical Units in Demand

NEW YORK CITY, Dec. 7—Since the publication of the list of starting and lighting systems used on the principal cars of 1916, which appeared in the last issue, we have been informed that the Apelco equipment will be used by several more companies than those listed. Pullman and Mitchell will have Apelco apparatus on some of their models and it will also be found on Arbenz, Briscoe, Cameron, Elkhart, Herff-Brooks, Hollier, Sphinx, Richmond and Wayne cars.

Ignition System Improved in Detail

(*Continued from page* 1047)

Dixie magnetos operate on what is known as the Mason principle. The rotating shaft passes through the magnet poles instead of between them and instead of carrying an armature on which the windings are placed, the shaft carries two solid polar extensions separated by a non-magnetic distance piece. Surrounding these revolving pole pieces is a light laminated field structure carrying a core. The core carries both the primary and secondary windings and the current is generated by sending magnetic lines alternately in opposite directions through the field structure.

Advance is secured by the fact that the field can be rocked through several degrees, the rocking being accomplished by turning the timer arm with the circuit breaker in the ordinary way to advance or retard the spark. By means of this positive connection between the field and the circuit breaker, it is possible to arrange the instrument so that the sparks are produced when the magnetic lines are at their maximum, thus breaking the circuit at the peak of the current wave.

In the circuit breaker, nothing moves except the cam attached to the shaft and by this construction it is possible to adjust the contact points while the motor is running. The grounding terminal is insulated at the end of the spring clip which holds the breaker cover in position and as it bears on the center of the cover. The ground wire is also stationary while moving the timer arm.

The four- and six-cylinder instruments are identical in every respect except the distributer and timing gears. In the eight- and twelve-cylinder model the shape of the rocking field and also the polar extension is changed so that four and six sparks can be produced per revolution. The whole instrument is featured by its compactness, the windings for instance, being remarkably small, being wound on a core of only ¾-in. by ½-in.

Simms for Fours and Sixes

The Simms Magneto Co. is concentrating on four- and six-cylinder magnetos and has brought out no new instruments for engines with a larger number. It has not been found necessary in these magnetos to change the breaker mechanism to meet increased speed demands, but refinements have been made for increasing the efficiency and life as well as the accessibility. All Simms magnetos have the extended pole shoes which have featured this make for some time past and which are designed to provide maximum sparks at low speeds.

These magnetos have a timing range of from 30 to 40 deg. crankshaft travel. On the four-cylinder motors, and 20 to 26.66 deg. for six-cylinder motors.

The Simms company has discontinued the manufacture of the so-called waterproof magneto, having found it undesirabl to inclose the magneto in the conventional manner. A tightly inclosed distributer board is relied upon to prevent short-circuiting. The models available for four-cylinder engines are SU4, SU4S, and SU4D. Four sixes SU6, SU6S and SU6G. Each type is furnished with single or double magneto. All these magnetos are true high-tension instruments, having double wound armatures. The SU4 is an independent machine which can be used for single ignition or in conjunction with a separate set or battery plugs; the SU4S has auxiliary apparatus for a vibrating spark dual system; and the SU4D uses a non-vibrating spark dual system.

Factory Miscellany

Automobile Woodwork Co. Adds—The Michigan Truck & Lumber Co., Holly, Mich., will erect a one-story addition, 70 by 76 ft. The company makes automobile woodwork.

Dry Climate Tire to Build—The Dry Climate Tire Co., Denver, Colo., plans to establish a branch plant at El Paso, Texas, for the manufacture of casings and inner tubes.

Mason Tire Secures Site—The Mason Tire and Rubber Co., Cleveland, Ohio, has secured a site at Kent, Ohio, and will construct a factory, the estimated cost being $60,000.

To Make Automobile Gates — The United States Auto Gate Mfg. Co., Tacoma, Wash., has filed articles of incorporation to manufacture automobile gates. A plant will be constructed in Sequim, Wash.

Motor Hearse Co., Doubles Capacity—The Michigan Hearse & Motor Co., Grand Rapids, Mich., maker of automobile hearses, is doubling its capacity by the erection of an addition to cost about $20,000.

Cleveland Ford Tire to Build—The Cleveland Ford Tire Co., Cleveland, Ohio, has awarded the contract for the construction of a two-story, 73 by 150-ft. plant at Ashtabula, Ohio. The estimated cost is $22,500.

Chicago Nut Co. to Build—The Chicago Nut Co., manufacturer of brass nuts, has awarded the contract for the construction of a two-story factory at 2513 West Twentieth Street, Chicago, the estimated cost being $38,000.

Pierce-Arrow to Add—The Pierce-Arrow Motor Car Co., Buffalo, N. Y., has let contract for the erection of a laboratory and experimental building, 50 by 90 ft., two stories, at its plant at Elmwood Avenue and New York Central Railroad Belt Line.

Chalmers Mechanical School Formed—A mechanical school has been established at the Chalmers Motor Co.'s Detroit plant by S. H. Humphries, vice-president in charge of manufacturing. Its purpose is to give a thorough mechanical education to Chalmers employees.

Denver Fuel Co. to Build—The Mountain Motor Fuel Co., Denver, Colo., expects to start building a new $40,000 plant next week on the site where its smaller plant was recently destroyed by fire and explosions. The new plant will have about twice the capacity of the old one, and will be equipped for refining and also for compounding lubricating oils.

Oakland Shipping Cars by Boat—The shortage of railroad freight cars has caused the Oakland Motor Car Co., Pontiac, Mich., to make most of its shipments during the last few weeks by road to Detroit and from there by boat to Buffalo, Cleveland and Toledo. From these cities shipments then went forward by the railroads.

J. B. D. Co. to Make Carbureters—J. B. Drahonovsky, who founded the J. B. D. Resilient Wheel Mfg. Co., 671 Smith Street, Milwaukee, has now organized the J. B. D. Carbureter Co. with $10,000 capital, to develop and market further inventions and designs in the automobile field. The new concern will occupy quarters with the Wheel company.

Motor Co. to Move to Oshkosh—The Lake Breeze Motor Co., Chicago, Ill., has filed a bond of $15,000 with the Chamber of Commerce of Oshkosh, Wis., to insure its removal from Chicago to Oshkosh. The company will be re-incorporated at once under the laws of Wisconsin, and C. C. Chase of Oshkosh, who takes a heavy financial interest, will be president. Factory quarters are now being provided in Oshkosh, and it is hoped that the company will be in shape to start actual production by March 1 or 15.

The Automobile Calendar

Dec. 6-11	Springfield, Mass., Show, Auditorium.
Dec. 7-10	New York City, American Society of Mechanical Engineers' Convention.
Dec. 11-18	New Castle, Pa., Show, Skating Rink on Nechannock Avenue.
Dec. 31-Jan. 8	New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.
	1916
Jan. 1	Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.
Jan. 3-9	Importers' Salon, Hotel Astor.
Jan. 5-6	New York City, S. A. E. Winter Session, Standards Committee Meeting.
Jan. 7, 8, 10, 11	New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13	Milwaukee, Wis., Show, Auditorium.
Jan. 8-15	Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15	Philadelphia, Pa., Show, Philadelphia Auto Trade Assn.
Jan. 14-22	Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.
Jan. 10-15	New Bedford, Mass., Show, State Armory.
Jan. 15-22	Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22	Rochester, N. Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22	Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22	Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22	Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29	Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29	Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30	Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5	Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5	Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12	Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 9-12	Peoria, Ill., Show, Coliseum, Peoria Automobile and Accessory Assn.
Feb. 14-19	Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19	Newark, N. J., Show.
Feb. 20-27	Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26	Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26	Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26	Portland, Me., Show, Exposition Bldg.
Feb. 21-26	Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 28-Mar. 3	Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.
Feb. 29-Mar. 4	Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11	Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 8-11	Mason City, Ia., Show, Armory.
March 21-25	Deadwood, S. D., Show, Auditorium, Deadwood Business Club.
Mar. 28-Apr. 3	Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13	New York City, Sheepshead Bay Speedway Race.
May 30	Indianapolis Track Race.
June 17	Chicago Track Race.
June 28	Des Moines, Ia., Track Race.
July 4	Minneapolis Track Race.
July 4	Sioux City Track Race.
July 15	Omaha, Neb., Track Race.
Aug. 5	Tacoma Track Race.
Aug. 18-19	Elgin Road Race.
Sept. 4	Des Moines Track Meet.
Sept. 15	Indianapolis Track Race.
Sept. 16	Providence Track Race.
Sept. 30	New York City Sheepshead Bay Race.
Oct. 7	Omaha Track Race.
Oct. 14	Chicago Track Race.

The Week in the Industry

Aument Resigns—E. W. Aument has resigned as superintendent of the Rock Falls Manufacturing Co., Sterling, Ill., to become general manager of the Michigan Hearse & Motor Co., Grand Rapids, Mich. The former company is also engaged in the manufacture of hearses and funeral cars. The Michigan company also manufactures its own chassis.

Changes in Hyatt Service Branches—The rapid extension of the service given by the Hyatt Roller Bearing Co., Newark, N. J., has necessitated several additions to the personnel of the various service branches.

L. R. Remington, formerly in charge of the Hyatt direct service branch at Atlanta, Ga., has been made service manager at Chicago, Ill. He will succeed J. R. Phillips. R. B. Campbell, recently manager of the service branch at Detroit, Mich., goes to Atlanta, Ga., to take charge of the work in that territory. J. W. Taylor, a new man in the Hyatt organization, has been named as service manager at Detroit.

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Dealer

New Home for Abbott-Toledo—The Abbott-Toledo Co., Toledo, Ohio, will be situated at Madison Avenue and Thirteenth Street.

Ford Buys Brooklyn Site—The Ford Motor Co. has purchased a site on the Eastern Parkway and Bedford Avenue, Brooklyn, N. Y., on which a large structure will be erected. This building will be used as a showroom.

Firestone Tire Buys Brooklyn Bldg.—The Firestone Tire and Rubber Co. has purchased the building at the corner of Sterling Place and Bedford Avenue, Brooklyn, N. Y., now occupied by the Ford company. The Firestone company now occupies the building at 1197 Bedford Avenue.

Denver News Items—Tom Botterill, 1278 Broadway, Denver, Pierce and Hudson distributor for Colorado and Wyoming, and Dodge dealer for Denver and vicinity, is re-arranging his office and salesroom to provide for more show space for cars on account of closing his separate Dodge salesroom at 1530 Broadway and handling all three lines at the one place.

Mulnix & Rarie, Grant distributors for Colorado and Wyoming, with salesroom at 17 East Colfax Avenue, Denver, have opened a nearby Grant service station at 1431 Cleveland Place, with George Hale, formerly of the Grant factory, in charge.

Motor Men in New Roles

Mohler Pathfinder Production Mgr.—C. M. Mohler has joined the Pathfinder Co., Indianapolis, as production manager.

Schmidt Joins N. Y. Metz—W. L. Schmidt has joined the Robert Lurie Co., New York City, eastern distributor of the Metz, as secretary and treasurer.

Kelly Joins White—George Kelly, of the Baker R. & L. Co., Cleveland, has left that company and joined the White Co. He will devote his attention to truck sales.

Harrington, N. Y. Packard Sales Head—A. C. Harrington, for thirteen years a a member of the Packard forces, has been appointed sales manager of the Packard Motor Car Co. of New York.

Weimer to Form Wagner Station—Otto Weimer, who has been in charge f the Wagner Electric Co.'s exhibit at the Panama-Pacific fair, will shortly establish a service station in Portland, Ore.

Carey Goes to Portland—W. H. Carey, after resigning his position with the Kelly-Springfield Tire Co. at San Francisco, has come to Portland to take charge of the Portland agency, which is operated in conjunction with the Oregon Motor Car Co.

Griffin Maxwell Rep.—Jack Griffin, former Los Angeles newspaper man, has been appointed special Western factory representative of the Maxwell Motor Sales Corp., with headquarters at San Francisco, and territory embracing California, Oregon, Washington, Idaho, Montana, Utah, Nevada and Arizona.

Ruddle Los Angeles Mercer Mgr.—Jack Ruddle, a veteran of the automobile industry in Southern California, has been appointed manager of the Los Angeles retail Mercer house by George R. Bentel, who now controls the Mercer throughout the entire territory west of Denver.

Montgomery Pasadena Kissel Head—The Pacific Kissel Kar branch, with offices and salesrooms in Los Angeles and San Francisco, has opened a branch at 130 East Union Street, Pasadena. The Pasadena territory was formerly controlled by a sub-agent. J. H. Montgomery has been appointed manager of the new branch.

Gans New Studebaker Indianapolis Mgr.—E. W. Gans has been appointed manager of the Indianapolis district office of the Studebaker Corp. Mr. Gans, before his affiliation with the latter company, was for seven years with the White Co., where he held the position of southern manager.

Burt Joins Henney Buggy—R. M. Burt has taken a position as special representative with the Henney Buggy Co., Freeport, Ill., and will introduce the company's new line of commercial bodies for Ford chassis. The company recently decided to devote a large portion of the buggy plant to the manufacture of car bodies, the demand for horse-propelled vehicles falling off greatly of late years.

Atwood Makes Cleveland Change—B. E. Atwood, who for a number of years was connected with the Cleveland branch of the Ford Motor Co., is now identified with the Coate Motor Co., Cleveland distributor of Paige and Pullman cars, as secretary and manager. L. E. Green, R. E. Craig and L. E. Von Heyningen, formerly with the Ford company, have also joined the Coate company, in full charge of the sales in Cuyahoga County.

Bawden Overland Factory Rep.—F. P. Bawden, formerly receiver of the Child, Day & Churchill Automobile Supply Co., Spokane, Wash., has been appointed factory representative for the Inland Empire for the Willys-Overland Co. Mr. Bawden will make his headquarters with the Harry L. Olive Co., Overland representative in Spokane, and will be under the supervision of J. V. Hough, who has been promoted to take charge of the northwest states, with headquarters in Seattle.

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Dealer

Newark Pierce to Add—The Ellis Motor Car Co., Newark, N. J., Pierce-Arrow distributor, will build a 90 by 106-ft. garage on New Street.

Prest-O-Lite Opens Battery Station—The Prest-O-Lite Co. has opened a service station for the charging, care and repair of storage batteries at its Cleveland branch at 2032 Euclid Avenue.

Seattle Midgley Adds Territory—The Midgley Tire and Distributing Co., Seattle, of which E. K. Allen is manager, have been appointed distributor of this tire throughout the State of Washington. Quarters have been opened at 1609 Eighth Avenue.

Motor Equipment Co. Moves—The Motor Car Equipment Co., New York City, which for the past five years has been located at 55 Warren Street, has leased the entire building at 19-21 West Sixty-second Street. This structure comprises 55,000 sq. ft.

Takes Falcon Tire Agency—The Buckeye Tire & Supply Co., 75 South Fourth Street, Columbus, Ohio, has taken the central Ohio agency for the Falcon line of tires.

Takes Top Agency—The Cott-McKelvey Auto Co., 446 North High Street, Columbus, Ohio, has taken the central Ohio agency for the Cozy Cab tops, designed for Ford cars.

Springfield Supply House Adds—The United Tires and Sales Co. has established a branch salesroom at 302 East Washington Street, Springfield, Ill., with N. F. Neidringhaus as manager. Tire repairing and car painting will be specialties, while a full line of accessories and tools will be carried. The company is agent for the Vortex Manufacturing Co., Cleveland, and the Schelp-Budke Tire and Rubber Co., St. Louis. The agency will also distribute the Pitner lighting system.

New Willard Stations—The Willard Storage Battery Co., Cleveland, has added a number of service stations in various parts of the country.

The new stations are: Athol Storage Battery Station, Athol, Mass.; F. H. Smith, Pekin, Ill.; James Workman & Sons, Steubenville, Ohio; East Hill Auto Repair Co., Sharon, Pa.; John Electric Co., New Castle, Pa.; Duncan & Fraser, Ltd., Adelaide, Australia; Chellin's Garage, Litchfield, Minn.; New Rochelle Storage Battery Co., New Rochelle, N. Y.; Charles C. Smith, Port Richmond, S. I.; A. A. Seeley, Jr., Troy, N. Y.; Shary Garage, Fairbury, Neb.; Lew & Clark, Baker, Ore.; H. M. Cates & Son, Houlton, Me.; Consolidated Auto Supply Co., Inc., New York City; Plainfield Storage Battery Co., Plainfield, N. J., and Mission Garage, Portersville, Cal.

St. Louis Ford Building Started—The foundation for the $300,000 addition to the local Ford assembling plant at Sarah Street and Forest Park Boulevard, St. Louis, Mo., have been dug and the concrete work is now well under way. The builders hope to finish the concrete work before the bad weather sets in. The addition, which will be a duplicate of the present Ford building there, will be ready for occupancy early next year.

Recent Newark Changes—The Paige-Detroit Co., 588 Broad Street, Newark, N. J., has been formed. J. H. Knox is manager.

The Moon Motor Car Co. of New York, has formed the Motor Sales Agency in Newark at 607 Bloomfield Avenue and at Main and Clinton Streets, East Orange. The Moon agency will embrace Newark, the Oranges and Montclair. H. F. Herdman is president of the new company.

The Mallon Motor Car Co., distributor for the Franklin in Newark, which was formerly located at 35 Halsey Street, has moved into its new quarters at 296-298 Washington Street.

The Bonnell Motor Car Co. has taken the Newark agency for the Haynes.

New Milwaukee Dealer—The Fowler Motor Sales Co. has been organized at Milwaukee by J. C. Fowler, formerly of La Crosse, Wis., who has purchased the business of the Creek Motor Sales Co., 441-445 Jackson Street, agent for the Inter-State and Apperson in Wisconsin and Upper Michigan. Mr. Fowler has effected a close organization, which includes: F. C. Yahr, in charge of retail sales; R. G. Bates, Milwaukee, city sales; A. B. Kent and W. J. Dieman, wholesale representatives.

Give Ford Oiler Territory—The selling territory in eastern Missouri and southern Illinois for the Strong Sight-Feed Oiler for Fords has been divided up among the following four St. Louis firms: Missouri Auto Specialty Co., Illmo Mdse. Co., Campbell Iron Co. and Beck and Corbitt Iron Co. The Strong oiler is manufactured by the Perkins Mfg. Co., Des Moines, Iowa.

Nowick Double Tread Agent—Philip Dolkart has bought out the Nowick Double Tread Tire Co. at 1320 Broadway, Denver.

Louisville Agent Moves—The Kentucky Automobile Co., agent for the Cadillac and Oakland, moved Nov. 15 to the new quarters at 728-730 Fourth Street, Louisville, Ky. This is the building erected several years ago by the Olds Motor Works as a sales and distributing station for the South. It is a three-story fireproof structure.

N. Y. Goodyear Leases—The Goodyear Tire & Rubber Co., New York City, has leased a store at 10 Central Park West, with a large basement space and offices on the second floor.

New Redfield Carbureter Station—The Delmar Automobile Co., 103-5 Orange Street, Wilmington, Del., has completed arrangements to become the service station in Wilmington for the Redfield carbureter.

Minneapolis Items—The Wilcox-Bennett Carburetor Co. is expending $4,000 for a new building at 1024-1026 Ramsey Street. It will be a two-story brick. The Electric Detector Co., 2905 Nicollet Avenue, has changed management, Fred J. Fowler now in charge. The Hudson-Thurber Co., 308 Third Avenue N., hardware, recently adding automobile accessories, has been awarded the exclusive agency in the immediate vicinity for Timken roller bearings.

Trade News from St. Paul—The Brahy-Frei Auto Co., W. H. Frei, manager, has been organized and opened garage, salesroom, storage and machine shop at 825 Selby Avenue. It has taken the Auburn local agency. The Roller Motor Co. is constructing a brick and stone garage, one-story, at Smith Avenue and West Sixth Street to cost $2,000. It is 50 by 70 ft. The Twin City Cord Tire Co., which expects to open a factory in the Gloster shops of the Northern Pacific railroad, has new offices at 1002 Pioneer building.

Excavation has begun for the Twin City Four Wheel Drive Co., $51,000 building at University Avenue and Pelham Street. It will be brick, two stories and will have store fronts and factory facilities. The building is 200 by 142 ft. and is only one block from the new plant of the Overland Stores Co.

South Dakota Changes—Horace Key has sold the Key Auto Co., Huron, S. D., to C. E. Alford, Redfield, S. D., who has changed the name to the Alford Overland Co. Mr. Key has opened a salesroom and will continue to represent the Buick. The F. A. Castle garage has been sold to E. W. Barrett. At Sioux Falls Lind Bros., who came from Centerville, S. D., have leased the former Folkens garage, 324 N. Phillips Avenue. The salesrooms in connection will be used to display Oakland cars.

Cheyenne Hudson to Build—W. E. Dinneen, Cheyenne, Wyo., agent for the Hudson, plans to enlarge his quarters by putting up a new building on an adjoining site. The new building will be used for his machine shop, thus making more room in the present place for salesroom and storage.

Trade Changes in Milwaukee.—The Auburn Motor Sales Co. of Milwaukee, which has just been incorporated with $5,000 capital stock to act as State agent for the Auburn, has leased the former E. F. Sanger garage at 441 Jackson Street, Milwaukee, as headquarters and service station. Mr. Sanger moves to the new Sanger garage at 564-574 Farwell Avenue.

The Noble Z. Smith Co., Green Bay, which has been appointed distributor of National cars for the Fox River Valley district of Wisconsin, has established an office at 730 College Avenue, Appleton, Wis., in addition to maintaining an office in Green Bay, in the Gazette Building.

The Dicke Motor Car Co., Manitowoc, district agent for the Ford, has established a branch house and agency at Two Rivers, Wis., under the name of Two Rivers Auto Supply Co. The company will operate a service station for Ford cars and sell supplies and accessories.

Frisco Goodyear Enlarges Firm.—J. E. Power, who has the agency for the Goodyear truck tires in San Francisco, Cal., and was recently appointed distributor of Goodyear pneumatic tires, has enlarged his firm by forming a co-partnership with T. J. Turner and Frank Marisch. The new firm will be known as the Power, Turner & Marisch.

VOL. XXXIII NEW YORK—THURSDAY, DECEMBER 16, 1915—CHICAGO No. 25

The Automobile

Carbureters Classified

Basic Principles Analyzed—Five Divisions Suggested—Definite Trends Difficult to Decipher

CARBURETER development during the past year leaves it still impossible to see which type, if any particular one, will eventually dominate. Different manufacturers are producing instruments operating along entirely different lines yet aiming to accomplish the same results. The past twelve months have witnessed improvements in the carbureters and makers following different lines. New adherents have joined the different divisions so that it is as difficult as it was a year ago to decipher, even vaguely, the trend of development. One thing is certain, namely, that carbureter makers are endeavoring to keep pace with production, and if production in automobiles has resulted in simplified design and lower cost of production, the carbureter makers are awake to this realization and are keeping step in step with the demands of production.

Carbureter development in the last year has not brought out any new principles in the art, but effort has largely been confined to changing designs to meet the requirements of production as well as in some cases elaborating on present designs to meet more rigid requirements of car owners and manufacturers. Some manufacturers have made considerable changes in their designs to meet these new conditions, while others have brought out new models of a distinctly simplified type, yet incorporating the basic principles of the older and more complicated designs.

The demand for greater acceleration has been one of the distinctive requirements of the 1916 carbureter. With high-speed motors and multiplicity in cylinders together with a reduction in weight of reciprocating parts in the engine the problem of greater acceleration has been placed before carbureter makers, and they have wrestled with it very satisfactorily. Some makers have accomplished this asked-for acceleration by adding somewhat to the complexity of the design while others have started out with new basic principles in design with the hope of solving it in that way.

The year has shown a slight trend toward wider use of the hot-air attachment in preference to water heating. This movement is not general enough to be considered a trend and has been stimulated by the side-outlet carbureter, which eliminates the manifold. Heat in connection with a carbureter is needed to prevent condensation, which is avoided by the internal manifold in the side-outlet type. The production of side-outlet types constitutes one of the conspicuous movements of the season. The side-outlet design is now dividing production with the vertical-outlet design on a fifty-fifty basis. Some concerns that were late in getting their side-outlet types out are behind in orders. The more general use of block motor castings will greatly increase the use of this type.

Before taking up individually the work done during the year by the different carbureter makers it will simplify matters to analyze the general field of carburetion and classify the different makes according to the basic principle on which they are designed.

The Maybach Type

The simplest form of carbureter which incorporates the float chamber and the spraying nozzle was that credited to Maybach in Europe brought out in 1893. This carbureter, Fig. 1, embraced but two features, the float chamber with the float to maintain a fuel level, and the spraying nozzle in the air pipe. There were no regulations, no adjustments. There was a defi-

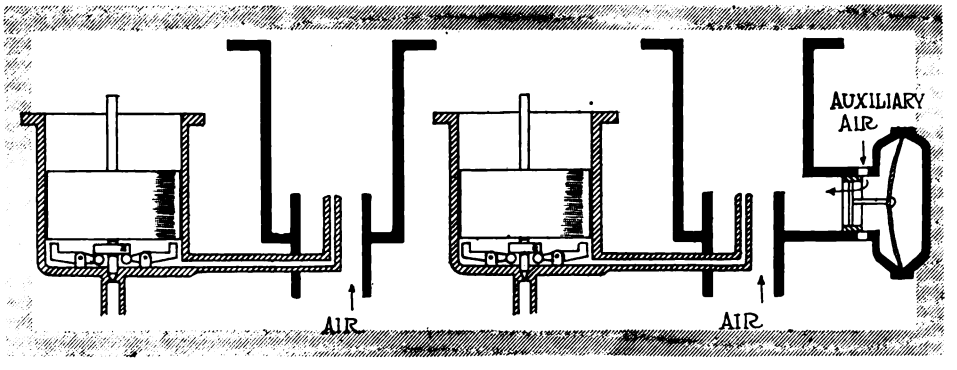


Fig. 1—Diagram of Maybach carbureter with float and nozzle

Fig. 2—Diagram of Krebs carbureter with auxiliary air valve added

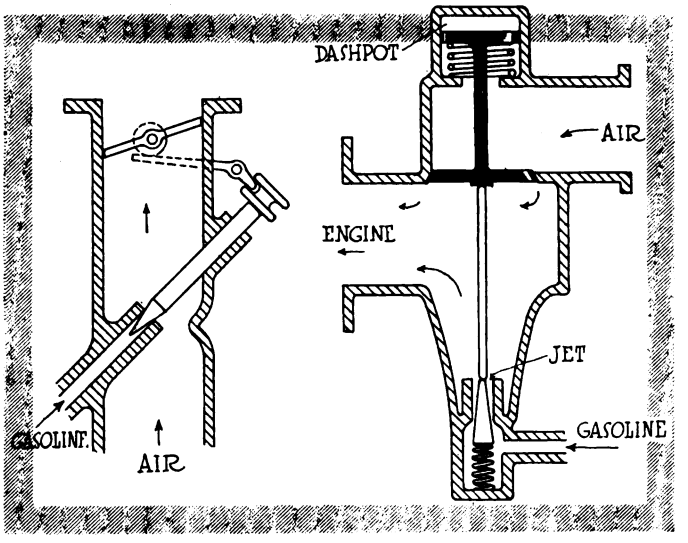


Fig. 3 (left)—Diagram of Schebler model L with metering pin controlled by throttle
Fig. 4 (right)—Diagram of new Schebler model T with metering pin controlled by air valve

nite size of air passage and a fixed size of nozzle out of which the fuel issued. The nozzle and the air passage were proportioned according to the richness of mixture, but once the size of each was set there was no changing.

This type of carbureter proved satisfactory in a relatively limited range of motor speeds such as existed at that time, but when the motor speeds increased, covering a range between 300 and 1200 r.p.m. this type proved inadequate. If it gave a satisfactory mixture for relatively low speeds the mixture was too rich in gasoline vapor on the higher speeds due to the increased air velocity past the nozzle or jet creating too great suction on the gasoline and increasing the rate of flow of gasoline in proportion to the volume of air.

Air Valve Added

It was this weakness in the Maybach type that led to the second important step in carburetion, namely, the introduction of what has come to be known as the auxiliary air valve, the credit of which has been ascribed to Krebs, an engineer of the Panhard company, Paris, France. Krebs realizing the failure in the Maybach design conceived the idea of adding more air when the engine speed increased and he accomplished this by an air valve, Fig. 2, in the form of a leather diaphragm, which while not affected by the relatively low motor speeds, was affected by the higher speeds and when sucked by the increased air current gradually opened an auxiliary valve adding to the air supply and thereby maintaining the desired proportion of gasoline vapor and air.

Air Valve Types

THE Krebs type can to-day be considered the simplest form of carbureter which operates satisfactorily and there are several different models now manufactured based on the principle of the auxiliary air valve only. In these the problem is worked out in different ways. One manufacturer uses a spring-controlled valve; another hopes to get better results by regulating the movement of the valve by two springs, instead of one; still another maker adds an air dashpot with the hope of getting finer regulation and a better functioning of the auxiliary air valve; another uses a dashpot filled with gasoline; and there are others who use metal balls to serve as the auxiliary valve; while others use what are known as weighted air valves. While they all differ in the details of working out the design they are, nevertheless, based on the basic principle of the auxiliary air valve as originally worked out by Krebs. For simplicity in nomenclature we will refer to this type as the air valve type. Some of the concerns manufacturing this type of carbureter are G. & A., Air-Friction, and Breeze. G. & A. uses different sizes of metal balls; Air-Friction uses a weighted air valve; and Breeze a spring-controlled valve.

Metering Pin Class

THE next type of carbureter may, for convenience, be referred to as the metering pin class, metering pin being synonymous with measuring pin. This division incorporates all that is in the air valve or Krebs classification but goes further and inserts a metering pin, which is a pin with a bevel point, not unlike the sharpened end of a lead pencil, in the nozzle or jet from which the gasoline issues. This pin is inserted with the object of regulating the flow of gasoline, and is used in addition to the auxiliary air valve so that this type incorporates four basic features: the float control, the auxiliary air valve, the nozzle in the air passage and lastly, the measuring pin in the nozzle.

Schebler Metering Pin

This metering pin is not stationary but is designed to be moved endwise, either raised or lowered so as to regulate the size of the opening through which the gasoline issues. A conventional form of it is that shown in Fig. 3 used on one Schebler model. The metering pin is linked with the throttle so that as the throttle is opened the metering pin is raised out of the nozzle so as to increase the flow of gasoline in a desired ratio with the increased air, the ratio of increase being obtained by various adjustments between the throttle and the metering pin.

There are other concerns which move the metering pin other than by the throttle, in fact, in the latest model T Schebler, Fig. 4, the metering pin is controlled by the auxiliary air valve. When the valve moves downward, opening, it carries with it the metering pin which extends downward into the jet and is designed to increase the jet volume as it is lowered, whereas in the older Schebler type the jet volume is increased by raising the metering pin. In both the auxiliary air valve is used. In one it is controlled by a spring and in model T by a dashpot and spring.

There are other carbureters in which the metering pin is regulated by what is known as a metering air valve, in short, a measuring air valve to control the measuring gasoline pin. An example is the Stewart, Fig. 5, in which the metering valve shown in black, is rather a complex affair. The metering pin stands vertically in the center of the valve and can be located by the collars on the lower end meshing with

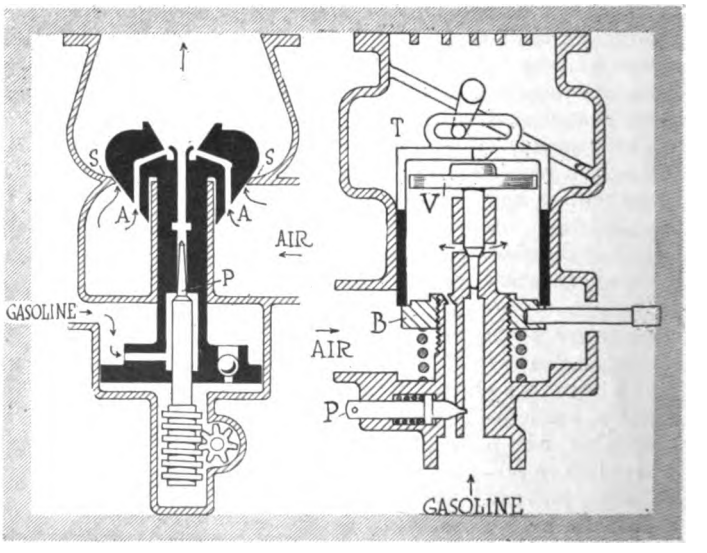


Fig. 5 (left)—Diagram of Stewart with metering pin P controlled by air valve shown in black
Fig. 6 (right)—Diagram of Heath with metering pin controlled by mushroom valve V

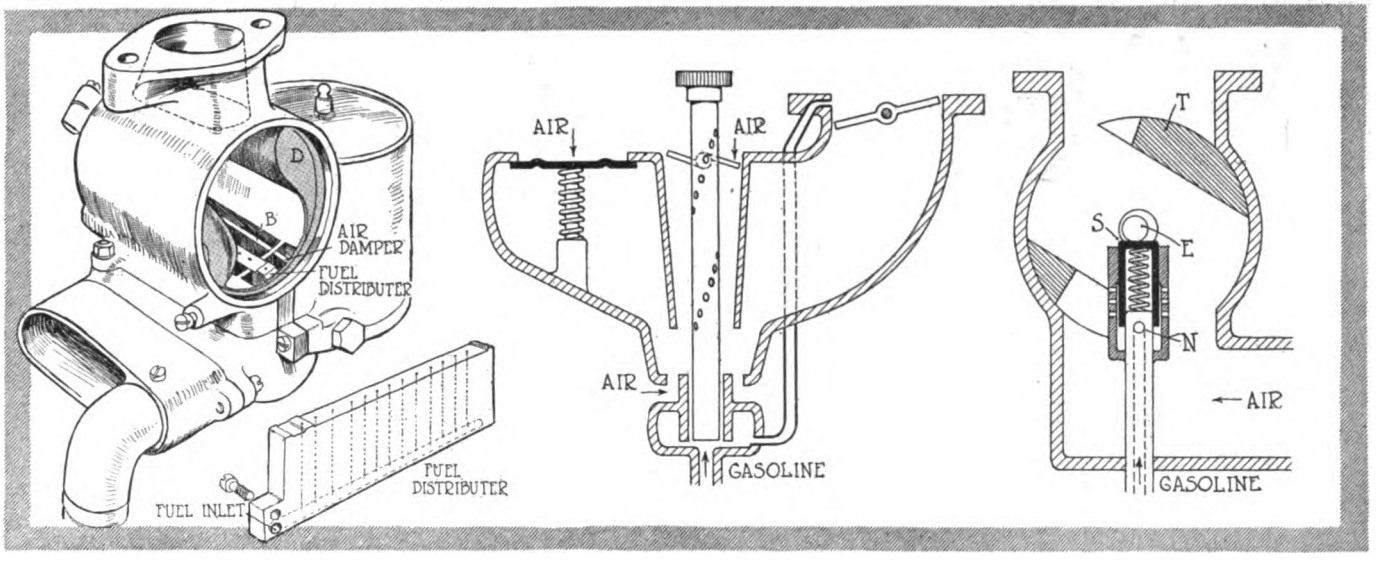


Fig 8 (left)—Master expanding carbureter showing the distributer with dotted lines indicating nozzles. Fig. 9 (center)—Diagram of Carter with standpipe nozzle having spirally-located perforations. Fig. 10 (right)—Diagram of Parkin showing nozzle N covered and uncovered by sleeve S

the small adjusting wheel by which the pin can be raised or lowered as desired. Normally the metering air valve by its inverted cone-shaped top fills the entire air space, the only open space for air to pass being through the two small openings *A* with the arrows indicating the direction of air flow. These passages have air capacity for only very low speeds and as soon as the motor requirements exceed their volume the suction of the engine begins lifting the entire air valve indicated in black. The higher this valve is lifted the wider is the space between it and the metering pin at the point *P* and the greater the volume of gasoline permitted to pass the jet. Also the greater the volume of air passing between it and its seat *S*. By the adjustment provided at the base of the metering pin, the pin is set to supply a definite amount of fuel when the air valve rests on its seat. This quantity can be regulated as desired. In order to get the best possible action of the air valve the lower end of it is in the form of a piston constituting a dashpot operating in a gasoline well. There is a ball valve by which the gasoline is permitted to rise from below to above the piston as the valve settles on its seat. This dashpot gives a more uniform movement and prevents the valve from fluttering.

Heath Metering Pin

The metering pin assumes still another form in the Heath carbureter, Fig. 6, in which it is supported on a mushroom-shaped valve *V* and within the throttle *T*. The throttle is a vertical cylinder open at both ends but the lower end is closed by resting on an adjustable base *B*. The top is open, only the blackened portions of the sides representing the cylinder wall. Raising the throttle *T*, which is equivalent to opening it, raises the lower end off the base piece, so admitting air. This air current impinging on the lower face of the valve *V* raises it, thereby lifting the metering pin out of the nozzle. The greater the air current the higher is the valve *V* raised and the more gasoline issues. This maker goes still further in his regulation by the adjustable throttle base *B* which can be raised or lowered by hand. In order to get a still more delicate relationship between the amount of air and gasoline the upper face of the base *B* is stepped so as to give a finer air regulation. A novel priming device takes the form of a plunger *P* which regulates a separate fuel passage that vertically parallels the fuel passage in the nozzle, and is shown at the left of it. Efforts tending for a more complete mixing of the air and gasoline vapor take the form of a spiral fin in the mixing chamber above the throttle and also a coarse screen across the top of the mixing chamber.

Still another form of carbureter using the metering pin regulation is the Newcomb, Fig. 7, in which the metering pin *P* is carried in a hollow plunger indicated in black, this plunger operating vertically in a cylinder *C* and being lifted in this cylinder by the motor suction. The stronger the demands of the motor the higher is the metering pin raised from the nozzle and the greater the amount of gasoline permitted to flow. The illustration shows the metering pin almost entirely out of the nozzle, and represents the condition with the motor operating at high speed. With the motor at rest the plunger shown in black would be lowered considerably, so that the metering pin would almost close the nozzle. With the first demands of the motor air is drawn from inside the plunger through holes *H* at the base and it is through these holes that the gasoline vapor must also escape and mingle with the air currents in the vertical channels at each side of the cylinder *C*. At the base of the plunger carrying the metering pin is an adjusting collar by which the height of this plunger when at rest can be altered so that a definite setting can be given the metering pin in the nozzle.

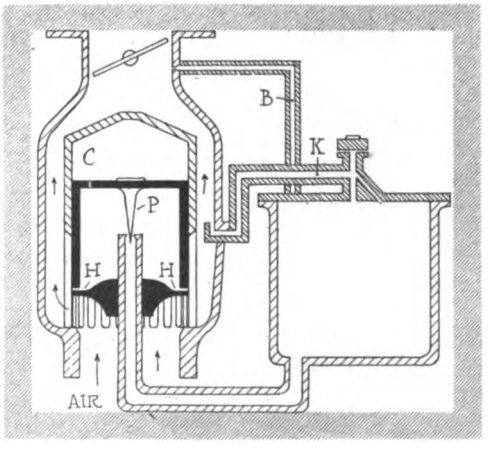


Fig. 7—Newcomb carbureter diagram with metering pin controlled by hollow air valve

Still a further type of metering pin carbureter is that used on the Sunderman, in which an auxiliary air valve, bearing practically the same position with regard to the metering pin as that in the Stewart, lifts the metering pin as the valve is lifted from its seat by the air current.

These five designs include practically all the makes which combine the metering pin and the auxiliary air valve in regulating the flow of gasoline. There are several makes not included herein which make use of the metering pin in controlling the flow of gasoline but introduce many other combinations, making it impossible to include them in this class. The Rayfield uses a metering pin in

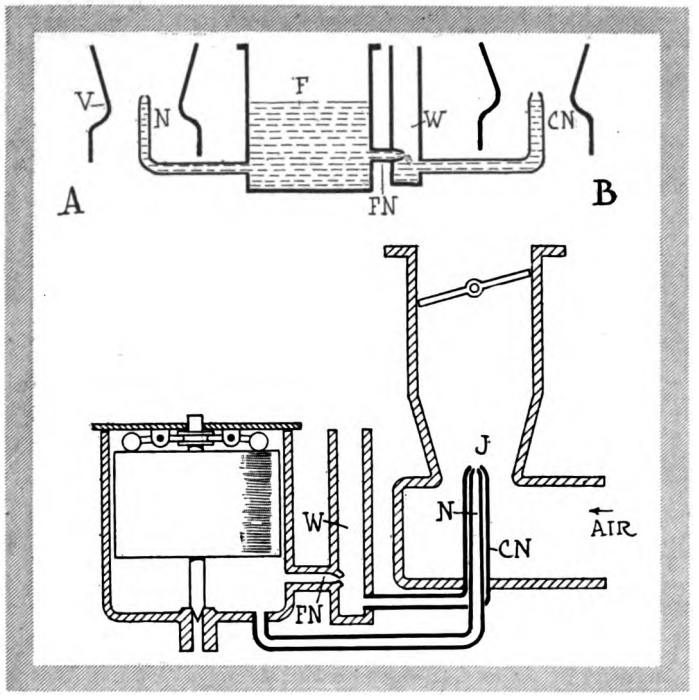


Fig. 11—Zenith compensating jet type made up of two carbureters, one at A, the other at B, which are united in the lower illustration

the main nozzle, but it also employs a secondary jet which places the instrument in a different classification.

Expanding Carbureter Types

THE third division of carbureters are those known as the expanding types and include such makes as Master, Carter, Parkin and Greuter. As the word expanding implies, this division might be designated as the multiple jet type in which the gasoline is fed through several openings rather than one, these openings being progressively uncovered or brought into use according to the opening of the throttle and the demands of the motor. In the Master there are a great many small openings progressively uncovered by the opening of the throttle. In the Carter the gasoline issues through a vertical standpipe in the mixing chamber, this standpipe having a series of small holes drilled in an ascending spiral so that the greater the motor suction the higher the gasoline rises in the standpipe and the more of these small holes it issues through. In the Parkin the fuel nozzle has a cap or covering over it which covering is raised or lowered as the throttle is opened and closed, thus increasing the flow of gasoline in proportion to the demands of air. In the Greuter, which is the only example of a multiple carbureter, there are really three separate nozzles in three separate mixing compartments, these individual carbureters being brought into operation progressively, according to the requirements of the motor.

While all of these expanding types of carbureters vary and are quite different in their external appearance they are really alike in their functioning, for which reason they are grouped under the one head of expanding types. Expanding means enlarging, which is done by bringing into use the additional nozzles or openings through which the fuel issues.

Fig. 8 shows how this is done in the Master. In the lower right is shown the fuel distributor with its thirteen vertical dotted lines indicating as many openings for the flow of gasoline from the main fuel passage in the base of this distributor. The top of this distributor is shown in position in the carbureter, as also is shown the barrel throttle *B* with its curved opening designed to start uncovering these thirteen nozzles in the distributor progressively from one end to the other until all are uncovered, thus establishing its right to be classified as an expanding type. This carbureter also has an air valve or damper, by which the volume of air entering over the top of the various nozzles can be regulated.

Carter Expanding Design

Fig. 9 shows why the Carter carbureter must be classed as an expanding type. In this carbureter is a standpipe constituting the spraying nozzle, and it is in this pipe that are drilled the various holes in the form of an ascending spiral, each hole in reality being a nozzle. At low speeds, when the gasoline is drawn only a moderate height in this standpipe, the fuel issues from but few of the lower holes. As the gasoline rises higher in the standpipe at intermediate speeds it issues from more of the openings; and when it rises still higher at high speeds yet more of the openings are brought into operation. The main air opening is in a vertical tube surrounding this standpipe so that the inrushing air passes along the pipe, excepting at the lower end. There is an auxiliary air valve.

Fuel regulation in the Parkin expanding carbureter is obtained mechanically as the throttle is opened. The throttle *T*, Fig. 10, is a horizontal revolving barrel type with its axis carrying an eccentric pin *E*. This pin bears on the top of a cylindrical sleeve *S* which covers the nozzle. By raising or lowering this sleeve the single large nozzle *N* is uncovered or covered in proportion as the throttle is closed or opened. This is accomplished mechanically by the eccentric *E*, which operates as the throttle is rotated. This eccentric can be adjusted as desired with relation to the throttle. The cylindrical throttle performs a double function: the upper part is the throttle proper and the lower part a variable air shutter. This lower portion controls the amount of air which passes the jet by varying the area of the passageway around the jet.

Compensating Jet Class

THE fourth classification of carbureters has for convenience been called the compensating jet type, and in this class are such makes as Zenith, Holley, Longuemare, and one of the Stromberg models. This carbureter type has been designated the non-moving-part division by some, a title more or less of a misnomer in that there are other carbureters without moving parts, yet which are entirely different in functioning from those mentioned in this division. For example, such as Master and Carter, are without moving parts, yet are expanding types, whereas Zenith, Holley, etc., are not expanding types, and yet are without moving parts.

The Zenith System

The basic principle of the compensating jet type is illustrated in Fig. 11 of the Zenith. This illustration is made up of three parts, parts *A* and *B* above showing the two elements which are incorporated in the complete carbureter shown below. This compensating jet type may be described as a two-fold type: Part *A* shows a float chamber to the right with a nozzle *N* leading into the venturi-shaped mixing passage *V* at the left. This part practically corresponds with the original Maybach carbureter design. It is simply a fixed nozzle located in a fixed air passage. The part *B* at the right illustrates the compensating feature. Here is what is termed a compensating nozzle *CN* in an air passage. This nozzle does not communicate direct with the float chamber *F*, but leads into a well *W*, which receives its supply of gasoline through a fixed nozzle *FN* in the float-chamber side. This well *W* is open to the atmosphere at the top. Its *modus operandi* is: When the motor is idle the gasoline is at the same level in the well *W* as in the float chamber *F* and also in the nozzle *CN*. With the acceleration of the motor the supply in the well *W* is soon consumed, after which air is drawn through the nozzle *CN* along with the gasoline, and it is this

of air and gasoline being fed through nozzle which gives it the name of the ensating nozzle, the air being the m which mixes with the gasoline and es the richness of the mixture.

us combining parts *A* and *B* we have -fold carbureter, shown in the lower on of the illustration, where the two es *N* and *CN* are arranged concen- lly, one outside the other. The nozzle nside, draws its supply of gasoline t from the float chamber, whereas the ide or compensating nozzle *CN* draws supply from the atmospheric well *W*, h in turn is fed by the fixed nozzle *FN* the float chamber. It is because the *W* is open at the top to atmospheric sure that this type of carbureter has n called by some the atmospheric type. term compensating is preferable in t the compensating nozzle *CN* really es care of the desired richness of the xture. The main nozzle *N* would give a xture too rich on the higher speeds, as s shown in the original Maybach, but combining the com- nsating nozzle *CN* with it there is obtained a reduced suc- n on the top of the jet at the point *J* by the fact that a rtain amount of air is mixed with gasoline in coming rough the compensating or outside nozzle, thereby reducing e gasoline flow at higher speeds and effecting the desired mpensation between gasoline vapor and air in proportion- g the mixture.

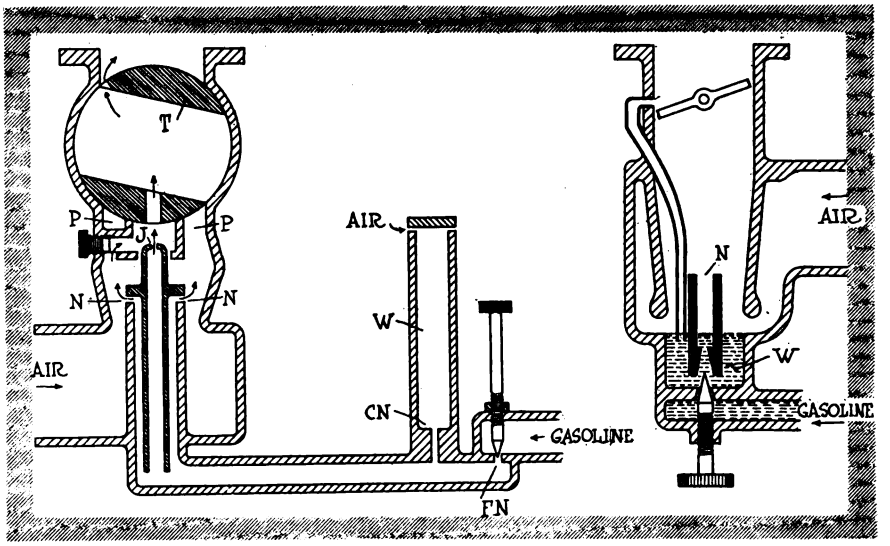


Fig. 12 (right)—Diagram Holley compensating jet type with main nozzle N in gasoline well. Fig. 13 (left)—Diagram Longuemare compensating jet type, main jet N, starting jet J and gasoline well W

he Compensating Holley

A second example of the compensating jet carbureter is ne Holley, the principle of which is diagrammed in Fig. 12. he fuel flows into a little cup or well *W* past a needle valve, which is for hand regulation and does not enter into the asic principle of the design. Into this well *W* dips two ozzles, one *N* which dips deep into the well and ends in he lower part of the mixing chamber. This is the fixed nozzle. The other nozzle takes the form of a tube, which does not dip deeply into the well *W* and extends upward into the manifold above the throttle. This is the compensating nozzle. Study the working of this carbureter. When starting and the throttle is practically closed a rich mixture is sucked up the tube, giving easy starting. Opening the throttle brings the main nozzle *N* into action and soon the fuel may drop in the well *W* below the bottom of the pipe, so that instead of all gasoline being sucked up this pipe there is air mixed with the gasoline, thus giving the compensating effect.

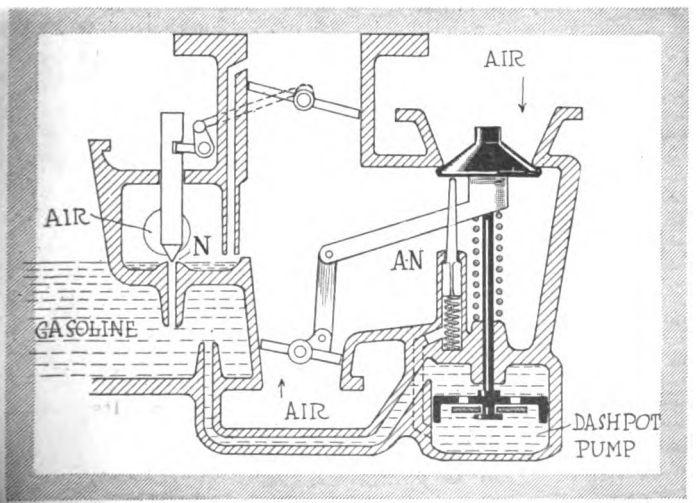


Fig. 14—Diagram Rayfield with main jet N, auxiliary jet A N controlled by air valve and dashpot pump for rapid acceleration

Longuemare Compensation

Another type of compensating jet carbureter is the Longuemare which is diagrammed in Fig. 13, the diagram not conforming accurately to the location of the parts in the carbureter, certain license being taken to make the explanation more simple. This carbureter has a starting nozzle *J* with the top of which registers a small slot in the lower part of the revolving throttle *T*, there being a small escaping slot in the upper part of the throttle. When the throttle is in this position the main nozzle *N* is not functioning. As the throttle is opened the large opening in it uncovers the air passages *P*, thereby bringing into action the nozzle *N* and leaving in operation the small starting nozzle *J*. At the start the gasoline well *W*, open to the atmosphere at the top, is filled with gasoline to the level of the nozzle *N*, but soon this surplus is exhausted and all of the supply must come through the fixed opening *FN* leading to the float chamber. When the gasoline is exhausted in the well *W* then air is drawn in through the top of the well, these air bubbles mixing with the gasoline issuing through *FN* and flowing with it to and through the main nozzle *N*. Thus do these air bubbles reduce the richness of the mixture at high speeds and bring about the desired compensating result. In this carbureter an exceptionally neat design is accomplished by having the adjusting needle for the opening *FN* in the middle of the float and having the gasoline well *W* surround it so that the two thus located concentrically form the vertical guide for the annular float.

A Mixed Division

LASTLY in this classification we come to three of the leading American carbureter types which it is difficult to classify and which do not strictly come under any of the four divisions already delineated. These makes are Stromberg, Rayfield and Kingston. Rayfield uses a metering pin, which pin is lifted as the throttle opens in the main jet *N*, Fig. 14, through a linkage diagrammed, and so establishes a right to be classified as a metering pin type, but it goes further: It incorporates an auxiliary nozzle *AN* which also has a metering pin which is depressed when the auxiliary air valve opens. Thus by having two distinct nozzles it establishes its right also to be classified as an expanding type of instrument. But Rayfield goes still further in that it combines a pumping action on the gasoline in the auxiliary

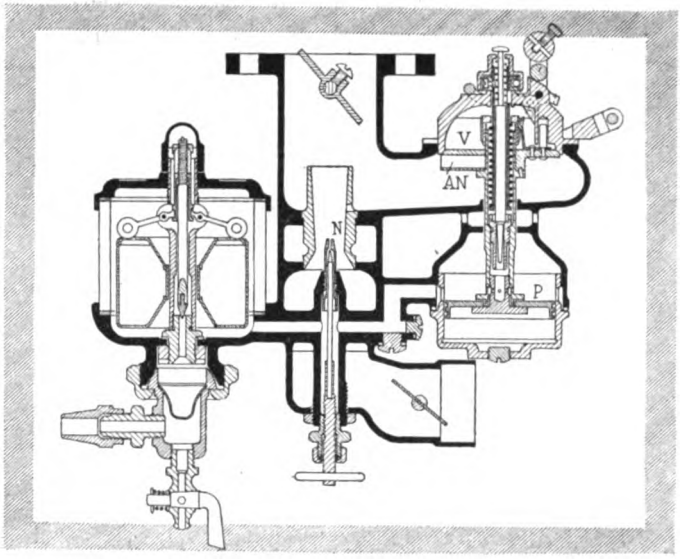


Fig. 15—Section Stromberg model K with main jet N and auxiliary jet A N in the air valve and controlled by it

nozzle *AN* whereby a very rich mixture is furnished for acceleration whenever the air valve is suddenly opened. This is accomplished by the piston on the lower end of the air valve stem, this piston working in a dashpot filled with gasoline. Gasoline enters the dashpot above the piston and is admitted to the space below the piston by the disk valve in the piston. When the air valve suddenly opens, forcing the piston downward, this disk valve is automatically closed, forcing or pumping the gasoline upward through the dotted fuel passage into the nozzle *AN*, where it is sprayed into the inrushing air. Only when the valve opens is this pumping function occurring and at other times the gasoline issues through this auxiliary nozzle according to the suction of the motor. Thus Rayfield is a compound of two metering pins in conjunction with the pumping function for acceleration.

A Stromberg Model

Under our classification Stromberg model K, Fig. 15, is a combination instrument incorporating a main nozzle *N* without any metering pin, having an auxiliary nozzle *AN* incorporated in the auxiliary air valve *V* and which nozzle is regulated by a metering pin shown in the lower portion of the valve stem. The valve *V* is carried on a piston *P* working in a dashpot filled with gasoline. As the valve opens downward the annular space around the pointed end of the metering pin is increased, increasing the flow of gasoline through nozzle *AN*. This measures the additional gasoline needed by the opening of the air valve. The air valve is closed by the spring indicated, the rapid upward closing of the valve being retarded by the slower movement of the gasoline above the dashpot piston passing around the piston to the space below it. Thus does this carbureter combine the features of two nozzles, the auxiliary nozzle including means for supplying gasoline for quick acceleration.

The Kingston Type

Lastly comes the Kingston, Fig. 16. It is a combination of the compensating jet type and also the weighted air valve design. Gasoline flow is regulated by a hand-adjusted needle valve *N* located in the bottom of a gasoline well, the level of which is shown at *W*. Into this well extends the lower end of a small air tube *T* which surrounds the needle valve stem. The normal air passage is obstructed by a hinged metal ball *V* forming a weighted air valve. When starting the motor this air valve remains seated as illustrated, all the air necessary being drawn up the small tube *T*, this tube sucking up a rich supply of gasoline. Soon the supply of gasoline in the well *W* falls below the lower end of the tube *T* and then only air or air mixed with gasoline vapor is drawn up the tube. With increasing motor speed the weighted air valve *V* is lifted off its seat and lifted as needed by the demands of the motor. In operation this carbureter is similar to the Holley excepting that it employs the weighted air valve which the Holley does not make use of. To classify the Kingston it might be regarded as a combination of the compensating jet and weighted air valve type.

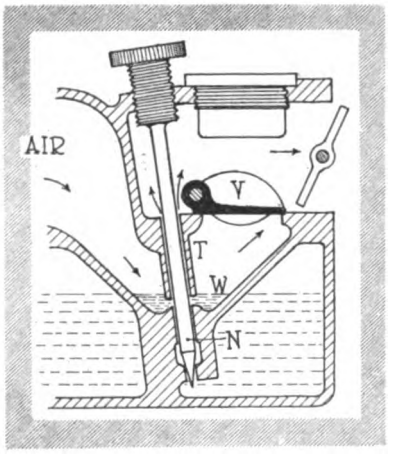


Fig. 16 (left)—Diagram Kingston with starting air tube around adjusting needle and weighted air valve

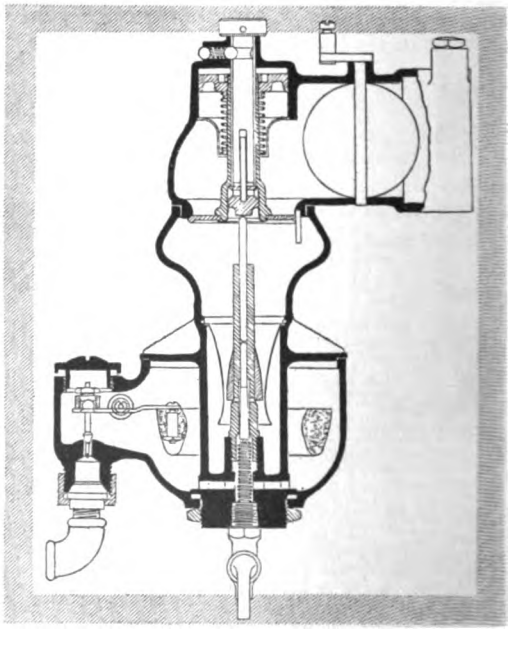


Fig. 17 (right)—Section new Schebler model T with auxiliary air valve controlling the metering pin

Other Carbureter Attachments

THIS concludes the classification of the various carbureters the majority of which are included, although there are some that it has not been possible to incorporate in this review for want of information.

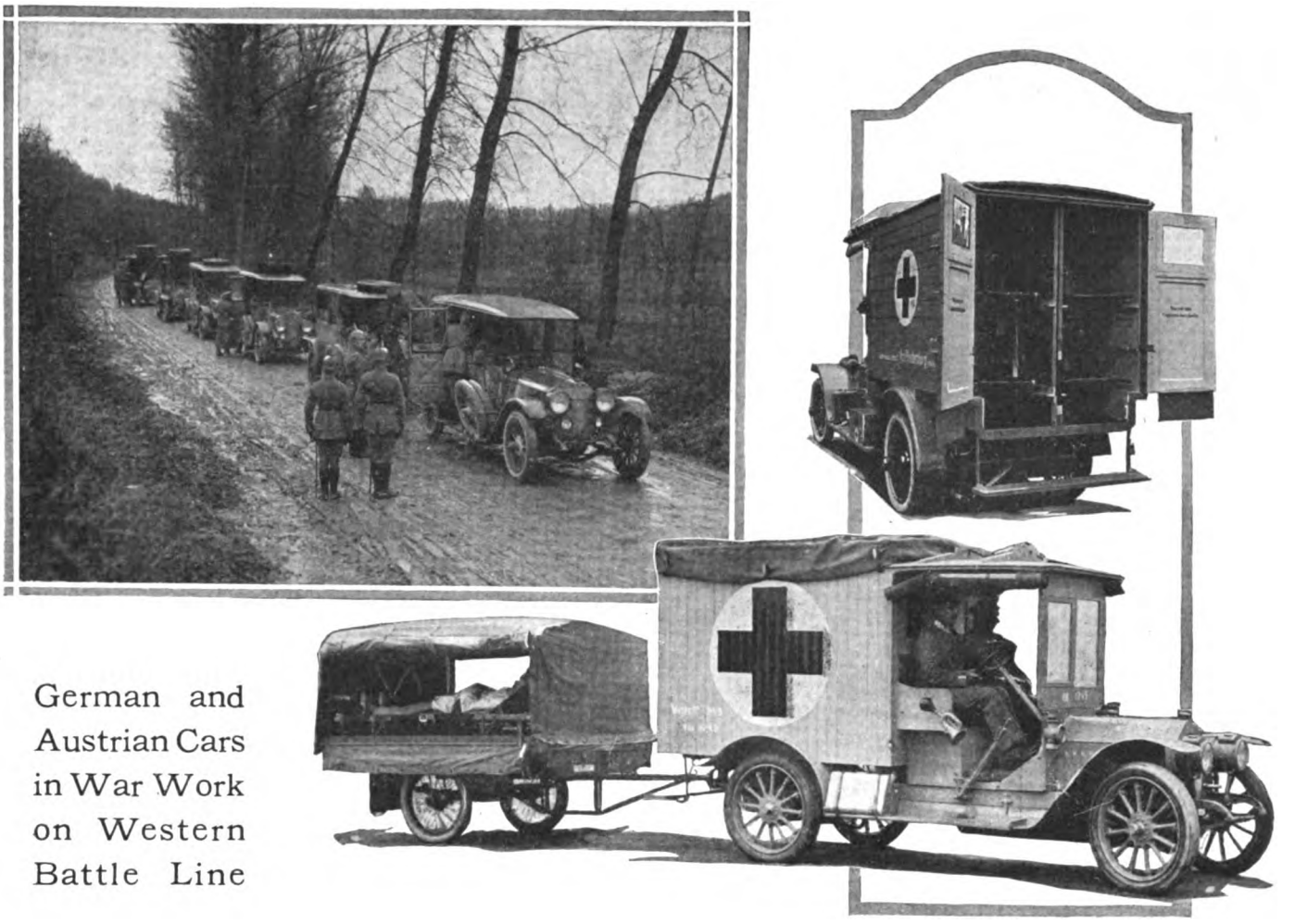
Many of these carbureters incorporate many devices which are not essential so far as the basic principles on which they are based are concerned but which play their part in making more efficient the general work of the instrument. Thus nearly all of them have some feature or other to facilitate starting. The problem of making starting easy in cold weather consists in getting commensurate flow of gasoline. When gasoline is cold it will not issue from a nozzle so rapidly as when it is warmer, thus in starting there must be furnished a larger orifice or opening in the nozzle or else the air supply must be temporarily restricted so that there is a stronger suction on the gasoline.

The customary way to accomplish this is by the shutter valve in the primary air passage. Practically shutting off this passage puts the entire suction on the fuel jet.

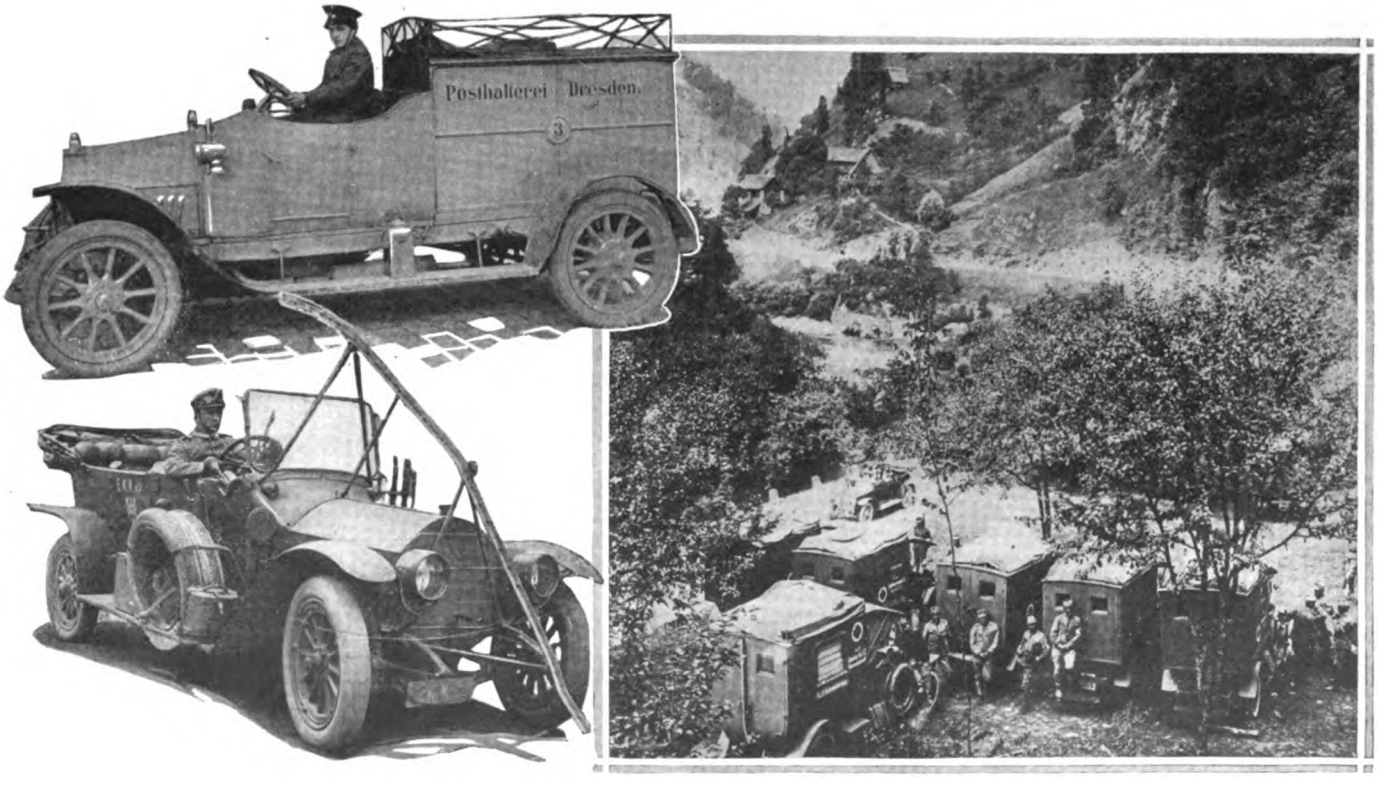
Those makers not following this plan have what is termed a by-pass which is a restricted passage leading from the nozzle or near it to a point above the throttle so that when the throttle is closed the engine suction is exerted on this small passage, thus securing the requisite supply of gasoline.

Stromberg uses a shutter valve in the main air intake; Schebler employs a similar valve; Rayfield uses a small by-pass channel to the manifold above the throttle.

German and Austrian Cars in War Work on Western Battle Line



Above at left—Imperial automobiles constituting the cortege of the Kaiser. At right—German Red Cross ambulance presented to von Hindenberg's army. Note trailer attached

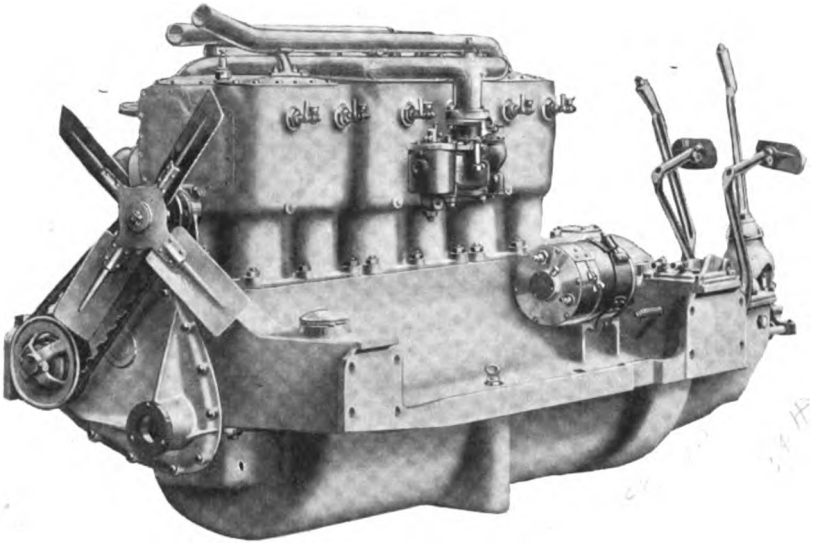


Above—One of the women post deliverers of Dresden, Germany. Below—Mercedes fitted with wire-cutting device for work at the front

A train of motor vehicles in the service of the Austrian army sheltered under trees while awaiting orders. Note the mountainous character of the country

Winton Has Two New Sixes

Chassis on Same Lines Has 33 Hp. or 48 Hp. Motor—Many Small Improvements



New Winton six motor, showing clean design and also mounting of starting motor and carbureter. Note pair-cast cylinders. The two new models are similar, the larger being 4½ by 5½ and the smaller 3¾ by 5¼

FOR 1916 the Winton Co., Cleveland, Ohio, will concentrate its energies upon two new models, both sixes. The larger has 4½ by 5½ in. bore and stroke and the smaller 3¾ by 5¼ in., both being similar in design. With seven-passenger touring bodies the respective prices are $3,500 and $2,285. There are nine bodies listed as standard equipment for each chassis, including practically all types, and the chassis are also obtainable without bodies at $3,000 for the larger and $2,000 for the smaller, while special inclusive prices are quoted for one chassis supplied with two bodies of different type.

Motor Is Neater

The outside of the motor has been cleaned up a great deal, though retaining the lines of former Winton engines. It is noticeable that the pair casting for cylinders is adhered to though the assembly is so compact that the effect is almost the same as that of a block casting. The upper half of the crankcase, which is divided horizontally in the conventional way, has as part of the casting, an aluminum tray which extends from end to end of the motor on either side. Thus the front portion of the chassis frame is completely filled by the crankcase which makes its own sod pan.

On these trays the electrical accessories are disposed very accessibly, the water pump being central on the right side with the magneto behind and Bijur generator in front. On the left side is the Bijur starting motor and the carbureter, which latter has a long intake manifold that is led over the top of the cylinders to a distributing pipe on the valve side of the motor. Both this part of the intake manifold and the exhaust branch are positioned so that they do not interfere with the accessibility of the valves, which are inclosed by the conventional type of cover plate.

In the bottom of the crankcase there is a plunger oil pump, driven by a vertical shaft which carries a skew gear meshing with a corresponding wheel on the rear extremity of the camshaft. This pump draws oil through a screen and delivers it to a main supply tube, cast in the crankcase, whence it passes to each of the four main bearings.

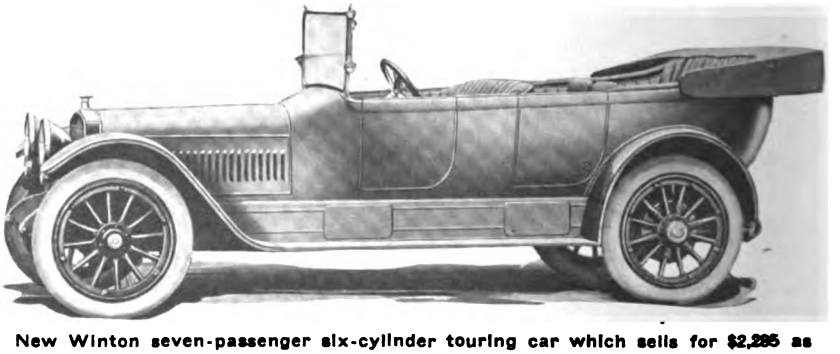
The use of four crankshaft bearings enables each crankpin to have a separate feed through oil holes drilled in the crankshaft, and the smaller moving parts of the motor are cared for by the spray of oil escaping from the main bearings and lower ends of the connecting-rods.

The distribution gearing at the front end is a silent chain passing over the crankshaft pinion, the camshaft sprocket and the generator pinion, and this chain is fed by a pipe that screws into the far end of the main oil supply pipe, thus being streamed with oil continuously.

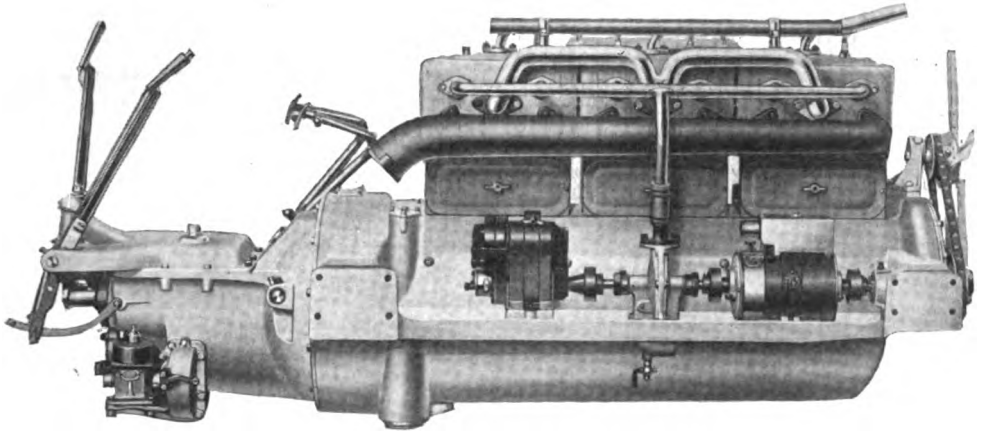
Balance Studied Carefully

The pistons exhibit no especial peculiarity, but are fairly light in section, and they provide the bearing for the wristpin which is fixed to the upper connecting-rod end. The connecting-rods also are the accustomed I-beam forgings, but the makers state that very special care is taken in weighing up the different reciprocating parts, so that the piston and connecting assemblies of each cylinder have the same mass reactions. For the crankshaft, which is 2 in. diameter, a very high tensile steel is employed, and the four bearings are most rigidly supported in the crankcase by spreading webs of metal backing the bearings. A detail which makes for efficiency in the motor is the use of constant acceleration type cams, and quietness is sought by the use of roller ended tappets. The head of the tappet is maintained in contact with the valve stem by a cushion spring, and it is noteworthy that the roller is considerably larger in diameter than usual, being 1¼ in. across by ¼ in. wide.

There are several other interesting details about the motor. For instance, there is a water passage completely around each cylinder, the two included in each casting being separate individually. Owing to the position of the water pump, high up and midway on the side of the motor, its delivery is easily so divided as to give an equal supply to each



New Winton seven-passenger six-cylinder touring car which sells for $2,285 as the smaller model and $3,500 as the larger



Right side of new Winton motor showing mounting of magneto and generator. Note mounting of tire pump on the side of the gearbox

cylinder block and, a conspicuous user's advantage, the glands are ideally accessible for adjustment.

The pistons have rings of a new pattern with step joint ends and there are three to each piston, no scraper ring being used. Priming cocks are supplied in each cylinder, with a cup for holding the necessary small quantity of gasoline and there is also a priming cock in the intake manifold. The placing of the Bosch dual magneto at the rear end of the cylinders allows the wires to be taken into the end of the conduit and so to be distributed with a minimum of exposed length.

The carbureter employed is a Rayfield and the fuel is raised from a tank of 21 gal. capacity at the end of the frame, by a Stewart vacuum feed.

Clutch Has Many Plates

The multiple disk clutch has alternate plates of steel and fabric, and very light pressure suffices to release it, owing to the extremely large surface given by the number of plates employed. It is entirely inclosed between the motor and gearcase, but an amply large hand hole gives free access to the spring.

In the gearset four forward speeds are provided with direct on third, and the top speed ratios are variable. For the large chassis the choice is of four different bevel combinations, the highest being 3.77 to 1 and the lowest 4.73 to 1. On the smaller car the higher of these two is not given, but each of the other three is available.

In the rear axle the driving gears are spiral bevels, and taper roller bearings are used throughout. The propeller shaft is open type and a torque stay is employed.

Springs are three-quarter elliptic at the rear, and take the driving stress, a feature being that both front and rear springs are supplied with the Dann insert which maintains lubrication between the leaves.

Bodies Avoid Extremes

In the bodies the designers have successfully aimed at modernity without adopting ultra-streamline forms. Hoods, cowls and body lines merge, but there is no attempt to make the section of the same shape throughout. On the touring cars there is a slight rise in the level of the side panels, the cowl being the lowest point and the rear seat the highest. A choice of either divided front seats or the old style is given, the price being the same for either. Another option is either wire or wood wheels and practically no limit is put upon the buyer's choice of color schemes.

Of course the equipment is complete to the last detail. The tires are 36 by 4½ in. on the smaller chassis and 37 by 5 in. for the larger.

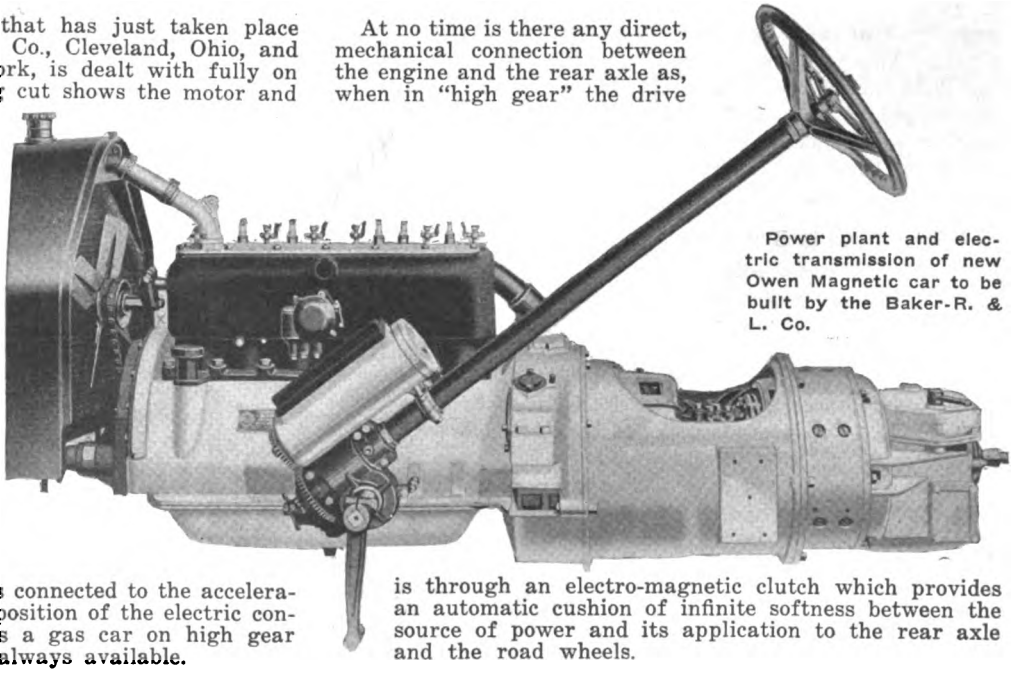
Owen Magnetic in Smaller Size Announced

New Model Is Intended Especially for Town Use

THE combination of interests that has just taken place between the Baker R. & L. Co., Cleveland, Ohio, and the Owen Magnetic Co., New York, is dealt with fully on another page. The accompanying cut shows the motor and electric transmission of the smaller chassis which will at once be added to the large Owen car the manufacture of which will be continued.

The new car is intended to be especially suitable for town use, having a six-cylinder 3½ by 5 in. motor and a steering lock that will allow the car to turn in 38 ft. despite its 126 in. wheelbase. The transmission will be just the same as that which has been used for the present Owen Magnetic, and the whole control is concentrated upon the steering column, as shown in the cut. From starting up the gas engine to braking, everything is controlled by a lever on the steering wheel, except the throttle of the carbureter which is connected to the accelerator pedal. When in the limiting position of the electric control the car operates precisely as a gas car on high gear except that the electric brake is always available.

At no time is there any direct, mechanical connection between the engine and the rear axle as, when in "high gear" the drive is through an electro-magnetic clutch which provides an automatic cushion of infinite softness between the source of power and its application to the rear axle and the road wheels.



Power plant and electric transmission of new Owen Magnetic car to be built by the Baker-R. & L. Co.

New England Tourist Gain 50 Per Cent

$25,000,000 Spent in the Past Summer by Automobile Parties—225,000 Cars and 675,000 People on the Road During July and August

By James T. Sullivan

BOSTON, MASS., Nov. 29—When it is estimated that some $25,000,000 was spent in New England the past summer by motor tourists; that there was a 50 per cent increase in the visitors over a year ago; that during the busy months of July and August some 225,000 cars carrying approximately 675,000 people were moving about day after day leaving a golden trail behind them, it is proof unquestioned that New England was not sidetracked for the San Francisco exposition, and that war did not have any effect on the automobile owners this season.

The writer has made a tabulation of figures each year for the past four seasons on motor car visitors to Massachusetts and New England, and this year the totals show a very substantial increase. In fact, there has been a gain of about 50 per cent in the Bay State visitors this year, which is rather remarkable.

An analysis of the totals for the four years from 1912 to 1915, inclusive, shows that the gain has been nearly 100 per cent, the addition of twenty-eight more cars being needed to reach that score. In four out of the six groups in which the visiting cars are divided the gain from 1912 to this year has been above 100 per cent. This proves the value of expending money on good roads when there are scenic attractions to draw the tourists. It would be hard for any other State—New York with its area and attractions, New Jersey with its Atlantic City and California with its exposition this year excepted—to excel Massachusetts in attracting visitors.

The figures for 1915 show that the motorists east of the Mississippi still kept their machines headed for the Atlantic coast, while those west of the big river were a bit inclined to go to the exposition. In other words, of the different groups, all of them except the far west combination showed a gain. This year there were thirty-four States represented, the same number as a year ago, for while four—Delaware, Mississippi, Arizona and Oklahoma—dropped out, a similar number were added—Arizona, New Mexico, South Carolina and West Virginia. There were cars also from five foreign countries this season.

1310 Registered in Bay State

In the total compilation of machines registered in Massachusetts for the summer months it was found that there were just 1310. It must be remembered that these machines belonged to people who came to stay more than a month. Now for each car that is so registered by an owner who comes here to stay there are scores of machines which are never registered. If one were to make an estimate and say that for each car so registered there are at least fifty machines traveling about that do not have to register it would not be putting the figures too high. And that would give 65,500 such cars added to the 1310 registered ones. Assuming that 66,810 machines came to Massachusetts, each carrying three passengers, we have 200,430 motorists from outside the Bay State who were welcomed here last summer.

To get some idea of what this means one must remember that Boston is particularly fortunate in its situation to attract motorists. It is a central point for tourists that cannot be overlooked. If they come in through the Adirondacks, Canada, the Green or White mountains they gravitate down to the ocean and Boston. From that point there are many places of historic interest to keep them a few days. Then they pass on their way West and South. If they come along the coast or through the Berkshires again Boston is the destination, for through that city the path lies to the famous North Shore where the Atlantic is seen at its best, and then on up to the mountains.

So when one takes the figures for Massachusetts he takes the tone representative of all New England. The other States get a large proportion of the tourists that visit the Bay State, perhaps 85 or 90 per cent, but Massachusetts gets about 99 per cent of all who visit the five other New England States.

Spend $600,000 a Day

Therefore if more than 200,000 motorists from outside Massachusetts entered her domain last summer it meant that they were spending at least $600,000 a day on their touring. And limiting them to some ten days or so in the Bay State there is $6,000,000 scattered about. Now if they spent an equal sum among the other States—that is, figuring that 50 per cent of the tour was in the Bay State and the rest in one or all of the others—it gives a total of $12,000,000 from summer tourists.

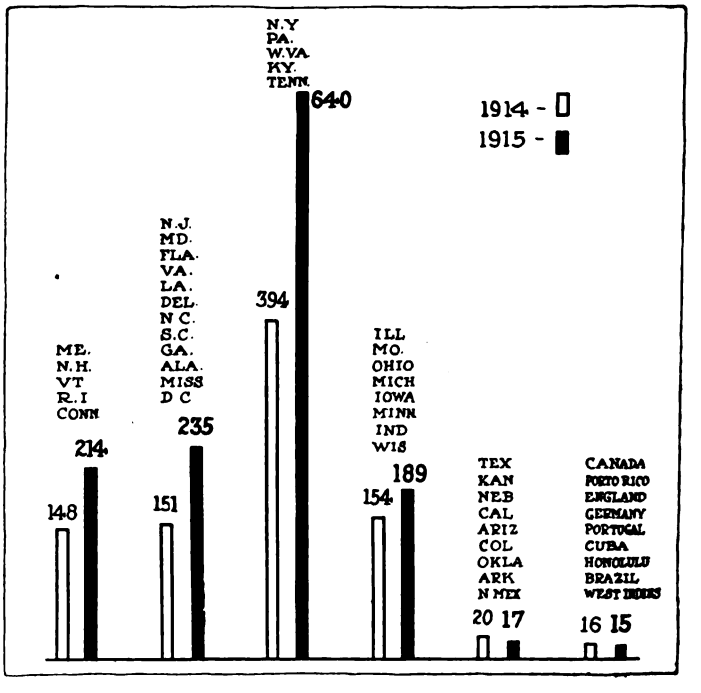
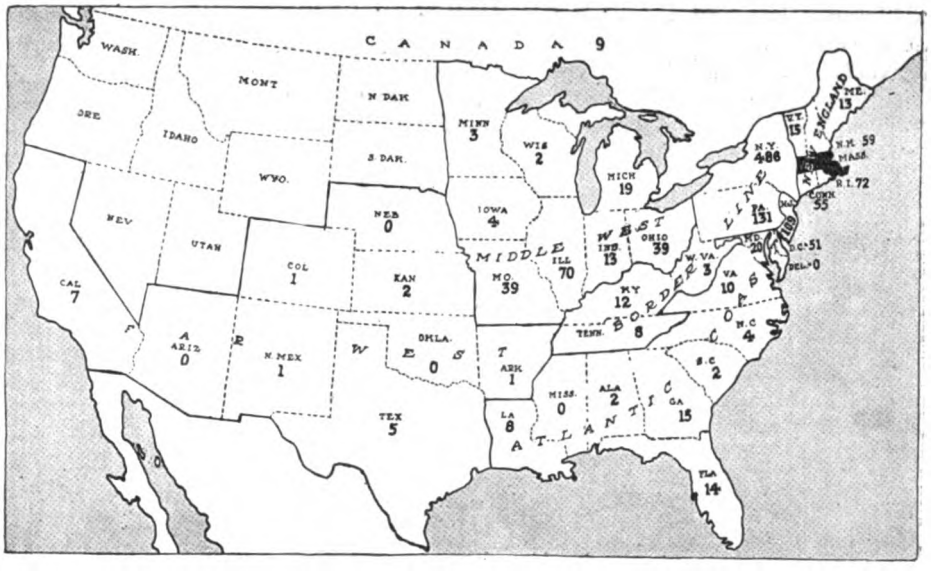


Diagram showing the comparative representation of various States and countries among the automobile tourists in Massachusetts during the past Summer and that of 1914

But that is not all. Take the motor cars owned in New England, numbering about 175,000, as an additional total. They were out every day with their owners and families or friends, and placing the average passengers at the low figure of two for a car, there were 350,000 more people on the New England highways. And living at home they did not all have hotel bills to pay, so the cost of each for a day may be put down for $1, the price of a few sodas, cigars, etc., and you have an expenditure of $350,000 a day. Assume that the great majority has but two weeks vacation and it was spent touring, the cost would roll up to that time about $5,250,000. But there are Sunday and holiday tours in summer. From May 1 to Oct. 31 there are five holidays in Massachusetts. There are at least four Sundays to a month so that would mean twenty-four more. Eliminate three Sundays and say two holidays and class them in the vacation period and a couple of Sundays for bad weather and there still remains at least twenty real out-of-doors days in which motorists spend money. It gives you a total of some $7,000,000. Here is a summer's total reaching $24,750,000 in New England alone, an entire section of country smaller than any one of several Western States. Certainly, with the money spent by the wealthy people who come to Massachusetts or other New England resorts for long stays and that spent on odd days an estimate of $25,000,000 for the summer months is not excessive.



Map of the United States showing the number of cars in each state which traveled over the Massachusetts roads in the past summer

Comparison by Groups

In past years the writer has divided the various sections into groups and the figures allow an admirable comparison. The New England group comprises the cars from the five other States that registered with our Highway Commission for lengthy stays. All the States except Maine show a gain this year so that the figures run to 214 when last year they were 148, that is sixty-six more. Here they are:

New England Group

	1912	1913	1914	1915
Maine	3	6	16	13
New Hampshire	12	10	41	59
Vermont	2	4	4	15
Rhode Island	42	42	57	72
Connecticut	43	43	30	55
Totals	102	105	148	214

Next, we have the States along the Atlantic coast from New Jersey to the Gulf. Here again there is a pronounced increase. There are eleven States in the group. Eight show a gain, two a loss and one is similar to the figures of a year ago. There were 151 machines registered last season and this year the total jumped to 235, a gain of eighty-four. This shows that in the number of States increasing their figures meant some 75 per cent, and in machines registered it went above 50 per cent. New Jersey and District of Columbia were the big gainers. Here are the figures:

Atlantic Coast Group

	1912	1913	1914	1915
New Jersey	56	80	64	109
Maryland	17	16	17	20
Florida	3	8	7	14
Virginia	5	5	8	10
Louisiana	4	3	6	8
Delaware	..	2	1	..
North Carolina	..	2	5	4
South Carolina	..	2	..	2
Georgia	1	2	7	15
Alabama	2	..	2	2
Mississippi	..	..	1	..
District of Columbia	12	23	23	51
Totals	100	143	151	235

The next section is divided into what is termed the Border States and while numerically they number less than any other group except New England the totals are far greater. That is because New York and Pennsylvania are included.

Non-Resident Tourists Visiting Massachusetts

	1912	1913	1914	1915
Alabama	2	0	2	2
Arizona	0	0	1	0
Arkansas	0	0	0	1
California	7	4	4	7
Colorado	2	0	1	1
Connecticut	43	43	30	55
Delaware	0	2	1	0
Florida	3	8	7	14
Georgia	1	2	7	15
Idaho	0	0	0	0
Illinois	39	45	56	70
Indiana	3	7	9	13
Iowa	2	5	3	4
Kansas	1	9	4	2
Kentucky	4	9	4	12
Louisiana	4	3	6	8
Maine	3	6	16	13
Maryland	17	16	17	20
Michigan	15	13	18	19
Minnesota	2	4	4	3
Mississippi	0	0	0	0
Missouri	40	41	39	39
Montana	0	0	0	0
Nebraska	4	3	0	0
Nevada	0	0	0	0
New Hampshire	12	10	41	59
New Jersey	56	80	64	109
New York	209	220	300	486
New Mexico	0	0	0	1
North Carolina	0	2	5	4
North Dakota	0	0	0	0
Ohio	40	29	21	39
Oklahoma	0	0	1	0
Oregon	0	0	0	0
Pennsylvania	78	80	81	131
Rhode Island	42	42	57	72
South Carolina	0	2	0	2
South Dakota	0	0	0	0
Tennessee	6	5	9	8
Texas	8	10	9	5
Utah	0	0	0	0
Vermont	2	4	4	15
Virginia	5	5	8	10
Washington	0	0	0	0
West Virginia	0	1	0	3
Wisconsin	1	2	4	2
Wyoming	0	0	0	0
District of Columbia	12	23	33	51
FOREIGN				
Canada	2	3	7	9
Porto Rico	2	4	3	2
England	0	1	1	1
Germany	0	0	1	0
Portugal	0	0	1	0
Cuba	1	1	3	2
Honolulu	1	0	0	0
Brazil	1	0	0	0
West Indies	0	0	0	1
Totals	670	744	882	1,310

Of the five States four showed a gain. New York was the more notable with 486, a jump from 300 of last year. Pennsylvania went from eighty-one to 131, and Kentucky, considering its distance, made a triple advance from four to twelve. The total for 1915 was 640. Last year it was 394, a remarkable jump. The totals follow:

Border Line Group

	1912	1913	1914	1915
New York	209	220	300	486
Pennsylvania	78	80	81	131
West Virginia	..	1	..	3
Kentucky	4	9	4	12
Tennessee	6	5	9	8
Totals	297	315	394	640

The Middle West group comprises the States in the section about the Mississippi Valley. There are eight States included in it and five of them, a majority, did better than a year ago; two lost and one was even.

Middle West Group

	1912	1913	1914	1915
Illinois	39	45	56	70
Missouri	40	41	39	39
Ohio	40	29	21	39
Michigan	15	13	18	19
Iowa	2	5	3	4
Minnesota	2	4	4	3
Indiana	3	7	9	13
Wisconsin	1	2	4	2
Totals	142	146	154	189

The Far West group comprises the States beyond the Mississippi. It was expected that if there were any loss it would be in that region, due to the exposition. And that is where the loss occurred. But it was not so very great. There are nine States in the list. This is the first year that Arkansas and New Mexico are included and they balance up for the loss of Arizona and Oklahoma. Of the nine, Texas and Kansas show a loss, while California, the most distant, shows a gain. There were twenty cars on the list a year ago and this season the figure is seventeen, a drop of three. The figures follow:

Far West Group

	1912	1913	1914	1915
Texas	8	10	9	5
Kansas	1	9	4	2
Nebraska	4	3	..	..
California	7	4	4	7
Arizona	..	..	1	..
Colorado	2	..	1	1
Oklahoma	..	..	1	..
Arkansas	..	..	..	1
New Mexico	..	..	..	1
Totals	22	26	20	17

The final group comprises the cars outside the United States known as the foreign section.

Foreign Group

	1912	1913	1914	1915
Canada	2	3	7	9
Porto Rico	2	4	3	2
England	..	1	1	1
Germany	..	..	1	..
Portugal	..	..	1	..
Cuba	1	1	3	2
Honolulu	1	..	..	..
Brazil	1	..	..	..
West Indies	..	..	..	1
Totals	7	9	16	15

When these groups are all placed together it shows that there were 1310 machines listed this year, while last year the figures totaled 882, or a gain of 428, as follows:

Totals for All Groups

	1912	1913	1914	1915
New England	102	105	148	214
Atlantic Coast	100	143	151	235
Border line	297	315	394	640
Middle West	142	146	154	189
Far West	22	26	20	17
Foreign	7	9	16	15
Totals	670	744	882	1310

Places Represented

Number of States	30*	32*	34*	34*
Foreign Countries	5	4	6	5

*Includes District of Columbia

To Make Hydromotors in Los Angeles

LOS ANGELES, CAL., Dec. 9—A factory is to be built in this city for the manufacture of Hydromotors. The company is now applying for articles of incorporation under the laws of California.

The experiments with the Hydromotor at the Panama-Pacific International Exposition were successful enough to prove that a land and water automobile was a practical possibility. During the closing week of the exposition, six voyages were made on San Francisco Bay and once the automobile launch ventured out of the yacht harbor.

A. Maini, president of the company which put out the first model, announces that the factory will be located in southern California. G. Lopizich, president of the International Bank of Los Angeles is to head the new company which will manufacture these land and water automobiles.

More than a year ago, the Board of Trade of Lankershim, Cal., offered the company a manufacturing site. A site has now been offered at Wilmington, the Los Angeles Harbor, and it is probable that the site will be accepted as at Wilmington, the location will provide for the testing of machines on both land and water.

According to the present plans of the corporation's backers, four models are to be offered. A two-passenger roadster, a seven-passenger touring car, a light delivery truck and seven-passenger limousine. The same chassis is to be used for each type of body. The limousine is to sell for $3,000 and the roadster at $2,000 with the touring car and truck coming between these figures.

The machine shown at the exposition weighs 3000 lb. The body is of aluminum. All the joints are made water tight. To insure this condition, 2-in. brass bands are riveted to the edges. The length of the car is 16½ ft. In the water the machines is propelled by a 16 in. screw propeller. The wire wheels measure 42 in. in diameter.

In the water a patented bronze sliding device locks the water out of the axle housing.

The first machine is propelled by a 6-35 Haynes engine hung on a special chassis.

A ventilator at the prow and a small opening on the forward deck, allows enough air circulation to keep the engine cool. Gear levers at the right of the steering post allow the driver to shift the power from the wheels to the screw when the machine begins to float. Both the wheels and the propeller may be operated at the same time.

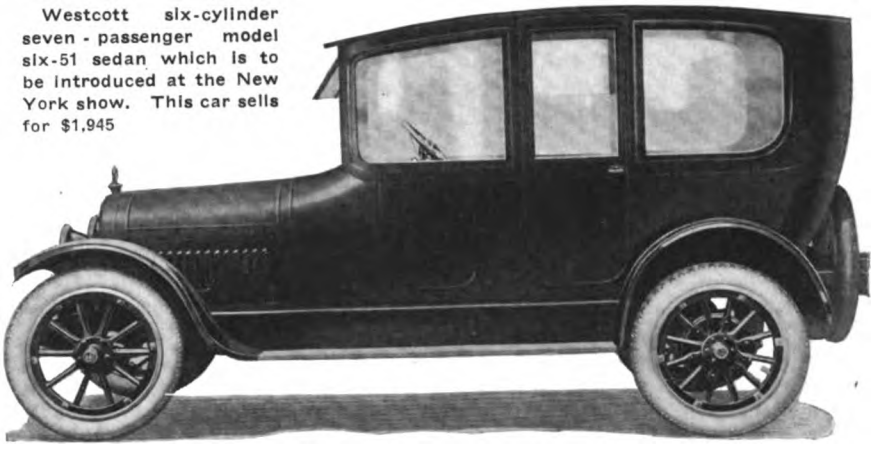
A sleeve engages a pin on the steering post which provides for change of steering control, automatically locking the front wheels and engaging the rudder. A reverse of the operation releases the wheels and disengages the rudder.

The Hydromotor—an amphibious automobile

Westcott Adjusts to Suit Driver

Two New Sixes Announced—Sedan Top for Touring Car—Lightness Studied

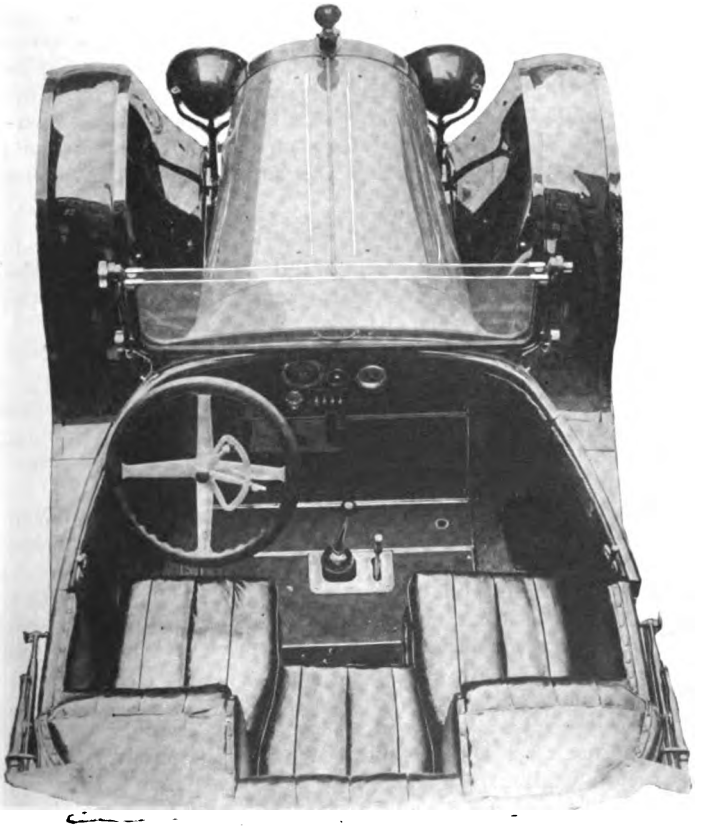
THE two new Westcott cars made by the Westcott Motor Car Co., Richmond, Ind., are both sixes, one a little larger than the other, being intended for seven-passenger bodywork. In design the two are similar, the same motor, a Continental 3½ by 5¾ in., being used for both. The respective wheelbases are 121 in. and 126 in. and the longer chassis has larger tires. Prices are $1,945 for the seven-passenger sedan, with an alternative choice of open touring or three-passenger roadster bodies at $1,595. The short chassis has similar open bodies, at $1,445, but with a maximum of five-passenger capacity, and also a cabriolet, for $1,746.



Westcott six-cylinder seven-passenger model six-51 sedan which is to be introduced at the New York show. This car sells for $1,945

Sedan Has Special Windshield

Particular pains have been taken with the sedan car, which is convertible to an open touring type. When the two portions are joined together, the upper structure has no overhang where it meets the sides of the lower part, and one of the greatest difficulties with demountable top bodies, that of making a good join around the windshield, is overcome by supplying a special shield for the closed car and utilizing it as one of the main, basic attachments. Two bolts suffice to make the attachment, the shield detaching from the brackets that hold it in place.



Driver's compartment of new Westcott model six-42 roadster, showing seating arrangement. This car lists at $1,445

The interior of the demountable top is finished in accordance with proper limousine style with good grade cloth, silk curtains, etc.

Adjustable Driving Position

On the roadster and cabriolet bodies the clover-leaf seating arrangement is adopted, and it can be seen from the plan view that the seats have been so disposed that the middle passenger has plenty of elbow room without the driver being pushed so far to the left that he has to sit sideways to the steering wheel, as has happened in some similar designs. Further, the comfort of the driver is studied by giving no less than a 6-in. adjustment on either pedal, and so mounting the steering column that it can be moved to suit the driver's length of arm. These adjustments give practically the same effect as an adjustable seat, without calling for extra weight in the body which is necessary to enable a sliding seat to be made rigid.

A special point is made of the quality of the leather used for upholstery, which is an enameled finish variety. It is fitted without buttons, which, in conjunction with the smooth surface, makes it very easy to keep perfectly clean.

Lubrication Simplified

Another, and quite different way in which the Westcott engineers have studied the convenience of the driver, is in the disposition of small parts requiring attention, and one result of this is that there are only five greasers under the body.

Lightness has been studied, and the motor has pistons and cylinders as the only cast iron parts, the whole crankcase being aluminum. The rear springs are cantilevers of chrome-vanadium steel and are 52 in. long; very short shackles are used at the front ends of these springs, this being claimed to eliminate roll while not affecting any riding quality. The chassis has a unit power plant and Timken axle equipment, with open type driveshaft and a double torque arm.

Accessory equipment includes a clock, dome lights in the sedan, double tonneau lights and, on the touring cars, a special fitting for stowing the Jiffy curtains wherein they are held by springs and cannot rattle.

Altogether the Westcotts are excellent examples of how an assembled chassis can be made a car of decided character.

The Rostrum

Gasoline Plus Chamois Gives Electricity

EDITOR THE AUTOMOBILE:—Am sending you herewith a clipping from the Timken magazine, House Organ of the Timken Detroit Axle Co. which in part reads as follows:

Let us assume that you are about to fill your tank. The funnel is in the nozzle. A chamois strainer is in the funnel. The gasoline is turned on and as it pours through the chamois it generates static electricity. Static electricity may be defined as electricity that is at rest.

Static electricity, as we have said, is now in the funnel. The funnel is charged with it. So long as the funnel fits securely into the mouth of the tank, thus creating a "ground," you are safe.

Now, let us assume that you did not allow the funnel to rest inside the nozzle of your tank, as the gasoline seeped through the chamois skin. Either yourself or someone else held the funnel in midair, or it rested free of the sides of the tank. No "ground" was formed.

We have seen that gasoline, a volatile substance, passing through chamois forms static electricity, which charges the funnel. When the amount of electricity is sufficient to produce a jump spark, that spark, jumps to the nearest "ground," which is your tank. In doing so it must pass across the opening between the end of the funnel and the edge of the tank through which gasoline vapor is rising.

The moral to be derived from this article is this: DO NOT PUT GASOLINE THROUGH CHAMOIS SKIN. But if you will insist on taking chances, be sure that you have a "ground" on it, by seeing that the funnel touches the opening of the tank. Be doubly sure that you take this precaution.

Would you please give us the best advice on this subject through THE AUTOMOBILE?

Newfoundland, N. J. R. E.

—The article which you cite was from information furnished to the Timken magazine by Henderson Bros., of North Cambridge, Mass. who recently nearly suffered the loss of a relative through the combination of circumstances mentioned. The fact that static electricity is generated by the pouring of gasoline through chamois seems to be clearly demonstrated. To secure the view point of the Henderson Bros., on this subject THE AUTOMOBILE received from them a letter of which the following is a copy:

"This accident happened to my son, and as there was no possibility of anything except static electricity we went into the matter a little more thoroughly than seemed necessary after it had happened. We found the fact to be known to most fire chiefs that gasoline and chamois was a fatal combination, but none of them could explain the reason why. At a consultation with one of the leading electrical engineers in Boston, and by experimenting we found that this static electricity was dangerous only when the funnel, or the pipe was not grounded, and this was caused in three ways. First, as in the Timken magazine, that is the funnel resting on the wood making a perfect insulated funnel; and the second condition was, when filling the funnel and the tank becomes nearly full, it is the custom to hold the funnel outside the tank, the gasoline running through the funnel and when the funnel touches the tank it again forms a spark of static electricity.

"We also had a long talk with young Mr. Firestone when he was here, and he informed us that his brother was burned to death in a garage accident. You might possibly get some added information from the Firestone family in regard to this accident. There have been four fatal burnings in and around Boston since my son's accident which was directly attributed to static electricity forming in the funnel. The more that this particular thing is impressed on the automobile public, the less chance there will be of repeating these accidents. If we have been instrumental in stopping that condition anywhere, we will have been amply repaid."

Renault Cover Plate Threads Worn

Editor THE AUTOMOBILE:—In my Renault's transmission the threads which support the back plate are all worn. New threads have been replaced and after about 100 miles the threads became worn out again so that no hold whatever can keep the plate to the larger part of the transmission. On account of the same trouble the high speed cannot keep in place but slips out causing a sort of noise as if some part of the car had dropped off. Could you instruct me how to repair this and if possible give me diagram?

Barranquilla, Colombia. R. I.

—From the information you give it is surmised that you refer to the back plate in the gear box. To make a satisfactory job the holes where the studs are fitted should be filled up with aluminum alloy and new studs fitted in. This work should be handled very carefully as otherwise, the gearshaft will be pulled out of parallel. If there is a Renault service station in your location the work should be done there.

Wants Data on Farm Tractors

Editor THE AUTOMOBILE:—Will you kindly answer the following questions in regard to motor farm tractors in the Rostrum:

1—What power is needed in a gasoline tractor to pull four 16-in. plows?

2—Can a tractor wheel of 30 to 32 in. in diameter have as much traction or pulling power as a larger wheel, assuming the vehicle is run at the same speed and with the same power applied?

3—Has a tractor got as much pushing power as pulling power or would the maximum load vary according to whether it was pushed or pulled?

4—Could an electric generator powerful enough to start a 40 to 45 hp. motor run an electric motor requiring about 3 hp.? What would be the wholesale price of such an apparatus?

5—Is there any way to transmit power between two points, the distance between which is constantly changing, except by the use of a flexible cable? Would it be possible to construct a cable strong enough to transmit from 3 to 5 hp. over a distance of 4 ft. and if possible, would it be practical?

6—Kindly publish a formula whereby I can calculate the pulling power at the drawbar of a tractor when the weight,

horsepower of the motor and the distance between the motor and the center of the driving wheels are given.

Red Wing, Minn. N. L. W.

—This question cannot be answered definitely without much other data such as the weight of the tractor; the method of drive and the power loss therein; the drawbar pull of the unit; the approximate weight of the plows and platform; the depth of the furrow and the condition of the soil. However, THE AUTOMOBILE can cite you one of several makes of tractors now on the market which will pull four 16-in. plows. The Knapp tractor, made by the Rochester Gas Engine Co., Rochester, N. Y., is a three-wheeled, gear-driven unit weighing about 8750 lb. and equipped with a four-cycle four-cylinder gasoline motor of 4¾ in. stroke and 6¾ in. bore, developing 36.15 S. A. E. hp. This power is sufficient to pull four 16-in. plows and platform and give a depth of furrow of 6 to 10 in., varying with the condition of the soil.

2—With no slip, the pulling power of a wheel varies inversely as the diameter, the power applied and the gear reduction remaining a constant, or the smaller the wheel, the greater the pulling power. But in your case, assuming the same vehicle speed and a change in gear reduction, a 30- or 32-in. wheel would have no greater pulling power than a larger wheel, provided it did not slip. Here other practical considerations come into play, such as the condition of the soil, the coefficient of friction between the wheel and the ground and the pressure per square inch of the wheel on the soil due to the weight of the vehicle and its load. From these considerations, it may be deduced that greater pulling power may be obtained by the use of large wheels with the power applied and the vehicle speed remaining constant, because they give a larger area in contact with the ground and prevent slipping or sinking into the soil. They also mount obstructions much more easily than smaller wheels.

The relation between the pulling power of a vehicle and the diameter of the driving wheels is shown in the formula given below:

$$VC = \frac{8.4\, nb^2sR}{DW} \times em \times et$$

Where VC = Tractive factor or vehicle coefficient.
n = The number of cylinders
b = The bore in inches
s = The stroke in inches
R = The gear reduction
D = The diameter of the driving wheels in inches
W = The total weight of vehicle and load in pounds
em = The efficiency of the motor as compared with the S. A. E. rating as unity
et = The efficiency of the transmission system, *e.g.*, the percentage of the power developed which reaches the driving wheels.

The above formula was derived by C. T. Myers, mechanical engineer, Detroit, Mich., for the purpose of comparing motor vehicle performance. It shows the very important inter-relation of the motor displacement, the gear reduction, the diameter of the driving wheels and the total weight carried. It also shows how very important the reduction of weight becomes and the marked effect of an increase in the gear reduction.

3—On a perfectly level road any motor vehicle has as much pushing power as pulling power, but as there are no such roads in existence, this equality does not hold and the pulling power exceeds the pushing power. The path of a farm tractor over rough and uneven fields is one continual process of lifting the vehicle wheels over small obstructions, and as it takes more power to push a wheel over an obstruction than it does to pull it over, the vehicle can pull more than it can push. The reason why it takes more power to push a wheel over an obstruction than it does to pull it over, may be best understood by analyzing the forces which comes into play.

The force transmitted to the driving axle of the vehicle may be shown graphically by a horizontal line parallel with the ground. As soon as the front wheels strike an obstruction, a portion of this force is resolved along a line from the point of application on the driving axle to the point where the front wheel touches the obstruction. The remainder, resolved at right angles to the latter force, tends to raise the wheel up and over the obstruction. This lifting force acts on an imaginary bellcrank lever, the fulcrum of which is at the point where the wheel strikes the obstruction and whose arms extend from the fulcrum to the center of the wheel hub and to the point of contact of the wheel on the ground.

The lifting component of the total force acts on the arm of the lever between the fulcrum and the center of the wheel hub at distances proportional to the distance from the fulcrum to the point of application of the total force on the driving axle of the vehicle. The nearer the driving axle is to the fulcrum, the greater is the leverage of the lifting component of the force about the fulcrum. The greater the leverage, the easier is it for the wheel to mount the obstruction.

In the case of a tractor pushing a trailer, the driving axle would be further away from the fulcrum than if the trailer were pulled, and for this reason the leverage of the lifting component of the propelling force would be less, thus making it harder to push the trailer over the obstruction than to pull it.

This principle is shown in Fig. 1, which illustrates the analagous case of a front- and rear-wheel-driven vehicle. In the case of the front-wheel-driven vehicle, *ab* represents the force propelling it along a level road. When it strikes an obstruction, such as *D*, the force *ab* may be resolved perpendicular to and parallel with the line *ED*, *D* being the point of contact of the wheel and the point about which the wheel must be lifted so that the vehicle may continue on its way. *D* is the fulcrum about which the resolved lifting component *ac* of the force *ab* is applied.

In the case of a rear-wheel-driven vehicle the same force *ab* is applied along the line *eD*, this line continued passing through the point of application on the driving axle. The force *eg* is equal to *ab*. Its lifting component *eh*, however, acts about the fulcrum *D*, at a distance *ef*, which is less than *ad* in the case of the front-wheel-driven vehicle. Therefore, in the first case, $ad \times ac$ is greater than $eh \times ef$ in the second case, because whereas *eh* and *ac* are equal, *ad* is greater than *ef*. Thus a front-wheel-driven vehicle may pass over obstructions with greater ease than a rear-wheel-driven type.

4—Yes. The wholesale price of a 3-hp. direct-current motor-generator set would be about $150.

5—THE AUTOMOBILE knows many other methods of transmitting power betwen two points, the distance between which is constantly changing, besides that of a flexible shaft, as follows: Electric current; hydraulic circulation; compressed

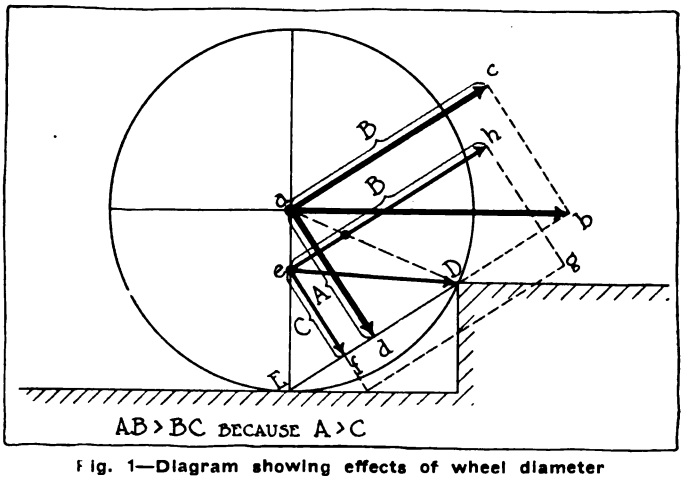


Fig. 1—Diagram showing effects of wheel diameter

air; vacuum; a scissors-shaped frame using any one of a number of forms of transmission, such as trains of spur gears, belts and pulleys, chains and sprockets, bell-cranks and connecting rods, etc. Transmitting 3 hp. through a flexible shaft 4 ft. long is practicable, providing the speed of the shaft is not excessive.

6—Comprehensive tests with motor trucks have shown that the average motor truck when full loaded develops a drawbar pull equal to about one-quarter its gross weight; *i.e.*, weight of vehicle and load. This ratio is changed by road conditions and grades.

According to George Watson, of John I. Thornycroft & Co., Basingstoke, England, drawbar pull may be calculated by the two following formulae as published in Vol. 1 data sheets of the *Society of Automobile Engineers:*

$$T = \frac{n \text{ Horsepower } 375}{V}$$

Where T = Tractive effort in pounds
V = Velocity of vehicle in miles per hour
n = Efficiency of gearing. Take 0.9 for each gear and

$$T = W\left(R + \frac{2240}{m}\right)$$

Where T = Tractive effort in pounds
W = Gross weight of vehicle and load
R = Resistance to traction in pounds per ton of 2240 lb.
For loose sand, $R = 560$; for hard, dry clay, $R = 100$
m = Gradient, 1 in M. For instance, when grade is 1 in 5, $m = 5$.

It will be observed that these formulas contain the weight and the horsepower of the motor. The distance between the motor and the center of the driving wheels has nothing to do with the drawbar pull except that it might affect the efficiency of the power transmission, but this is covered in the first of the two formulas given.

Power Strokes of Eights and Twelves

Editor THE AUTOMOBILE:—In an eight- and twelve-cylinder motor how many power strokes to one revolution of the crankshaft?

2—How many strokes does the piston make to one of crankshaft, of the eight and twelve-cylinder motor?

3—How many revolutions does the crankshaft make to one of the cams?

4—How many degrees are the S. C. P. and E. strokes apart?

5—Recently my car has been giving me quite a little trouble. The battery is all right. When I put my foot on the starting pedal it will not crank the motor, if I use the crank handle and turn the motor over about eight times, then if I use starting pedal, it cranks the motor all right. At the same time, the motor runs in good order.

6—Kindly tell me how to adjust the brakes on the rear wheels?

Jersey City, N. J. S. B. S.

—Four power strokes to a revolution in an eight and six power strokes to a revolution in a twelve.

2—There are always two strokes to a revolution regardless of the number of cylinders for each piston.

3—The cams always operate at one-half crankshaft speed in a four-cycle motor.

4—This depends upon the individual timing. It will generally happen that the intake valve will open somewhere near 5 deg. past upper dead center and close at somewhere near 25 deg. after lower center and the exhaust valve will open about 35 deg. before lower center and close at just a little past upper dead center.

5—It may be possible that there are some short circuits which are draining the battery or it may be that the generator is not charging properly. Be careful to keep the specific gravity of the electrolite in accordance with the instructions of the battery maker.

6—You do not mention the make of car therefore it is impossible to give specific information. The brake adjustment should be tightened sufficiently to give a firm application of the brake without allowing the brake bands to drag on the drums when the car is in ordinary use.

No Colored Running Lights Prescribed

Editor THE AUTOMOBILE:—Please publish which is the correct placing of red and green side lights on cars? Also the relative visibilities of number on license plates; e. g., black on white, white on black, red on white, etc., etc. A list appeared some time back.

Atlanta, Ga. E. McD.

—There is no such thing as the correct placing of red and green side lights on cars as the rules of the United States Government on the carrying of correct marine running lights do not apply to any form of land vehicle.

THE AUTOMOBILE has no record of any such list as you mention.

Packard Made 102.25 M.P.H.

Editor THE AUTOMOBILE:—What rate of speed did the Packard Twin Six make at a trial some few weeks ago?

2—Was this equipped with regular gear ratio as well as a regular stock motor or were there special gears used in this test?

Jeromeville, Ohio. C. L. E.

—As stated on page 847 of THE AUTOMOBILE for Nov. 4, the Packard car you mention made 102.25 m.p.h.

2—The gear ratio was changed. This was a stock car in every particular except that it used a racing body, the timing was changed for high-speed work, the pistons were arched on top to give higher compression, a double Zenith carbureter was used and the rear axle was geared to give 34 m.p.h. at a crankshaft speed of 900 r.p.m.

Burman's Record Still Stands

Editor THE AUTOMOBILE:—What is the fastest a man ever travelled in what, and where?

2—What is the fastest ever travelled on a motor cycle?

3—What is the fastest time made in a Packard Twin Six stock car, what body and number of passengers?

4—What is the fastest time made in a Packard Twin Six stripped chassis and stock car?

Charlottesville, Va. C. E. S.

—The fastest a man ever traveled, and lived to tell of it is 141.73 m.p.h. This record was made by Bob Burman in April, 1911, at Daytona Beach, Fla. The car used was the Blitzen Benz. The mile was traveled in 25.40 sec.

2—THE AUTOMOBILE keeps no record of motor cycle records.

3—The fastest time that the Packard Twin Six stock car ever made as far as official timing is concerned is 72.7 m.p.h. for 10 miles. This was with one passenger with top and windshield on the car. The top was down but the windshield was up.

4—The time made by the Packard Twin Six stripped chassis at the Sheepshead Speedway was 102.25 m.p.h.

Sign Your Inquiries

The Rostrum is in receipt of a number of inquiries which are either unsigned or signed by initials only. All letters to be answered by this department must bear the signature of the sender as an evidence of good faith, although *in publishing* only the initials are given.

The History of the American Automobile Industry—8

Completing the Narrative of Early Endeavors in the Steam Automobile Field —Public Grows More Accustomed to Self-Propelled Road Vehicles

By David Beecroft

AT that time, even bicycles were causing considerable trouble to horse drivers whose horses were as nervous as themselves and a number of farmers threatened the Smith company with suit if it did not keep the motor vehicle off the roads. Smith, therefore, had it stored in the loft over the pattern shop until people got ready for it, as it was probably 20 years ahead of the times. The Smith machine was afterward destroyed without further test, Mr. Smith having died before the patent was issued.

Whitney's Practical Ideas

In considering the activity of advocates of the steam automobile, the successful efforts of George E. Whitney were very largely the immediate forerunners of the work of the Stanley brothers, through whom the steam vehicle finally was introduced successfully to the public. During the years preceding 1898 Whitney operated several very successful steamers substantially like that of the Stanleys. These little vehicles, driven around New England, went far to accustom people to the steam vehicle idea and prepare them to receive it when placed on the market. While it is true that Whitney was indebted to Roper, Copeland and Bullard and probably others for the ideas embodied, it is also true that he put these ideas in the most thoroughly practical shape and demonstrated them so successfully that a casual observer could see little difference between his vehicles and the products that followed in the next few years.

All told, he built seven cars in 3 years. He gave preference to bicycle wheels and pneumatic tires, tubular steel frames and chain drive. His fifth vehicle had 30-in. front wheels and 34-in. rear wheels with 2-in. pneumatic tires. It had a boiler that was 14 in. by 20 in. and contained 340 ½-in. copper tubes. One of his vehicles ran from Boston to Hartford, a distance of 142 miles, in less than 8 hr. in Sept., 1897, an average of 17.7 m.p.h., and he exhibited two of these carriages at the Charles River Park, Boston, Mass., in the fall of 1898, where the steamer first successfully attracted the attention of the public.

Other Steam Vehicles

One of the interesting vehicles entered at the Chicago *Times-Herald* exhibition and contest in 1895 was a little attempt at steam propulsion by A. C. Ames of Chicago, Ill. This vehicle was nothing more or less than two ordinary bicycles, the cranks of which formed the crank-shaft of a steam engine. That the engine might be small the cylinder bore was 1¾-in., with a stroke of 13 inches. The boiler capacity looked inadequate but such a light vehicle did not require much power to propel it. Aside from being exhibited at this first American automobile event this Ames construction seems not to have had much influence on the industry. Like one of A. L. Riker's early electric experiments it carried a vehicle body on springs between the cycle frames, and its total weight was said to have been under 400 lb., which was extremely light considering that the body seated four people.

The Simonds Design

A fairly successful attempt at constructing a steam car was made in 1893 by C. L. Simonds, an engineer of Lynn, Mass. This vehicle carried two people mounted rather high, the frame being under cut so that the front wheels could turn on a continuous axle as in a horse vehicle. At the rear was mounted a vertical boiler and the control was a hand wheel at one side just back of the seat where the operator could reach it. It used wire wheels but was not of the later accepted design and probably saw no great amount of service.

A couple of years later Dr. F. L. Sweaney of Philadelphia, Pa., had a steam car built by the Charles S. Caffrey Co. of Camden, N. J.

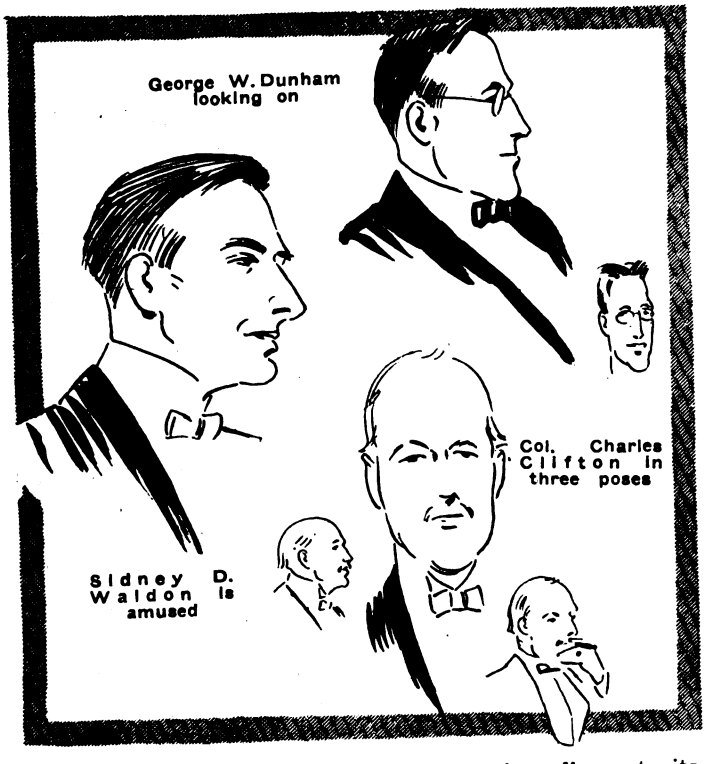
Public Assumed Failure

There were many other sporadic attempts throughout the country during this period but for one reason or another they were not followed up. Not knowing the reason for their non-continuance the public very naturally assumed them to be failures, and this, as much as anything, was responsible for the slow growth of favorable opinion in the minds of the public concerning the motor vehicle.

In most cases these pioneers did not lose faith but later appeared more or less actively in the industry, Dr. Sweaney, for example, being afterward the owner of the first Winton car taken to Philadelphia.

450 at Detroit S. A. E. Banquet

Enthusiasm and Striking Co-operative Spirit Pervades Record Representative Gathering of Men Prominent in the Industry—Talks by Chas. Clifton, W. H. VanDervoort and I. F. Marcosson



DETROIT, MICH., Dec. 9.—As a fitting climax to its activities of the year, which have been the most successful in its history, the Detroit Section of the Society of Automobile Engineers held a monster banquet to 450 automobile manufacturers, engineers and other representatives of the motor car industry here to-night. It was a big affair, not only in point of number, the guests swelling to overflowing the banquet hall of the Ponchartrain Hotel, but also in the striking enthusiasm and co-operative spirit which pervaded the entire assembly.

A Notable Gathering

Many well-known automobile men were in attendance including officers of the national S. A. E. and other big men in the industry. President W. H. VanDervoort acted as toastmaster and at the speakers' table there were among others C. W. Nash, president General Motors Co.; H. M. Jewett, head of the Paige-Detroit Motor Car Co.; Howard Marmon, Nordyke & Marmon; Col. Charles Clifton, head of the N. A. C. C.; Coker Clarkson, general manager S. A. E.; John F. Dodge, Dodge Bros.; W. C. Anderson, Anderson Electric Car Co.; Arthur B. Cumner, S. A. E. Council; David Fergusson, Pierce-Arrow Motor Car Co.; W. E. Flanders, president Maxwell Motor Co., Inc.; Christian Girl, Perfection Spring Co.; Earl Holley, Holley Bros. Co.; E. W. Lewis, Timken-Detroit Axle Co.; Isaac F. Marcosson, business writer; Wm. E. Metzger; C. S. Mott, Weston-Mott Co.; Thomas Neal, General Motors Co.; C. A. Pfeffer, Chalmers Motor Co.; C. B. Rose, S. A. E. Council; J. G. Rumney, Detroit Steel Products Co.; W. R. Strickland, Peerless Motor Car Co.; R. H. Spear, Scripps-Booth Co.; John Utz, Perfection Spring Co.; S. D. Waldon, Cadillac Motor Car Co.; W. E. Scripps, Scripps-Booth Co.; Artemus Ward, Jr., King Motor Car Co.; Percy Owen, Saxon Motor Corp.; George W. Houk, Houk Mfg. Co.; J. W. DeCou, Jeffrey Co.; H. W. Alden, Timken-Detroit Axle Co.; Fred Haines, Regal Motor Car Co.; Harry Bassett, Weston-Mott Co.; George W. Dunham, consulting engineer; F. E. Moskovics, Nordyke & Marmon; Lee Anderson, Hupp Motor Car Co.; W. C. Rands, Rands Mfg. Co.

The above are some of the stars at the speakers' table, acting as a sort of bodyguard for Toastmaster VanDervoort. This is without doubt the most representative gathering of automobile men ever assembled in Detroit and their presence gives fitting proof of the rapid strides that the Society is making not only nationally but locally as well.

The speakers of the evening were in addition to the toastmaster, Col. Charles Clifton, whose topic was Engineering Co-operation; Nicolas Kouznetzoff, representative of the Russian government, who greeted the gathering in his native tongue; James Schermerhorn, publisher of the *Detroit Times;* Isaac F. Marcosson, whose subject was "The War and Business"; Arthur Nealey, the boy president of the Illinois Model Aeroplane Club of Chicago, who made some prophecies regarding the future aeroplane and entertained the staid business men with the flights of toy flying machines.

A Plea for Co-operation

President VanDervoort, before introducing the first speaker, took the occasion to plead for greater co-operation between the manufacturers and the engineers who design their cars. He said he could think of no better Christmas present to worthy employees than to give them a membership in the Society. He further asked that special attention be given to communications from the Society to the end that the interests of all might better be served.

In his opening address Mr. VanDervoort also brought greetings from the new Mid-West Section which was organized last week in Chicago. He expressed himself as being astounded at the vigor and vim shown by the Detroit Section and said that it was very gratifying to the Society as a whole. Push and co-operation must be the aim in order to make the automobile industry the greatest in the world.

Standardization and Progress

"You are all interested in the work of the Society of Automobile Engineers, either directly or indirectly," said Mr. VanDervoort, "and we are extremely anxious that this interest shall develop far beyond the passive point. When called upon for financial assistance, you have readily responded here in Detroit, and elsewhere. You have given us liberal appropriations, through the Automobile Chamber of Commerce, for carrying on the standardization work of this Society. But financial assistance is not all that the Society of Automobile Engineers wants. It requires your interest in its work, and your appreciation of the results. This Society has come to be a very necessary factor in the development of this greatest of American manufacturing industries, and we desire the unqualified sympathy and support

of those high up in the management of the affairs of these great manufacturing institutions.

"The present highly developed state of this industry is very largely due to the standardization work of the Society of Automobile Engineers. Through its efforts, duplication of effort is being eliminated, and the standardization of parts, materials and design has made possible great economies in the production of automobiles. I wonder if we fully realize the enormous financial savings we have received from this standardization work. I fear that the efforts in this direction are not as keenly appreciated at all times, as they should be.

"You ask how you can help in this work. It is simple. Join the Society as an associate member, if your engineering qualifications do not permit your coming in as a regular member. In so doing, remember that the Society is working directly for your benefit. We cannot expect you to devote any considerable amount of time talking about the merits of this Society."

Col. Charles Clifton briefly summarized the early performances and contests of automobiles as an introductory to his main topic. One generation ago the experimental automobile made its bow in America, he said, and 20 years ago Thanksgiving Day there was a so-called race in Chicago. To qualify, the machines had to cover a 33-mile course in 9 hr. None of them did it in 9 hr., but the prize was awarded anyway because it was bad, snowy weather. He contrasted that early performance with the ability of the automobile of to-day. The thousands of motor vehicles in use to-day are an example of the greatest co-operation the world has ever known. They are the result of co-operation of human instincts and Col. Clifton holds that this spirit of getting together for united effort must continue to grow as the industry grows. He paid special tribute to Detroit when he said that whenever anyone sees an automobile, he thinks Detroit. He pronounced this relationship the greatest any city ever had.

B. V. Constantinoff, interpreter for Nicolas Kouznetzoff, Russia's representative, spoke for his principal and greeted the American engineers on behalf of his people. "America now," he said, "is a heart of automobiledom, and he wants us to bring some business to Russia. "We need you there, and you think so little of us," he said.

Mr. Schermerhorn, after a series of rapid-fire moral lessons and as an entertaining mixture of humor, paid tribute to Henry Ford when he said: "In your hearts you should be thankful that your industry has produced the man to head the peace expedition which has set forth with an honest desire to bring about peace. Fanciful, unpractical, fanatical, and all, it may be, but despite the criticism, it is sincere."

Mr. Marcosson, in his authoritative talk on war and business, told the manufacturers that they must prepare for a gigantic trade war with Europe at the close of the present great conflict. He struck deep at the impairment of our goodwill with foreign countries, by sending them in their hour of need inferior merchandise for the sake of enormous profits. He warned the country to be prepared industrially.

Extracts from Mr. Marcosson's speech follow:

What the War Means to Us

"The war is the ill wind that blew us good. Before Europe saw red we were in a bad way, as you and I knew, to our cost. Our business had been legislated, 'investigated,' commissioned and regulated almost into extinction; capital was wary; panic hovered.

"Then this war crashed into commerce, paralyzing trade, stifling credit, choking up the channels of communication. Yet the world had to be fed and clothed and armed. We alone stood at the universal trade counter ready to do business, and we did it. A frenzied prosperity fell into our laps. The era of the war order began.

"But the plain truth of the matter is, that while we have capitalized a great prosperity out of the war, we, as a commercial people, have been very short-sighted. We have only seen the profit of to-day and lost sight of the permanent gain of to-morrow. We have been speculators where we should have been investors; we regarded a vast world trade opportunity as an expediency rather than an asset. We have sold goods instead of good-will.

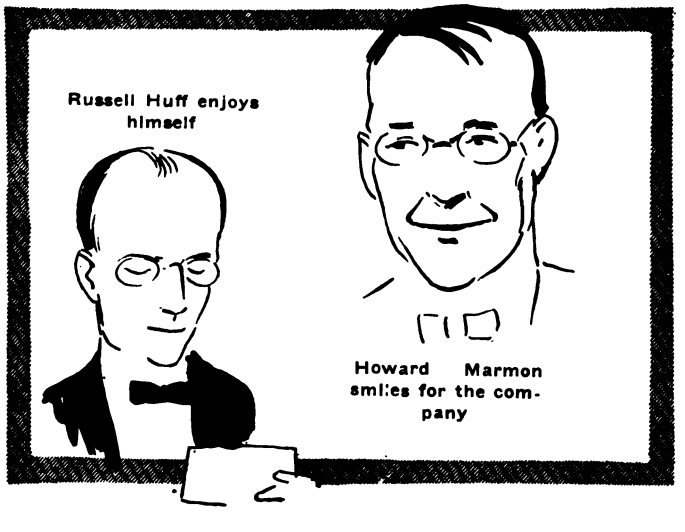
Automobile Quality High

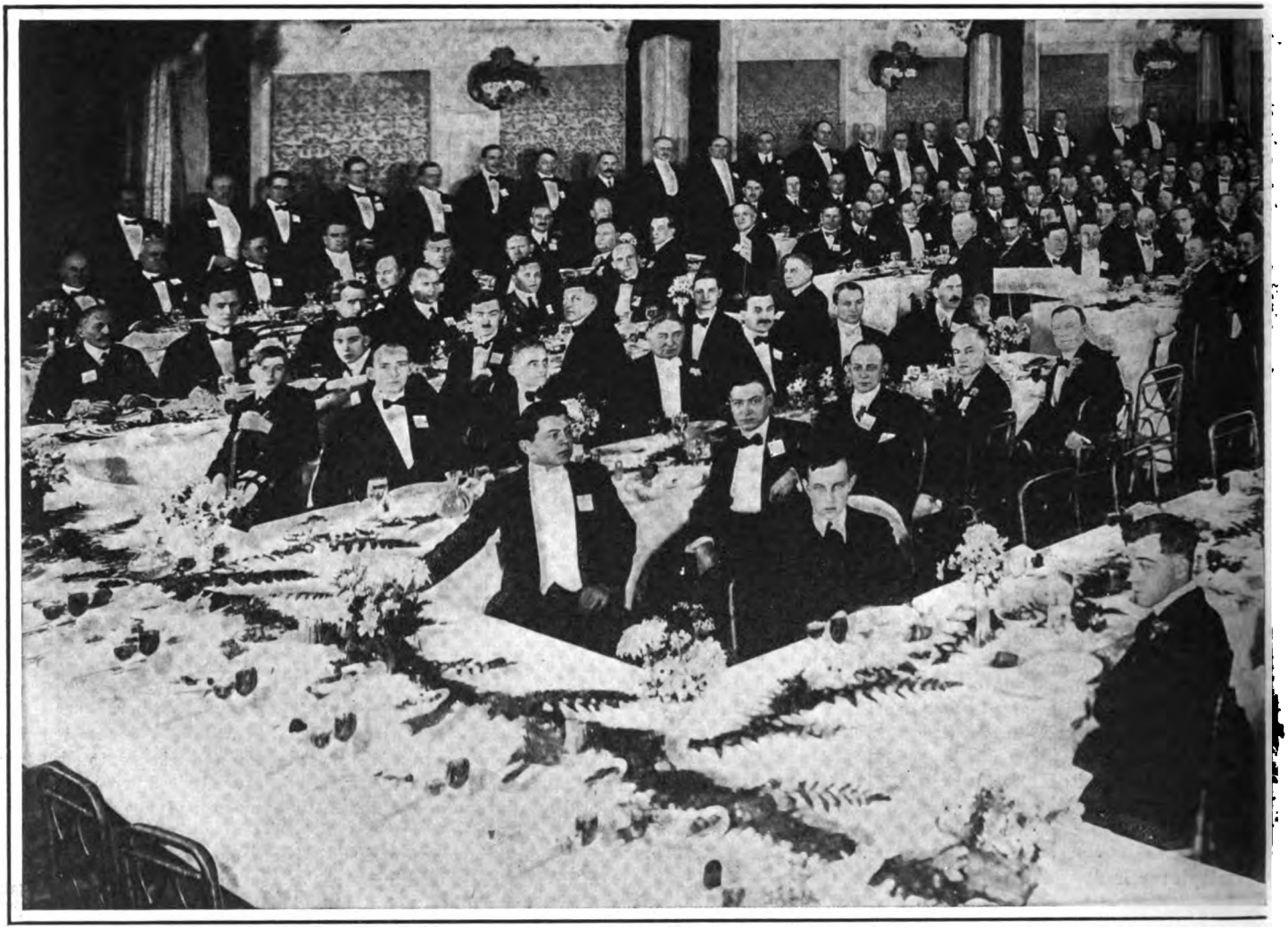
"And let me say right here that in all the stream of exports that has rolled up a foreign trade of over five billions of dollars in twelve months the one product that has maintained the standard of its integrity, whether for mission of mercy or destruction, in fair weather and foul, is the American automobile. It has been 100 per cent efficient every time, and you may well be proud of the record you have made.

"But this European business is only one phase of our commercial short-sightedness in such a crisis. Take South America. Here is a region bound to us by sentimental and geographical ties that could have been the easiest of commercial fields if we had taken the trouble really to study and prepare for its exploitation. England, France and Germany did it. When Germany wanted to invade that region she first sent men who studied the language; learned the customs and needs of the people. When she shipped goods it was goods that the countries wanted and kept on wanting. *We* were content to send a sporadic salesman with samples.

Germany's Forethought

"The war cut off South America from the source of supplies





Banquet given by the Detroit section of the Society of Automobile Engineers to 450 manufacturers, engineers and other

and money. We were too busy capitalizing a temporary opportunity to develop what was a permanent asset. Here is an example: One of the South American countries got rid of a president, and because of the decrease in import duties, due to the war, needed a loan. Vainly she tried New York. Do you know who produced the money? A German commission house in her capital city. The nation behind this house was at war, a war that menaced its life. Yet she was wise and far-sighted enough to buy some good-will with that loan. It will return a thousandfold after the war.

"These, and many other instances that I could give, show clearly that we have not definitely and deeply regarded this war as a permanent opportunity; it means that if we do not readjust our whole policy we will find ourselves isolated and alone when a merciful peace sheathes the sword and the world becomes normal again.

"If there is one message above all others that I would bring home to you it is this: Let us not deceive ourselves about this present war-time prosperity. What seems the easiest of selling now is but the prelude to the bitterest trade war that the world has ever known.

"No man can visit England now without feeling that in more ways than one we have lost prestige irretrievably. This loss of respect will inevitably be followed by loss of trade.

"She buys our goods now because she must. But this toleration of necessity will be followed by indifference, even trade hostility when peace comes, in a bitter trade reprisal.

England's Trade Reprisal

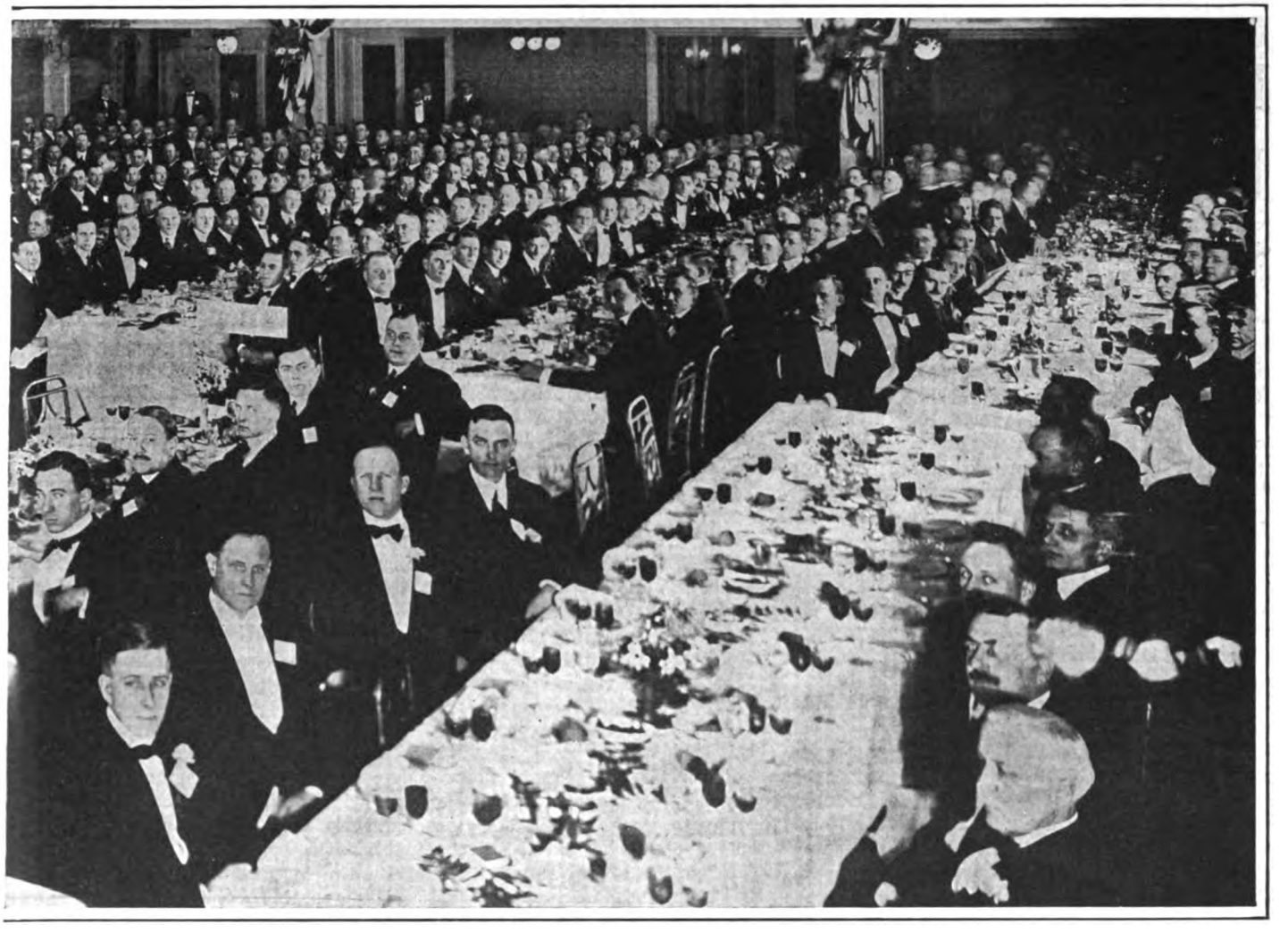
"And England will be equipped to make this reprisal as never before. Every turn of the industrial wheel in that galvanized and speeded-up Britain is full of significance for all of us. I have stood in her shell factories watching the forest of American-made automatics whirl and hum as they turned and beveled the cases that were soon to scatter death and terror on a hundred hard-fought fields. Half the population of the Kingdom is at work on this job; practically every lathe is on war work. And new factories are literally springing up over night.

"This huge and well-oiled machine, that works 24 hr. out of every 24, has a meaning for us far beyond its steady flow of munitions. In this perfectly organized industry, geared to highest efficiency, is the instrument for Britain's industrial regeneration after the war. Quantity production of ordnance now will mean quantity production of a hundred things, from small motor cars to safety razors, as soon as peace comes.

"Backing this is a national spirit of revolt against imports. 'What can we do without?' is the slogan that is now hitched up to the cry of 'Down with imports!' The war is teaching England what it has already taught Germany—the supreme lesson of self supply—and we will find it out to our cost in a diminished export on the one hand and a fierce trade war on the other.

The Cheap Labor Problem

"So, too, with France. One incident will illustrate. There is in the United States to-day a French Industrial and Commercial Commission, sent to buy machinery for the replenishment of the devastated factories of the North Country. Now it will be a good piece of business for us to sell $1,000,000,000 worth of machinery to these people.



representatives of the industry at the Pontchartrain Hotel on Thursday, Dec. 9, as a climax to the activities of the year

"But what else will it mean? These machines, and others that we will ship for some time to come, are for factories that in the main have employed hand labor—labor that only costs from 50 to 80 cents a day. What will happen when the war is over and the host of fighting men return to peaceful pursuits? Labor will not be dear; it will be cheaper.

"And what will happen? This cheap labor will be engaged in quantity production for articles that will meet ours in the great open market of world trade. The 50-cent worker on an American automatic in France will compete with the $3 to $5 a day worker in our own land. You don't need a diagram to tell you what product will be the cheapest, and what product the colonies will use when backed up by an efficient system of foreign trade development.

"No matter how the war ends, Germany will be an immense factor in this readjustment of world business. Mistress of efficiency in peace and war, she will not be long in striking her stride. Already she is buying the munitions for this new offensive of peace, and they are being bought in this country; agricultural machinery, vast quantities of raw material, all to be rushed to the home country as soon as the seas are free.

"Nor will quantity production and all its by-products be our only menace after the war. The hatreds that are now being fought out amid screaming shot and devastating shell on the battlefield will continue long after the smoke clears away. The nations that have fought together will trade together. Even those who are now fighting each other will find a community of trade interest because politics must inevitably enter into the new commercial alliances.

"Unless I am much mistaken, the United States, because of the rich harvest that it has reaped out of the war; because of the accepted belief abroad that our neutrality is a failure; because of our economic short-sightedness, will find itself almost isolated. Are we to become a commercial Ishmael with the economic hand of the world raised against us? It is a plain, blunt question, but it is well worth asking.

"But there is a remedy, my friends, a remedy that lies in a preparedness as important in its far-reaching effect on the great mass of the American people as is the defense of our hearth and home.

United States Must Standardize

"We need an adequate merchant marine; we must conclude new commercial treaties before the war ends in which we capitalize the supremacy that the world's need of us creates; we need a more complete system of international finance in which dollar credit goes hand in hand with the dollar product; we need some of the spirit of sacrifice that is animating the countries at war, for out of its fiery ordeal there will come a new and more efficient Europe. We need a business statesmanship that will put business advance above petty politics and will offer no barrier to legitimate enterprise."

Toy Aeroplanes Demonstrated

It is doubtful if the demonstrations of indoor flying of model aeroplanes was ever better carried out than by Arthur Nealey, who has made a study of the construction and operation of the model flyers. These tiny aeroplanes, which were made by Mr. Nealey, flew the length of the banquet hall, and some of them looped, while a model hydroplane was made to rise and fly from a basin of water with a run of only 10 in.

Reclaimed Scrap vs. Cheap New Rubber

PRICES for scrap tires have fallen to one-half of those ruling two years ago. In this fact there is indicated certain new and interesting relations between the rubber reclaiming industry and the tire industry. The principal reason for the lower value of the scrap seems to be that the reclaimed rubber is no longer used as an ingredient in new tires to any considerable extent and that the new uses which have been developed do not justify the old prices for the raw material. Much is now used for flooring materials, it is said, and for insulating compounds. The place formerly taken in new tires by reclaimed rubber is now taken more and more by inferior new plantation rubber and the low grades known as jelutong and almadeina, the prices for which are constantly going down and which, after all, are much more plastic and valuable for tire purposes.

Scrap Supply Reduced by War

While this is the general situation, there is at the present experienced a hardening in the prices paid for scrap tires, but this upward tendency seems to be only transitory and mainly due to the special conditions caused by the war. America is the foremost rubber-reclaiming country. Only during the last decade have reclaiming plants founded on American practice been established in England, where there are now four of large size, and Germany is farther behind, having bought increasingly large quantities of reclaimed rubber every year from both England and America until the war broke out. The prize of 100,000 marks offered by Germany for a really satisfactory reclaiming process testifies to her desire for an independent production in this line as well as to small faith in the widely announced methods for synthetic manufacture of rubber substitutes. The American mills, which formerly worked mainly with discarded rubber shoes and still make full use of this supply, now gather scrap tires not only from domestic sources but also from Europe. For the fiscal year ending June, 1914, about 20 million pounds of tire scrap were imported from European countries, according to the figures of the Department of Commerce of the United States, but for the year ending June, 1915, the imports were reduced to 4,286,195 lb., showing the effect of the war and perhaps also the effect of the lower prices paid. The incentive and the facilities for gathering the thousands of tires which are used up in the warfare are lacking, causing a temporary shortness in the supply, but on the other hand it is naturally to be expected that the close of the war will see the market glutted with the enormous quantities of tire scrap which must be piling up in different places near the war zones of the continent.

In considering the question whether the reclaiming industry is doomed to eventual collapse, *The Engineer* (London) arrives from these and other facts at the conclusion that reclaiming will remain an important branch of the rubber industry at least until new rubber is freely offered at 25 cents per pound, and in this connection it presents in its issue of Nov. 5 an account of the purposes and methods in the reclaiming of tire scrap which will be found of general interest.

The Commercial Object

Generally, the object in reclaiming vulcanized rubber scrap is to convert it, in so far as possible, into its original unvulcanized condition, so that it may be cast or formed in molds and revulcanized. But vulcanized rubber is insoluble in all solvents, whether it consists merely of rubber and sulphur or is heavily compounded with mineral matter, such as chalk, barytes, litharge, zinc oxide, etc. It may also contain organic additions such as oil substitutes, mineral oil, vaseline and pitch. Cotton fabric and wire are prominent components which must be removed.

In practice the aim of the large reclaiming works is simply to produce a substance for which there is a steady demand, rather than to attempt competition with the rubber planters in India and Africa, who now in many cases have got their local production cost down to 20 cents per pound for new rubber and eventually will be able to offer it in the markets of the world at a very modest figure. Even if it were found practicable to perfect the reclaiming methods technically to the point of producing from the scrap an equivalent for new rubber, it is evidently more than doubtful if all the impurities of the scrap may be removed so economically as to make such a refined output compete with the natural product. When nevertheless reclaiming works are not dismantled but, on the contrary, new ones are constantly erected, it is plain that the aim is no longer to arrive at a relatively pure rubber material of value as an ingredient in new automobile tires but to produce a plastic substance commanding its price for other less exacting purposes; and this observation explains also the stadily declining prices paid for scrap tires in conjunction with the continued demand for them and the slight increase in present quotations.

Chemical and Mechanical Methods in Reclaiming

In spite of numerous patents, only two methods for reclaiming rubber scrap have achieved any real success, one the acid and the other the alkali process. The acid process is the older and is still the more extensively used one, especially in the United States. By this process the scrap is first ground between steel rollers and thoroughly washed to remove dirt and metallic fragments. It is then treated with dilute sulphuric acid in tanks heated by steam, until all the canvas is destroyed. The rubber is then removed and washed separately to free it from acid, and the next process consists in heating it in live steam at about 300 deg. Fahr., either alone or mixed with mineral oil, after which it becomes softened sufficiently to remain plastic after a thorough drying, so that it can be sheeted on rollers.

By the alkali processes, some of which are controlled by patents, the canvas of the tire scrap is destroyed by a caustic soda solution at high pressure, and the softening of the rubber goes on at the same time, dispensing with subsequent heating. The method has the advantage that the caustic soda removes all oil substitutes as well as all free sulphur and the rubber resins.

By both methods, all operations are automatic after the first grading of the material. A more definite idea of the work can be gained by following its actual sequence at one of the modern mills, as follows:

Sequence of Operations

The scrap, after grading, is broken up, small enough to pass a ¾-in. screen, between fluted horizontal steel rollers which are about 4 ft. long and revolve inwardly at varied speeds. The next step is to remove metal fragments, and for this work a magnetic separator is used, whereafter the rubber is ready for the digesters or de-vulcanizers. These are steel-jacketed pans of cylindrical form and varied capacity. After the rubber and the caustic soda solution have been put into them, the manholes are tightly fastened and high-pressure steam is turned into the jackets. This process lasts several hours at between 300 and 400 deg. Fahr., until all canvas is destroyed, whereafter the contents of each digester, whose capacity is rarely less than two tons of rub-

ber, passes to special washing machines which remove the dissolved canvas, dirt and oily matter. The rubber, swelled with water, now passes to a mechanical water separator or draining machine where the bulk of this water is removed and and thence to vacuum driers which remove the rest of the moisture. From these driers the rubber comes in the form of crumb, and this is worked for some time on mixing mills, finally forming into homogeneous sheets. Two sets of mills are employed, one the same as used for fresh rubber and the other made with shorter rollers of larger diameter and working under higher pressure, so as to make sure of breaking up any granulated formation still occurring in the mass.

"The Car That Stays Young"

An Incipient Department for Data on Durability

APPARENTLY the popular trend of thought on durability runs irresistibly toward those features in the construction of a car which have always been most talked about; namely, the machinery parts. And these are precisely the parts with regard to which it may be said that all data on durability are smothered or complicated by a multitude of theory and operative considerations, but nowise neglected in practice. The two accompanying letters on the subject are both in this vein. In one of them the expenditure of $2,000 to provide a new dress for a 1909 chassis is mentioned as a means successfully employed for making the car continue to appear "young." But the intended object of this column is not to glory in the chassis which outlasts its body work, but rather to collect facts which will show how the stationary parts of the car may be made to give satisfactory service as long as the machinery parts on which nearly all competent attention has been concentrated in the past; in other words, in the case just referred to, how the the expenditure of $2,000 may be avoided, reduced or delayed without loss of style or service. By degrees this phase of the subject, though knowledge of it is composed of many odds and ends not so far collected in one place, may perhaps come into its rights. Meanwhile the views on durability which are actually entertained in the industry and among the public are not without interest.

Editor THE AUTOMOBILE:—The following outline of facts relating to Hyatt bearings may interest readers of your columns on "The Car That Stays Young."

In every motor car there are some parts which are constantly subject to wear. Eventually they must be replaced. In the building of such parts, the engineer's aim is to produce such high quality as to guarantee long life, with a minimum expense for replacement when that replacement finally becomes necessary.

The Hyatt flexible roller bearing, due both to its principle and its construction, offers an example of how such a difficult problem may be solved.

Loads carried on Hyatt bearings are distributed over the entire length of the bearing roller which has the ability to flex very slightly. Under certain conditions, therefore, it is possible to operate a Hyatt roller bearing directly on a surface which is considerably less hard than is ordinarily required for bearings made of solid rollers or balls.

Naturally, the proper attention must be given to the relation between the bearing sizes, the loads imposed, and the hardness of the surfaces involved. For the most severe applications, the inner and outer races provided with the bearings of the Hyatt flexible roller type are hardened to a point comparative with ball bearing usage. For other places, where the bearing proportion and lighter loading make it possible, an outer race is furnished which is not quite so hard as the races previously mentioned, and is less expensive to manufacture. These races, for their particular duty, are entirely practical and satisfactory in operation and at the same time they may be replaced at lower cost when they have suffered the wear which is bound to occur, because of the greater hardness of the rollers.

There is a temptation at times for the car manufacturer to omit entirely both inner and outer races, and to operate the rollers directly upon adjacent units. For example, the bearing rollers might be operated directly upon the tubing in an axle housing. If this tubing could be made so tough and hard that there would be no wear, of course something would be gained in bearing cost. Such a construction, however, appears to be almost impractical, whether it is contemplated to use the tubing as an outer race or, in connection with floating wheel hub bearings, as an inner race.

It has been found quite practical to heat-treat solid shafting of alloy steel so that it may be satisfactorily used as a bearing race. This construction is widely used in connection with Hyatt bearings, particularly in transmissions or gearboxes.

The engineering department of the Hyatt company approves such applications only when the ultimate cost to the consumer is given as much consideration as the first cost to the manufacturer.

A certain manufacturer at one time operated the bearing rollers directly against the tubing in the axle housing, in connection with a semi-floating wheel hub application. Recently he was convinced, after some argument, that the sensible way to keep his car "young" at this particular point was *not* to omit the outer race of the Hyatt bearing for the sake of the small first cost.

Usually we find that the slight saving in first cost by omitting the hardened and ground inner and outer bearing races is more than offset by the loss of ability to withstand wear. Very fortunately, however, more and more motor car manufacturers are seeing this in the right light.

Detroit, Nov. 29, 1915. CLIFF KNOBLE.

In the following letter our easy distinction between "young" and "new" is thought needful of explanation.

Editor THE AUTOMOBILE:—As to "the car that stays young," I think that it must be conceded that there is a good deal about it that is psychologic in character. Are all of the cars OLD which we speak of, and think of, as being old? Just as it is with the garments which we wear; to look right we must don modern clothes, and to keep a car young we must be able to furnish it with a new suit for appearance sake. In 1913 it cost Bill Grandin about $2,000 to get a new party dress for the old 1909 (* *) chassis. But it was worth it. That chassis was not old, although it had been driven 60,000 miles over rough country. With the new dress, and paint, and the streamlines, and the chassis rebushed, that car is to-day quite young, and will be young when the debutantes of to-day have succumbed to *locomotor ataxia* or *paralysis agitans*.

I have a little, modest, 15-30 (* * *) car which is now six summers, five winters, and 30,000 miles old. She wears the original suit of clothes dyed over. Her back hair is different and the skirt and sleeves are criticized by the fashion editor, and she does not go to parties because she has no evening dress suit, but she is not old. Her heart, lungs, digestive system, are perfect and she can show most of them how to run and jump, and she comes in laughing, eats and sleeps well, and gets up in the morning with a clear brain.

Back in 1912 it almost seemed that it might be nice to exchange this same little lady for a fresh flame selling at $1,800, or so. but she was kept in the harness and properly groomed. When 1913 came the fresh-looking flame of the year before could not be considered as a match for the little girl, now in the senior class.

About a month ago I spent a week in Boston and saw the crowds of automobiles. It seemed to me that all of the output of the one special factory must have gone into Boston. They ranged from the newest creations back, at least as far as 1909. But how sweetly they all ran! No matter how old, or how it was dressed, it showed class. Those cars stayed young. You don't need to tell me that the present day cars are made of better stuff! I don't believe it.

I saw a rear axle in one of the modern creations go up a few days ago. The stuff that was in that assembly was a crime. And they would have wanted $1,000 to trade that beast for my Molly.

I am glad that Mr. Osborne draws attention to the question of lubrication. The designers have given it but little attention, and the users think of it still less. There has been a

(*Continued on page* 1109)

Leakage Past Rings 9 Per Cent Water

Collects in Crankcase and Must Be Carefully Watched in Multi-Cylinder Motors

By Victor C. Parker

A GREAT many motorists have been surprised when draining the oil from their motors, to find a pint, or even a quart of water emerge with the oil. Others have never noticed its presence in their motors until it made itself apparent in a lack of lubrication or, in winter, by means of a frozen oil pump. This phenomenon has been the cause of much worry and not a little real trouble to owners and service men alike, and with the advent of the eight- and twelve-cylinder motors, bids fair to become a full-fledged bogey of equal rank with missing cylinders and slipping clutches.

How does the water get there? Where does it come from? You start out with a brand new car, we will say, taking care to strain the gasoline through a chamois and examining the cylinder oil closely for any suspicion of water. You drive a few hundred miles and then remove a drain plug from your crankcase to get rid of sediment and—Presto! you have caught a pint or more of perfectly good water. There is the mystery!

A number of explanations of how and why the water gets into the crankcase have been advanced, and different drivers have observed all the precautions possible. Gasoline has been strained, lubricating oil analyzed, cylinders examined for cracks and leaks, the position of the carbureter intake investigated for the possibility of collecting rain or spray coming through the radiator, and even the garage attendant with his hose and sponge has been looked on with suspicion, but the next time the crankcase was drained, the water would be there as usual.

The explanation, of course, is very simple, once the process of combustion is thoroughly understood, because water is one of the products of combustion in the gas engine cylinder, and its presence is to be expected in every motor, though there are several reasons why certain motors will collect more of it than others.

Combustion Is Oxidation

In the first place, it must be understood that the "explosion" which occurs once every other revolution in each cylinder of a four-cycle engine, is nothing more or less than a rapid combustion of the gasoline vapor provided by the carbureter. From a chemical standpoint, combustion is merely an oxidizing process, by means of which the constituents of the gasoline are combined with the oxygen of the air to form new compounds and liberate a large amount of heat.

Gasoline is a mixture of a number of compounds of hydrogen and carbon, all of which have the general formula $CNH_2N + 2$. When burned with the proper amount of air, the hydrogen and carbon combine with the oxygen to form water (H_2O) and carbon dioxide (CO_2). Hence, water is always one of the products of combustion, and at the temperature of the explosion, exists in the cylinder in the form of superheated steam at high pressure.

Now, no matter how perfectly the piston rings fit the cylinders, or how tight their joints, there is always bound to be some slight leakage of the products of combustion past the rings and into the crankcase of the motor. As the superheated steam enters the crankcase it expands rapidly and cools down until it condenses into fine globules of water on the crankcase walls and eventually finds its way to the lowest point. The carbon dioxide, however, is a fixed gas, and simply passes out through the breather tubes unnoticed, but the water continues to collect as long as the motor runs.

The presence of water vapor in the exhaust gases may also be noticed in the white steam formed at the muffler tail pipe on a cold day, or in the constant drippings from the jackets of carbureters that are exhaust heated.

From the above it may easily be deduced that leaking or ill-fitting piston rings and scored cylinders will allow more gas to blow by, and consequently more water will condense in such motors. It is also true that new motors, in which the rings have not yet had time to become thoroughly lapped to the surface of the cylinder walls, will condense more water than those which have been well run in. It is equally evident that the more ring surface exposed to the pressure of the hot gases, the more chances there will be for slight leaks. This explains why water in the crankcase is more prevalent with six-cylinder motors than with four, and no doubt this trouble will be more apparent in the new eights and twelves than in the sixes, because with the bore-stroke ratio kept constant, doubling the number of cylinders for a motor of a given displacement increases the ring surface, and consequently the chance for leakage, by over 50 per cent.

Carbureter Adjustment Important

But the number of cylinders and the fit of the rings are not the only factors to deal with in considering the amount of water likely to condense in the crankcase. Strange as it may seem, the carbureter adjustment has fully as much or more effect on the quantity of water collected. In fact, it is to the adjustment of the carbureter that we must look for the only available remedy in existing motors. Too rich a mixture means an excessive amount of water in the crankcase just as surely as it means the formation of carbon in the cylinders, a smoky exhaust, and fouled spark plugs, and once this point is properly appreciated by engineers and service men, the presence of excessive amounts of water can be largely avoided, though it cannot be entirely eliminated.

Returning to the chemical theory of combustion, let us first consider the case of a motor running on a perfect mixture. For practical purposes we can use the formula for hexane (C_6H_{14}) as representing the proportions of hydrogen and carbon in ordinary 70 per cent gasoline. We will adjust our carbureter to burn, say 1 lb. of gasoline and give perfect combustion in all cylinders.

The atomic weight of hydrogen is 1, and that of carbon 12. One lb. of gasoline (C_6H_{14}) will therefore consist of 0.163 lb. of hydrogen and 0.837 lb. of carbon. The products of combustion of a perfect mixture, as we have seen, are water (H_2O) and carbon dioxide (CO_2), the oxygen for these compounds being obtained from the air. The other constituent of the air, nitrogen, is generally considered inert and does not take any part, chemically, in the combustion.

To convert our 0.163 lb. of hydrogen into water (H_2O) will require 1.304 lb. of oxygen (atomic weight 16), and to convert the 0.837 lb. of carbon into carbon dioxide (CO_2) will require 2.231 lb. of oxygen, making a total of 3.535 lb. of oxygen required for combustion. But since oxygen consti-

tutes only 23 per cent of the atmosphere and nitrogen 77 per cent, we will have to take 11.835 lb. of nitrogen into our cylinders along with the oxygen, which means that we will use 15.370 lb. of air with our lb. of gasoline, the resulting products of combustion being 1.467 lb. of water (H_2O), 3.068 lb. of carbon dioxide (CO_2) and 11.835 lb. of inert nitrogen. The water therefore forms 8.96 per cent of the products of combustion and this proportion of any leakage past the rings will condense in the crankcase.

Lean and Rich Mixtures

It will be observed that in our perfect combustion we used 1 lb. of gasoline to 15.370 lb. of air, but it is a well known fact that mixtures as rich as 1 to 7 or as lean as 1 to 32 will burn. Now suppose that instead of the perfect mixture we have been using we run our motor on a very rich mixture, say about 1 to 10. What are the results?

In the first place, the size of the carbureter, throttle opening, and speed of the motor will determine the amount of air taken in during a given length of time, and as we should endeavor to keep those conditions as nearly constant as possible, we will enrich our mixture by adding more gasoline to the 15.370 lb. of air used in the first case. As a result, it will be discovered that we have not enough air for complete combustion, and therefore will not obtain the same products as the result of the combustion.

Hydrogen, having a greater chemical affinity for oxygen than carbon, will take out enough oxygen to form water, regardless of the remaining reactions, and as we now have 0.245 lb. of hydrogen it will require 1.960 lb. of oxygen for its combustion, forming 2.205 lb. of water. This leaves only 1.575 lb. of oxygen remaining from the 3.535 lb. contained in our original 15.370 lb. of air, or an amount insufficient for the complete combustion of the carbon, which under these conditions will form the unstable compound carbon monoxide (CO). Combining the available 1.575 lb. of oxygen with carbon to form carbon monoxide (CO) requires 1.181 lb. of carbon, resulting in 2.756 lb. of carbon monoxide (CO) and leaving 0.075 lb. of free carbon, which will either collect on the cylinder walls and piston head or be blown out of the exhaust in the form of a dense black smoke.

In this second combustion we have used 1.5 lb. of gasoline to 15.370 lb. of air, the resulting products being 2.205 lb. of water (H_2O), 2.756 lb. of carbon monoxide (CO), 0.075 lb. of free carbon (C) and 11.835 lb. of inert nitrogen. The water now forms 13.06 per cent of the total, and will be apparent in that proportion in the leakage to the crankcase.

In other words, we have increased the amount of gasoline in our mixture by 50 per cent and the amount of water in the crankcase by nearly 70 per cent.

Incidentally, the rich mixture has further handicapped our motor by leaving a generous deposit of free carbon in the cylinders to cause knocks and overheating, and materially cut down the amount of power by an incomplete combustion.

From the above, it will be seen that water is one of the natural products of combustion in the gasoline motor, and that its presence in the crankcase under certain conditions cannot be entirely eliminated, but that properly fitted piston rings and a proper carbureter adjustment will reduce it to the minimum. In the eight- and twelve-cylinder motors with their largely increased ring surface in proportion to their piston displacement, engineers may yet find it necessary to provide some means for trapping and removing the water before it can collect in the lubricating system.

"The Car That Stays Young"

(*Continued from page* 1107)

lot of talk of keeping the springs lubricated, but *they* do not wear out; but what of the shackle-bolts? Why doesn't some kind person get up some easy and efficient way of taking care of them? Even in cheap cars it seems to me that the spring-eyes could be fitted with bronze bushings and hard shackle-bolts used, so that the replacement of the bushings would be all that would ever be necessary.

The best sort of lubricant for the different parts is not taught as it should be. Mr. C. W. Stratford is the first to give it attention for the public [in S. A. E. paper]. Graphite is not used as much as it should be. I drove an old * * * * 30,000 miles without adjusting the main bearings of the motor, because I used Oildag in my motor oil. Ninety per cent of the people never wash out the crankcase.

Proper care, and even great care, is the price we must pay for the "car that stays young."

W. M. ROBERTSON, M.D., B.Sc.

Warren, Pa., Dec. 10, 1915.

In this letter the names of the cars to which Dr. Robertson refers have been omitted. But if real test data on materials or design details had been offered care would have been taken to identify them completely.—M. C. K.

The Palace of Motoria

THE accompanying illustration gives an idea of the plan of decoration to be used in transforming the Grand Central Palace into the Palace of Motoria for the New York show which is to open at 2 p. m., Dec. 31. Motoria is the goddess who watches over the destinies of the automobile industry and, visualized in statuary, has been a part of the decoration at a number of automobile shows of the past. The goddess stands with hands outstretched upon a steering wheel with her draperies blowing in the breeze.

The Palace will be decorated with 25,000 yd. of maroon velvet festooned in blue and gold, and on the main floor the columns which form the central court are to be treated with blue hangings draped from the bays between the tops of the columns and gathered near the base. The hangings will be edged in gold braid and fringed.

The upper cornice surmounting the columns forming the railing of the second floor will be decorated with a mass of flowers, while the columns on this floor will be treated in Renaissance figures and pergola effects.

Illustrating the decoration scheme for the central court at Grand Central Palace for the New York automobile show

ACCESSORIES

Left—American top for Fords. Right—Heiser valve tester

American Top for Fords

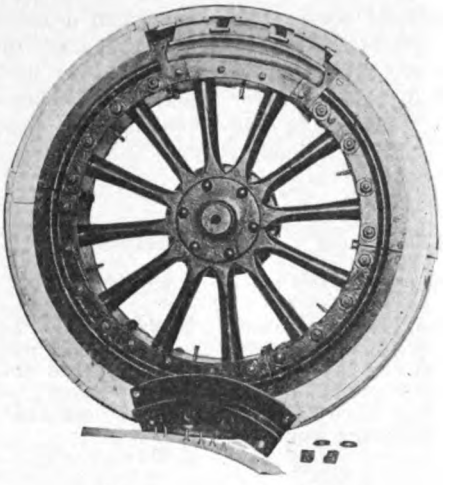
A NEW design convertible top for Fords has been added to the line of the American Top Co., which has three salient features, according to the maker. It is weather-proof and embodies the advantages of the convertible detachable top but weighs much less; it includes a standard one-man type of touring top with Jiffy curtains; and it includes a rain-vision ventilating windshield with cowl, making it adaptable to all Ford models.

It may be installed in about 2 hr. and permanently takes the place of an ordinary top, the mounting of the glass sides for winter use requiring only about 30 min. These glass sides are set in enameled steel frames with heavy tape insertions between glass and frame on both sides, making a noiseless, firm setting. The glass is fastened to the doors by a one-piece steel flange that connects directly with the door and may be quickly screwed into position. With the door glass is included a door lock by means of which the regular Ford lock can be opened from the outside. Doors are all equipped with anti-rattle rubber inserts and fit tightly. The glass partition between the two doors fits firmly to the top rail and at the bottom by a metal flange, and is again attached firmly to the top, the contact being made between two heavy cloth folds so that there is no friction or chance for squeak or rattle. Top material is long-grain English effect artificial leather.

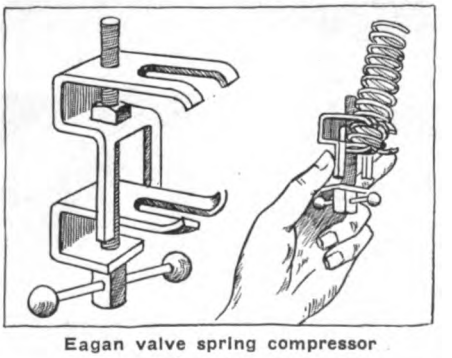
Including windshield, cowl, glass sides and one-man type top with Jiffy curtains, the price is $55. Daly & Co., Detroit, Mich., have exclusive sales rights. —American Top Co., Jackson, Mich.

Heiser Valve Tester

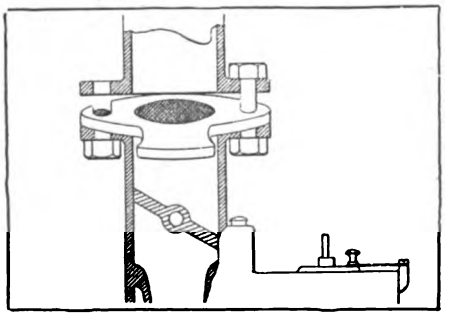
This device is a little reservoir with a funnel at the top and a drain cock at the bottom and in the body an opening which is clamped against the valve port, after the manifolds have been removed, by the same means that are used to clamp the manifolds in place. Gasoline or water is poured into the tester when the valve under test is seated, and leakage past either valve or stem indicates the need of attention. The device can be applied to any valve port not more than 2 in. in diameter. Price, $2.—Heiser Special Tool Co., Kingston, Mo.



Cannes pneumatic wheel



Eagan valve spring compressor



Joswich intake manifold screen

Cannes Pneumatic Wheel

This is a new type of pneumatic wheel which has recently been patented. The wheel has its pneumatic part embodied in the wheel itself and forms an inseparable part of it. The resiliency is obtained, as in the present tires, by inner tubes inclosed in metallic casings. Instead of one casing per wheel, there are six segmental ones absolutely independent of each other and each containing its own inner tube. The segmental casing is formed by metallic side plates bolted to the rim and a metallic shoe sliding between these plates. The shoe is covered with solid rubber at the outside and is prevented from leaving the casing by the plates' flanges. The segmental feature of the tire has the advantage of keeping the radius of the wheel always constant and therefore the centrifugal force is also constant. It is claimed there is no increase of stresses in the rim, neither is there required any additional effort of the engine to overcome the increase of the centrifugal force.

The wheel-tire is puncture-proof and should an inner tube wear out its replacement by a new one is simple and can be made without having to jack up the car.—E. Cannes, New York City.

Joswich Vaporizing Screen

This is a gasket designed for insertion between the manifold and the carbureter, containing a wire gauze screen for breaking up solid particles of gasoline from the carbureter. The gasket has slots instead of bolt holes, so that to insert it the bolts are loosened, not removed, and the device slipped in. To remove it for cleaning the process is reversed. The screen is said to prevent the passage of flame down the pipe when the motor backfires. Price $3.—F. Joswich Mfg. Co., St. Paul, Minn.

Ieco Steer Warm for Winter

For winter driving the Ieco Steer Warm grips are intended to displace cumbersome gloves which tend to lessen the firmness of control of the steering wheel. The operation is electrical, depending upon a resistance coil which consumes but a small amount of current to furnish the necessary warmth to the hands. The device consists of two leather-covered grips, one for each hand which

can be laced upon the steering wheels at any points convenient for driving. The resistance wires are arranged between two copper plates in such a way that the heat is readily led to the hand. After a certain heat is attained the Steer Warms become no hotter but maintain an even temperature. For Ford cars there is a specially-designed pair which are so made that the electric headlights can be used at the same time as the heater.

One of the advantages claimed for the Steer Warms, besides the comfort obtained, is the fact that with only a light pair of gauntlets, one is enabled to grip the wheel tightly on the coldest day, thus giving good control of the car on icy surfaces. The price for Ford cars is $5 and for other makes $7.50.—Interstate Electric Co., New Orleans, La.

Eagan Valve Spring Compressor

The Eagan valve spring compressor is designed for Fords or other small cars. It is made of sheet steel, hardened, and has forked arms, one of which is placed under the spring cup and the other as high as it will go in the convolutions of the spring. By operating the screw handle at the bottom the spring is easily compressed until the pin and cup can be removed. Price, 60 cents.—Fred. Gabriel Auto Supply Co., Brooklyn, N. Y.

A. B. Neutral Lever Lock

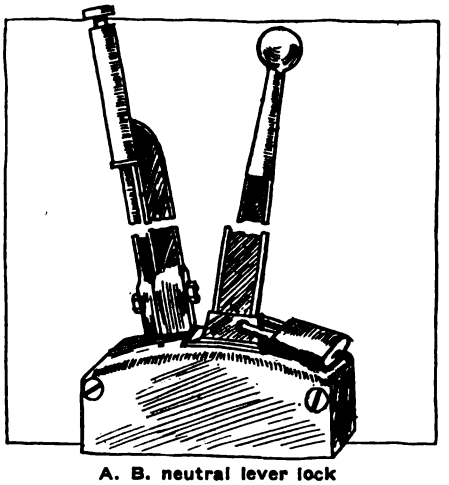
A plate with an upstanding flange which fits around the gear lever like a collar has in it two holes. A hole is drilled in the shank of the lever in line with the two holes in the collar, and all three holes are in line when the lever is in neutral. A Yale padlock, supplied with the device, is slipped through the three holes, holding the lever in neutral. This arrangement permits the car to be moved by pushing, which is not only convenient but is necessary in an emergency when there is no time to unlock the lock or when there is no key at hand. Price, $1.50.—A. & B. Specialty Co., Milwaukee, Wis.

Peerless Battery Box Black

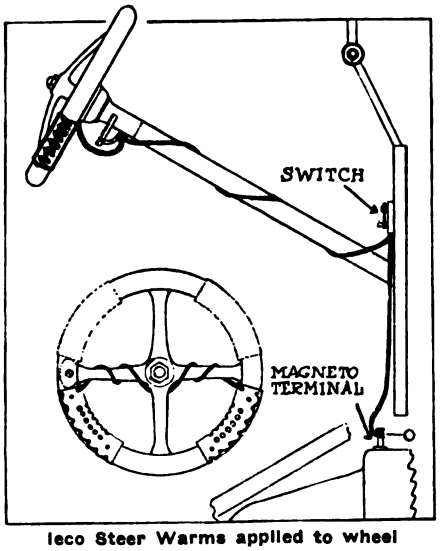
This is a solid-covering black enamel-like paint which resists the action of acid and is especially useful for battery boxes, cases and any part where the acid is likely to come in contact with the wood or metal. It saves having the wood cases replaced and the metal battery boxes from being eaten away. The maker states that this product has been tested out for over a year and that one test board coated with it was submerged for three weeks in strong acid without any effect on the finish.—Columbus Varnish Co., Columbus, Ohio.

Lyon Adjustable Bumper

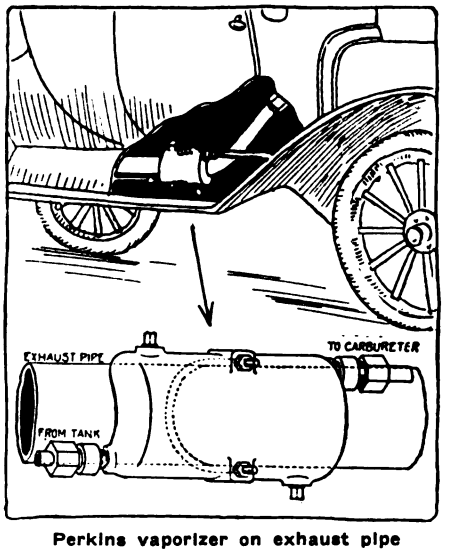
This bumper is made in two sections overlapping at the front and held together by clips, the adjustment for width being made by increasing or decreasing the amount of overlap. The amount of projection forward is regulated by moving the bumper backward or forward on the frame. The angle is also separately adjustable. Spring-tempered steel is the material used and clips and brackets are provided to fit practically all cars on the market. The Ford type sells for $6 when finished in black enamel with nickeled or brass clips and for $8 when nickel or brass plated with black clips.—Metal Stamping Co., Long Island City, N. Y.



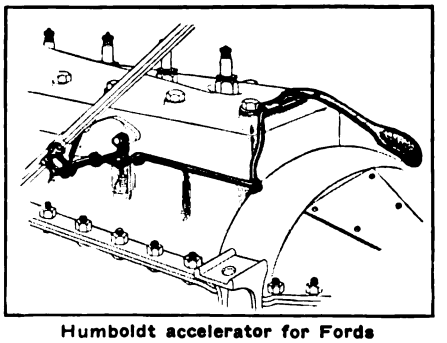
A. B. neutral lever lock



Ieco Steer Warms applied to wheel



Perkins vaporizer on exhaust pipe



Humboldt accelerator for Fords

Perkins Fuel Vaporizer

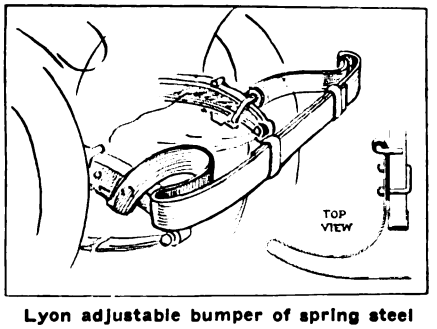
The Perkins vaporizer is a small casting with a chamber through which the gasoline passes on its way to the carbureter, the casting being clamped to the exhaust pipe and let in on the fuel line between tank and carbureter. The gasoline reaches the carbureter at a high temperature and is easily vaporized without the use of hot air. It is also filtered in passing through the casting. Solderless connections are used and the makers claim that the device, which can be installed in ½ hr., effects a considerable saving in fuel. The vaporizer sells for $3.—United States Agency, Inc., Boston, Mass.

Humboldt Accelerator for Fords

This device employs a pedal pivoted on the rear end of the Ford engine which actuates the throttle through an arm and connecting rod, permitting foot control of speed. The pedal, which is of hard rubber baked enamel finish, does not interfere in any way with the removal of the floorboards. Price, $1.—Humboldt Machine & Stamping Co., Long Island City, N. Y.

Hilton Hammock for Babies

To provide a secure resting place for baby while on automobile tours the Hilton hammock has been designed to clip to the robe rail and safely hold the little one with all the comforts of home and without the necessity of taking up some of the ordinary passenger space. The hammocks are designed to fit any make of car and are provided with sun and windshield. On the under side of the hammock are pockets for milk bottles, etc., and plenty of space is provided for articles of clothing.—Hilton Hammock Co., San Francisco, Cal.



Lyon adjustable bumper of spring steel

The FORVM

CLAIMS THAT BALL BEARINGS ARE BEST FOR TRANSMISSIONS—ARGUING THE ADVANTAGES OF CONE CLUTCHES AS COMPARED WITH DISK

Ball Bearings Lead

By J. J. Jennings,
[*New Departure Mfg. Co.*]

EDITOR THE AUTOMOBILE:—In discussing ball bearings in gearsets in your issue for Nov. 18, one of your writers made a statement with reference to ball bearings as compared with roller bearings with which we cannot agree.

In broadly judging a country-wide trend of design, we must consider cause with effect as designers have to allow practical necessity to temper their ideal. If, for instance, they aim for quietness alone in the gearbox and to attain this, use plain bearings throughout at the expense of long life and efficiency, they are risking the car reputation by losing the confidence of the car owner. If we aim at quietness alone, we might have mufflers the size of gas tanks and gears of rubber.

Plain Bearings Originally Used

Let us review the history of gearbox design as to bearings: Originally plain bearings were used at great expense of fitting and scraping in, but they absorbed too much power through friction, which also caused wear, so that when ball bearings became practical, they also became at once popular. As other noises became less, the hum of the gearbox became more pronounced. As car prices dropped, high grade bearing cost became less attractive. Then was the transmission engineer confronted by the question of how much to sacrifice efficiency and life to quietness and price.

His decision was the natural one; to reduce cost where loads were least. Hence, the loss of countershaft and pocket bearing positions by ball bearings in many moderate-priced car gearboxes, but where car quality has been maintained, the ball bearing is still in use even in the least loaded positions and since no objectionable noise would be tolerated in these higher grade cars, it is evident that the blame for being noisy was largely thrust on the ball bearing by carelessness in surrounding parts, rough gears, poor shaft alignment and resonant boxes.

We take exception, therefore, to the statement that ball bearings are losing popularity due to their noisiness or that plain bearings or roller bearings are likely to supplant them through equal efficiency, greater quietness and less cost. The ball bearing still holds important gearbox positions in the great majority of cars of any price.

Clutches and Gear Gates

By Marshall P. Slade

EDITOR THE AUTOMOBILE:—In your article on Gearsets, published Nov. 18 occurs the sentence "Where the cone clutch fails is in making a quick shift from high to intermediate, for it cannot be speeded up without a double pedal action, which very few drivers ever learn to perform."

In my experience the cone clutch is quite free from the objection mentioned, while the disk clutch makes gearshifting extremely difficult. I have three cars with cone clutches and find that gearshifting either up or down gives absolutely no trouble whatever. One of the cars has the transmission on the rear axle and therefore the clutch is directly connected to the universal joint and the propeller shaft—a very considerable weight. The other two cars have the gearbox back of the clutch, with a universal joint between. The thrust collars on all of these cars are ball bearing, so that the clutch and parts connected thereto revolve very freely. There are no clutch brakes on any of these cars.

I find that if the clutch is disengaged when the engine is running at a speed corresponding to 25 m.p.h. it continues to spin for 4 or 5 sec.—a considerable time. This is what facilitates gearshifting from high to intermediate—the shift that is the most important of all. Suppose I start up a long steep hill at a speed of 25 m.p.h. When the speed drops to 18-20 m.p.h. I throw out the clutch, pause about 1 sec., and shift into intermediate without the slightest chatter of the gears. During that pause of one second the clutch continues to spin at almost its original speed, while the car rapidly slows down. When the shift is made, therefore, the gears are running at approximately the same speed and there is not the slightest trouble in making the change.

I have also a 1916 model car fitted with a multiple-disk clutch. The gearshift on this car is most troublesome. I find that when the clutch is disengaged it stops almost instantly, due to its light weight and the friction of the thrust collar. The consequence is that with this car it is impossible to change gears quietly when going at a speed of over 12 m.p.h., without recourse to the double pedal action, which you say very few drivers ever learn to perform, and which I say it is outrageous to expect them to perform.

The cone clutch, as originally made, was troublesome to keep in smooth working order, but with cork inserts or springs to permit easy engagement this trouble has been done away with. In my opinion the engineers have been working on the wrong track in striving for lightness in a clutch. What is wanted is a clutch which will continue to spin when disengaged. Theoretically this should make shifting from first to intermediate or from intermediate to high difficult, but as a matter of fact this is not the case. It certainly is not the case with any of the old Stoddard-Dayton cars.

In these days when everything possible seems to be done to make easy the running of a car, it is a great pity that the matter of gearshifting should have taken such a decided step backwards. It does not seem possible that a complicated multiple-disk clutch can be built more cheaply than a cone clutch. Why then, with its manifest disadvantages to the driver, do so many engineers use it?

There is another subject treated in your issue of Nov. 18, namely, gear gates. It seems to me that those manufacturers who have not adopted the standard shift are very short-sighted.

THE AUTOMOBILE

PUBLISHED WEEKLY

Vol. XXXIII Thursday, December 16, 1915 No. 25

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
T. B. Van Alstyne, Advertising Manager
231-241 West 39th Street, New York City

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The S. A. E. Program

WORKING on the basis that a vigorous 1-day meeting is better than a 3-day meeting, in which the attendance is bound to be poor at any one session owing to the impossibility for all members to visit all the periods, the winter program of the Society of Automobile Engineers should bring valuable results.

Each year sees the work of the standards committee more rapidly accepted by the manufacturer, and the interest in this phase of the work and its importance makes it desirable that a day be set apart during the winter session in which the members of the standards committee can discuss the important phases of this work. It is realized, however, that the entire membership of the society cannot intelligently discuss the highly specialized topics which are often brought to a point in standards committee work. This absence of general interest in discussing the report of a division of the standards committee is often apt to cut into the attendance, as only those who are interested in the topic will remain.

Now that the standards are accepted by mail ballot, it is not necessary to insert standards committee reports between interesting papers in order to have a quorum for voting. The result is that with the standards committee work concentrated in one day, leaving an entirely separate day for the president's address and the professional session, the attendance at the reading of these papers should be much higher, and the chances for even better discussions than heretofore are increased on account of the hoped-for attendance increase.

So far as announced at present, the program of the S. A. E. winter meeting covers a field of wide interest and is one which cannot fail to interest those directly or indirectly concerned with the manufacture of automobiles and accessories. Every promise is made for a short but highly valuable technical session, from which S. A. E. members and associates are not justified in being absent if such absence is avoidable.

Carbureter Evolution

WHILE developments of a mechanical nature have taken place in the carbureter field during the past 12 months, little if anything new, in the basic principles of operation, has been given to the public. Mechanically the carbureter makers have been exceptionally busy altering mechanical details and, in some instances, quite rearranging the components of the instruments to change them from vertical-outlet models to side-outlet ones. This has called for a rearrangement of parts, but not any alteration in basic principles.

The rapidly increasing demand for side-outlet models has resulted in still another mechanical change, namely, the more general use of the hot-air jacket in preference to the water jacket, due to the fact that the waterjacket was necessary to provide the heat needed to prevent condensation in the manifold. With the side-outlet model the manifold has disappeared, and there is no demand for the additional heat, rather the hot-air pipe seems to be entirely adequate.

The demand for more rapid acceleration has been one of the loads imposed on the carbureter designer during the year, and while it has been met by the addition of or duplication of certain parts, there has not been any alteration in first principles. The means used will unquestionably take a place in carbureter design, until more simple extensions of basic principles can perform the desired functions.

The demands of production are exhibiting themselves in the forms of simplified mechanical designs and alterations to make machining and other shop operations easier and fewer. It is creditable to the carbureter fraternity that in these days of vastly increased car production the old-line carbureter makers have been able to keep pace with production and have given instruments of such satisfaction that the car makers have not been compelled to begin manufacture in their own shops.

What is needed is a better classification of carbureter types, perhaps a standardized system of nomenclature having regard for the basic principles on which different types are built. THE AUTOMOBILE has outlined a more or less incomplete system in this issue, a work which could be continued to advantage. The Society of Automobile Engineers, with its international reputation for standardizing activities, has a field of endeavor in this work.

Baker-R. & L. and Owen Merge

New Baker-R. &. L. Co. to Build Owen Magnetic Cars —Continues Electrics

NEW YORK CITY, Dec. 13—A consolidation of the Owen Magnetic Co., this city, manufacturer of the Owen Magnetic car, and the Baker-R. & L. Co., Cleveland, Ohio, has been effected. The new concern will be known as the Baker-R. & L. Co., but the cars to be manufactured will be known as the Owen Magnetic, which will be built in two models. The Baker factory in Cleveland will be given over to the manufacture of Owen Magnetic cars. The R. & L. factory at Cleveland will be used for the manufacture of bodies for the Owen Magnetic and in addition will continue the manufacture of electric cars, which the Baker-R. & L. Co. has been producing.

Capital to Be $5,000,000

The capital of the Baker-R. & L. Co. will be increased from $2,000,000 to $5,000,000. R. M. Owen, who is president of the Owen Magnetic Co., in this city, will be vice-president and director of sales. The General Electric Co., which recently obtained a considerable interest in the Owen Magnetic or Entz patents, will have directors on the board of the Baker-R. & L. Co. because of its interests in the electric transmission used in the Owen Magnetic cars.

Anson W. Burchard, vice-president of the General Electric Co., D. C. Durland and Richard H. Swartout have been elected to the board of directors of the new company, representing the General Electric interests.

The present Owen factory in this city will be continued for development purposes as well as serving as a service department. The assets of the Owen Magnetic Co., however, have all been acquired by the Baker-R. & L. organization.

Six Cylinders 3½ by 5

It has been known for some months that the Baker-R. & L. Co. was producing a gasoline-electric car built under the Entz patents, which are the basic ones in the Owen Magnetic design. This car is a smaller one than the present Owen Magnetic which has been on the market during the past year. The smaller Owen Magnetic will use a six-cylinder motor 3½ by 5 in. bore and stroke with 126-in. wheelbase. The car is claimed to turn in a circle with a diameter of 38 ft. This new car is specially designed to meet the needs of town-car work and is well suited for inside drive types such as sedans, etc. This chassis was developed with a view to meeting the requirements of those owners at present using electric cars.

The Fort Wayne factory of the General Electric is already tooled up to take care of the manufacture of electric units for these two models of Owen Magnetic cars, as well as to manufacture units for other concerns that may be licensed under the Entz patents to manufacture magnetic cars.

Manufacturers Protest New Export Declarations and Procedure

DETROIT, MICH., Dec. 10—Under the auspices of the Board of Commerce, a meeting was held to-day, at which a large number of representatives of many concerns doing an export business were present to protest against the enforcement of the new export declarations and procedure promulgated by the Department of Commerce, and which were to go into effect Feb. 1.

Exporters here claim that the statistical information the government requires could be obtained in a much more simple way and at much less inconvenience, expense, loss of time and business, than the method suggested by the government. It was proposed, and those present approved the idea, to suggest that an advisory board be selected, all the members to be experienced in the practical conduct of export business, and that this board work in co-operation with the government in getting up regulations as to how to procure the information desired by the government.

Among those attending the meeting were: Charles Denby, Hupp Motor Car Corp.; C. F. Carew, Saxon Motor Car Corp.; James Archer, Willys-Overland Co.; H. M. Robbins, Dodge Bros.; Joseph Drake, Hupp Motor Car Corp.; M. J. Breitenbeck, Detroit Steel Products Co.; P. H. Lynahan, American Blower Co.; W. L. Hoagland, chairman of the foreign trade committee of the Detroit Board of Commerce.

Moon Six-Thirty at $1,195

ST. LOUIS, MO., Dec. 9.—The Moon Motor Car Co., this city, has announced the 1916 six-thirty at $1,195, completely equipped.

In many respects the car resembles the six-forty seven-passenger selling at $1,475. The wheelbase, however, is shorter, being 118 in. The 3¼ by 4½ Continental-Moon unit power plant is block cast, with removable cylinder heads. The tires are 33 by 4 and are demountable, with an extra rim on rear.

The new model has a tumble-home type body with convex side and embodying streamline design. Other features of the body are: Deep cowl and instrument board, wide tonneau doors, 22-in., with concealed hinges and concealed locks and 44-in. leg room.

Fisk Buys Federal Rubber Co.

Gets Control After B. C. Dowse Disposes of Interests —H. T. Dunn New Head

MILWAUKEE, WIS., Dec. 13—Rumors of long standing that the Fisk rubber interests of Chicopee Falls, Mass., were negotiating for control of the Federal Rubber Mfg. Co. of Milwaukee, were confirmed Saturday night, Dec. 11, when official announcement was made that B. C. Dowse, president and general manager of the Federal had disposed of his interests and is succeeded as executive by H. T. Dunn, Toledo, Ohio.

It is stated that the Federal company will continue as a separate and distinct organization under its present name, and the change is simply one of ownership.

The board of directors will be at once increased from five to nine members, who are: H. T. Dunn and J. E. Kepperley, Toledo; H. G. Fisk, E. H. Broadwell, G. A. Ludington and E. M. Bogardus, Springfield, Mass., and B. H. Pratt, Herbert A. Githens and Richard Ward, Milwaukee.

Officers have been elected as follows: President, H. T. Dunn; vice-president and general manager, B. H. Pratt; assistant general manager, H. A. Githens; treasurer, H. G. Fisk; secretary and assistant treasurer, Richard C. Ward; comptroller, E. M. Bogardus.

The Federal company operates a large tire and commercial rubber plant at Cudahy, and employs in excess of 2000 workmen. It was established about five years ago, shortly after the consolidation of the G. & J. factories at Indianapolis with the United States Tire Co. Messrs. Dowse, Githens and Ward were formerly associated with the G. & J. During the last eighteen months the capacity of the Cudahy works have been increased more than 50 per cent and much new construction is under way and projected for 1916.

There will be no material changes in the present organization of the Federal company, according to the announcement.

Mr. Dowse intends to maintain his residence in Milwaukee, although he is not ready to discuss his plans for the future at this time.

Schooley Kearns Truck V-P

BEAVERTOWN, PA., Dec. 10—S. W. Schooley has become associated with the Kearns Motor Truck Co., this city, in the capacity of vice-president and sales manager. He was formerly special factory representative for the Atterbury Truck Co.

Many Congressmen Protest Tax

Will Fight Bill to Tax Gasoline and Horsepower if Presented

WASHINGTON, D. C., Dec. 11—A hornet's nest has been stirred up by President Woodrow Wilson in his message to Congress advocating a tax on automobiles and gasoline. To show how some members of Congress stand on the proposition THE AUTOMOBILE correspondent has secured the following expressions of opinion from Congressional leaders:

"I believe it unjust to suggest the taxation of automobiles, thus putting a burden on a great industry now bringing millions into the country. I shall make a vigorous fight on the proposal," said Senator Townsend, of Michigan. Senator Townsend is one of the Senate leaders and wields much influence in the upper body of Congress.

Representative Steele, an Iowa Democrat, says he is absolutely opposed to the proposition of taxing automobiles and gasoline. "All our farmers own automobiles and they will never stand for such a tax," he declared.

"You can depend on it that no automobile or gasoline tax will be levied by this Congress," says Congressman Miller, a Republican representative of Minnesota.

Congressman Humphrey, a Republican of Washington, said he was against all direct taxes. "There is no necessity for such a tax except in war times. I oppose automobile and gasoline taxes," he announced.

"Count me against gasoline and automobile taxes," said Congressman Tavvener, a Democratic representative from Illinois.

Congressman Sloan, a Republican representative from Nebraska, claims that gasoline and automobile taxes would be extremely unpopular in his State. "Half our farmers own machines," he added.

The matter will not come before Congress until the new year, as Congress is about to adjourn for the holiday season.

65,000 Cars and Motor Trucks on French Battle Lines

NEW YORK CITY, Dec. 13—There are 65,000 motor vehicles, including both passenger cars and motor trucks, supplying the French Army in France, according to Charles Ryer, who returned to this country from France on the Anchor liner Cameronia.

$300,000 Company to Make Electric Steel Castings

MILWAUKEE, WIS., Dec. 11—The demand for electric steel castings from numerous industries, notably manufacturers of automobiles and trucks, has induced several large steel foundrymen of Milwaukee to install electric furnaces and the organization of a new company of considerable size. The Gerlinger Steel Casting Co. of Milwaukee has recently installed an electric furnace producing 6 tons in 24 hr., this being one of the largest installations in the Middle West. The new company is the Electric Steel Casting Co., capital stock, $300,000, organized by L. G. Smith, former manager, and F. G. Wetter, former purchasing agent of the Prime Steel Co., Milwaukee. This concern is arranging to build what will be one of the first foundries in America designed exclusively for electric furnace work. The structure will be 80 by 500 ft. in size and equipped with two 3-ton electric furnaces. It will be ready to make castings about April 15, 1916. Officers of the new company are: President, L. G. Smith; vice-president, Chauncey W. Yockey; secretary and purchasing agent, F. G. Wetter; treasurer, C. F. Taylor.

Goodyear Elects Two New Vice-Presidents

AKRON, OHIO, Dec. 10—The Goodyear Tire & Rubber Co. at its annual meeting last week elected two new vice-presidents. Secretary G. M. Stadelman, who has been sales manager throughout the Goodyear upbuilding, was made a vice-president. He continues as sales manager. P. W. Litchfield, a factory manager, was also elected a vice-president. He will continue in charge of the factory operations. The company now has three vice-presidents, C. W. Seiberling, formerly vice-president, being re-elected.

A. F. Osterloh was elected secretary, stepping into the place from that of assistant secretary. He is also assistant sales manager.

The other Goodyear officers for 1916 are: President, F. A. Seiberling; Treasurer, F. H. Adams; Assistant Secretary and Assistant Treasurer, W. E. Palmer; and Second Assistant Treasurer, H. J. Blackburn.

In his statement to the stockholders, Mr. Seiberling said that the company had made over 2,000,000 tires in the year just closed.

Canadian Goodyear Tire Co. Issues New Preferred Stock

AKRON, OHIO, Dec. 9—The Goodyear Tire & Rubber Co. of Canada has issued $850,000 7 per cent preferred stock. The price is par and accrued dividend. The proceeds of the issue will enable the Canadian company to repay advances made by the Goodyear Tire & Rubber Co. of Akron, which owns all of the common stock of the Canadian company except small amounts purchased by employees of the latter. The Akron company has invested about $1,700,000 in its Canadian subsidiary, which was formed to overcome a high restrictive tariff.

The new issue of Goodyear of Canada preferred is redeemable after Jan. 1, 1919, at 110 and accrued dividends. Net earnings have been running about four times the dividend requirements, including the stock to be sold. Net sales for the year ended Sept. 30 were $2,370,914 and net income $323,874. After all charges there was a surplus of $235,135.

Canadian Ford Capital $10,000,000

600% Stock Dividend—Seven Shares of New for One of Old

DETROIT, MICH., Dec. 14—The capital stock of the Ford Motor Co. of Canada, Ltd., was increased to-day from $1,000,000 to $10,000,000. A 600 per cent stock dividend will be distributed, stockholders receiving seven shares of the new stock for every share of old stock they hold, which will make the total outstanding capital $7,000,000.

G. M. Board Meeting First Week of Jan.

NEW YORK CITY, Dec. 10—The next meeting of the board of directors of the General Motors Co. will be held during the first week of January, and dividend action on the common stock is expected at that time. The executive committee will meet within a week.

Bucyrus Rubber Elects Directors

BUCYRUS, OHIO, Dec. 9—The annual meeting of the stockholders of the Bucyrus Rubber Co., this city, was held here recently, at which the following nine directors were elected: P. J. Carroll, Jacob Colter, W. A. Blicke, George Donnenwirth, A. B. McVay, A. G. Stoltz, H. A. Paxton, Col. C. W. Fisher and M. R. Lewis.

Fahrig Exports Bearing Metal

NEW YORK CITY, Dec. 10—The Fahrig Metal Co., this city, sole manufacturer of Fahrig anti-friction metal, a special process tin base alloy, composed of 10 per cent copper and 90 per cent tin, is shipping this metal to France for the bearings of the Lorraine de Dietrich motors. The French company has adopted this material for its regular motors as well as its aeronautical motors.

Beck, of Hayes Wheel, Promoted

JACKSON, MICH., Dec. 9—Charles L. Beck, who has been general foreman of the Hayes Wheel Co., has been appointed assistant general manager of this concern's new plant in Anderson, Ind., where from 600 to 700 men will be employed when the works will be in full operation. His successor here is Henry Flick, who is assistant manager of the local plant and has been in the wheel business for the last thirty years.

Oregon Has 23,581 Cars

PORTLAND, ORE., Dec. 11—The total count of registered automobiles in the State of Oregon for 1915 is 23,581, as compared with 16,347 for 1914.

Gasoline Continues Rise

Recent Advances Make It from 40 to 60% Higher Than Last Summer

NEW YORK CITY, Dec. 11—The Standard Oil Co. of New York yesterday advanced the price of gasoline in this city 1 cent a gal., making the tank wagon basis 20 cents a gal. It is expected that the advance of 1 cent a gallon in price of gasoline will be followed by the posting of a 1-cent advance by all Standard Oil and independent companies throughout the eastern territory. Prices were advanced 1 cent a gal. at all stations in South Carolina and Louisiana.

The Standard Oil Co. of Kentucky has advanced the price 1 cent a gal., effective Dec. 13, making tank wagon basis 18 cents.

New England prices have been advanced 1 cent by the Standard Oil Co. to 21 cents a gal. in all the states with the exception of Connecticut which remains at 20 cents. Owners in Massachusetts are wondering what the outcome will be of the higher prices asked for gasoline. Within the past six months there has been a 36 per cent increase in its cost, and since January last it has jumped more than 60 per cent. The Standard Oil Co., the Gulf Refining Co. and the Texas Co. are united in that state on the price. This will mean 25 to 26 cents a gal. to the automobile owners.

Toronto gasoline is now quoting at 25 cents. As there are over 80,000 automobiles in Canada, and each car consumes on an average 400 gal. per year, this will mean a cost to the owners of Canada of nearly $3,200,000 more annually to operate their cars.

The advance made by Texas Co. on Dec. 11 in Chicago, has been met by the Standard Oil Co. of Indiana, which has advanced its prices 1 cent, tank wagon basis. The price at Chicago is now 15½ cents.

The Atlantic Refining Co. in Philadelphia has raised its price 1 cent to 19 cents a gal., tank wagon basis.

A 2-cent rise has been made in Mississippi and a 1-cent rise in Atlanta, Ga. Tank wagon basis is now 18.5 cents in Mississippi and 21 cents in Atlanta.

Gasoline prices in Portland, Ore., are now quoting at 13½ cents, and the retail prices range from 14 to 15½ cents, according to the margin of profit demanded by the respective dealers.

Gasoline in Kansas City, tank wagon basis, has been advanced 1 cent a gallon. The Standard Oil price is now 13.8 cents and independents 14.8 cents. An advance to 20 cents a gallon this winter is predicted there.

The price of gasoline at filling stations has been advanced to 14.9 cents a gallon by both the Standard Oil Co. and independents.

The Atlantic Refining Co. has advanced the price, tank wagon basis, 1 cent to 20 cents a gallon.

The advance follows an increase of 10 cents in the price of crude oil in Oklahoma and Kansas oil fields, now selling at $1.10 per barrel.

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Rittman Talks in Detroit on Gasoline Process

DETROIT, MICH., Dec. 11—Dr. Walter F. Rittman of the United States Bureau of Mines spoke to-night at the Board of Commerce on the subject of gasoline and explained his patented process.

The Rittman process and methods were described in detail in THE AUTOMOBILE for March 25.

Some of the reasons given by Mr. Rittman for the shortage of gasoline are as follows: The tremendous increase in sales of automobiles in this country, it being stated by the lecturer that more than the production of automobiles in American factories averages 3000 a day now. A second important reason given is that the export business in oil now averages 250,000,000 gal. a year. The third big reason for the shortage, according to Mr. Rittman, is the fact that the Cushing oil fields in Oklahoma, which a year ago produced 300,000 barrels of oil a day, or even more, are gradually drying out.

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New Truck Company in Detroit

DETROIT, MICH., Dec. 13—A new truck concern is being formed here, and G. E. Porter, who was chief engineer of the J. C. Wilson Co., is to be one of the organizers. A plant has been secured at Howell, Mich.

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W. McK. White with Lozier

DETROIT, MICH., Dec. 11—William McK. White, formerly with the Dayton Motor Car Co., Dayton, Ohio, has been appointed sales manager of the Lozier Motor Co.

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McBeth Westcott Advertising Mgr.

RICHMOND, IND., Dec. 10—R. S. McBeth has been appointed advertising and publicity manager of the Westcott Motor Car Co., this city.

112,000 Cars in Bay State

One Car to 32 People—One Licensed Operator to Each 27—1742 Dealers

BOSTON, MASS., Dec. 11—The fiscal year for the Massachusetts Highway Commission closed Dec. 1, and the figures show that the automobile registration receipts ran up close to $1,250,000; that there is one car to each thirty-two people in the Bay State and one in every twenty-seven people is licensed to operate a motor car. Statistics show that there has been a 33 per cent increase in the number of machines registered; a 35 per cent gain in the number of drivers licensed and a 30 per cent addition to the amount of money turned in to the State from registrations.

There are now just about 112,000 motor vehicles registered in the Bay State. These are divided into some 90,673 passenger cars; 11,960 commercial vehicles and some 9000 cars belonging to manufacturers and dealers. A year ago the figures showed about 85,500 cars in all, including 69,010 passenger vehicles, 8236 trucks and about 7800 cars belonging to the trade. The trucks alone show a gain of about 45 per cent.

Last year there were 1518 makers and dealers licensed and this year the figures show 1742, or a jump of 224. And it must be remembered that the Highway Commission is pretty strict now as to allowing any people to assume the rôle of dealers and so get registered unless they are doing a bona fide business.

133,935 Licensed Operators

There are now 133,935 people authorized to operate cars in Massachusetts, which, based upon population, gives one out of every twenty-seven people the right to drive cars.

The biggest gain has been in the number of new licenses issued, for a year ago 26,858 original licenses were given out while the number this year has jumped to 44,656. The renewals show a gain of 21 per cent, or from 72,674 to 89,279. The fees have run up to $1,205,420.19. This is the first time that the motor receipts have reached above the $1,000,000

Massachusetts Registration Statistics Compared

	1904	1914	1915	One Year Gain
Motor vehicles	*4,889	**77,246	***102,633	25,387
Motorcycles	533	8,161	9,520	1,359
Makers and dealers	102	1,518	1,742	224
Licenses, operators and chauffeurs	6,869	26,858	44,656	17,798
Renewals, operators and chauffeurs	None	72,674	89,279	16,605
Examinations	None	7,497	10,523	3,026
Receipts	$24,490.50	$925,964.75	†$1,205,420.19	$279,455.44

*Registered. About 7000 unregistered.
**Including 8236 commercial vehicles.
***Including 11,960 commercial vehicles.
†Does not include fines which will total about $50,000.

mark. When the fines are computed and added it will make the total about $1,250,000, so the gain will be more than 30 per cent, the total receipts a year ago being $925,964.75.

4899 Cars in 1905

If one looks back a decade and notes the figures it shows a wonderful growth for in 1905 there were but 4899 cars registered with 102 dealers and manufacturers. The private operators numbered 3736 and the chauffeurs 3133. At that time the annual registration law was not in force and it was estimated that there were about 12,000 cars in the State. The yearly receipts totaled $24,490.50. Comparative figures appear in the tabulation on page 1116.

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American Wagon to Make Farm Truck Bodies

DIXON, ILL., Dec. 9—The American Wagon Co. of Dixon will soon commence the manufacture of a convertible farm wagon body which also will be available for the chassis of a motor truck. Plans and specifications are now under discussion, and as soon as the models are produced which accord with the ideas of the company, production will commence upon an extensive scale. The decline in the demand for farm wagons forces the company to adopt the new side line.

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Box Co. to Make Trucks

SHEBOYGAN, WIS., Dec. 11—The R. L. Frome Mfg. Co., Howard's Grove, Sheboygan County, Wis., a large producer of boxes and other packages and containers, has decided to engage in the manufacture of motor trucks. A large addition is now being made to the plant to accommodate the new truck shops. Details of the new truck will be disclosed within a short time. Experimental work has been under way for more than a year. The truck will be a light delivery type, employing worm-gear drive.

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Beech Creek To Make Truck

BEECH CREEK, PA., Dec. 13—A new four-wheel-driven, four-wheel-steered truck is to be manufactured by the Beech Creek Truck & Auto Co., of this city, the first model of which was recently tried out here. The feature of the new truck is that both front and rear axles are pivoted to the frame at their center points by means of large ball-and-socket joints. These permit the entire axles to turn when rounding a corner, allowing the wheels to give a straight pull on the axle.

Wis. to Buy 30,000 Cars in 1916

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80,000 Registered for 1915 and 110,000 Total Estimated for 1916

MADISON, WIS., Dec. 13—Wisconsin will absorb 30,000 cars during 1916, according to the estimate made by the office of the Secretary of State, who is in charge of registrations. The secretary plans to issue 110,000 licenses to private owners next year, based on a registration of approximately 80,000 for 1915.

Interesting statistics on Wisconsin registrations have been compiled by A. J. Cobban, registry clerk, Secretary of State's office. The figures show that during 1913, Wisconsin absorbed 10,068 new cars; in 1914, 18,514 new cars, and during the year now closing, 26,631 new cars. This goes to show that the annual gain over the previous year has been uniform, being in the neighborhood of 8000. While it would appear inconsistent to estimate a gain for 1916 of only 3400 compared with 1915, in the face of 8000 gains for three successive years, Mr. Cobban explains that the car market necessarily becomes more restricted year after year and the percentage of gain declines by the same token.

It is interesting to note that while the number of dealers who registered in 1914 was 191 less than the 1913 registry, a gain of 381 is shown for 1915.

The Secretary of State is figuring on issuing 1600 dealers' licenses next year, which is only seventeen more than the 1915 registry, but as has often been proved, the early estimates are generally far below the actual registration.

A comparative tabulation of registrations for the four years ending in December, 1915, appears herewith.

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Car Sales Good in Manitoba

WINNIPEG, MAN., Dec. 8—Probably no figures could better indicate the state of Winnipeg's prosperity in a year of what has been termed financial depression than those in the municipal commissioner's office in the Parliament Buildings relating to automobiles. Statistics show up remarkably in comparison with former years and demonstrate that the automobile business is, if anything, busier than ever. The Province of Manitoba shows a record increase in the number of cars, for over 2000 new automobiles have been purchased during 1915 and the revenue of the Province has been increased in a corresponding proportion.

Manitoba is receiving this year upwards of $100,000 from the automobile business alone. Licenses have been granted to 9073 automobiles up to the end of September and it is anticipated that fully 500 more applications will be shown when the returns for the last 3 months of the year are tabulated at the end of December.

The straight license fee of $10 makes a total of $90,730 for the motor cars already registered. In addition licenses have been granted to 1144 chauffeurs at $5 per head, making a total of $5,720. Only 7000 licenses for automobiles were granted in the Province of Manitoba last year, showing that from April 30 up to the end of September 1915, only 6 months in all, 2073 cars have been purchased. Some most striking features have been compiled by the department with a view of showing the distribution of cars throughout the Province and also with a view to showing the number of makes of cars in use in Manitoba. The census of makes of cars operating in Manitoba during the past year numbered 174. During the present year the various numbers given the departmental census of makes of cars has been vastly increased and the increase is largely in the country where the farmers have been able to purchase cars by reason of the increased crops and prices and the general increase of prosperity.

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1916 Tractor Tests in August at Bloomington

CHICAGO, ILL., Dec. 10—At a meeting of representatives of the leading tractor companies of the Middle West, held in Chicago, it was voted to accept the offer of Bloomington, Ill., for the tractor demonstration of 1916, to take place in August. Owing to the great expense in putting on these demonstrations, it was decided to hold but one in each State annually.

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Velie To Add 1200-Pounder

MOLINE, ILL., Dec. 10—A 1200-lb. truck is to be added to the line of heavier Velie trucks, made by the Velie Motor Vehicle Co., Inc., this city, it will be ready sometime in the coming spring.

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Republic Internal-Gear 5-Tonner

DETROIT, MICH., Dec. 10—A 5-ton internal-gear-driven truck is to be brought out by the Republic Motor Truck Co., Alma, Mich.

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Iowa a New Truck

OTTUMWA, IOWA, Dec. 13—The Iowa Motor Truck Co. was recently formed in this city for the manufacture of 1- and 1½-ton trucks of the internal-gear-driven type. The truck will be known as the Iowa and will be sold in the Middle West.

Wisconsin Registration Statistics Compared

Class of License	Annual Fee	1912	1913	1914	1915
Automobiles	$5	24,578	34,646	53,160	79,791
Motorcycles	2	4,060	6,120	7,881	8,601
Dealers	10	1,052	1,393	1,202	1,583

500 at Anti-Glare Device Test

Small Bulb for Dimming Claimed Not to Meet Mass. Law.

BOSTON, MASS., Dec. 9—The Massachusetts Automobile Club last night conducted an educational test on anti-glare devices before 500 motorists for the purpose of observing whether the different non-glare devices really eliminate the glare or not. The tests were conducted with the sanction of the Massachusetts Highway Commission, which has the power of regulating these devices, but Col. Sohier, chairman of the commission, has refused to make any official statement as to whether or not any particular devices meet the requirements of the law. The tests were conducted in a closed room 140 ft. long and of width sufficient to test the devices. The floor was painted black to represent an oiled roadway and a stand was erected at one end on which the headlights were mounted at the ordinary height above the ground. At each side of the stand at an angle of 45 deg. or 10 ft. on the side and 10 ft. in front were two wax figures to represent pedestrians. Just 50 ft. in front of the light stands was a crossbar 3½ ft. high. At the extreme end of the imitation roadway stood another figure supposed to be a pedestrian. These conditions were intended to represent as nearly as possible the law requirements, in that they will not glare or dazzle 3½ ft. above the ground or 50 ft. ahead, but will clearly show up objects 150 ft. ahead and standing at either side of the road.

No Official Results

No official results were given but the sentiment seemed general among all the spectators that the present-day lights with a small bulb, that is, the dimmer arrangement, will not satisfactorily meet the requirements of the Massachusetts law.

The club intends to retain its testing place for some months so that manufacturers of other devices will have an opportunity of making tests whenever desired.

Testing the Devices

In the tests some of the non-glare devices would pick up the side objects but were not strong enough to make the objects at 150 ft. clear. In other cases the devices gave sufficient light at 150 ft., but were glaring 3½ ft. above the ground at the 50-ft. line. In several cases where the lens was frosted all over the glare was eliminated but there was not sufficient light to show objects 150 ft. distant.

Some of the dimming devices tested by the means described were:

Aderente Non-Blinding Co., Jersey City, N. J.
Opalite Deflector, New York.
Legalite Lens, Boston, Mass.
J. M. Non-Blinding Lens, New York City.
Haskins Lens, New York.
Reliable Sales Co. Lens.
Perrin No Glare.
Osgood Auto Light Deflector.
Greenwood Silvered bulb.
Lancaster Lens frosted.
Jones Lens.
Gray & Davis Frosted Bulb.
Gray & Davis frosted top and bottom with a clear surface slit horizontally.
Lancaster lens all frosted.
Lancaster half frosted from top.
Haskins lens all frosted.
Haskins open-eye lens.
Solar Eclipse lamp.

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Rough Ozark Section of Mo. Buys Cars

KANSAS CITY, MO., Dec. 10—The Ozark section of Missouri, rough and hilly, the most backward section of the State, has started to purchase automobiles. The total for the State now is 76,257, an increase from 54,000 from the registration of a year ago.

Greene County, in the center of the Ozark section with Springfield as its county seat now boasts a registration of 1041 cars and, outside of the cities of St. Louis and Kansas City, stands fourth in the State ranking. The registration in the other Ozark counties, none of which has any cities in excess of 2000 or 3000 population is as follows:

Barry 252; Barton, 379; Camden, 37; Carter, 1; Cedar, 139; Christian, 138; Dade, 177; Dallas, 71; Douglas, 18; Hickory, 48; Howell, 145; Laclede, 94; Lawrence, 415; Oregon, 49; Ozark, 10; Polk, 177; Pulaski, 52; Shannon, 9; Stone, 46; Taney, 10; Texas, 65; Webster, 83, and Wright, 79.

Many of these counties are not touched by railroads and practically none of them have ever improved their roads. The highways through most of them follow the ridges or hollows, filled with stones and ruts. The entire district is one abounding in fish and game and is but little settled.

St. Louis leads, in the State registration with a total of 16,362 cars. Kansas City is second with 9289. The registration fees this year have amounted to $322,383, a record for Missouri.

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New Era Capital $200,000

JOLIET, ILL., Dec. 11—The capital stock of the New Era Engineering Co. of Joliet, has been increased to $200,000. A foreign department office has been opened at 44 Whitehall Street, New York City, J. B. Crockett being placed in charge. Orders have been received for $1,500,000 worth of cars. J. P. Buckley of Detroit, has been elected vice-president and factory manager. The company was organized in April, 1915, and now has a semi-monthly payroll of $1,300.

Revival in Mexican Trade

Large Field for Trucks—Large Demand for Cars Expected

EAGLE PASS, TEX., Dec. 10—That the automobile trade with Mexico is on the eve of a big revival is shown by the movement of this class of traffic through the Eagle Pass and Laredo gateways during the last few days. During his recent visit to the border First Chief Venustiano Carranza purchased six car loads of new automobiles, and the shipment passed through here a few days ago destined to different parts of Mexico. For his personal use, and the use by his staff officers General Carranza placed orders in San Antonio for six up-to-date seven-passenger, eight-cylinder cars and three four-cylinder touring cars. The former order included seat cover equipment, bumpers and Silvertow cord tires. The cash price paid for the nine cars was $15,000.

With the return of normal business conditions in Mexico automobile dealers in all Texas border towns expect an unprecedented rush of orders for cars.

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1,000,000 Model T Fords

DETROIT, MICH., Dec. 10—At 1:55:30 this afternoon car No. 1,000,000 of the model T Ford was completed at the Ford Motor Co. main plant. The first model T was made in 1908. Including other models, the company has made a total of approximately 1,080,000 Ford cars, which have been made and sold up to this afternoon. Ford officials estimate that 750,000 of the 1,000,000 model T cars are in operation in the United States.

Based on the average value of the model T roadster, touring car and town car of the last five years, the value of the model T cars made to date is over $668,000,000.

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Ford Motor Co. Buys 20 Acres of Ground in Detroit

DETROIT, MICH., Dec. 10—Vice-President Frank L. Klingensmith of the Ford Motor Co. confirmed to-day the purchase by the Ford company of property aggregating about 20 acres of ground on Woodward Avenue and adjoining the big plant to the north.

Negotiations had been pending for several months and the deal is said to involve between $500,000 and $1,000,000, the exact figures not being made public. The property includes land of the Braun Lumber Co., the H. W. Harding Lumber Co., the United Fuel & Supply Co. and

the St. Francis Home of Orphan Boys.

For the present, it is said, that only provisions will be made for larger railroad switching facilities and to embellish the northern approach to the Ford plant.

With the newly acquired property the Ford company has a frontage of about 1490 ft. on Woodward Avenue, which does not include property now being used as recreation grounds.

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Harrow Tractor Co. Organized with $300,000 Capital

DETROIT, MICH., Dec. 8—The A. T. Harrow Tractor Co. has been formed and incorporated, its capital stock being $300,000 and its officers and incorporators A. T. Harrow, president; H. M. Sweet, vice-president and E. A. Cobo, secretary-treasurer. This new concern has taken over the Michigan Tractor Co., which was recently organized by the same parties interested in the Harrow company.

The company is now endeavoring to find a factory either in Detroit or vicinity in which to start making its tractor, which was invented by Mr. Sweet, and which is to sell at $950 without the plowing outfit and at $1,100 with this accessory. The temporary headquarters of the concern are at 12 Jefferson Avenue, East.

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To Test Michigan Law

DETROIT, MICH., Dec. 11—As there has been a good deal of controversy about the new Michigan automobile tax law, which goes into effect Jan. 1, it being claimed that the law is unconstitutional, a test case will be taken to the courts. Pending a decision, it has been announced by Secretary of Police, George Walters, that motorists may continue to use their cars with their present or 1915 license number. If they care to, they may secure the 1916 license plate and pay their tax according to the new law, and in case the latter is declared void, they will receive the difference in excess over the present taxation.

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Another Injunction for Prest-O-Lite

LOUISVILLE, KY., Dec. 10—A preliminary injunction has been issued here in favor of the Prest-O-Lite Co., Inc., Indianapolis, Ind., in its suit against the Sun-Lite Gas Co., Thomas F. Hackett, C. A. Tucker and J. J. Moran and Margaret Moran, charging illegal refilling of Prest-O-Lite tanks. The injunction compels the refillers to destroy the identity of the Prest-O-Lite cylinder, to convert it into a properly branded Sun-Lite tank and then forbids the fraudulent substitution of such a tank upon a Prest-O-Lite user.

Thropp Patent Suit Dismissed

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New Testimony Fails to Change Decision in Litigation vs. U. S. Tire

NEW YORK CITY, Dec. 10—The suit of the De Laski & Thropp Circular Woven Tire Co. against the United States Tire Co. was dismissed by Judge Hand this week. This case was an effort on the part of the De Laski & Thropp company to secure the upholding of its tire core patent by means of new testimony, following a decision of the Circuit Court of Appeals holding the patent invalid because anticipated.

The patent in question covers molds used in the manufacture of tires by practically the entire industry, and if upheld would give a practical monopoly to the owner which would permit the exaction of large sums.

Judge Hand agrees with the decision of the Circuit Court of Appeals that the patent was anticipated, referring to the use of tire molds by the Goodrich company, and points out that the Fisk cold press of 1903 and 1904 antedates Thropp's press, the date of invention of which the testimony sought to carry back from Feb. 1, 1905, to January, 1904. The opinion also states: "I have no hesitation in finding that the Fisk mold antedated Thropp's 1904 mold. I do not, of course, mean that the Fisk mold was itself an anticipation of the patent, but if Thropp may carry back to January, 1904, then he is met by an apparatus as near to his invention as that by which he would carry it back."

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Lee Tire & Rubber Corp. Formed—To Increase Output

CONSHOHOCKEN, PA., Dec. 10—The formation of the Lee Tire & Rubber Corp., this city, has completed the refinancing of the Lee Tire & Rubber Co., which has provided for a large increase in its output. The new company has 100,000 shares issued of an authorized amount of 150,000 shares, no par value. This stock will be controlled and managed by the same officers that have controlled the old company. The output is to be increased from the present rate of 200,000 tires a year to at least 400,000. Of the 100,000 outstanding shares, 67,000 shares are being offered at $50 a share, and the 33,000 shares are being retained by officers and interests identified with the company. All of the property, assets, and business of the old company are taken over.

The officers selected for the new company are: President, A. A. Garthwaite; vice-president, J. J. Watson, Jr.; secretary, Samuel Wright; treasurer, H. C. Coleman.

The new board of directors of the company are as follows: S. B. Fleming, president of the International Agricultural Corp.; A. A. Carthwaite, president of the Lee Tire & Rubber Corp.; J. J. Johnson, president of Johnson & Johnson, New Brunswick, N. J.; S. H. Miller, vice-president of the Chase National Bank; G. M. P. Murphy, vice-president of the Guaranty Trust Co.; J. W. Prentiss of Hornblower & Weeks; J. J. Watson, Jr., vice-president of International Agricultural Co., and Joseph Wayne, Jr., president of Girard National Bank, Philadelphia.

The statement of earnings for the ten months ended Oct. 31, last, follows:

Net sales		$2,794,025
Cost of sales after depreciation		1,991,691
Gross profits on sales		802,334
Profit on materials sold		1,100
Total profits		803,434
Selling, administration and general expenses		364,018
Balance		439,416
Add: Discount on purchases	$14,740	
Income from properties	3,758	18,498
Balance for interest		457,914
Interest paid		45,439
Surplus		$412,475

The balance sheet of the company, with the new financing accomplished, is as follows:

Assets

Cash	$127,240
Accounts and notes received	334,436
Inventories	963,701
Total current assets	$1,435,378
Deferred debts	8,558
Plant and equipment	1,094,987
Patents, trade marks, etc.	400,300
Total	$2,939,524

Liabilities

Current liabilities	$117,758
Reserves	188,175
Stock 100,000 shares in par value	2,638,591
Total	$2,939,524

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Jameson To Take Two Years' Leave of Absence

TOLEDO, OHIO, Dec. 10—For several months C. S. Jameson, vice-president and director of the Willys-Overland Co., this city, has been in ill health and has finally decided to relieve himself of all commercial responsibility and obtain a much needed rest. That he may carry out this intention he has resigned as an officer and director of the Willys-Overland Co. to take a two years' leave of absence. Mr. Jameson leaves shortly for Florida where he will spend the winter.

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Premier Cushion Spring Co. Formed

DETROIT, MICH., Dec. 8—The Premier Cushion Spring Co. has been incorporated, its capital stock being $25,000. The incorporators and officers are William D. McCullough, president; William A. Falls, vice-president and Joseph A. Schulte, secretary-treasurer. The first two members were formerly with the Detroit Wire Spring Co. and Mr. Schulte is manager of the local Cadillac branch.

Hupp Gains 97% in November

1915 Production 50% Over 1914 to the End of That Month

DETROIT, MICH., Dec. 9—Production and sales of the Hupp Motor Car Co. during November were 97 per cent greater than in November, 1914, and show an increase of 47 per cent over the record of last October. Taking the production for the 1915 season to the end of November, the increase in production has been 50 per cent as compared with the same period of 1914. While the material market, according to the Hupp officials, is still a cause for holding back production, it is not quite as serious as it was during the summer and fall months. Complaints now coming are rather owing to slow deliveries and this is due to a shortage of railroad freight cars, thousands of which are now tied up in the East.

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Steel Higher

NEW YORK CITY, Dec. 14—Automobile material prices were steady last week. Bessemer and open-hearth steel each went up $1 a ton to $30 and $31 respectively. These metals have seen a steady rise, the price in June last being $19. Fine up-river Para fluctuated throughout the week and closed yesterday at 71 cents. The recent rise in price of rubber, it is believed, will cause a rise in tire prices. Prices, however, in the rest of the materials that are included in the structure of tires, have made higher advances proportionately than rubber, and it is stated that these will have a greater influence on a rise in tire prices than will rubber, of which the manufacturers are well supplied with.

Gasoline in this city has risen 1 cent to 20 cents a gal. to garage men. Oil men are predicting that Pennsylvania crude oil will go to $2.50 a barrel before many months. This is of interest in connection with the prospect of a higher price of gasoline, as Pennsylvania petroleum is generally credited with carrying the highest content of gasoline. Pennsylvania crude is at present quoting at $2.10 a barrel, while that from Kansas is selling at $1.10, a rise of 10 cents taking place to-day.

The undertone in copper continued firm throughout the week. Prices remained steady at 19½ cents in both electrolytic and lake. Aluminum remained constant at 56 cents. The Virgin quality, which is 99 per cent pure is held at 58 cents. Lead was firm though lower at $5.20 per 100 lb.

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Consolidated Car Stock Par at $10 per Share

DETROIT, MICH., Dec. 9—As reported briefly in THE AUTOMOBILE for Dec. 2, the Consolidated Car Co., this city, which makes the Abbott-Detroit, has increased its capital stock to $500,000. This stock will be sold at par, $10 a share, not through brokers, but by the members of the company. The former capitalization of the company was $200,000 and it is intended to sell $200,000 of the new stock and hold the balance of $100,000 in reserve. It is said that about $135,000 worth of the stock has been thus far subscribed for. Of the new model six-44 brought out recently, it is planned to build 2000 the first year.

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Overland Meeting Jan. 14 to Consider Increasing Capital

TOLEDO, OHIO, Dec. 13—A special meeting of stockholders of the Willys-Overland company, will be held Jan. 14, in this city, to consider and take action upon a proposal to increase the authorized capital stock of the company to $75,000,000, consisting of $50,000,000 common and $25,000,000 new preferred stock. Action will also be taken in regard to a proposal to make this preferred stock redeemable and convertible into common stock.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat	Mon.	Week's Ch'ge
Aluminum	56	.56	.56	.56	.56	.56	...
Antimony	.38½	.38½	.38½	.38½	.38½	.38½	...
Beams & Channels, 100 lb.	1.97	1.97	1.97	1.97	1.97	1.97	...
Bessemer Steel, ton	29.00	29.00	30.00	30.00	30.00	30.00	+1.00
Copper, Elec., lb.	.19½	.19½	.19½	.19½	.19½	.19½	...
Copper, Lake, lb.	.19½	.19½	.19½	.19½	.19½	.19½	...
Cottonseed Oil, bbl.	8.56	8.34	8.32	8.32	8.24	8.24	—.32
Cyanide Potash, lb.	.23	.23	.23	.28	.28	.28	...
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl.	.19	.19	.20	.20	.20	.20	+.01
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.22½	5.20	5.20	5.20	5.22½	5.20	—.02½
Linseed Oil	.62	.62	.62	.62	.62	.62	...
Open-Hearth Steel, ton	30.00	30.00	31.00	31.00	31.00	31.00	+1.00
Petroleum, bbl., Kansas, crude	1.00	1.00	1.00	1.00	1.00	1.10	+.10
Petroleum, bbl., Pennsylvania, crude	2.10	2.10	2.10	2.10	2.10	2.10	...
Rapeseed Oil, refined	.88	.88	.88	.88	.88	.88	...
Rubber, Fine Up-River, Para	.69	.70	.69½	.69	.70	.71	+.02
Silk, raw, Italian	...	...	5.25	...	...	5.25	...
Silk, raw, Japan	...	...	4.70	...	...	4.62½	—.07½
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	37.25	37.35	37.35	38.00	38.00	37.50	+.25
Tire Scrap	.05¼	.05¼	.05¼	.05¼	.05½	.05½	+.00½

Motor Stocks Soar

General Motors Common and Preferred Rise 48 and 13 Points Respectively

NEW YORK CITY, Dec. 14—Notwithstanding the sluggishness and backwardness of the rest of the market during the past week, automobile and accessory stocks as a group have continued on their upward movement. There is a certain element in Wall Street that believes the best speculative mediums of the future will be the automobile and accessory stocks. They base this theory on the large growth of the automobile industry and prospects of still greater expansion.

High Marks Made

The speculative boom at present in automobile stocks under the leadership of General Motors, saw new high marks made last week. General Motors common and preferred both rose substantially, the former 48 points and the latter 13 points. The announcement that there will be a directors' meeting next month at which action will be taken in regard to a common stock dividend seemed to have a strong effect on all the stocks. A comparison of the prices of the four leading automobile stocks, General Motors, Chevrolet, Studebaker and Willys-Overland, on Saturday with those on Monday, will show the sensational rises that have been taking place in these stocks lately: General Motors, 474 on Saturday and 558 on Monday, gain 84; Chevrolet, 125 on Saturday and 155 on Monday, gain 30; Studebaker, 150⅞ on Saturday and 173½ on Monday, gain 22⅝; and Willys-Overland, 235 on Saturday and 255 on Monday, gain 20. Incidentally, Chevrolet stock will shortly be added to the list of motor shares on the exchange. The stock was offered to the public at 85 by a banking syndicate some time ago.

A number of important gains were made in other stocks, Ajax-Grieb common rose 25 points and reached the 400 mark. Its preferred closed at 105 with a 4 point gain. Goodyear common rose 4 points and its preferred 3 points. The first and second preferred of Kelly-Springfield rose 1 and ¼ points, respectively. Packard common rose 5 points. Stewart-Warner common rose 1 point.

G. M. C. Common High

General Motors common featured the Detroit Exchange with a 57½ point rise, the stock reaching 520. Its preferred rose 11½ points, reaching 120. Packard common rose 9 points. Studebaker reached the 164 mark with a 14-point gain. In the inactive stocks there was

a 400-point gain in Canadian Ford stock, which closed at 2400.

During November 49,375 shares of stock were sold on the Detroit Stock Exchange and of this number 12,465 were Reo Motor Truck Co.'s shares and 10,566 were Reo Motor Car Co.'s shares. The price of the shares of the truck company varied from 20¾ to 25¼ and the shares of the Reo car company varied in price from 40½ to 55. The par value of these shares is 10.

The next largest sales of motor stocks was that of 1746 Maxwell common, at from 68¼ to 80½, 1295 shares of General Motors common were sold, at from 370 to 478. Other sales for the month were: 500 shares of Packard common and Studebaker preferred, 40 Packard preferred and 215 Studebaker common; 128 shares of Paige-Detroit, 35 shares of General Motors preferred; 240 shares of Chalmers common and 60 preferred; 471 shares of Continental Motor Mfg. common and 20 preferred.

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Weier-Smith Truck Raises Capital

BIRMINGHAM, MICH., Dec. 6—The capital stock of the Weier-Smith Truck Co., has been increased from $30,000 to $50,000. This company, which started in business in 1914, will soon bring out a new model of its four-wheel-drive trucks, of 1½-ton capacity.

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Michigan Fender Capital $60,000

YPSILANTI, MICH., Dec. 9—The capital stock of the Michigan Crown Fender Co. has been increased from $20,000 to $60,000.

New Premier Co. Is Organized

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Premier Motor Car Co., with $2,500,000 Capital, to Continue Car

INDIANAPOLIS, IND., Dec. 10—Following the purchase of the Premier Motor Mfg. Co.'s plant by a syndicate as announced in THE AUTOMOBILE for Dec. 2, a new corporation is being formed which will be known as the Premier Motor Car Co. It will have a capitalization of $2,500,000 and will continue the manufacture of Premier cars. A deal has been completed by which the new company becomes the owner of the T. B. Laycock Co. plant, and all the machinery and other material at the old Premier plant will be moved to the Laycock factory. A manufacturing concern which has been occupying a part of the plant will move out to make way for the new Premier company.

The new Premier Motor Car Co. is composed of a syndicate of manufacturers and bankers from Joliet, Ill., Indianapolis and Detroit. The prime movers in the enterprise are: J. C. Flowers, of the Gerlach-Barklow Co., Joliet; E. W. Steinhart, Indianapolis; C. F. Jensen, president of the Vanguard Mfg. Co., Detroit; F. W. Woodruff, vice-president of the First National Bank and the Woodruff Trust Co., Joliet; George Woodruff, president of the First National Bank of Joliet and president of the Illinois Bankers' Assn.; T. R. Gerlach, vice-president of the Gerlach-Barklow Co., Joliet and H. L. Thompson, secretary of the Gerlach-Barklow Co., Joliet.

It is understood that other interests in Joliet, New York, Chicago and elsewhere are also interested in the enterprise. Mr. Flowers is slated for president and general manager of the new company and he, with the others named, will constitute the board of directors.

The Laycock plant consists of a main building 900 by 300 ft. with a 137 by 70-ft. three-story administration building and a modern power plant, all being located on a 43-acre tract inside the city limits overlooking Brookside park and the Indianapolis parkway. The buildings are of brick, steel and concrete and an automatic fire-sprinkling system is a feature. It is stated that 3500 men will be employed in the plant and that several large new buildings will be erected. The appraised value of the Laycock real estate, plant and equipment is approximately $1,000,000 and it is said that there will be no mortgages or debts of any kind against the company.

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Dividends Declared

Reo Motor Car Co., quarterly, 2½ per cent on common, payable Jan. 10.

Gray & Davis, quarterly, 1¾ per cent on preferred, payable Jan. 1, to stock of Dec. 22, 1915.

J. I. Case T. M. Co., quarterly, 1¾ per cent on preferred, payable Jan. 1 to stock of Dec. 13, 1915.

Maxwell Motor Co.; 14¼ per cent on first preferred stock, payable in non-interest bearing warrants which have privilege of conversion into preferred stock at par. Warrants distributed Dec. 31 to stock of Dec. 29.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	250	..	400	425	+25
Ajax-Grieb Rubber Co. pfd	100	..	105	..	+4
Aluminum Castings pfd	95	100	..	..	..
J. I. Case pfd	..	..	88	91	..
Chalmers Motor Co. com	..	92½	150	160	..
Chalmers Motor Co. pfd	87½	92½	101	103½	—1
Chevrolet Motor Co	..	..	146	148	+16
Electric Storage Battery Co	..	..	68	69½	+1
Firestone Tire & Rubber Co. com	340	..	690	705	..
Firestone Tire & Rubber Co. pfd	109	111	112	..	..
General Motors Co. com	84½	86	538	542	+48
General Motors Co. pfd	89½	91½	129	131	+13
B. F. Goodrich Co. com	25	26	72	73½	..
B. F. Goodrich Co. pfd	94	96	113	115	+2
Goodyear Tire & Rubber Co. com	185	191	334	339	+4
Goodyear Tire & Rubber Co. pfd	101	102	113	114	+3
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	..	..	30	34	—4
International Motor Co. pfd	..	..	55	60	—5
Kelly-Springfield Tire Co. com	68	69	*295 † 74	300 75½	.. — ½
Kelly-Springfield Tire Co. 1st pfd	77½	78½	98	99	+1
Kelly-Springfield Tire Co. 2d pfd	95	97	†75	76	+ ¼
Maxwell Motor Co. com	14	14½	74	75½	— ½
Maxwell Motor Co. 1st pfd	43	45	99	99½	..
Maxwell Motor Co. 2d pfd	16	18	55	57	..
Miller Rubber Co. com	..	..	235	243	—5
Miller Rubber Co. pfd	..	..	110	111	—1
New Departure Mfg. Co. com	..	..	..	..	..
New Departure Mfg. Co. pfd	..	..	..	..	..
Packard Motor Car Co. com	..	100	150	160	+5
Packard Motor Car Co. pfd	90	..	99	102	—2
Paige-Detroit Motor Car	..	..	700	..	..
Peerless Motor & Truck Corp	..	..	36¼	36½	+1¾
Portage Rubber Co. com	25	30	60	65	..
Portage Rubber Co. pfd	80	85	99½	100½	+ ½
Regal Motor Co. pfd	..	..	18	23	..
‡Reo Motor Truck Co	10½	11¼	..	25	..
‡Reo Motor Car Co	21½	22¼	54	56	..
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed Corp. com	46½	48½	87	89	+1
Stewart-Warner Speed. Corp. pfd	97	100	108	..	..
Studebaker Corp. com	32¾	34	165	167	+13
Studebaker Corp. pfd	87	88	114	114½	+3½
Swinehart Tire & Rubber Co	67	71	85	86	—3
Texas Company	..	..	213	215	+3
U. S. Rubber Co. com	49	51	53	55	—1
U. S. Rubber Co. 1st pfd	100	102	108	108½	+1
Vacuum Oil Co	..	..	226	231	..
White Company pfd	107	110	110	..	..
Willys-Overland Co. com	77	80	238	242	+8
Willys-Overland Co. pfd	86	90	114	114½	+1½

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	94	..	160	—1
Chalmers Motor Co. pfd	87½	92½	102	104	+1
Continental Motor Co. com	155	180	247	257	+2
Continental Motor Co. pfd	..	75	92	..	+1
General Motors Co. com	76	77	520	530	+57½
General Motors Co. pfd	86	88	120	129	+11½
Maxwell Motor Co. com	13½	14½	74	76	+1¼
Maxwell Motor Co. 1st pfd	42	44	98	100½	+ ½
Maxwell Motor Co. 2d pfd	16	18	54	57	+1½
Packard Motor Car Co. com	..	100	152	161	+9
Packard Motor Car Co. pfd	90	..	100½	..	+2
Paige-Detroit Motor Car Co	..	..	700	735	..
‡Reo Motor Car Co	21⅝	22¼	54¾	55½	..
‡Reo Motor Truck Co	10½	11⅛	21½	22½	—1½
Studebaker Corp. com	..	..	164	167	+14
Studebaker Corp. pfd	..	..	113	117	+1½

INACTIVE STOCKS

‡Atlas Drop Forge Co	..	25	28	30	+1
Ford Motor Co. of Canada	..	500	2400	2750	+400
Kelsey Wheel Co	185	..	220	..	..
‡W. K. Prudden Co	..	20	24½	..	+ ½
Regal Motor Car Co. pfd	..	25	..	22½	—1½

*Old. †New. ‡Par value $10.

Militia To Have Cars

War Dept. in Conference with Automobile Reserve Corps Accepts Its Plans

WASHINGTON, D. C., Dec. 11—The Automobile Reserve Corps movement, promoted by *Motor Print* magazine, received recognition by the War Department to-day. The plan of organization of an Automobile Reserve Corps Company was described by Lieut. Col. Chauncey B. Baker, the army transportation expert, in a conference to which had been invited G. T. Bindbeutel, editor of *Motor Print*, and H. D. Brandyce, editor of the Automobile Blue Book. The conference was at the direction of Brig. Gen. A. L. Mills, Chief, Division of Militia Affairs.

It is said that a number of cities can now proceed with the organization of an Automobile Reserve Corps which will be acceptable to the government. The formation of a volunteer motor car company has been given thorough study by Colonel Baker, whose report, not ready for publication until approved by the general staff, covers many pages of typewritten matter.

Twenty-seven Cars per Company

The plan calls for twenty-seven cars to each company and twenty-eight drivers, one an emergency driver. These drivers are described as chauffeurs to distinguish them from wagon train drivers. A chauffeur will have the rank of sergeant. Each motor company will be under the command of a first class sergeant with the title of car master. There will be three assistant car masters, sergeants; one machinist, sergeant; one helper, private; one cook; one watchman, private; one trumpeter, private. Each company is also to have one wrecking car and five motorcycles.

In the report of the study of an Automobile Reserve Corps Company by Colonel Baker is a full statement of the duties of the chauffeur. This is so minute in its details as to specify the time when grease cups are to be turned, when brakes and tires are to be tested, when the storage battery is to be given attention—in fact, a program has been drawn up which would convert an ordinary motorist into a very cautious, well trained driver in a short time. One of the principal provisions, which is emphasized by strong language and many paragraphs of repetition, is against over-loading.

There would be one or more automobile companies to a regular army division consisting, for instance, of nine regiments of infantry, one regiment of cavalry, two regiments of field artillery, one battalion of engineers, one battalion of the signal corps and the hospital and ambulance equipment.

Accompanying an army in campaign will also be a complete field repair shop. These shops will be in charge of officers who have spent some time in the leading American automobile factories. It is understood that a great many officers are now being so trained. Just how many, Colonel Baker would not say, although he admitted that the plan would be given a fairly extensive trial.

During the conference a sergeant reported to Colonel Baker, advising that he had finished his three months' course with the White Co. in Cleveland. Colonel Baker asked him for recommendations. The sergeant said:

"The experience was very valuable. I think, however, that we should spend six months instead of three months in these factories. I was kept on a job in the White plant until I had mastered the process. Then I moved to another department. While I am completely instructed as to the construction of a car, I am sure that there would have been more benefits if I had had just twice as much time."

In the event that the Automobile Reserve Corps is not fully organized all over this nation, the government has a substitute plan for the chartering of cars and trucks from automobile factories and large concerns having many cars and trucks in service. This plan embraces the enlistment of experienced drivers. A form of contract has been drawn up, by the terms of which the lessee of the automobile or truck would receive so many dollars a day for the hire of the car and so much extra depending on mileage. These figures are in Colonel Baker's report but cannot be given out for the present. In the contract the value of the car is stipulated and the government agrees to keep the truck in first class condition and, in the event of an accident, to reimburse the lessee for the full value as agreed.

Truck Company Organization.

The organization of a truck company, already in the military regulations, is similar to the car company. There is the same number of vehicles and chauffeurs and car masters; and the same ranking, excepting that two machinists are named who are corporals. In addition, the regulations require no trumpeter but specify two oilers which, according to Colonel Baker, have been found to be unnecessary and probably will be discontinued at the next change of the regulation.

The motor companies in the Automobile Reserve Corps are principally intended for the transportation of troops. It will be left to the automobile truck companies to transport ammunition, food and supplies of clothing and incidentals.

"That is, the trucks will deliver to the wagon train, which will in every case deliver to the army on the firing line," said Colonel Baker. "Ordinarily an automobile truck should not approach closer than a one and one-half day journey what we call the line of kitchens. Occasionally when the army is on the march the trucks may come as near as a half day distant. But armies, you know, spread out over corn fields and swamps and hills and off roads, where a heavily laden truck cannot proceed with the same success as a horse-drawn wagon."

Colonel Baker said that the use of automobiles of all descriptions for the transportation of troops was proved with vehemence when the Germans were marching on Paris in 1914. He said that it was only by the use of motor cars that General Gallieni was able to dispatch troops from Paris so swiftly to certain points as to thwart the advance of the invaders. Colonel Baker said that the great value of the Automobile Reserve Corps would be in concentrating and mobilizing troops—in the event of war, moving great masses of troops to new positions over night.

Militia Lacks Transports

Brigadier General Mills, in a statement to Mr. Bindbeutel just before the conference to-day, said:

"It is encouraging to know that you have been able to get promising responses in your work, and I can assure you all possible encouragement will be extended to you by this office. Inasmuch as the transportation facilities of the organized militia are now in great part lacking, so far as divisional trains are concerned, the War Department will be very glad to see the States organize and maintain their proper components. Of course, the organization of such units is entirely a matter to be taken up by the States concerned; such organizations being part of the organized militia would participate in federal assistance just as is the case with infantry or other units."

Preparedness Meeting for Met. S. A. E.

NEW YORK CITY, Dec. 9.—The Metropolitan section of the Society of Automobile Engineers will hold its December meeting on Dec. 16 at the Automobile Club of America, where a paper will be read by Capt. Gordon Johnson, Eleventh Cavalry, U. S. A., on What the S. A. E. Can Do for the U. S. Army.

New Troy Trailer Out

TROY, OHIO, Dec. 10—A new four-wheeled trailer of 1250 lb. capacity to sell at $125, has just been brought out by the Troy Wagon Works Co., this city. This is the lighest Troy trailer made. It has a 70-in. wheelbase, standard 56-in. tread and is mounted on solid tires.

54 New Show Exhibitors

80 Car Exhibitors for N. Y. and 86 for Chicago—307 Accessory Firms

NEW YORK, Dec. 13—Six additional car exhibitors for the National Shows at New York and Chicago and forty-eight new exhibitors of accessories were allotted space during the past week, making the list of complete car makers for the New York Show eighty and for the Chicago exhibition eighty-six, while the accessory exhibitors total 307, nearly all of whom will be present at both shows. There will be seven makers of electric cars at each show.

The new car exhibitors are S. J. R. Motor Co., Boston, Mass., maker of the S. J. R. car; the Lescina Auto Co., Newark, N. J., the Lescina car; both exhibiting at the Palace. At Chicago, the Princess Motor Car Co., Detroit, Mich.; Walker Motor Vehicle Co., Chicago, and the Gadabout Co., New York City, are to be added, while the Champion Auto Co., Chicago, will exhibit the Champion car at both shows.

Society day at the New York Show is to be Wednesday, Jan. 5, but contrary to the custom of previous years, no double admission will be charged. The show will open at 2 p. m. Friday, Dec. 31, and at 10 a. m. daily thereafter. The Chicago show will open at 2 p. m. Jan. 22 and at 10 a. m. daily thereafter. The closing hour in each case is 10.30 p. m.

Exhibits for the fourth floor at the Palace may be received as early as 8 a. m. Tuesday, Dec. 28. The receiving room will be closed at noon on the opening day and at 10 a. m. on Monday, no cars, boxes or crates being permitted to enter after noon of the opening day. Shipments will be received at New York on Thursday morning and at Chicago on Friday morning preceding the opening day. At Chicago no cars will be admitted after Sunday following the opening day.

The new accessory exhibitors are as follows:

New York and Chicago

American Chauffeur Pub. Co. Cincinnati, Ohio
Champion Auto Equipment Co. Chicago, Ill.
Burd High Compression Co. Rockford, Ill.
Clear Vision Cleaner Co. New York City
Efficiency Oil Corp. St. Louis, Mo.
J. Rogers Flannery & Co. Pittsburgh, Pa.
Friestedt Rim Contractor Co. Chicago, Ill.
Militaire Autocycle Co. of America, Inc. Buffalo, N. Y.
Platt Washburn Refining Co. New York City
Fulton Co. Knoxville, Tenn.
Hill-Smith Metal Goods Co. Boston, Mass.
Prest-O-Lite Co. Indianapolis, Ind.
Master Carbureter Corp. Detroit, Mich.
Wayne Oil Tank & Pump Co. New York City.

New York Only

Adams Express Co. New York City
Adamson Mfg. Co. E. Palestine, Ohio
Corbin Screw Corp. New Britain, Conn.
Auto Journal Pub. Co. Pawtucket, R. I.
Boston Blacking Co. E. Cambridge, Mass.
Brilliant Products Co. New York City
Continental Auto Heater Co. New York City
Dubois Machine Shop, Inc. Albany, N. Y.
Eisenstadt Mfg. Co. St. Louis, Mo.
Foster Accessories Co. Chicago, Ill.
General Electric Co. Schenectady, N. Y.
Matt Irion & Sons. Louisville, Ky.
Jay & Dee Specialty Co., Inc. New York City
Juhasz Carbureter Co. New York City
Ward-Leonard Electric Co. Bronxville, N. Y.
Lowe Motor Supplies Co. New York City
F. W. Mann Co. Milford, Conn.
Paul G. Niehoff & Co. Chicago, Ill.
Price Elec. Devices Corp. Waynesboro, Va.
Rubberset Co. Newark, N. J.
Seiss Mfg. Co. Toledo, Ohio
Small & Singleton. Brooklyn, N. Y.
Standard Accessories Co. New York City
G. T. Sutterley & Co. Philadelphia, Pa.
Traveller Tire & Tube Co., Inc. New York City
Wells-Fargo & Co., Exp. New York City
Westinghouse Air Spring Co. New York City

Chicago Only

F. A. Ames Co. Owensboro, Ky.
Becker Bros. Chicago, Ill.
Edison Storage Battery Co. Orange, N. J.
H. H. Franklin Mfg. Co. Syracuse, N. Y.
Hess Spring & Axle Co. Cincinnati, Ohio
National Carbureter Co. Chicago, Ill.
N. Y. & N. J. Lubricant Co. New York City

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Three Detroit Show Buildings

DETROIT, MICH., Dec. 13—The fifteenth annual Detroit automobile show which will be held Jan. 15 to 22, will be quartered in three large buildings, forming part of the Riverside summer gardens, and located at East Jefferson Avenue and the Belle Isle bridge. They will provide about 60,000 sq. ft. of floorspace and will be decorated appropriately.

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Fifty Exhibitors for Cleveland

CLEVELAND, OHIO, Dec. 10—All the display space at the Cleveland automobile show, to be held at the Wigmore coliseum Jan. 8 to 15, has been taken. In all there will be fifty exhibitors.

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25 Wintons Cover 303,919.3 Miles Without Repairs

CLEVELAND, OHIO, Dec. 14—The chauffeurs of twenty-five Winton cars drove 303,919.3 miles without any expense for repairs in the eighth annual chauffeurs' contest of the Winton company. The average repair expense for the nearly 2,000,000 miles in these eight contests is 19¼ cents per 1000 miles. Thirty-five hundred dollars was awarded. Mileages were restricted to a maximum of 12,500. Twenty drivers covered this distance. A special prize to owners for a best record by a model 21-A was won by H. J. Browning of Tarrytown, N. Y., who will receive a new Winton for the one he is driving. The leaders among the winners are tabulated herewith.

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Kelly-Springfield Tire May Move to Springfield

AKRON, OHIO, Dec. 9.—The Kelly-Springfield Tire Co. may move its Akron plant to a new one in Springfield, Ohio, according to plans of the company. Though up to the present time no suitable location has been obtained in that city the officials of the concern have been negotiating for the purchase of land there, upon which to erect new factory buildings.

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Rumely Properties Sold

SOUTH BEND, IND., Dec. 11—The properties of the M. Rumely Co. and the Rumely Products Co., totaling $32,000,000, were sold at receiver's sale Dec. 9, at the main offices of the M. Rumely Co., in Laporte, Ind., by F. P. Mount, receiver and special master, acting under instructions from Judge A. B. Anderson of the Federal Court at Indianapolis. The purchasers were the Advance-Rumely Co. and the Advance Thresher Co.

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S. G. V. Creditors Meeting Dec. 21

PHILADELPHIA, PA., Dec. 11—Stephen M. Meredith of Reading, Pa., has been appointed by the Berks County Court as master in the equity proceedings of the S. G. V. Co., against itself, in the distribution of the balance in the hands of R. E. Graham, receiver. Creditors are advised to meet the master in the Court House on Dec. 21.

Twenty-five of the Winners in Winton Chauffeur Contest

Prize	Winner	Car Owner	City	Total Mileage
$500	Vivian Prichett	S. J. Franklin	Millville, N. J	12,500
400	F. S. Weaver	S. R. Bush	Easton, Pa.	12,500
300	A. C. Burton	Mrs. T. B. Dozier	San Francisco	12,500
200	W. M. Newsome	M. R. Hirsch	Atlanta, Ga.	12,500
100	Hugo Larson	R. W. Stevens	Highland Park, Ill.	12,500
100	A. E. Withers	J. A. Robertson	Montreal	12,500
100	Herbert Lewis	Geo. Spottiswoode	Orange, N. J.	12,500
100	J. L. Dondero	F. M. Hauthaway	Brookline, Mass.	12,500
100	Robt. Clements	F. H. Jones	Andover, Mass.	12,500
100	Jas. F. Kerrigan	F. W. Carter	Newton Center, Mass.	12,500
100	Wm. F. Swart	Edwin A. Oliver	Yonkers, N. Y.	12,500
100	Thos. Murren	Jas. M. Anderson	Boston, Mass.	12,500
100	Geo. T. Macone	F. E. Coursen	Stockbridge, Mass.	12,500
100	Grant E. Gregor	C. J. Rainear	Philadelphia	12,500
100	E. Ziegeler	M. W. Sanger	New York City	12,500
100	Geo. M. Lewis	E. R. Caldwell	Syracuse, N. Y.	12,500
100	Robt. Goetsch	H. K. Browning	Tarrytown, N. Y.	12,500
100	P. O. Hale	A. P. Friend	Waltham, Mass.	12,500
100	E. M. Armstrong	C. M. Goodnow	Boston	12,500
100	Clarence Hudson	S. Harry Worth	Philadelphia	12,500
*100	W. J. Desillire	Allen Arnold	Boston	11,267
*100	Paul Hesselnberg	Gustav Lange	Bronx, N. Y.	12,464.7
*100	Wm. C. Ball	F. F. Rowe	Kalamazoo, Mich.	11,380
*100	Geo. H. Von Arx	Jos. J. Gross	St. Louis	12,416.4
*100	B. Thyssen	S. Aronson	Los Angeles	6,391.2
	Totals			303,919.3

*Winners of district prizes.
Total repair expense of all cars in the table, None.

Chicago Feature Race 300 Miles

Speedway Directors Follow Hoosier Track's Example—Prizes Reduced to $30,000

CHICAGO, ILL., Dec. 15—There will be no 500-mile race on the Chicago speedway during the season of 1916, the directors of the local track following the example of the Indianapolis promoters and reducing the distance of their feature event to 300 miles.

They also have adopted a policy of financial conservatism and conservation of gate receipts and have cut the prize money from $54,000 to $30,000. It is probable that the winner will receive $12,000 or 40 per cent of the total.

Chicago's 300-mile race will be held June 19 and the entry blanks will be sent out immediately. The entry fee will be $100 but this will be refunded provided the car reports for the elimination trials.

Amateur Race May 20

May 20 is the date decided on for the amateur drivers' race and entry blanks will be mailed as soon as the contest board of the American Automobile Association confirms the special set of rules.

A. C. A. Tests Car Heater

NEW YORK CITY, Dec. 15—The Four-in-One automobile heater made by the Continental Auto Heater Co., New York City, was tested yesterday by the technical committee of the Automobile Club of America. The heater draws gas from the exhaust pipe of the motor and the test was for the purpose of determining whether or not there was any loss of power due to the installing of the device. According to the officials of the A. C. A. there was less back pressure with the device attached than without it, showing conclusively that the application of the Four-in-One heater would cause no loss of power.

$10,000 Addition for Crow

SOUTH BEND, IND., Dec. 11.—Owing to the fast increasing demand for Crow cars, the Crow Motor Car Co., Elkhart, Ind., has found it necessary to increase the capacity of the plant and the construction of a large addition has been commenced. It is expected the addition will be completed by the first of the year and the output of the plant will have been increased to 350 finished cars a month. The new extension will be 45 by 240 ft. and cost approximately $10,000. The main part of the new building will be utilized as the body department. The arrangement will allow for the rough lumber to be unloaded from the cars at one end and be worked through to the finished body at the other. At present the plant is turning out a complete automobile almost every working hour. The December production will be 150 cars, and orders have been received which will keep the concern busy during practically the entire automobile season of 1916. The gross business of the Crow company the past year was approximately $2,000,000. With the completion of the addition it is expected to double the production of the present plant.

Non-Stop Maxwell Covers 7647.6 Miles to Dec. 7

LOS ANGELES, CAL., Dec. 7—With a total of 7647.6 miles covered since noon, Nov. 22, the Maxwell 25 which is making an attempt to establish a new world's non-motor-stop record is now on the second half of the record run.

A puncture made one tire change necessary but there has been no other stop except for oil, gas and water at the regular control where the supplies taken on have been recorded by the observer on duty and in most cases by the one to go on the next eight-hour shift.

The present non-motor-stop record is 12,404.9 miles, made in San Francisco more than 2 years ago.

American Brass Gives $35,000 Christmas Present

KENOSHA, WIS., Dec. 10—As an appreciation of the co-operation given by its 1900 employees in making 1915 the most prosperous year the concern has ever experienced, the American Brass Co., Kenosha, Wis., on Dec. 7, made a Christmas present to each employee, the whole amounting to $35,000.

Champion Plug Convention Dec. 27-30

TOLEDO, OHIO, Dec. 14—The annual convention of salesmen affiliated with the Champion Spark Plug Co., will be held in Toledo, Dec. 27, 28, 29 and 30.

The main purpose of the meeting is to bring the selling staff together so that they can go over the advertising and selling plans for the coming year. Last year the Champion company made and sold 6,000,000 spark plugs while the plans for the coming year call for a production of 12,000,000.

Overland Service Station in Boston

BOSTON, MASS., Dec. 15—The Willys-Overland Co. will erect a three-story service station in this city at Brookline Avenue and Butler Street, for Overland and Willys-Knight owners. The building, which will be 105 by 260 ft. will give 81,900 sq. ft. of floorspace.

Iowa Maxwell Dealers Meet

DES MOINES, IOWA, Dec. 10—Iowa dealers for the Maxwell Motor Co. assembled in Des Moines on Dec. 8, to discuss trade conditions and make plans for the 1916 selling campaign. The partial payment plan for selling Maxwell cars was outlined by F. L. Buckbee, factory representative from Detroit and addresses were made also by E. M. Lubeck of Chicago, district sales manager; C. R. Newby of Detroit, factory sales representative; and W. L. Giffens of the Maxwell Auto Sales Co., Chicago.

U. S. Tire Convention Opens

DETROIT, MICH., Dec. 14—About 350 members of the sales organization of the United States Tire Co. are here from all over the country to take part in the annual convention starting to-day. They will be addressed by the officers of the company on many subjects dealing with the tire business and part of the time will be spent in going through the local plant.

Chalmers Warehouse in Des Moines

DETROIT, MICH., Dec. 10—The Chalmers Motor Co. will establish a large factory warehouse in Des Moines, Iowa, to enable its Iowa dealers to be supplied quicker and at less transportation charges, of the cars they need. J. H. W. Mackle, who was Chalmers district manager for the Central States, will be in charge of the warehouse and the work of distribution. His offices are temporarily at 411 Hubbell Building. The Iowa Auto & Supply Co. remains the Chalmers distributor in Des Moines.

DES MOINES, IOWA, Dec. 10—Chalmers Day for Iowa was celebrated in Des Moines on Dec. 9, with Chalmers dealers and distributors from every section of the State to the number of over 200 in attendance. Business sessions were held during the day with a luncheon party at noon and a dinner at night.

Michigan Firestone Dealers Meet

DETROIT, MICH., Dec. 11—Firestone tire dealers from Michigan met here this week at a business convention, at which officials of the Firestone Tire & Rubber Co., Akron, Ohio, were present. At the banquet given the dealers, Secretary S. G. Corkhuss announced that owing to the great increase in business in Michigan, a new and much larger branch house will be built here. At the convention the new Firestone tire with black tread and red side walls was shown the dealers for the first time.

Continental Contract for Splitdorf

NEWARK, N. J., Dec. 10—The Splitdorf Electrical Co., this city, has secured a contract from the Continental Motor Mfg. Co., Detroit, Mich., for Dixie-40 magnetos, cables and switches. All Continental motors used for show purposes or submitted to manufacturers as samples will be Dixie equipped and so filled on orders unless working specifications call for other ignition.

Plant for Tubeless Tire—The Tubeless Tire and Rubber Co., recently organized, will establish a plant at Millersburg, Ohio.

Parts Plant for Columbus—Dore Ogden, manufacturer of automobile parts, will construct a plant at Columbus, Ind.

Mason Tire to Build—The Mason Tire and Rubber Co. is planning a factory at Akron, Ohio, the estimated cost of which is $60,000.

Faultless Rubber Adds—The Faultless Rubber Co., Ashland, Ohio, has awarded contracts for an addition to its plant, which will cost about $10,000.

Wheel Co. for Montana—The Montana Improved Wheel Co., Bozeman, Mont., will erect a plant for the manufacture of a spring wheel for automobiles.

Apple Top Co. to Build—The Apple Auto Top Co., Dayton, Ohio, has had plans prepared for a brick building, 100 by 150 ft., four stories, to take the place of its plant recently destroyed by fire.

Cleveland Automatic Machine Adds—The Cleveland Automatic Machine Co., Cleveland, Ohio, has bought from the Pontiac Improvement Co. and the Kurtzner Radiator Co. the radiator company's property at 2225 Ashland Road. The deal represents between $50,000 and $100,000.

Columbia Truck to Build—The contract for the plant of the Columbia Motor Truck & Trailer Co., Pontiac, Mich., has been let. It will be a one-story structure, 60 by 250 ft. The company, which moved here from Kalamazoo, is reported to have sufficient orders on its books to keep it running for the next six months.

Perfection Coil Spring Adds—Pending the erection next spring of a new plant, 140 by 140 ft., the Perfection Coil Spring Co., Jackson, Mich., is adding to its present factory a building 150 by 36 ft., to be used as a stock room and for plating purposes. Although this concern started in business less than two years ago it has been growing exceptionally fast and must make provisions to double its production.

Salisbury Co. Makes Improvements—The Salisbury Wheel and Mfg. Co., Jamestown, N. Y., has erected a new office building to provide room for its front axle department, moved there from Greenville, Pa. The new office building is three stories high and is 30 by 50 ft. in size. By March, 1916, it is expected that additional factory buildings, providing 30,000 sq. ft. more of floorspace, will be completed. With this increased space the production will be brought up to 150 full sets of automobile wheels and axles per 9-hr. day, an increase of 50 per cent over the present capacity of 100 sets per day. The number of employees of the company is 400.

Continental Adds Another Building—Work is progressing upon the various additions to the plant of the Continental Motor Mfg. Co., Muskegon, Mich. It has just been decided to put up another new building, one story high, 50 by 150 ft., adjacent to the new drop forge plant, to be used for storage of materials. The new drop forge plant is expected to be ready within the next two weeks, as far as the building is concerned, but the six steam drop forge hammers, weighing from 1500 to 5000 lbs. each, are not expected here from the East for about six weeks, for which 6-ft. concrete foundation bases are being put up. The new motor storage and carpenter building is ready, having been completed in fifty-one days. A 150-ft. subway, 7 to 15 ft. in height and 11 ft. wide, of concrete, will be ready in ten days. It connects the new lake front building with the office and machine building.

The Automobile Calendar

Dec. 11-18	New Castle, Pa., Show, Skating Rink on Nechannock Avenue.
Dec. 31-Jan. 8	New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.
	1916
Jan. 1	Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.
Jan. 3-9	Importers' Salon, Hotel Astor.
Jan. 5-6	New York City, S. A. E. Winter Session, Standards Committee Meeting.
Jan. 7, 8, 10, 11	New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13	Milwaukee, Wis., Show, Auditorium.
Jan. 8-15	Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15	Philadelphia, Pa., Show, Philadelphia Auto Trade Assn.
Jan. 14-22	Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.
Jan. 10-15	Fort Wayne, Ind., Show, Auto Trade Assn.
Jan. 10-15	New Bedford, Mass., Show, State Armory.
Jan. 15-22	Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22	Rochester, N. Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22	Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22	Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22	Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29	Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29	Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30	Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5	Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5	Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 1-3	Frederick, Md., Show, Armory.
Feb. 7-12	Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 9-12	Peoria, Ill., Show, Coliseum, Peoria Automobile and Accessory Assn.
Feb. 12-19	Hartford, Conn., Show, First Regiment Armory. Hartford Automobile Dealers' Assn.
Feb. 14-19	Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19	Newark, N. J., Show.
Feb. 20-27	Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26	Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26	Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26	Portland, Me., Show, Exposition Bldg.
Feb. 21-26	Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 28-Mar. 3	Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.
Feb. 29-Mar. 4	Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11	Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 9-11	Mason City, Ia., Show, Armory.
Mar. 21-25	Deadwood, S. D., Show, Auditorium, Deadwood Business Club.
Mar. 28-Apr. 3	Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13	New York City, Sheepshead Bay Speedway Race.
May 20	Chicago, Ill., Amateur Drivers' Race, Chicago Motor Speedway.
May 30	Indianapolis Track Race.
June 17	Chicago Track Race.
June 28	Des Moines, Ia., Track Race.
July 4	Minneapolis Track Race.
July 4	Sioux City Track Race.
July 15	Omaha, Neb., Track Race.
Aug. 5	Tacoma Track Race.
Aug. 18-19	Elgin Road Race.
Sept. 4	Des Moines Track Meet.
Sept. 15	Indianapolis Track Race.
Sept. 16	Providence Track Race.
Sept. 30	New York City Sheepshead Bay Race.
Oct. 7	Omaha Track Race.
Oct. 14	Chicago Track Race.

The Week in the Industry

Culver Makes Change—C. R. Culver, for many years a prominent figure with the Knox Automobile Co., is now vice-president and general manager of the Stoddard Motor Car Co., Springfield, Mass., handlers of the Pierce-Arrow line.

Cottingham Makes Ford Change—H. R. Cottingham, former sales manager of the Ford Motor Co. of Canada in Montreal, has been appointed manager of the Saskatoon branch of the same company, and has left to take up his new duties.

Causer Resigns—E. T. Causer, factory superintendent of the Mitchell-Lewis Motor Co., Racine, Wis., for the last three and one-half years, has resigned to accept the position of works manager of the R. D. Nuttall Co., Pittsburgh, Pa., gears, couplings, etc. Mr. Causer assumes his new duties at once.

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Dealer

N. Y. Auburn Moves—F. W. Wright, Inc., general Eastern distributor for the Auburn car, has opened a new retail salesroom at 1874 Broadway, New York City.

Savage Tire in Vancouver—The Western Oil & Supply Co. has been appointed distributor for British Columbia for Savage tires, and a depot has been opened at 427 Hill Street, Vancouver, B. C.

Louisville Items—The Louisville Double Tread Tire Co. has opened an office and shop at 542 South Third Street. H. N. Cohen is president.

The Cherokee Motors Co., a new concern, has opened an office and salesroom at 305 West Walnut Street. A garage will be maintained at 712 Baxter Avenue. The company handles the Maxwell.

New Waco Wholesale Supply Co.—The Spencer-Carroll Co., Waco, Tex., will open a wholesale supply house, Feb. 1, succeeding the Stamford Motor Co., Stamford, Tex., which has operated a wholesale accessory business in connection with the Ford dealership. The latter will be dropped. J. O. Hughes, now manager of the Stamford Motor Co., will be active manager of the new company. Harry Knight, now connected with the Stamford Motor Co. as traveling salesman, will not travel for the new concern, but will have complete charge of the service end of the business. He was connected with the Electric Appliance Co., Dallas, as traveling salesman, and left it to affiliate with the Stamford Motor Co. about six months ago.

Motor Men in New Roles

Thompson Heads Mors Chain Branch—The Mors Chain Co.'s Detroit branch has opened a showroom and offices at 1003 Woodward Avenue. F. E. Thompson is the local manager.

Evans Maxwell Superintendent—J. F. Evans has been appointed superintendent of the service department maintained by the Maxwell Motor Co., at its plant on Oakland Avenue, Detroit.

Grasser Assistant Hupp Mgr.—Walter Grasser is now assistant manager of the Grasser Motor Co., Detroit and Toledo, distributor for the Hupmobile in Michigan and northwestern Ohio.

Wilson King Rep.—H. L. Wilson has been appointed factory district representative by the King Motor Car Co., his headquarters being Dallas, Tex. He was formerly connected with the King-Dort Sales Co., Detroit distributor for the King and Dort.

Two Chalmers District Mgrs.—C. L. Logan, until recently manager of the Cuyahoga Sales Co., Cleveland, Ohio, has been appointed a district manager by the Chalmers Motor Co. He will be in charge of the territory in West Virginia, Ohio and Kentucky.

H. L. Pelton has been appointed district manager of the Chalmers Motor Co. in the East, with the State of New York as his territory.

Kenyon Hupp Service Mgr.—J. L. Kenyon has been appointed service manager of the Hupp Motor Car Co., Detroit. He was formerly in the same capacity with the Cadillac Motor Car Co. M. E. Houser has succeeded J. L. Kenyon as service manager of the Cadillac company.

Falk Chalmers Rep.—J. H. Falk has become a special representative for the Chalmers Motor Co., with headquarters in Detroit.

DeWitt Makes Change—Frank DeWitt, manager of the Detroit office of the Electric Products Co., Cleveland, during the past two years, has been appointed director of sales of the American Distributing Co. of Detroit. R. C. Enos was elected vice-president and general manager of the American Distributing Co. at a recent meeting of the stockholders of the Detroit corporation.

Riley Resigns—N. S. Riley, for four years head of the Kansas City, Mo., branch of the Studebaker Corp. and president of the Kansas City Automobile Dealers' Assn., has resigned from both positions. His resignation will take effect Jan. 1. Mr. Riley will be succeeded as head of the dealers' association by W. A. Brace, president of the Hudson-Brace Motor Co., who formerly was vice-president. George A. Bond of the Bond Motor Co. becomes vice-president to succeed Mr. Brace.

Henshaw Makes Worcester Changes—The Henshaw Motor Co. of Boston, Mass., Eastern Massachusetts agent for the Dodge Brothers car, has leased the building at 256 Pleasant and 3 Newbury Streets, Worcester, Mass., to be used for stock and service purposes, the company retaining its present salesrooms at 27 Foster Street. This is the second time the company has been forced to expand in Worcester. New men have been added to the organization, among them F. W. Bailey, former secretary to the general manager at Gray & Davis factory; G. R. Green, former owner of the Commonwealth garage, who are on the sales force; J. J. Glennon, mechanical expert of the King Motor Car Co of New England, who becomes service chief, and E. W. Jacocks, an insurance official who is now chief accountant.

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Dealer

Philadelphia Fisk Adds—The Fisk Tire & Rubber Co., 258 North Broad Street, Philadelphia, Pa., is having plans prepared for a three-story brick service building, 20 by 30 ft.

Philadelphia Packard Enlarges Territory—Manager L. J. Eastman, of the Packard Motor Car Co. of Philadelphia, announces the opening of additional tributary offices in the local territory at Wilmington, Del., Lancaster, Pa., and Williamsport, Pa. Announcement has also been made of the appointment of L. S. Jullien as territorial manager for the Pennsylvania district exclusive of Philadelphia.

Minneapolis Trade Items—The Willard Storage Battery Co., Minneapolis, Minn., has bought three lots at Harmon Place and Tenth Street and will erect a Northwestern headquarters.

Harvey E. Mack Co., representing Dodge Bros., and the B. F. Goodrich Co., is erecting a three-story building at Harmon Place and Thirteenth Street. It will remove from Hennepin Avenue. The Goodrich company will have 56 by 150 ft. and the Mack Co. 50 by 100 ft.

VOL. XXXIII NEW YORK—THURSDAY, DECEMBER 23, 1915—CHICAGO No. 26

The AUTOMOBILE

1915

A Master Moulder in Fashioning The Industry

¶ The Year in Review, Showing Those Dominating Tendencies of the Year, Those Industry-Building Forces That Are Impelling the Automobile Industry and Those Rewards That Are the Fruits of Judicious Investigation, Shrewd Planning and Bold Operation

THE year 1915 will, in the perspective of decades, be recorded as an epoch-making year in the automobile industry, a year unprecedented in the breadth of evolutionary movements as well as in the variety of them; epoch-making from a production viewpoint, with a possible output of 892,000 automobiles being manufactured in the calendar year, this including cars and trucks; epoch-making to the engineer as witnessing the introduction of the twelve-cylinder motor, confirming the engineering judgment that led to the introduction of the eight a year ago and establishing the permanency of the high-speed motor with its light-weight parts. Epoch-making in the general expanse of factory facilities and equipment in that over $15,000,000 was expended in factory additions, and added equipment, this during the year when many industries were not working at capacity, due to depression attendant on belligerent conditions in Europe; epoch-making because of the unprecedented demand at home for automobiles and motor trucks, a demand in which lies the reason for the phenomenal growth, although many would attribute it to war requirements of a mushroom nature, which unquestionably had their influence. Epoch-making because of the exceptionally large increases in capitalization of many large companies and the re-financing of them on a scale hitherto adopted by the few; epoch-making to the wage earner, due to a wider extension of profit-sharing principles, assuming the form of division of profits with employees, higher wage scales, shorter hours, and improved sanitary factory conditions; and epoch-making in that the metal markets have reached new levels, due to shortage of raw stocks, occasioned by the increased demand on the market from other industries that were directly influenced by the war.

Important Patent Decisions

AFTER having been reared in an atmosphere of patent litigation, the automobile industry, through its governing body, the National Automobile Chamber of Commerce, Inc., has made a herculean effort to do its part in solving the patent problem which has been so disturbing from the day when the Selden patent was first placed in court. To do this, the national organization adopted a cross-licensing plan by which owners of patents agreed to extend shop rights on these to other members of the association who reciprocated. Sixty-nine companies controlling over 900 patents agreed; an

action which augurs well in solving the patent problem.

Several patents have been adjudicated during the year, among these being the Conrad patent controlled by the Hess-Bright people, and referring to annular ball bearings with a continuous metal rim on which the balls between the two races bear. This patent was declared valid and the Hess-Bright company has already licensed several companies under the patent.

The electric horn patents, known as the Hutchinson patents, controlled by Lovell-McConnell, were declared invalid, the court holding not only that the claims were invalid, but that those claims covering special details were not infringed by the Sparton horn, the defendant in the suit.

A patent which was speedily adjudicated during the year was that known as the two-speed axle, owned by the Austin Automobile Co., and alleged to be infringed by the Cadillac Motor Car Co. The court held the Austin patent on a two-speed axle valid, and infringed by Cadillac. Cadillac was enjoined from making or selling new cars with that type of axle, but permitted to use, repair and sell its cars using the axle.

Another patent adjudicated was the Hanlon adjustable windshield, using a double glass, which can be placed at an angle, forming a roof to keep rain or sleet from the vertical pane. This patent alleged infringed by Rauch & Lang and the National Automobile Chamber of Commerce, was declared valid and infringed. Some manufacturers have taken out royalties and the majority of N. A. C. C. members infringing have ceased its manufacture.

An important patent, which has been in the courts for years, affecting the tire industry, was that relating to the use of metal cores in tire manufacture and known as the Thropp patent. The courts have recently ruled the patent invalid, holding that it was anticipated in that different tire concerns were using the metal mold in 1903 and 1904, thus constituting anticipations.

The Lindsay Auto Parts Co.'s patents on floating rear axle construction were declared valid. The Winton Co. was the defendant, having used this construction four years ago, but since discontinued it.

Litigation has proceeded throughout the year on the Kardo patents in the suit against Studebaker, the matter being still in the courts. Certain decisions in connection with these patents have been handed down. One patent in question referred to ball bearing steering knuckle construction, the defendant being the representative of the Chalmers Motor Co. The court held the patent was void for want of patentable novelty and invention. Another Kardo case, with respect to differential construction and brought against the Reo company, was dismissed by the court on the ground that the Kardo Co. was not lawfully organized under Ohio statutes.

An important patent adjudication was that of the Perlman patent covering a form of demountable rim which is generally in use. The Standard Welding Co. was defendant. The court decided the patent valid and infringed, and gave Perlman exclusive rights under it.

Several other patents are still in the courts, among them being the carbureter patents controlled by Stromberg.

What is known as the Motometer patent granted to Harrison H. Boyce has been declared valid, the court holding that in the patents cited as prior to the Boyce one there were no anticipations.

Exports Approximate $115,000,000

EXPORTS of automobiles, motor trucks, and parts for the calendar year, ending Dec. 31, 1915, will approximate $115,000,000 as compared with $28,000,000 for the calendar year ending Dec. 31, 1914, this representing a four-fold increase. The number of trucks exported for the first ten months of the year aggregate 20,514, which is a new high water mark. Passenger car exports reached the total of 32,965 cars. While much of the export business was due to war orders, particularly in the motor truck field, the figures have been heavily increased by the added export of parts in which are included motor truck and automobile tires, these parts totaling over $12,000,000, approximately four times what they were during the previous calendar year.

American exports have increased heavily during the first ten months through countries other than those engaged in the European war, a notable example being Australia, where for the first time the American car exports exceeded in value those from Great Britain, according to official figures of the Australian Government.

Three Controlling Factors

Three controlling factors have entered into the export business during the past year. For the first time in its history England placed an import duty of 33 1/3 per cent on cars and parts entering the United Kingdom, tires being excluded from this arrangement. This duty in contrast with Britain's free trade principles will show its effect. The duty took effect Oct. 1 and it has not been possible to judge its influence as yet. France is to-day talking of an import duty of 45 per cent which, if enforced, will practically quadruple import duties. Should France enact such a measure, it will mean a heavy revenue to these countries on post-war business, which the American manufacturer will, of course, have partially to pay.

Still a third factor is the rubber embargo by which the United States is prevented from exporting rubber goods of any nature to any European countries excepting the Allies. This arrangement was effected in February, and under it the American tire manufacturers have secured all the necessary supply of crude rubber, all of which is consigned to the British Consul General of New York for distribution. Under the terms of the embargo rubber goods cannot be exported to neutral European nations or the belligerent enemies of the Allies.

Export business with South America has not de-

veloped as anticipated, due to the enormous increase of demands at home for cars and poor shipping facilities to South America, Australia and other places. All told, 1915 cannot be considered as a healthy export year from the American manufacturers' viewpoint, this notwithstanding the fact that exports to Europe have quadrupled. This has been due much more to Europe coming and buying the goods than to Americans developing the market.

Unprecedented Factory Financing

THE closing year has witnessed more factory financing and more combinations of interests than have been experienced since the formative days of the General Motors, the United States Motors and U. S. Tire. General Electric has been the big outside organization that has become a factor, having during the past twelve months secured large interests in what were five individual concerns at the start of the year. It first secured greater interests in the Peerless and General Vehicle companies, in which it previously held interests, and merged these in the Peerless Motor and Truck Corp. Since then it has secured a considerable interest in the Entz electric transmission by purchasing an interest in the Owen Magnetic Co., building cars with this transmission, and thereby securing control of the Entz patents. Following this came a merger of the Owen Co. with Baker-R. & L. which concern will build the Owen cars, the General Electric securing its representatives on the board of directors of the manufacturing concern.

The second outstanding financial development has been the refinancing of the White Co. by New York and Philadelphia interests, increasing the capital to $16,000,000, and thus bringing new influences into the organization, which is changed in name to the White Automobile Co.

A third far-reaching financial development was the recent entry of money representing the Swift packing interests in Chicago into the Briscoe organization, which has already resulted in the concern purchasing outside factories, including that of the Lewis Spring and Axle Co. and some other plants. The outcome of this new capital and the Swift influence can be looked upon as particularly conspicuous.

A fourth large financing deal is definitely reported to be under way in Indiana in which several Hoosier automobile and parts makers are uniting, the ostensible object being to insure an adequate supply of car components, among the concerns mentioned being Cole, Auburn, Inter-State, Westcott, Peru Auto Parts and Parker Auto Parts Co.

Great Increases of Capital

In addition to these large merging and extending interests there have been many instances where outside capital has been brought into organization and capitalization doubled, all preferably for reasons of increased production. Then again other large organizations have heavily added to their capitalization to care for the natural growth. In a word, it has been a year of great financing, a fact which indicates that money came easy to the automobile companies, the enormous advertising of certain automobile war stocks and others not in the war column being largely responsible. Some of the more conspicuous increases in capital stock are as follows:

Overland has authorized the increase of common stock from $25,000,000 to $50,000,000 and has authorized the issue of $15,000,000 of 7 per cent preferred. Ford has increased from $2,000,000 to $100,000,000, only one-half of which can be issued under the Michigan laws. Chevrolet increased from $2,500,000 to $20,000,000. The capitalization of the Hupp company has been increased from $1,000,000 to $6,500,000 and the company has recently purchased a new plant for axle manufacture.

The Saxon company, an organization less than two years old, has increased from $350,000 to $6,000,000. Chandler, also a relatively new organization, has increased from $425,000 to $10,000,000, and is rapidly expanding its factory. Simplex has taken over the Crane interests, and increased its capital from $1,500,000 to $5,000,000. Franklin has increased from $900,000 to $2,000,000.

With automobile concerns increasing as these figures indicate, there must naturally be corresponding increases in some of the accessory lines, the past year being a very busy one, chiefly with the manufacturers of parts and tires. One of the leading activities has been the recent purchase of the Federal Rubber Co. by the Fisk company, the latter having added $500,000 preferred. The Federal capitalization was increased in January $1,000,000. Republic increased its preferred stock by a $3,000,000 issue, and Ajax has within the last week increased its capital from $118,500 to $5,000,000. There have been many other increases in the rubber field, including $1,000,000 added to the capital of the Hood Co.

Capital increase among the makers of component parts was led by the Continental Motor Mfg. Co., increasing from $500,000 to $2,900,000. Gray & Davis increased from $1,750,000 to $2,000,000, and the Hayes Wheel company from $300,000 to $1,000,000. Perfection Spring raised from $1,500,000 to $2,500,000.

Huge Stock and Cash Dividends

With such enormous financing propositions recorded during the year it is not surprising to read of some fabulous stock dividends as well as extra cash dividends, a few of which will suffice to show the earnings in some of the larger organizations. Ford divided $48,000,000 in stock dividends and rebated $15,000,000 to car purchasers. Chandler distributed a stock dividend of 77½ per cent, making a total of 100 per cent for the year. Haynes doubled its capital and declared 100 per cent stock dividend. General Motors paid its first dividend of 50 per cent. Continental Motor declared a stock dividend of 100 per cent; Hayes Wheel, 166 per cent; Canadian Ford Co., 600 per cent, and Fire-

stone tires 16 per cent. Republic truck 100 per cent.

Unprecedented Factory Activity

THE past year has been one of unequaled activity in the building of new factories, adding additions to existing plants and installing with machinery equipment. Approximately $15,000,000 has been spent in this work, this sum being a conservative estimate on a vote representing perhaps 70 per cent of the more active element of the industry. Car, truck, accessories and parts makers have all shared in this building activity.

Approximately 12,000,000 sq. ft. of floorspace has been added, the car makers alone adding 6,000,000 sq. ft. and truck makers 500,000 sq. ft. Tire makers, who have profited by increased protection and war orders, have added over 2,000,000 sq. ft. Some of the other accessory manufacturers who have made great increases are those building axles, gears, motors, carbureters, starters and springs.

Of the total of approximately $15,000,000 spent in buildings and equipment, over half has gone into new buildings and the remainder into new machinery. The past year has been a record one in the development of automatic machinery designed to increase production and reduce cost. This machinery has been demanded by the enormous production increases and has been made possible by the standardization of parts and the general simplification of design. Automobile manufacturers now recognize that a part must be designed for engineering requirements, but also to meet the requirements of production, and this influence has been felt more during the past year than ever before.

S. A. E. Pushes Standardization

THE Society of Automobile Engineers, the national engineering organization of the industry, has not only sustained but greatly increased the interest of the industry in its work, particularly that of standardizing vehicle parts and specifications of metals. This standardization work has been in progress for several years, but only during the past season have the manufacturers had an opportunity of appreciating the advantages of standardization. In the steel field the adoption of standard specifications for different steels has practically offset what would otherwise have been a quite considerable increase in steel prices during the past year.

Two influences have been started to assist this standardization work during the year, one being the opening of a Detroit office for the benefit of the standardization work, and the other a new mode of procedure in voting on standards by mail, a movement which has very perceptibly broadened and made more representative the balloting of different standards.

The society early in the year moved to the Engineering Building, 29 W. Thirty-ninth Street, New York City, a building occupied by allied engineering associations, and an ideal home for the society. In addition to a slightly increased membership during the year the society has grown by forming two sections, the Mid-West in Chicago and the Pennsylvania section in Philadelphia. These, added to the Metropolitan section in New York, and other sections in Detroit, Indianapolis and Cleveland, give a total of six, all of which have been active during the year. The section meetings in Detroit and Indianapolis have been particularly conspicuous by their enormously increased attendance, attributable to the subjects being very pertinent on current engineering topics, such as eight and twelve-cylinder motors, aluminum pistons, and other equally pertinent subjects. The discussions provoked have been remarkable for their interest and value.

Great Engineering Development

THE past year has been prolific in engineering development, those who believed that the automobile chassis had reached or approached the ultimate design being entirely upset. It was expected that the European war closing the doors to the engineering laboratories of the Old World would have its effect, but instead of a dearth there has been greater engineering activity displayed than ever before in the industry. This new wave began a year ago with the introduction of the eight-cylinder motor, then an experiment, but which has now taken a permanent place in the industry universally accorded it. Closely following this came the twelve-cylinder V-type motor, announced during the past year, and which has already been adopted by five concerns, and is now in the production stages. Both of these movements are distinctly American. Although both types of motors originated in Europe, yet it remained for America to develop them to the practical stage where confidence was strong enough to make them stock equipment in a single-model program.

Chassis Are Simpler

The year has been one of simplification in automobile chassis design due largely to the fact that there have been few, if any, upheavals occasioned by adding unexpected accessories, such as were precipitated three years ago when the starter movement was launched a few months before the automobile shows and completely upset production in many factories. To-day electric starting and lighting are corporate parts of the chassis and are not after-thought attachments. This was realized nearly eighteen months ago, so that to-day the engine starter and electric generator are as integral portions of the car as axles or gearbox.

The simplification of design has extended to other portions of the chassis, notably the brake connections, where there is commendable improvement. Motor simplification has resulted from the more general use of the side-outlet carbureter by which the intake manifold is eliminated, this being made possible by the increased use of vacuum-gasoline feed, permitting of placing the carbureter high on the side of the motor chassis. The more general use of block cylinder castings and designing the gearbox as a unit with the motor have aided in this work.

A conspicuous movement of the year has been the increased attention given the double sleeve valve type of motor built under Knight patents. Heretofore this type of chassis has commanded above the average figure, but for 1916 the Knight-motored chassis has been brought to the $1,000 zone and now there are three different concerns manufacturing these cars to sell between $1,000 and $1,500. The taking up of this motor for production purposes by Willys-Overland will doubtless do much to popularize it with the medium-priced car buyer.

The advent of the eight-cylinder and twelve-cylinder motors, with their necessarily small diameter cylinders, has given impetus to the development of the high-speed motor. The Cadillac eight, the pioneer V type, must be considered the first high-speed American motor, and its practical life has been largely responsible for the development of this type of motor. Higher crankshaft speeds have been largely assisted by reduced weight of pistons, and in this connection the use of aluminum alloys for this work has been definitely accepted by the engineering fraternity. No longer is the practical use of the aluminum piston questioned. Aluminum has made further progress in that it is now being used for cylinder castings as well.

State Laws Little Changed

Little new has developed in the way of State laws with the exception of the Michigan law, which requires a registration fee at the rate of 25 cents per horsepower and 25 cents per hundredweight of car. New Jersey required the carrying of mirror-scopes on commercial vehicles, a regulation which has not worked out satisfactorily, as truck vibration is too great for these devices. Maryland obtained a decision declaring that non-resident motorists must take out licenses when using the Maryland highways, the measure working particular hardship against motorists of the District of Columbia. The Illinois wheel-tax was declared illegal, but motorists agreed to continue it as the money so collected goes for road maintenance.

The year has been a particularly active one with police departments in large cities enforcing speed ordinances with rather injudicious sway. There has been too much of arresting on the letter of the law and not the spirit. New York has started imposing fines for electric dash lights which are said to violate the anti-glare ordinance.

One of the most important decisions of the year, as applying to speeding, was that in which a New York motorist was fined for speeding 30 m.p.h., a violation of the state law which specified 30 m.p.h. with reasonable safety, in the country. The motorist established the fact that he was driving with reasonable safety in the open country and on a clear road. The judge so ruled and refunded his fine which had been previously imposed. This decision is of particular importance as the clause "with reasonable safety" is incorporated in many of the state statutes and where it is not so included should be.

The National Automobile Chamber of Commerce, Inc., the controlling body of the industry, has done valiant service during the year, as already mentioned, in coping with patent litigation. Its membership is now ninety-eight, having increased fourteen since Jan. 1, a growth of approximately 16 per cent. In addition to a truck convention which it held, the chamber has been establishing service organizations in different cities, which should prove of special value to the industry.

The national organization of parts and accessory makers is known as the Motor and Accessory Manufacturers. At present it has 240 members, representing the major accessory and parts industries in the country. This association has continued its valuable credit service to its members and has extended this in some respects.

A Banner Contest Year

THERE has never been a more active year in automobile contests than 1915. It marked the entry of the specially-built speedway on a large scale, six specially constructed speedways having been constructed during the year, which, added to the three previous ones, gave a total of nine tracks. On these nine tracks was a program of events scarcely considered possible a year ago, and for which the prize money actually distributed in cash totaled $282,000. Never before has automobile racing in this country, or abroad, or any other place in the civilized world, received such reward. Over $3,000,000 in cash was expended during the year in building the chain of speedways and improving the existing ones. New York led in the expenditure, exceeding the $1,000,000 mark, followed by Chicago, Minneapolis, Omaha, Des Moines and Providence.

As a reward for these enormous investments and prize moneys, America witnessed for the first time contests won at speeds well over 100 m.p.h. and saw individual performances that came close to capturing world's speed records. The highest speed record remains in the Old World, on the Brooklands speedway, but it is expected to come to America as soon as speedy enough cars have been developed, as America has one or two speedways credited with being the fastest in the world.

During the year, manufacturers have availed themselves of these new speedways by making numerous certified trials, a movement which it is hoped will gain headway during the coming season.

Heavy Automobile Registrations

THE past summer saw the total of automobile registration exceed the 2,000,000 mark. The tables compiled from state returns by THE AUTOMOBILE showed 2,070,000 registered up to July 1. It is a conservative estimate that registrations to date approach 2,400,000. New York leads all other states in registration, having 231,713 cars registered in November. California, which held second place for several years, is now fifth, with Ohio, Illinois, and Pennsylvania leading. Iowa is in sixth place, with a total of 140,000. Approximately 10 per cent of all the cars registered in the country are registered in New York State.

S. A. E. Influence Spreads During 1915

New Sections, New Divisions and New Standards Are Features of Society's Increased Activities

FOR the Society of Automobile Engineers, the year 1915 will be a memorable one for its accomplishment along all three lines of activity—professional, standardization and social. W. H. Van DerVoort, president of the Moline Automobile Co., was elected president of the S. A. E. on Jan. 6, and under his leadership the year has been one of general progress. High spots of the past twelve months have been the adoption of fourteen new standards, the formation of new divisions for silent chains and for international co-operation, with the view of obtaining some world-wide standards, the formation of S. A. E. sections in Chicago and Philadelphia, the appointment of two members to the naval advisory board and other activities of the year, while the discussion in the general and section meetings of a wide range of useful and instructive topics must not be overlooked.

Standards Committee Work

Two activities which have received much attention from the S. A. E. during the year are the work of the standards committee and that of the various sections. The notable points in the work of the standards committee, which this year has been under the direction of K. W. Zimmerschied, of the General Motors Co., have been concerned in carrying through work which has been under advisement for a long period. Among the most important standards of the year are: the new iron and steel list, vertical carbureter flange, standard tire sizes, electric vehicle ratings and nomenclature for spring parts adopted during the January and June meetings. Considerable progress has also been made by the electric vehicle, ball and roller bearings, truck standards, chain and lock washer divisions.

The Summer Session

The summer meeting of 1915 was held on the waters of the Great Lakes, the members cruising through the 30,000 islands of Georgian Bay in the Steamship Noronic. The vessel touched at Midland, Ont., and smaller steamers carried the party through the narrow island channel to Parry Sound. The trip covered four days, from June 13 to June 17. This summer meeting was characterized by excellent attendance and was particularly noticeable for the fact that men vitally concerned with the subjects under discussion took part in the debates. The feature of the meeting was the discussion on the eight and twelve-cylinder motors.

The Detroit, Indiana and Metropolitan sections have had monthly meetings throughout the winter, spring and fall, and as a result the work of the sections has received a forward impulse which cannot fail to be of considerable value to the parent organization. The fine attendance at the Detroit meetings has been the section feature of the year. Some of the papers which have been on the program of the Detroit section during the year have been on the subject of scientific chassis design, reasons for the twelve-cylinder motor and aluminum alloy pistons. Attendance at these meetings has run up well around the 300 mark.

The Indiana section has discussed the eight- and twelve-cylinder motor also, from various angles and, in fact; has had two meetings devoted to the subject, one in February when the eight and twelve were discussed regarding their basic principles, and then again in November, when C. S. Crawford, chief engineer of the Cole company, talked on the eight-cylinder motor in answer to the arguments for the twelve presented by J. G. Vincent, vice-president of engineering of the Packard company.

Activities in the Metropolitan section during the year have embraced a complete winter, spring and fall program, and reports of research committees of the section have been particularly important. The gas-electric research committee gave a preliminary report in February and another progress report in November.

Mid-West Section Established

In October a section of the society was established in Chicago which has been named the Mid-West Section and embraces all the territory of which Chicago is the natural metropolis. The following month, in November, a section was established in Philadelphia known as the Pennsylvania Section and this will take in parts of New Jersey, Delaware, and a considerable portion of Pennsylvania.

In carrying out the business of the Standards Committee it has been found advisable to leave the final decision as to whether or not a proposal should become a standard up to as many of the society as feel themselves capable of passing on the questions. For this reason standards are now accepted by mail vote and after a standards proposal or recommendation has been passed upon at a general meeting the ballots are sent to the membership at large, thus securing the maximum number of votes.

The Winter Meeting

One of the points brought out at the summer session was regarding the advisability of having the winter meeting extend over but one day. On reconsideration of this it has been thought advisable to have the standards committee meeting on a separate day in order to leave the one day of the session open to nothing but the president's address and professional work. This plan will be attempted with a view toward increasing the attendance at the winter session, where the business of the show is very apt to cut into the available membership unless the work can be concentrated in such a manner that the S. A. E. members in New York at the time of the show will be able to arrange their business so as to be able to attend the meeting.

In May the Society of Automobile Engineers changed its headquarters from the Rubber Building, at Columbus Circle, New York City, to the Engineering Societies Building, which is devoted entirely to engineering organizations. In connection with the new building, there is a library on engineering subjects which is open to the members of the Society and also better meeting facilities than were provided in the Rubber Building, which was intended primarily for offices.

A permanent location has also been established in Detroit. This Detroit office is primarily to aid in the standards work and a recorder for the standards committee is established there to attend to the clerical work of the organization. In carrying out their duties, members of the standards committee now receive mileage allowance and in place of the semi-annual meetings, the standards committee now manages to hold a session quarterly. These meetings are held about mid-way between the two semi-annual general meetings and also in connection with the latter. During the past year the standards committee met in Detroit in April and at Chicago at the time of the founding of the Mid-West section in October.

Membership Total Now 1783

In point of membership the society is again being favored by an upward trend. During 1914 there was a revision of the membership list which resulted in fewer names being upon the list. January 1, 1915, there were 1746 members of the S. A. E. On December 20, 1915, there were 1783. The membership of the sections is also increasing and the rule which permits of section associates who are not members of the parent body, has been taken advantage of by some of the sections, thus establishing a wider circle than the total figure would indicate.

1915—A Record Year for Speedways

Six New Speedways Opened—Races Won at Over 100 M. P. H.—Many Certified Trials—Few Accidents—End of Long Races

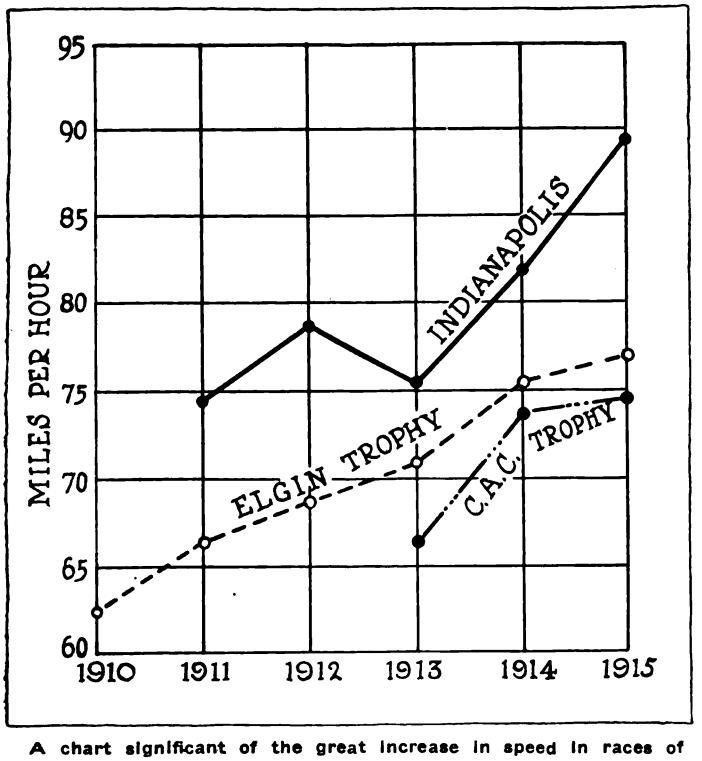
THE year 1915 has been epoch making in automobile contests largely due to the opening of three new motor speedways, in New York City, Chicago, and Minneapolis, all three with scientifically banked tracks making speeds of 100 m.p.h. not only possible in long-distance races but making it possible to establish world record marks in America as soon as faster cars can be made. Indianapolis has been relegated into about seventh place as a speed track, the new speed order being New York, Chicago, Minneapolis, Tacoma, Omaha, Des Moines, Indianapolis and Sioux City.

Nineteen hundred and fifteen has witnessed the passing of the 500-mile race and also the $50,000 purse, and for 1916 the 300-mile event for $30,000 will be the highwater mark.

The 1915 season was the greatest duel between American and European cars the world ever witnessed, Stutz and Duesenberg valiantly upholding America against superior numbers of Peugeot cars supported by Delages, Mercedes and Sunbeams. Although Resta, with the Peugeot, was perhaps the most spectacular figure in road and speedway events the palm of victory in both went to Stutz with its new valve-in-the-head design of racing motor.

For the first time in history the world has seen a race of 350 miles won at over 100 m.p.h. and on three different occasions has seen 100-mile events won at well over that figure, the fastest being 105.30 m.p.h., as against 82.47 in 1914.

An innovation were the 100-mile invitation races, one in Chicago and one in New York. Both events were won by Resta in a Peugeot in record time. The first event was made in 58:42.2 or 101.86 m.p.h., while the second event's time was 56:55.71 or 105.39 m.p.h., just 26 sec. behind the world's record created at the Brooklands track.



A chart significant of the great increase in speed in races of the past year. This is a comparison of the only three big events run over the same course and for the same distance each year, giving a fair basis of comparison

In the fourteen speedway events, the average speed of each winner was raised from 76.48 m.p.h. in 1914 to 87.23 m.p.h., and the average of each car that finished from 72.57 m.p.h. to 81.32 m.p.h.

Officially, only five new records were made in 1915, namely those made by Burman in a Peugeot on the 1-mile circular dirt track at Bakersfield, Cal., Jan. 3, for 10, 15, 20, 25 and 50 miles. New speedway marks were made from ½ to 500 miles. The Brooklands records of 200, 300, 400, and 500 miles were also broken, the new times being respectively, 1:56:21.40, 2:55:32.23, 4:04:49, and 5:07:26.

One dominating conclusion from the 1915 racing results is that one reason for the increased speed was the correct banking on the new board speedways. Then again the use of aluminum pistons, bigger valves and better steel, and fewer tire troubles, contributed greatly toward the attainment of new speed records.

The Drivers' Share

The drivers in 1915 were offered in the fourteen speedway events purse money totaling $282,000. Ten drivers, out of a field of fifty-six competing, divided $217,900. Resta earned $37,750; Anderson, $37,000; Cooper, $31,750; De Palma, $24,600, and Rickenbacher, $24,000. The rest of the drivers mentioned received purses ranging from $19,000 down to $10,000. The remaining $52,800 was split between twenty-five drivers.

Though the number of sanctioned contests in 1915 was smaller than in 1914, there being ninety-eight as against 120 granted by the Contest Board of the A. A. A., more class races were seen than in former years. Twenty-three major caliber events were held as against seventeen in 1914. There was a falling off in dirt track events, which numbered only fifty-nine as against eighty-eight in 1914. Certified trials and fuel economy tests were fewer with only six as against twelve in 1914. The number of road races was twelve as against ten in 1914. Four hillclimbs were held, at Uniontown, Newport, Ind., Utica, and Spokane, as against two in 1914 at Uniontown and Atlanta.

Road Racing Gains in West

Road racing in 1915 was especially prominent in the Middle West and on the Pacific Coast where several important 300-mile events were held. Most of the road racing in the early part of 1915 was on the Western Coast where such events as the 305-mile Point Loma race was held Jan. 9, the winner being Cooper in a Stutz who averaged 65.05 m.p.h. The Grand Prize race, a 400-mile event held at the Panama-Pacific Exposition, was won by Resta in a Peugeot at 57.5 m.p.h. The 300-mile Vanderbilt, held on the Exposition course, was also won by Resta at 67.2 m.p.h. The closing of the road racing season on the Coast was the 300-mile Venice, Cal., event won by Oldfield in a Maxwell at 68.8 m.p.h.

High Marks at Elgin

New records were established for the 301-mile Elgin and C. A. C. trophy road races. The Elgin Aug. 21 race was won

(*Continued on page* 1138)

Industry Adds 11,142,508 Sq. Ft. in 1915

Partial Returns Show Large Expansion in All Branches of Manufacture—Additions and New Equipment Represent $13,060,345

DURING the year 1915, companies actively engaged in the various branches of the automobile industry increased the capacity of their manufacturing plants by the addition 11,142,508 sq. ft., at a cost of approximately $10,000,000 to $15,000,000 and added new machine equipment, etc., representing $500,000 to $10,000,000 these estimates being very conservative. The returns received by THE AUTOMOBILE in response to letters inquiring as to the factory enlargements made throughout the industry, while by no means complete, show a total increase in area of 11,142,508 sq. ft. for the year in all branches of the industry, the cost of additions, also frequently not available, being $8,251,755. New equipment worth $4,770,590 was purchased during the past twelve months, making the total expenditure for greater factory facilities by those companies of the automobile and allied industries given in the accompanying tabulation $12,886,345.

To give an idea of the tremendous extent of this expansion throughout the industry, using the incomplete statistics available as a basis, if the total floorspace added in the past year represented but one huge single-story structure 100 ft. wide instead of hundreds of buildings, it would be 20.9 miles long. As an illustration of the magnitude of the sum expended for a part of this great manufacturing area, if this amount,—$8,251,755,—were in silver dollars piled one on top of another, the column would be 16 miles high. Also, since the amount expended for new machine equipment in the past twelve months is given as $4,770,590, this amount, if added to the other pile would make its height well over 26 miles. If the total amount expended were in silver dollars placed end to end it would cover 3710 miles, or several hundred miles farther than from New York to San Francisco.

Of the total additions, the passenger car and truck manufacturers are responsible for 6,144,044 sq. ft., costing about $4,496,650 and for new equipment worth $1,413,600, the total spent of which records are available being $5,892,250. Car makers added 5,645,840 sq. ft., at an outlay of $4,299,350 and new fittings worth $1,360,100, the total expense being $5,659,450.

Tire makers made big increases of space, the total being 2,053,160. Increase of equipment by gear makers cost $1,140,000, and correspondingly large amounts were expended in other branches of the industry.

Car Plants Add 11,142,508 Sq. Ft.

Of sixty-one companies manufacturing passenger cars and representing the leading producers, thirty-one have made additions to their factories, ranging from 15,000 to nearly 2,000,000 sq. ft., and five have occupied or arranged to move into entirely new factories during the past year. The cost of these additions averages from $4,500 to almost $2,000,000.

Nearly all these concerns have expended considerable sums for increased factory equipment, varying between $1,500 and nearly $700,000. Four of the largest companies which are working on broad schemes of factory expansion, the plans for which have already been announced. To give an idea of some of the building activity which has characterized the past twelve months in the automobile manufacturing field, we may cite some of the leading firms that have made extensive additions.

Willys-Overland has added 1,765,840 sq. ft. and has announced plans for increasing its working force by the addition of 10,000 men in the near future. Packard has carried out its plan of quantity production and concentration on the new twin-six, increasing its available manufacturing space 742,000 sq. ft., at a cost of $706,350. Reo has added 435,600 ft. and Dodge 416,000, including a new office building. This has been a big year for Franklin, three new buildings having been constructed containing 275,000 sq. ft. costing approximately $500,000. Hudson additions of 201,600 sq. ft. cost approximately $1,000,000 and the company has expended $500,000 for new equipment.

Metz has had a good year, expansion of its factory to the extent of 160,000 sq. ft. being required, the cost of the facilities thus provided being about $300,000. Briscoe added 150,000 sq. ft. to its plant and in addition has purchased the plant of the Lewis Spring & Axle Co., as well as securing still greater facilities by merging the Argo concern and the Jackson Motor Parts Co. The Lewis Spring & Axle Co. has secured the plant formerly occupied by the Flanders interest at Chelsea, Mich. Haynes secured increased space to the extent of 150,000 sq. ft. at a cost of $90,000, new equipment totalling $150,000 for the year.

Studebaker added over 150,000 sq. ft. and plans for expansion are under way requiring the outlay of approximately $1,000,000.

Maxwell increased its plant by 45,000 sq. ft., the additional space being secured at a cost of $55,000, but the company has spent no less than $373,000 on new equipment. Marmon expanded its factory to the extent of 37,500 sq. ft., the new equipment totalling $35,000.

Of the companies occupying new factories or arranging to do so during the past year, the most recent is the new Premier organization which has purchased the Laycock plant in Indianapolis, valued at $1,000,000; this comprising a main building 300 by 900 ft., a three-story structure 70 by 137 and a modern power plant. Empire's new factory gives the company 140,000 ft. of manufacturing space.

The adoption and development of the assembly plant system, which has been used to great advantage by Ford has been more marked during the past year than ever before. Ford has planned an assembly plant for Oklahoma City to contain 180,000 sq. ft. and to cost $500,000, and another for Washington, D. C. to contain 137,790 sq. ft. and to cost $400,000. The company has also bought an 80-acre tract of land near Newark and is said to be planning the construction of a large Eastern plant. Another land purchase by Ford was in Detroit, the object being reported as either the enlargement or the embellishment of the main factory. Two other companies who are building assembly plants are Chevrolet and Overland. Some of the cities chosen as sites by one or the other of these companies being New York, St. Louis, St. Paul, Kansas City and Dallas.

Truck Makers Add 498,204 Sq. Ft.

Thirteen representative truck manufacturing concerns have made additions to their factories during the year and twelve have made extensive purchases of new equipment. Three have occupied or are building new factories. Reo leads in expansion, having added 166,750 sq. ft. and Republic has increased its facilities by 92,300 ft. at an outlay of $50,000, and has also expended $10,000 on new equipment. Harwood-

(*Continued on page* 1139)

A Summary of the Principal Factory Additions

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The Cost and the Value of Equipment Added by the Industry in 1915

PASSENGER CARS

Company	Space Added Sq. Ft.	Cost of Additions	Added Equipment	Total Cost
Willys-Overland Co.	1,765,840	....	....	....
Packard	742.000	$706,350	....	$706,350
Reo	435,600	....	....	....
Dodge	416,000	....	....	....
Franklin	275,000	500,000	....	500,000
Hudson	201,600	1,000,000	$500,000	1,500,000
Metz	160,000	300,000	....	300,000
Briscoe	150,000	....	....	....
Lewis Spring & Axle Co.	150,000	90,000	150,000	240,000
Studebaker	150,000	1,000,000	....	1,000,000
Empire	140,000	....	....	....
Kissel	100,000	75,000	50,000	125,000
National	95,000	125,000	12,500	137,500
Hupmobile	90.000	....	200,000	200,000
Paige	90,000	275,000	....	275,000
White	89,000	....	....	....
Detroiter	86,000	....	....	....
King	70,000	....	....	....
Chalmers	69,600	125,000	....	125,000
Moore	67,200	....	....	....
Maxwell	45,000	55,000	373,000	428,000
Marmon	37,500	....	35,000	35,000
Crow	37,500	18,000	8,300	26,300
Moon	36.000	....	....	....
Interstate	36.000	....	....	....
Pierce-Arrow	25,000	....	....	....
Saxon	25.000	10,000	1,500	11,500
Mercer	24,000	20,000	20,000	40,000
Pathfinder	24,000	....	....	....
Dispatch	10,000	....	....	....
Madison	3,000	....	....	....
Stutz	....	....	3,500	3,500
Dort	....	....	3,200	3,200
Pilot	....	....	3,100	3,100
Total	5,645,840	$4,299,350	$1,360,100	$5,659,450

COMMERCIAL VEHICLES

Reo Motor Car Co.	166,750	....	....	....
Republic Motor Truck Co.	92,300	$50,000	$10,000	$60,000
Harwood-Barley Mfg. Co.	59.879	....	20,000	20,000
Sterling Motor Truck Co.	36,500	35,000	....	35,000
Commerce Motor Car Co.	30,000	35,000	....	35,000
Gramm-Bernstein Co.	30,000	30,000	15,000	45,000
"Old Reliable" Motor Truck Co.	32,000	....	10,000	10,000
Duplex Power Car Co.	12,500	10,000	10,000	20,000
Columbia Motor Truck & Trailer Co.	12,000	10,000	2,000	12,000
Mogul Motor Truck Co.	10.275	23,500	1,500	25,000
Available Truck Co.	8,000	....	1,000	1,000
Morris Motor Truck Co.	5,000	1,800	500	2,300
Hahn Motor Truck & Wagon Co.	3,000	2,000	500	2,500
Total	498,204	$197,300	$70,500	$267,800

AXLES

Timken-Detroit Axle Co.	200,000	$1,125,000	....	$1,125,000
Walker-Weiss Axle Co.	135,000	50,000	$30,000	80,000
Torbenson-Columbia Axle Co.	40,000	100,000	....	100,000
Russel Motor Axle Co.	11,000	....	....	....
Peru Auto Parts Mfg. Co.	10,000	6,000	15,000	21,000
Jacobson Machine Mfg. Co.	2.800	3,000	5,000	8,000
Western Spring & Axle Co.	25,000	....	....	....
Detroit Axle Co.	....	....	5,000	5,000
Total	423,800	$1,284,000	$55,000	$1,339,000

STARTERS

The Leece-Neville Co.	100,000	$125,000	$35,000	$160,000
Connecticut Tel. & Elec. Co.	40,000	50,000	25,000	75,000
Bijur	5,000	....	63,000	63,000
Total	145,000	175,000	123,000	298,000

MOTORS

Continental Motor Mfg. Co.	300,000	$200,000	$300,000	$500,000
Rutenber Motor Co.	46,560	27,355	73,115	100,470
Waukesha Motor Co.	40,000	39,000	35,000	74,000
Total	386,560	$266,355	$408,115	$674,470

TIRES

B. F. Goodrich Co.	860,000	....	....	....
Firestone Tire Co.	435,600	....	....	....
Fisk Rubber Co.	348,480	....	....	....
Miller Rubber Co.	130,680	....	....	....
Continental Rubber Works	85,000	$130,000	....	$130,000
Federal Rubber Mfg. Co.	50,000	....	....	....
Braender Rubber & Tire Co.	67.200	80,000	$30,000	110,000
Mohawk Rubber Co.	65,000	100,000	45,000	145,000
Swinehart Tire & Rubber Co.	7,200	30,000	30,000	60,000
Gordon Tire & Rubber Co.	3,000	2,500	15,000	17,500
Ajax-Grieb Rubber Co.	1,000	....	....	....
Total	2,053,160	$342,500	$120,000	$462,500

GEARS

Brown-Lipe Gear Co.	80,000	$120,000	$500,000	$620,000
New Process Gear Corp.	140,000	....	240,000	240,000
Warner Mfg. Co.	....	....	200,000	200,000
T. W. Warner Co.	....	....	100,000	100,000
Covert Motor Veh. Co.	17,500	35,000	10,000	45,000
Gemmer Mfg. Co.	30,000	....	....	....
Detroit Gear & Mach. Co.	12,000	30,000	90,000	120,000
Total	279,500	$185,000	$1,140,000	$1,415,000

SPRINGS

Perfection Spring Co.	54,525	$110,000	$109,000	$219,000
Hess Spring & Axle Co.	45,000	60,000	5,000	65,000
Tuthill Spring Co.	....	....	2,700	2,700
Total	99,525	$170,000	$116,700	$286,700

MAGNETOS

Remy Elec. Co.	....	$60,000	$100,000	$160,000
Bosch Magneto Co.	60,000	125,000	50,000	175,000
Splitdorf Electrical Co.	100,000	....	....	....
Simms Magneto Co.	9,420	15,000	100,000	115,000
Eisemann Magneto Co.	30,000	....	40,000	40,000
Total	199,420	$200,000	$290,000	$490,000

CARBURETERS

Findeisen & Kropf Mfg. Co.	12,000	$30,000	$25,000	$55,000
Byrne-Kingston & Co.	12,123	4,500	5,000	9,500
Breeze Carbureter Co.	6,000	15,750	12,000	27,750
Holtzer-Cabot Co.	150,000	....	....	....
Master Carbureter Corp.	26,624	50,000	35,000	85,000
Total	206,747	$100,250	$77,000	$177,250

CASTINGS

Aluminum Castings Co.	50,000	$50,000	$50,000	$100,000
Gen. Aluminum & Brass Mfg. Co.	50.000	40,000	60,000	100,000
Harley Co.	30.000	50,000	....	50.000
Nat'l Bronze & Alum. Co.	15.000	15,000	....	15,000
Atlas Brass & Fdry. Co.	3,360	4,500	1,500	6,000
American Bronze Co.	25,000	....	10,000	10,000
Indianapolis Brass Co.	....	....	7,500	7,500
Pioneer Brass Works	....	....	2,500	2,500
Ohio Forge	....	....	30.000	30.000
Jackson Motor Shaft Co.	3,000	3,000	15,000	18,000
Total	176,360	$162,500	$176,500	$339,000

ACCESSORIES

Auto Body Co.	50,000	$30,000	$50,000	$80,000
Lally Commercial Body Co.	8,000	10.000	15,000	25,000
Fuller & Sons Mfg. Co.	26,320	30,000	15,000	45,000
Fedders Mfg. Co.	110.000	100,000	60,000	160,000
McCord Mfg. Co.	106,500	....	....	....
Salisbury Wheel & Mfg. Co.	30,000	25,000	115,000	140,000
Stewart-Warner Speedom. Corp.	275,000	....	....	....
Van Sickien Speedom. Corp.	48,000	80,000	....	80.000
Champion Spark Plug Co.	....	....	160,000	160,000
Champion Ignition Co.	12,172	20,000	29,800	49,800
Gibson-Hollister Co.	....	7,500	8,375	15,875
Pittsfield Spark Coil Co.	12,000	....	....	....
J. H. Sager Co.	8,000	....	....	....
Duff Mfg. Co.	16,000	35,000	25,000	60,000
Gleason-Peters Air Pump Co.	4,000	10,000	15,000	25,000
Advance Machine Co.	....	....	5,000	5,000
Burd High Compression Ring Co.	25,000	40,000	35,000	75,000
Piston Ring Co.	6,500	8,000	13,000	21,000
Houpert Machine Co.	6,000	....	25,000	25,000
W. W. Wainwright & Sons	2,400	2,000	6,000	8,000
Prest-O-Lite Co.	45,000	60,000	25,000	85,000
Essex Storage Battery Co.	500	2,000	1,500	3,500
Standard Woven Fabric Co.	200,000	300,000	150,000	450,000
Royal Equipment Co.	35.000	110,000	50,000	160,000
Universal Machine Co.	2,000	....	20,000	30,000
Total	1,028,392	$869,500	$833,675	$1,703,175
Grand total	11,142,508	$8,251,755	$4,770,590	$12,886,345

Automobile Chronology for 1915

Industrial—Financial—Registrations—Miscellaneous

Industrial

January

1—Dort Co., Flint, Mich. incorporates for $500,000.
2—Pratt & Whitney buys Pope main works in Hartford, Conn., for $300,000.
6—Consolidated Car Co. buys Abbott for $500,000.
7—Used car reports of Chicago Automobile Trade Assn. nationalized.
11—Stevens-Duryea stops manufacturing. Plant taken over by Westinghouse.
11—Packard announces six worm-drive trucks.
12—Goodyear to take over Motz tire sales Feb. 1.
13—Ross & Young Machine Co., Detroit, to make eight-cylinder Ross car.
18—Willys sells Gramm and Garford interests.

February

1—Tire makers cut tire prices about 25 per cent.
3—Briscoe leases Cutting factory.
15—American Steel Foundries, Chicago, enter automobile field.
22—King gives employees 7½ per cent salary bonus.
23—Detroit Starter Co. builds Ward Leonard system starter.
26—Delion Tire & Rubber Co. opens Trenton plant.
27—Gasoline down to 10½ cents in Milwaukee.

March

4—Marion Motor Car Co. moves to Jackson, Mich.
6—Timken-Detroit Axle Co. buys Metal Product plant in Detroit.
10—Garford Motor Truck Co., Lima, Ohio, starts work.
13—Massnick-Phipps, Perkins motor maker, gets Wahl Motor Co. plant in Detroit.
19—Champion Spark Plug inaugurates profit-sharing plan.
22—Chevrolet buys second Tarrytown plant.
25—New Ford four-story assembly plant in Indianapolis.
29—Houk company buys American Spoke Co. plant in Detroit.

April

2—Ford buys 56.7 acres of land opposite Highland Park plant.
5—National Gauge & Equipment replaces Hans Motor Equipment Co.
22—Standard Steel Car Co., Butler, Pa., to build eight-cylinder cars.
26—Master Carbureter buys Air Compressor plant in Detroit.

May

1—Somerville Special Agency, Detroit, to make starter. First starters for Ford cars.
3—Kelly-Springfield Tire to share profits over $1,000,000.
6—Speedwell plant sold for $150,000 at receivers' sale to W. M. Pattison Supply Co. Assets sold to Puritan Machine Co.
13—Stevens-Duryea plants purchased by Westinghouse for $1,000,000.
14—Columbus Buggy assets sold—to supply parts.
15—J. W. Lyons disposes of Lyons-Atlas interests.
17—Monarch Motor Car Co. reorganized.
20—Leece-Neville buys a two- and three-story plant in Cleveland.
25—Lozier's Plattsburg plant sold for $200,000.

June

1—Ford reduces prices on parts from 10 to 25 per cent.
1—S. G. V. plant in Reading, Pa., sold for $55,600. Parts moved to Newark, N. J.
1—Winton changes name to Winton Co.
4—Colby plant in Mason City, Iowa, sold for $32,800 at receiver's sale.
4—U. S. L. reorganizes. United States Light & Heat Co. of New York formed with $8,000,000 capital.
5—Prest-O-Lite buys Pumpelly battery plant and enters electric lighting and battery field.
7—Baker and Rauch & Lang unite as Baker R. & L. Co. Capital increased from $1,000,000 to $2,500,000.
9—Torbenson Gear Co., Newark, N. J., buys Cleveland plant.
11—Fisher Body buys Universal truck plant for $120,000.
12—P. R. Mfg. Co., Detroit, buys Zephyr carbureter rights.
16—White gives 8-hr. day to 3800 men. Wages increased.
19—Bell Motor Car Co., York, Pa., plant starts production.
19—Knox Motors Associates formed to take care of sales and advertising of Knox products.
25—Overland raises wages 5 per cent.
28—Keeton plant sold for $45,000.

July

2—Tires may be shipped by parcels post.
3—Gasoline prices in Southwest unsettled. Costs 11 to 20 cents a gal. in Western Texas.
6—Michigan Buggy plant sold to States Motor Car Co., Toledo, for $60,000.
6—Studebaker insures employees.
7—Elgin National Watch to make Van speedometer.
7—Simplex takes over Crane Co. Will build Crane-Simplex 6 and 4.
10—Sternberg Truck changes name to Sterling.
12—Eight new Ford branches established, totaling forty-three with twenty-six assembling plants.
17—Briggs-Detroiter to continue. Detroiter Motor Car Co. formed.
17—Marion and Imperial to be marketed by Mutual Motors Co., Jackson, Mich.
19—National Rubber to move plant from Pottstown to Williamsburg, Pa.
19—Prest-O-Lite to make steel parts.
21—Pope's Westfield plant sold for $725,000.
28—Ford reduces car price $50.
31—Locomobile will share profits with workmen.
31—Autocar men given 10 per cent increase in wages.

August

2—Denby buys Briggs plant for $63,500.
2—International Motors raises wages 20 per cent.
6—Chevrolet takes over Mason stock. Twenty more acres added to Mason plant.
7—Vacuum Oil raises wages about 10 per cent.
11—Lyons-Atlas discontinues cars.
14—Hercules Motor Car Co. plant bid in for $20,800 at sheriff's sale.
16—100 Chalmers service men in annual convention at factory.
17—New Process Gear buys Monarch Typewriter plant.
21—Case has pension system.
30—Heinze Co. enters starter field with plant in Springfield, Ohio.
31—Walker Co. to sell electrics without batteries.

September

1—Hurlburt leases Mott Iron Works in New York City.
6—Miller Rubber starts free tire service.
8—15,141 carloads of automobiles shipped in August, against 8352 in 1914.
8—New York gasoline reaches 20 cents a gal., an advance of 4 cents in 4 weeks.
9—Packard grants bonus to employees in military system.
14—Prest-O-Lite buys Brown battery. Also purchases four special Maxwell racing cars.
20—Studebaker school for employees. Three-year commercial, mechanical and technical course with savings.

October

1—Champion Spark Plug Co. increases production from 35,000 to 50,000 spark plugs a day.
1—Chevrolet Motor Co. of Delaware formed, with capital of $20,000,000; 200,000 cars for 1917.
2—Canadian car sales gain 50 per cent; 7000 more cars sold than during 1914.
2—Post office contracts awarded for trucks. Ford, G. M. C., Buick, Kelly-Springfield, White and Packard get orders.
7—England imposes a 33⅓ per cent duty on cars and parts.
9—Norma Bearings now made in America.
11—1,006,835 Ford cars built up to Oct. 1.
12—Delco 1915 output will be 125,000 systems.
15—Stearns gives 10-hr. pay for 8-hr. work.
16—Goodrich to insure and pension employees.

November

1—Chevrolet cars to be assembled in McLaughlin carriage plant in Oshawa, Canada.
1—New York State automobile and accessory plants have 15,485 employees, twenty-six automobile and parts makers. Wages increased 10 per cent in September.
1—$1,000,000 building for Touraine Motor Co., Philadelphia. Company will lease six-story building.
3—Moline Plow Co., Moline, Ill., will continue making buggies as well as automobiles.
3—Peerless and General Vehicle companies sold. Peerless Truck & Motor Corp. formed to take over both.
4—De Tamble Motors plant equipment sold for taxes. Plant idle for 2 or 3 years.
5—October shipments consist of 15,972 carloads against 10,443 in 1914.
6—Acceptance Corp., New York City, will buy notes taken by truck dealers.
6—Mercer machinists receive 50-hr. week in place of 54-hr.
6—Argo Motor Co., Jackson, Mich., buys Standard Electric plant, which it has been occupying.
8—Guaranty Securities Co., Toledo, formed to finance time payments on Overland cars. Three kinds of discount facilities—special plan for farmers.
10—Walker-Weiss Axle Co., Flint, buys H. J. Martin forging plant in Indianapolis.
11—Yale & Towne Co., Stamford, Conn., increases wages 10 per cent.
12—Studebaker to build branches in Portland and Dallas.
15—Sun Motor Car Co., Buffalo, buys Sterling Motor plant in Elkhart, Ind.
15—Touraine Co., Philadelphia changes name to Vim Motor Truck Co. to make Vim delivery car.
16—Disco Electric Starter Corp. takes over company. New capital $250,000.
19—Chevrolet assembly plant for Dallas to cost $250,000.
20—Ford tractor to be made by Henry Ford & Son, Dearborn, Mich.
20—Parry Mfg. Co., Indianapolis, to build commercial bodies, tops and trailers.
20—Springfield Body Co. takes over business of Springfield Metal Body Co. Capital is $1,000,000. To operate plant in Detroit as well as in Springfield.
22—Hupp Motor Car Co. buys American gear plant in Jackson to use for making axles.
22—Sun Motor Car Co., Buffalo, moves to Elkhart, Ind., to plant formerly occupied by Sterling Motor Car Co.
23—Lavine Gear Co., Racine, is new name of Lavigne Co., reorganized and capacity to be doubled.
23—Standard Woven Fabric Co., Framingham, Mass., Multibestos maker buys former Walpole tire plant.
24—Hupp Motor Car Corp. chartered in Virginia with capital of $8,000,000.
25—Anderson Rolled-Gear plant taken over by Shaw-Kendall Engineering Co., Toledo, to make gears.
25—New Billings & Spencer Co. formed in Hartford.
26—Canadian Ford melon, 600 per cent dividend—capital increased from $1,000,000 to $10,000,000.
26—Ford plans Eastern plant. Buys 80-acre tract near Newark—begins work on three more Ford assembly plants in Milwaukee, Omaha and Oklahoma City.
26—Fostoria Light Car Co. takes over Storm Buggy Co.
30—General Electric buys interest in Owen Co. Entz Motor Patents Corp. is formed to control Entz electric patents.
30—Premier plant sold to syndicate for $125,000. To continue manufacture of Premier cars.
30—Two land deals in Cleveland. Baker R. & L. Co. to build new plant. Rollin White plans a tractor plant in Euclid.
30—U. S. Government proposes to raise a part of its extra revenue of $112,000,000 by placing tax of 1 cent a gal. on gasoline used, and also a tax on motor vehicles, according to horsepower.

December

1—Grinnell Electric Car Co., Detroit, discontinues manufacture of Grinnell electric.
2—Reliance Engineering Co., Lansing, takes over Seager Engine Works. Machinery of Reliance company moved to Seager plant, whose assets are estimated at $1,500,000.
3—Standard Truck Co. enters small truck field with 2-tonner selling at $2,000.
4—Niles Car & Mfg. Co., Niles, Ohio, manufacturer of interurban cars, will build trucks. Will turn out general delivery type.
4—Sparks-Withington buys Cleveland Radiator Co. plant, equipment and commercial good will. Equipment will be moved to old Sparks-Withington plant in Jackson where the manufacture of honeycomb radiators will be started.
4—Burd High Compression Ring Co., Rockford, Ill., moved into its new plant, capable of turning out 25,000 piston rings per day and employing 250 men.
4—Western Tire & Rubber Co., Kansas City, moves to Akron, where it is incorporated under name of General Tire & Rubber Co. with capital of $200,000.
7—Packard to build 12,000 cars in 1916, an increase of 4500 or 60 per cent over 1915.
7—Moline Plow Co., Columbus, buys manufacturing rights of Universal Cultiplow, produced by the Universal Tractor Mfg. Co., which discontinues.
8—Puritan Machine buys Cartercar parts business.
8—Briscoe and Argo buy Jackson Motor Parts Co. Machinery which was in plant formerly occupied by defunct Mason Motor Co., also has been bought and is now in Jackson plant.

Financial

January

1—Reo profits in 1914, $2,539,187. Built 13,516 cars.
5—Hood Rubber common increased $1,000,000.
9—Hudson sales for 5 months, $7,500,000.
23—Federal Rubber capital increased $1,000,000.
29—Republic Rubber approves $3,000,000 issue on preferred.
29—Goodrich 1914 profits $5,440,000.
29—Fisk 1914 profits $942,204.

February

2—Rolls-Royce profits $384,255, decrease of $71,500.
6—Gray & Davis 1914 sales amount to $4,000,000.
9—Republic truck dividend of 100 per cent.
9—Kelly-Springfield tire profits $1,215,143, gain of $939,194.
12—Fisk adds $500,000 preferred.
15—National Carbon's 1914 income $2,215,880.
23—Stewart-Warner earns 10 per cent on common.
24—Goodrich 1914 net sales $41,764,008.
25—Studebaker profits $4,441,966, a gain of 150.6 per cent.

March

5—U. S. Rubber's net profits $9,776,873.
5—Ford dividend of $48,000,000. Capital increased from $2,000,000 to $100,000,000. Henry Ford's profits $27,840,000.
7—Baker R. & L. capital increased from $1,000,000 to $2,500,000.
10—Goodrich reduces preferred $2,000,000.
13—Lozier gets $5,000,000 new capital.

April

1—Overland surplus for 6 months $2,853,864.
28—Ford to pay over $15,000,000 in rebates to car owners.

May

8—Packard's April sales $3,047,811.

June

16—Reo extra dividend of 12.5 per cent, a total of $450,000.

July

1—Chandler dividend of 77 1-2 per cent on common, making a total of 100 per cent on issue in 1 year.
3—U. S. Tire passes quarterly dividend of 1 1-2 per cent on common.
28—Goodrich 1915 profits $4,000,000. First 6 months show $1,348,922 gain.

August

3—Paige increases capital $750,000.
16—White increases stock $3,000,000 to pay 7 per cent. Former stock amounted to $500,000 preferred and $2,440,000 common. Preferred to be retired immediately at $115 per share plus accumulated dividends.
16—Haynes 100 per cent stock dividend. Capital increased from $600,000 to $1,200,000.

September

1—Firestone declares 4 per cent extra dividend, amounting to 16 per cent for the year. Net profits for year are $4,343,000, a gain of $2,800,000. Sales are $25,187,884, an increase of $5,937,774. Production is 7500 pneumatic tires and 1100 solids a day.
8—Reo pays extra dividend of 12 1-2 per cent.
9—Morton truck capital increased from $100,000 to $1,000,000.
14—Packards built in year number 4908, valued at $15,553,650.
18—General Motors declares 50 per cent dividend. Earned $4,926,322. Seventeen directors on new board.

October

1—Chevrolet capital increased from $2,500,000 to $20,000,000. Now Chevrolet Motor Co. of Del.
1—Hayes Wheel increases capital from $300,000 to $1,000,000. Stock dividend of 166 per cent of $500,000 to be declared.
4—G. M. voting trust dissolved.
4—Swinehart Tire earns 16 per cent on $800,000 stock. Gross earnings exceed $2,000,000 and net earnings pass $135,000.
8—Chevrolet Motor Co. of Mich. now. Current earnings at rate of $2,500,000 per annum or 12 1-2 per cent on stock.
9—Chalmers common listed on New York curb.
11—Perfection Spring raises capital from $1,500,000 to $2,500,000.
11—Disco raises capital from $40,000 to $100,000.
14—Ford surplus gains $10,308,738.59 in 10 months. $43,788,151.23 cash on hand, an increase of $16,346,682.44 over 1914. Total assets $88,535,840.41, an increase on $26,903,583.25 over 1914.
20—Continental Motor Mfg. Co., Detroit, declares 100 per cent dividend. Increases capital $500,000 to $2,900,000. Surplus of $1,200,000 or $500,000 more than 1914.
22—Packard surplus $3,713,747.22. Gains $1,915,926.80. Assets $21,814,153.71. 29,936 cars and trucks built.
23—Gray & Davis increases capital from $1,750,000 to $2,000,000.
26—Canadian Ford capital increased from $1,000,000 to $10,000,000. Dividend of 600 per cent.

November

1—Chandler stock increased from $425,000 to $10,000,000.
1—Maxwell to aid dealers' finances by using part of its surplus in deposits in different parts of country where its dealers are and enable latter to get loans from banks.
1—Studebaker to retire all serial notes amounting to $2,300,000. Company has no debts except current accounts. Working capital will be $22,050,000.
1—H. W. Ford, president of Saxon Motor Co. buys Hugh Chalmers stock and passes into control of company. $500,000 involved. Company will build 28,600 cars.
1—Canadian Ford profits $3,202,458.15. Gain of $1,179,962.09 over 1914. Cash on hand $2,609,997.65.
1—$3,000,000 company to build Lozier cars. Property bought by Associated Lozier Purchasers. Theodore Friedeberg elected president. Will keep property.
4—Chalmers common stock to pay $12 a share starting Jan. 1.
4—Continental Motor Mfg. Co., dividend of $416,000. Company increases capital $2,400,000 to $2,900,000.
5—Goodyear gross business to Oct. 31 totals $36,000,000, or $5,000,000 better than 1914. Over 2,000,000 tires made.
9—Peerless Truck & Motor Corp. earns 19 per cent on new $10,000,000 stock. Based on actual shipments of Peerless Motor Car Co. and General Vehicle Co. for calendar year.
10—Maxwell stockholders approve plan for paying back dividends.
13—Reo 10-months' surplus $3,661,802.20 or $1,969,720.20 over 1914—$2,390,951.60 cash on hand and in banks. Reo Truck assets gain $231,510.09 in 10 months.
13—Hyatt capital increased from $400,000 to $6,000,000 for plant enlargement.
13—United States & Heating Corp. gets working capital of $500,000 through sale of 50,000 shares of treasury stock.
16—Fifth Avenue Coach Co., New York City, earns $1,451,508.10 in year. Carries 14,050,471 passengers in 133 buses during year.
19—Hupp increases capital from $1,000,000 to $6,500,000, divided into $5,000,000 common stock and $1,500,000 preferred.
20—Saxon Motor Car Corp. succeeds company and increases capital from $350,000 to $6,000,000 common.
20—Autocar doubles capital to $2,000,000.
25—Simplex Automobile capital increased from $1,500,000 to $5,000,000.
30—Consolidated Car Co. capital increased from $250,000 to $500,000.
30—Kelly-Springfield Tire reduces common par value from $100 to $25.

December

4—Franklin to increase common to $2,000,000 from $900,000. Preferred stock, amounting to $600,000 is all in treasury of company.
4—Commerce Motor Car Co., Detroit, to increase capital from $100,000 to $200,000.
4—Denby Motor Truck Co. to increase stock from $250,000 to $750,000, of which $500,000 will be common and the balance preferred.
7—Goodyear earns 55 1-2 per cent on common. Sales amount to $36,490,652 and net income is $5,137,082. Assets are $14,500,000.

Registration

January

9—New York registrations 169,966 in 1914.

February

2—Canada has 61,599 car owners in 1914.
13—15,000 Pennsylvania farmers own cars.
15—Iowa has 106,087 cars in 1914.
15—Kentucky registrations number 20,000, an increase of 64 per cent.

March

1—New England gains 48,063 cars in 2 years; 142,497 cars and trucks in 1914, or 52 people per car.
25—United States has 1,754,570 cars in 1914, showing a gain of 500,695 over 1913. Increase of 1,077,570 in 4 years.

April

3—37,990 Michigan licenses in 2 months.
3—120,296 cars and trucks in Ohio.
8—Ontario has 34,000 cars.
17—New York State has 168,598 cars; 50,000 cars ahead of 1914.
21—California registration is 131,123.

June

11—144,750 cars and 1400 dealers in Ohio.
14—66,745 cars in Wisconsin, the 1914 registration being 53,161.

July

3—Canada has 77,339 cars, divided into 1155 trucks and 68,320 cars, with 1120 dealers.
15—Colorado has 21,826 cars and trucks, an increase of 5000.
17—Massachusetts registration is 83,868 cars and trucks, a gain of 27.5 per cent over 1914.
23—Oklahoma has 32,000 cars.

August

12—United States has 2,070,903 cars. Registrations for the first 6 months of 1915 show gain of 334,809. Output of 625,000 cars predicted.

September

14—New York State has 212,882 cars; 168,000 in Ohio; 166,886 in Illinois; 151,523 in Pennsylvania, and 150,232 in California.
16—Michigan registrations during the first 6 months are 91,683 cars and 2499 trucks. A gain of 20,000 over 1914 total.

October

2—Iowa has 140,168 cars; 36,000 more than 1914. Farmers big factor in 33 per cent gain.
8—Kansas has 2487 tractors.
8—Wisconsin has 78,169 cars, a gain of 25,008 over 1914 total.
9—Ohio has 176,428 cars. Nearly 50 per cent better than 1914 total.
9—New York State has 222,025 owners; 164,438 in 1914 up to Oct. 1; 1914 total was 170,171.
9—Iowa has 150,000 cars; 50,000 cars bought in 1 year. Cars average $800 to $900 in value.

November

1—Rhode Island has 14,017 cars. Fords number 4413 and Cadillacs 1070.
6—New York State has 227,467 cars; 57,296 more owners and dealers than in 1914. Chauffeurs number 77,675.

13—Iowa 3-year license law in force Jan. 1. Machines registered 4 years will be registered for ¼ regular fee.
20—Wisconsin has 79,759 cars, as against 53,161 in whole year of 1914; 26,600 new cars bought in 1915.

December

8—New York State up to Dec. 4 has 231,713 registrations, divided into 171,698 cars and 22,949 trucks. Dealers number 2194.

Miscellaneous

January

2—1200 London buses commandeered.

February

26—Germany cuts private car use 50 per cent to save in consumption of gasoline, rubber and oil.

March

6—London buses carry 734,000,000 in 1913.
6—Motor buses stopped in Berlin.

April

15—341,250 motor vehicles in United Kingdom.
15—New South Wales has 10,001 cars in 1914.
20—Italy to take over automobile plants.
26—War rushes French plants.
18—$4,467,453 for Paris Bus Co. from the French war department to compensate for vehicles requisitioned. No buses in Paris.

July

1—$108,191,774 for roads in 1914. Over 6000 miles of new roads added and over 35,500 improved during year 1914 in thirty-five States.
17—Only passenger cars allowed in Yellowstone Park. $5 fee for runabouts—$7.50 for five and $10 for seven-passenger cars.
24—France orders machinery declared.
26—Blue Book to add a volume. Will cover territory below Potomac and Ohio rivers—New index maps.
27—Lincoln highway route changed. Washington and Baltimore to be included.

August

1—Yellowstone Park opened to tourists.
6—Britons would protect motor trade by high duty.
8—English Ford sells 12,500 cars. War has not affected English business. Fifty per cent increase.
7—French car owners must pay taxes despite war.
28—Michelin French plant rushed. Produces 6000 tires a day.
28—$49,000,000 for rural delivery by U. S. post office department. $2,000,000 saving effected.

September

3—Cut accidents 54 per cent at Ford plant by teaching of English to workers.
18—Post office department authorizes 500 automobile rural routes. Cost per mile for automobile is $0.034.

October

1—Great Britain imposes 33 1/3 per cent import duty on automobiles and parts.
7—France to fix price of alcohol. Denatured product becomes government monopoly on Jan. 1, 1917.
9—Austria confiscates all tires.
9—Gasoline shortage in Paris. Fuel famine for first time since war began—Price, 42 cents.
11—Blaze Dixie highway trail. First official inspection tour from Chicago to Florida.
16—Spain has 10,548 cars, or one car to every 1896 persons.

November

1—Gasoline shortage in Paris threatens to stop taxicabs.
6—Community garage developed in Jackson County, Wis. Promoters to sell one share only to each automobile owner. Will provide service.
13—American motorists given 10 days to tour in Canada free by Customs Department at Ottawa.
30—Setback for U. S. cars in France. Agency negotiations affected by 33 to 45 per cent duty to be imposed.

RUBBER

January

1—Rubber imports from Para from Nov. 28 to Dec. 22 amounts 4,876,000 lb.
11—Great Britain agrees to permit rubber exports to U. S. from London via the British Consul General in New York.
23—Lusitania arrives with 200 tons of rubber with 1000 more on Menominee.

February

16—Rubber control committee appointed to handle situation in regard to certain agreements in the shipment of rubber from England to the United States.

March

1—Rubber imports from England in 1 month amounts to 4,859,200 lb.
13—Process for making synthetic rubber from crude oil discovered.
18—Rubber substitute made of coal tar, which is the chief ingredient.

July

27—No tires on cars for export to neutral countries.

August

27—South America ships 3,008,114 lb. rubber to the United States during the year, as against 1,035,396 in 1914.

October

6—Great Britain taxes 2 3/8 cents a pound on Ceylon rubber shipments from London to the United States.
23—142,000 tons of rubber predicted for 1915. United States to use 75,000.

November

6—No tire shortage in England. Manager of Goodyear Co. of Great Britain states business is tranquil.

1915—A Record Year for Speedways

(*Continued from page* 1133)

by Anderson in a Stutz with Cooper in a Stutz second. The winner averaged 77.256 m.p.h., as against 73.53 m.p.h. in 1914. The C. A. C. trophy, held the previous day, went to Cooper, with Anderson second, the winner's average being 74.979 m.p.h. as against 73.90 m.p.h. in 1914.

Two companies, prominent in the 1914 season as backers of racing teams, withdrew from racing in 1915. Stutz announced its indefinite withdrawal after the Sheepshead Bay speedway race, Oct. 14, and Maxwell, which had seven racers on the tracks up to July, 1915, was the other. Four of its cars were taken over by the Prest-O-Lite Co., which formed a company to race these cars on the speedways.

Racing in 1915 was fortunate in having few serious accidents. Only three deaths occurred at the important race meets and about two at the small track events. Harry Grant died Oct. 8 from burns suffered when his Maxwell took fire in practice. Joe Cooper in a Sebring was killed at the Des Moines speedway Aug. 8. Albert Johnson was killed when a Packard test car at the Indianapolis Speedway turned over from a blowout while going 86 m.p.h. Wm. Carlson was killed at Tacoma.

Fuel efficiency and economy tests in 1915 were gone into extensively by the automobile and accessory manufacturers. Four fuel and economy tests were attended by A. A. A. representatives, and a number of the automobile and accessory companies made unofficial tests with their products.

Under A. A. A. sanction Stromberg held a test Sept. 16 in Chicago with a Buick six which averaged 27.5 m.p.g. and in a speed test 56.2 m.p.h. In an acceleration test the car went from 0 to 30 m.p.h. in 11 1-5 sec. through first, second and third-speed gears. On high alone it accelerated from 5 to 25 m.p.h. in 12 2-5 sec.

Another official test was that of the Packard twin six in July at Chicago speedway when it made 50 miles in an economy run, averaging 13.3 m.p.g. In an acceleration test it went from 5 to 30 m.p.h. in 13.60 sec. and from 5 to 50 m.p.h. in 26.20 sec. In a speed test it went 10 miles at the rate of 72.9 m.p.h.

An Oakland touring car with a Marvel carbureter at Chicago on Jan. 27 made 13.1 m.p.g. in a fuel economy test. A roadster, also equipped with a Marvel carbureter, made 27.3 m.p.g.

A Buick equipped with Edwards carbureter averaged 28.9 m.p.g. and 58 m.p.h.

A number of unofficial tests were made in 1915. A Detroit electric made a 2065-mile run which cost $29. In a fuel economy test 137 Franklins averaged 32.1 m.p.g. An Owen Magnetic averaged 34.1 m.p.h. for 1935 miles in a trip from New York City to Indianapolis, averaging 12.8 m.p.g. A Chandler six completed a non-stop run across the United States, making 1889.5 miles from Mexico to Canada in six days. A Maxwell, driven by Ray McNamara, made Detroit to Indianapolis and return in 20:1. In a Maxwell efficiency run, Miss Eva Cunningham, the winner, drove 567 miles on 17 gal. of gasoline or 33.37 m.p.g. A Franklin in an oil consumption test traveled 1046 miles on 1 gal. and averaged 16.7 m.p.g. for gasoline consumption. E. C. Patterson in a Packard 3-38 touring car covered 1015 miles, Chicago to New York City, in 35:43, or 24.48 m.p.h.

The 1916 racing season will be opened on May 13 at the Sheepshead Bay Speedway. Next year's racing schedule is placed on a more systematic basis. With the exception of two clashing dates on July 4 at Minneapolis and Sioux City, the rest of the dates are arranged so as to fall, in a majority of cases, about two weeks apart. Sixteen dates, in all, have been allotted ten cities. Two spring races are scheduled, one at New York and the other at Indianapolis on May 30. Following these are two for June, one on the 17th at Chicago and the other at Des Moines on the 28th. Then come three for July, two for August, four in September, and two in October, the closing speedway event of the year being at Chicago on the 14th.

Industry Adds 11,142,508 Sq. Ft. in 1915

(*Concluded from page* 1134)

Barley has added 59,879 sq. ft. and has purchased $20,000 worth of new machinery, etc. Sterling has increased its space 36,500 ft. at a cost of $35,000 and Commerce and Gramm have each added 30,000 sq. ft., Gramm at an outlay of $30,000 and Commerce expending $35,000. Gramm also added $15,000 in new equipment during the year.

The three companies occupying or arranging to occupy new plants are: Federal, which will have 140,000 sq. ft. of space available about the first of the year; Vim, which is building a new factory in Philadelphia to contain 487,600 sq. ft. at a cost of $1,000,000; and Ware, which is preparing to occupy a new four-story plant of 200 ft. frontage which cost $51,000.

Expansion by Parts Makers

There has been a great deal of building activity among the axle manufacturers. Timken adding 200,000 sq. ft. at an outlay of $1,125,000; Walker-Weiss, 135,000 sq. ft. costing $50,000, and in addition $30,000 worth of new equipment; and Torbensen 40,000 ft. costing $100,000.

In the bearing field there has been almost unprecedented expansion, largely due to the stoppage of European bearing importation by the war. Nearly all the larger makers have made tremendous expansions, among whom might be mentioned New Departure, Hyatt, Hess-Bright, Timken, Gurney and Fafnir. S. K. F. is preparing to occupy a new plant containing approximately 348,480 ft.

Continental leads the motor manufacturers in expansion made during the past year, adding 300,000 sq. ft. at an outlay of $200,000 and expending $300,000 for new machinery, etc. Rutenber added 46,560 ft. at a cost of $27,355 and bought $73,115 worth of new equipment, while Waukesha increased its facilities 40,000 sq. ft. by the expenditure of $39,000 and added new factory fittings costing $35,000.

Huge Expansions by Tire Companies

A review of the tire field shows that the past year will apparently come close to being a record for the manufacturers, many of them having been forced to make very large expansions of their factory facilities. Goodrich and Goodyear made the largest additions, the total combined space of these running well over 1,000,000 sq. ft., while the cost represented an outlay of somewhere in the neighborhood of $1,500,000 to $2,000,000. Firestone and Fisk added 435,600 and 348,489 sq. ft. respectively, while Miller added 130,680 sq. ft. and Continental 85,000, the latter at an expenditure of $130,000.

The purchase of the Federal company at Milwaukee by the Fisk interests as reported in THE AUTOMOBILE last week will greatly increase the capacity of the organization.

Gear Makers Increase Equipment

The gear manufacturers have made a number of large additions to their factories, but the main feature of factory expansion in this field during the past twelve months was the increase in equipment. For instance Brown-Lipe-Chapin added 80,000 sq. ft. at a cost of $120,000, and purchased new machinery, etc., to the value of $500,000; New Process increased its space 140,000 ft., spending $240,000 on new equipment; Warner Mfg. Co. spent $200,000 for equipment and the T. W. Warner Co. expended $100,000 for the same purpose. Covert spent $10,000 also adding 17,500 sq. ft. to its plant at a cost of $35,000. Gemmer added 30,000 ft. and Detroit 12,000 at an outlay of $30,000, also spending $90,000 for new equipment. Timken-David-Brown is making an addition and purchasing sufficient equipment to enable the plant to quadruple its present production.

The same conditions prevail among the spring manufacturers as in the gear field, though perhaps in a more limited degree, Perfection has added 54,525 sq. ft. at a cost of $110,000 and has bought new equipment worth $109,000; Hess has added 45,000 at an outlay of $60,000 with $5,000 worth of new machinery, etc., and Tuthill has installed new equipment to the extent of $2,700.

Magneto Factories Enlarged

Factory additions have been the rule among the larger companies manufacturing magnetos, Bosch increasing its space 60,000 sq. ft. at an outlay of $125,000, and spending $50,000 for new machinery, etc.; Splitdorf adding 100,000 sq. ft., and purchasing the Sumter concern for $1,000,000; Simms increasing its space 9420 at a cost of $15,000 and expanding $100,000 on new equipment; and Eisemann adding 30,000 sq. ft. and buying machinery, etc., worth $40,000.

Activity in the way of new factory buildings has not been so marked in the carbureter field. Rayfield's addition was 12,000 sq. ft. at a cost of $30,000, with $25,000 worth of new machinery; Kingston's increase was 12,123 ft. costing $4,500 and $5,000 worth of equipment; and Breeze added 6000 ft. at a cost of $15,750, expending $12,000 for new equipment. Holtzer-Cabot has a new factory giving 150,000 sq. ft. of floorspace, while Master's new plant, which cost $50,000, provides 26,624 ft. and new equipment represents $35,000.

Casting and Forging Companies Expand

A number of the casting companies have made additions to their plants and equipment. General Aluminum & Brass Mfg. Co., has added 50,000 sq. ft. at a cost of $40,000, with $60,000 worth of new equipment. Harley added 30,000 sq. ft. at an outlay of $50,000. The Metal Products plant of the Timken-Detroit Axle Co. has made additions to its main plant and heat-treating department and has doubled its output in the past six months. National Bronze & Aluminum Foundry has added 15,000 ft. at a cost of $15,000; Atlas Brass Foundry 3360 ft. at a cost of $4,500 with $1,500 new equipment.

In the Accessory Field

In the radiator field, Fedders has increased his facilities 110,000 sq. ft. at an outlay of $100,000, spending $60,000 more for new equipment. McCord has added 19,500 sq. ft. to the main factory in Detroit and acquired two new factories, one at Wyandotte, Mich., containing 22,000 sq. ft. and to be used for gasket and stamping business and the other, for radiator manufacture, in Detroit and containing 65,000 sq. ft., the total additions for the year being 106,500 ft.

Of the wheel makers Salisbury has increased its plant by 30,000 ft. at an outlay of $25,000, spending $115,000 for equipment, a feature of the additions being the new office building.

Stewart-Warner Speedometer Corp. has added 275,000 ft. while the VanSicklen company has a 48,000-ft. new factory and has spent $80,000 for new equipment.

Of the spark plug makers, Champion Spark Plug Co. of Toledo, has added $160,000 worth of new equipment while the Champion Ignition Co., Flint, Mich., has increased its space by 12,172 ft. at a cost of $20,000 with new equipment worth $29,800. Gibson-Hollister has occupied a new factory 100 by 200 and has made an addition 40 by 100 costing $7,500, new machinery, etc., representing $8,375 being purchased during the year. Pittsfield Spark Coil Co. has occupied a new factory of 12,000 sq. ft.

Two manufacturers of brake lining have made considerable expansion during the past year. The Standard Woven Fabric Co. has occupied its new $300,000 plant containing 200,000 sq. ft. and has purchased new machinery equipment worth $150,000. The Royal Equipment Co. has added 35,000 sq. ft. at a cost of $110,000 and has spent $50,000 for new machinery.

New Marmon Is Unique Car

Remarkable Acceleration Obtained by Light Construction —Aluminum Motor, Special Frame, New Type Springs, Novel Body Construction—A Really Scientific Car

THE year 1915 has been one of new things throughout the whole automobile industry, never before have there been so many interesting new cars announced than during the past twelve months, and of the long list none will rank higher in interest than the new Marmon.

Possessed of years of experience in the manufacture of the largest and most powerful class of costly car, the Marmon company has now turned its attention to making a vehicle that will out-perform any it has made before and at the same time weigh vastly less. The new car is in every sense a luxury machine, yet it is 1000 lb. lighter than the great majority of automobiles in its class.

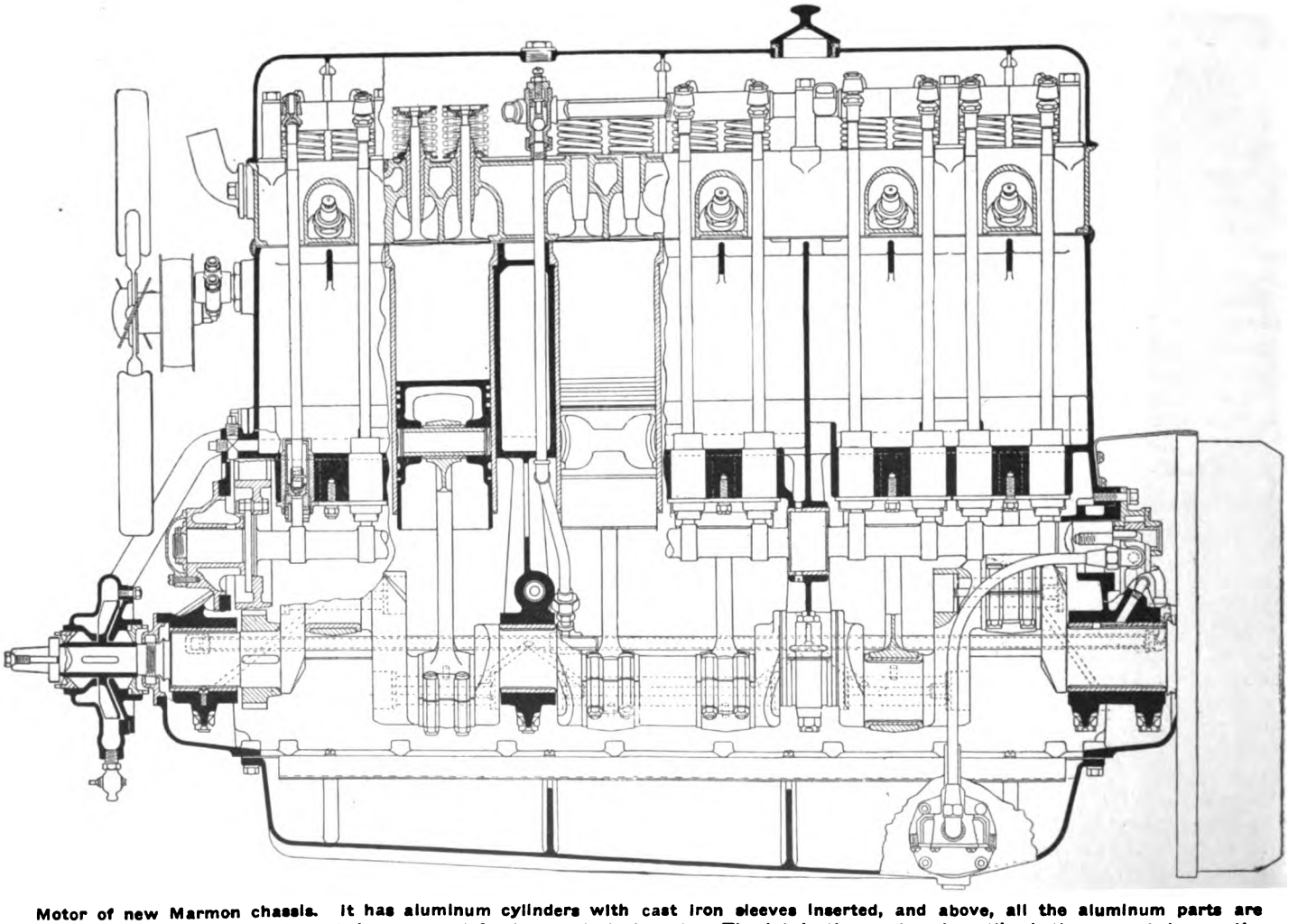
As a performer on the road its accelerative power on high gear is indicated by its ability to speed up from 10 to 50 m.p.h. in substantially less than 18 sec. Its maximum speed is between 60 and 70 m.p.h., it seats seven passengers with the comfort which is expected of the most expensive cars, and it has an unexcelled ease of steering and control.

The light weight has been secured by means of highly scientific design in combination with careful choice of material. There is much aluminum employed and much high tensile steel in thin section. The new car is new from stem to stern, from the motor to the rear axle no single opportunity has been missed where there was a chance to increase efficiency or reduce weight.

With this preamble the detail of the specifications may be considered, and some more concerning the performance of the car will be given later.

The engine is the first automobile motor to be placed in regular production with an aluminum cylinder casting. It is a six 3.75 by 5.125 in. with a piston displacement of 339.7 cu. in. The cylinders are cast in block with a detachable head and all the valves are located in the head, but the camshaft is in the customary position. The valves themselves are 1.75 in. clear diameter with a lift of ⅜ in. and the engine develops over 70 hp. at 2500 r.p.m. Thus the motor is not only a large six but a six of high efficiency.

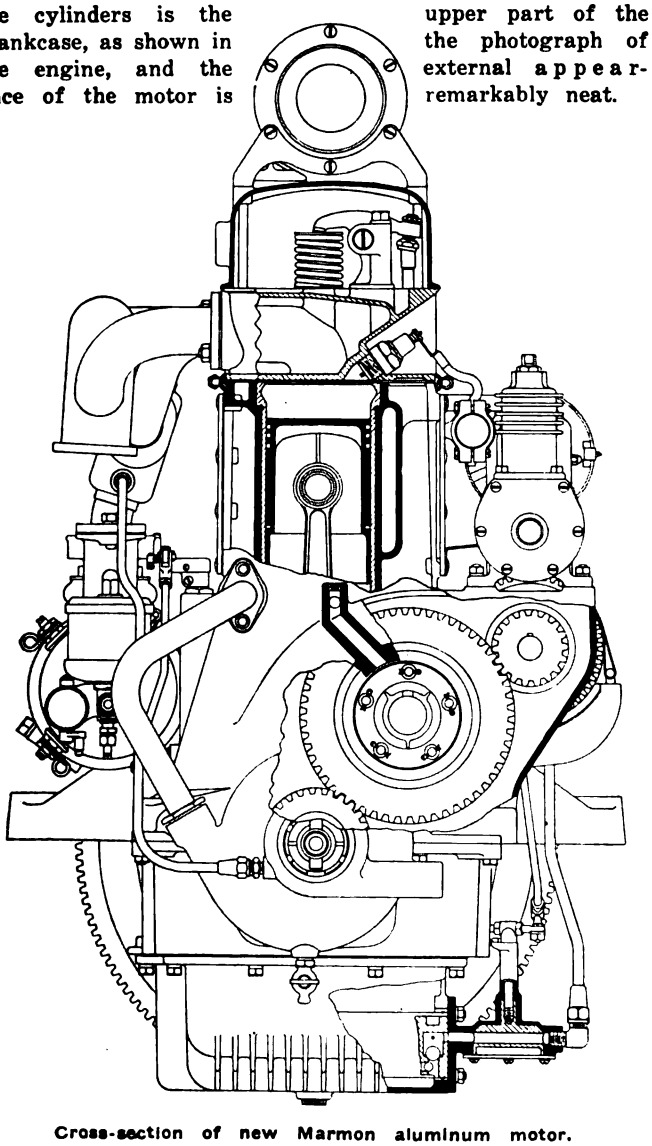
On the score of vibration the ever-present tendency to



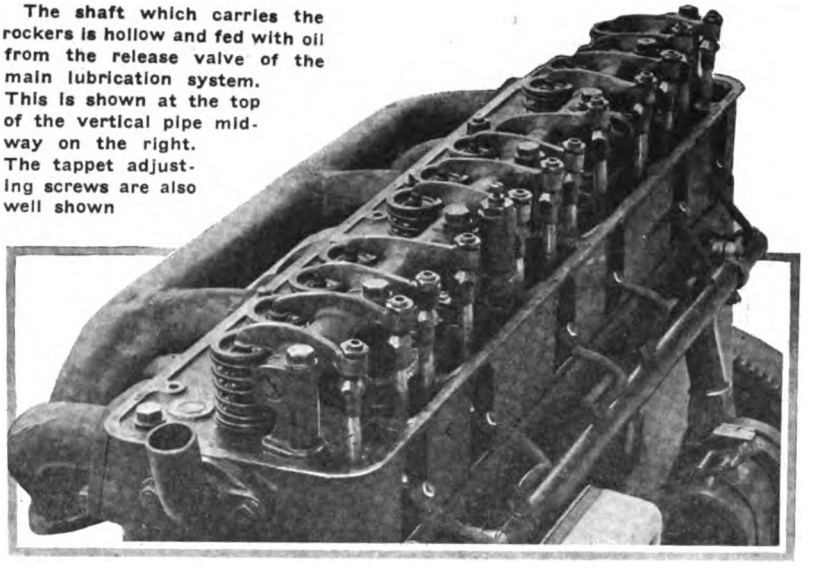
Motor of new Marmon chassis. It has aluminum cylinders with cast iron sleeves inserted, and above, all the aluminum parts are shown in black, the section lining being reserved for iron and steel parts. The lubrication system is outlined, the pump being on the camshaft and the oil throttle valve on the end of the suction pipe in the crankcase. It is connected to the carbureter throttle

crankshaft deformation in a six has been countered by the use of a 2.25 in. crankshaft with four main bearings, there is no detectable vibration at any speed between 3 and 65 m.p.h. Quietness has been attained to a high degree, the complete inclosure of the overhead valves eliminating sound from the tappets more effectively than is the case on most motors of normal design. Absence of torsional oscillations in the crankshaft renders it easy to make silent the front end gears, and there are no accessory drives which can easily produce noise. It is no exaggeration to say that there would be extreme difficulty in judging the number of cylinders except by the nature of the exhaust at low car speeds.

Nor is this motor geared very low on high gear in order to give the remarkable ability which the car exhibits since the ratio is 3.69 to 1 with 34-in. tires, giving a crankshaft speed of 1095 r.p.m. at 30 m.p.h. Into the aluminum cylinder block thin iron sleeves are pressed after machining is completed, in order to provide a working surface for the pistons, which are also aluminum alloy made by the permanent mold process. At present the head casting which carries the valves is iron, but it is hoped to be able to make this also in aluminum with iron valve seats when the supply of castings becomes a little more plentiful. Cast in unit with the cylinders is the upper part of the crankcase, as shown in the photograph of the engine, and the external appearance of the motor is remarkably neat.



Cross-section of new Marmon aluminum motor. Observe that these timing gears suffice for all drives. The excellent cooling round the valves is well shown



The shaft which carries the rockers is hollow and fed with oil from the release valve of the main lubrication system. This is shown at the top of the vertical pipe midway on the right. The tappet adjusting screws are also well shown

Lightness in the power plant does not depend solely upon the utilization of aluminum however, since simplification of design also plays its part. For instance, there are but three timing gears, a pinion on the crankshaft and one for the generator and magneto drive with the large camshaft gear intermediate. The water pump is ingeniously made up on the front end of the crankshaft, the material being aluminum and the packing glands of very large size and very easy to tighten.

Lightness Obtained by Ingenious Design

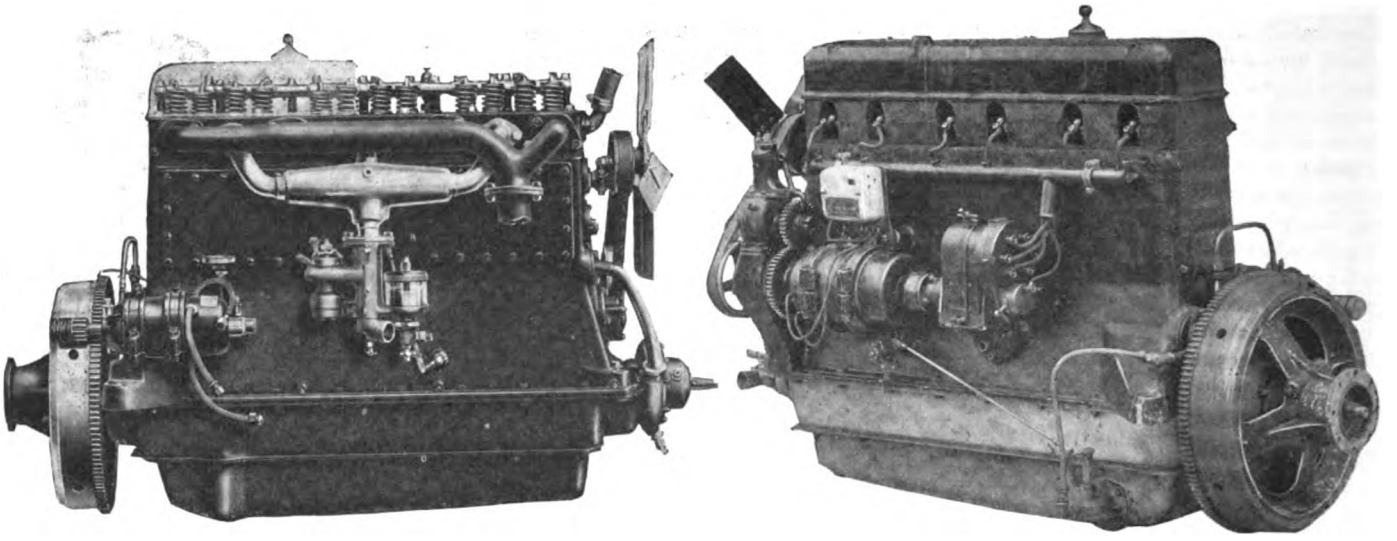
In the valve gear lightness is obtained in every detail. Tappets are die-cast with large bearing surface and a minimum of material for the size, the long push rods which connect with the rockers are aluminum alloy with steel ends, the rockers are highly finished forgings of alloy steel and the valves themselves are light for their size.

A point which doubtless assists quiet operation is that the push rods are inclosed entirely, and adjustment is provided on the rocker ends. The ends of the push rods are hemispherical and fit in sockets in little screwed set pins which are locked by split, conical seated nuts; the adjustment is rapid and delicate, while the locking is absolutely secure.

One reason that the overhead valve motor has not been more popular is the difficulty in lubricating the parts properly. In the Marmon this is cared for by making the rocker shaft hollow, and pumping oil to it, whence it escapes through the bearings and returns to the crankcase. Each little set screw which bears on the upper end of the push rod is hollow, and oil spray keeps it filled, so maintaining lubrication at this point, while overflow passes down the rod and cares for the lower end. Altogether the valve system is lubricated much more efficiently than is usual on L head motors and the precautions for draining the surplus are such that there is no possibility of oil seeping down the valve stems and so reaching the combustion chamber.

As to the main oil supply, this is controlled in an unusual way. On the rear end of the camshaft is the gear type pump, partly contained within the crankcase casting, and this sends oil to the four main bearings of the crankshaft, thence through drilled holes to the lower connecting-rod ends and thence by spray to the cylinders and wristpins.

It has been explained that oil is fed to the hollow rocker shaft, but this is not sent up under full pressure. At the center of the main oil lead, which is cast-in the crankcase, there is a vertical standpipe at the top of which is the pressure release valve, and it is through this release valve that oil goes to the rocker shaft. Also, besides the other oil feeds, the tappets are contained within a chamber separate from the crankcase proper and this is kept filled with oil so the



These views of the motor show its remarkable cleanliness and the great accessibility of the electrical units and of the carbureter

cams and the tappets operate beneath the surface of a tankful of lubricant.

Again, the oil supply is regulated in proportion with the work done; when the throttle is wide open the pump receives a full supply and delivers full pressure, but when the throttle is closed a constriction is put upon the suction intake of the pump and the supply thereby cut down. The device is a simple tap of large dimensions, and it is so arranged that no maladjustment can shut off the supply entirely; the tap is a loose enough fit to permit the passage of a great enough supply to feed the engine adequately when idling. The effect of the control is greatly to economize oil and to reduce the tendency to carbonize, already greatly reduced by the extremely efficient cooling furnished by the aluminum pistons and cylinders.

Engine Wonderfully Accessible

The engine is one of the most accessible ever built. An easily removable cover lays bare the valves in a moment, the carbureter, a Stromberg, stands high on the right side, the Bosch generator and magneto equally high on the left. The glands of the water pump can be reached without effort, the oil pump and the oil throttle are both removable without disturbing any other parts. As can be seen from the photograph, the spark plugs stand in the side of the head casting, and have wires of only a few inches in length, while all but three of the lighting equipment wires are centralized in the control box which is mounted upon the generator. The oil filler is in the extreme top of the cylinder block and the level gage is a quadrant situated horizontally just beside the carbureter. There is nothing which requires to be "reached" for. Carbureter accessibility and the accessibility of the starting motor is enhanced by bringing the exhaust manifold down at the front end of the motor, and this also keeps the heat away from the driver's compartment.

The foregoing deals with the main features of the motor, but there are many points of minor importance displaying as great an ingenuity; they are mostly made clear in the illustrations.

Frame Is Elaborate Structure

Passing on to other parts of this novel car, mention may next be made of the frame, since this is another place where much weight has been saved. In section the sills are narrow, and of thin stock, but the depth is 10 in. and use is made of the steel running-boards to provide much of the strength. The main side pieces end with the running-board, which is upswept at this point, so forming the front end of the mudguard, and the end of the body is supported by a separate portion riveted to the principal side pieces. Across this is a deep, cross member which makes the tonneau heel board; so the rear end of the body consists of nothing more than the back and sides of the seat. Although of such thin steel, the frame has its various parts so proportioned that the dead metal is reduced to a minimum, and it is thus stronger than usual as well as lighter.

Next, the body becomes light by virtue of the frame construction, as there are but three pieces, the cowl, the front seat and the rear seat. These are of sheet aluminum on light wood frames and carry the doors, which are remarkably free from shake owing to the immense rigidity of the very deep frame section. Thus properly speaking there is no separate body, both body and chassis are a unit and reduplication of strain bearing parts is thus eliminated completely.

However, to return to the chassis, the gearset is located on the forward end of a long torque tube, so forming a unit with the rear axle, and the clutch connects to the gear shaft by a universal joint, the only universal on the car. The clutch itself is the only part which is almost unchanged from previous Marmon practice, it being a fabric cone with aluminum center, the flywheel having the cushion spring inserts which have been largely instrumental in making the Marmon clutch so successful with large, powerful engines.

To suspend the end of the torque tube so that the rear axle shall have freedom of movement in all directions, there is a very large ball and socket joint, the ball being secured to the gearbox and the socket to the frame. Then, to connect the gear shaft to the clutch is a short shaft with a universal at the rear end and a universal coupling at the front end. The latter consists of a gear wheel with rounded teeth, set into an internal tooth gear which is part of the clutch. The centers of the ball support and the universal are as nearly as possible the same, so very little motion is put on the front end coupling.

Clutch Draw Combines Brake

In the center of the short clutch shaft are three collars like the thrust collars of a marine propeller shaft, and inclosing these is a casing which is oil retaining and forms the

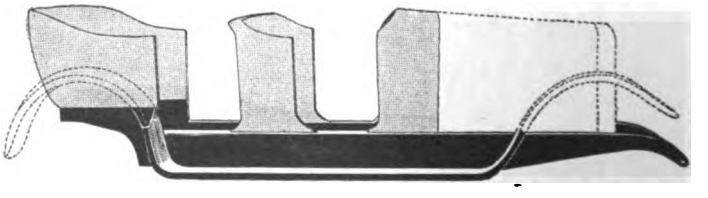
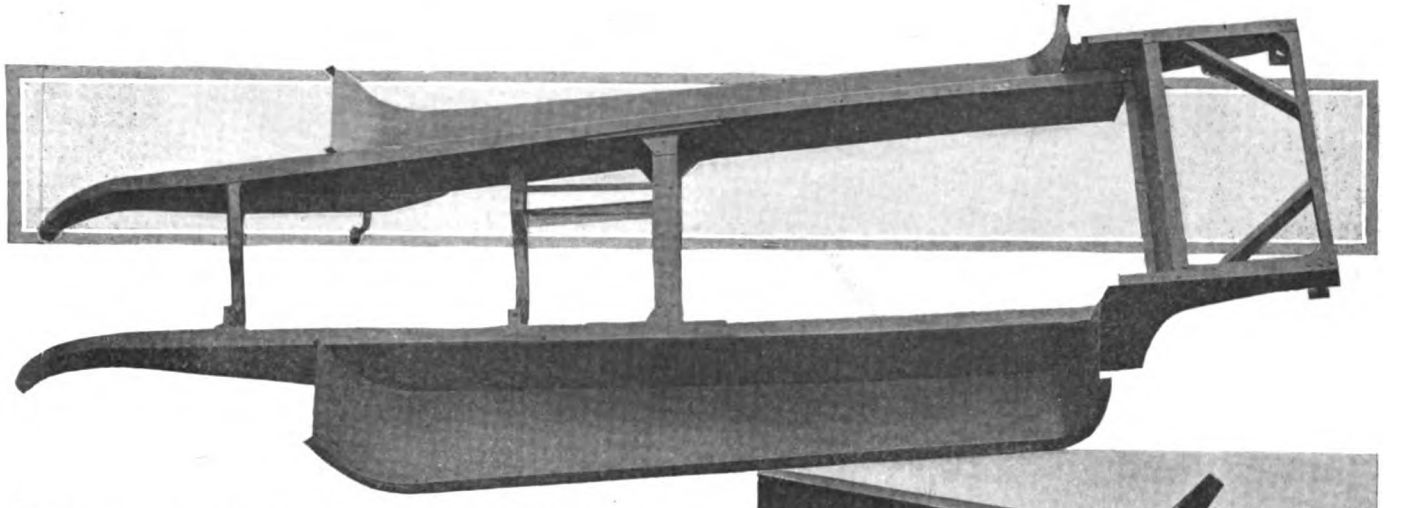
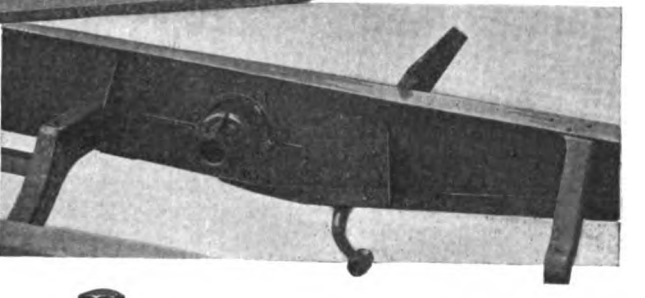


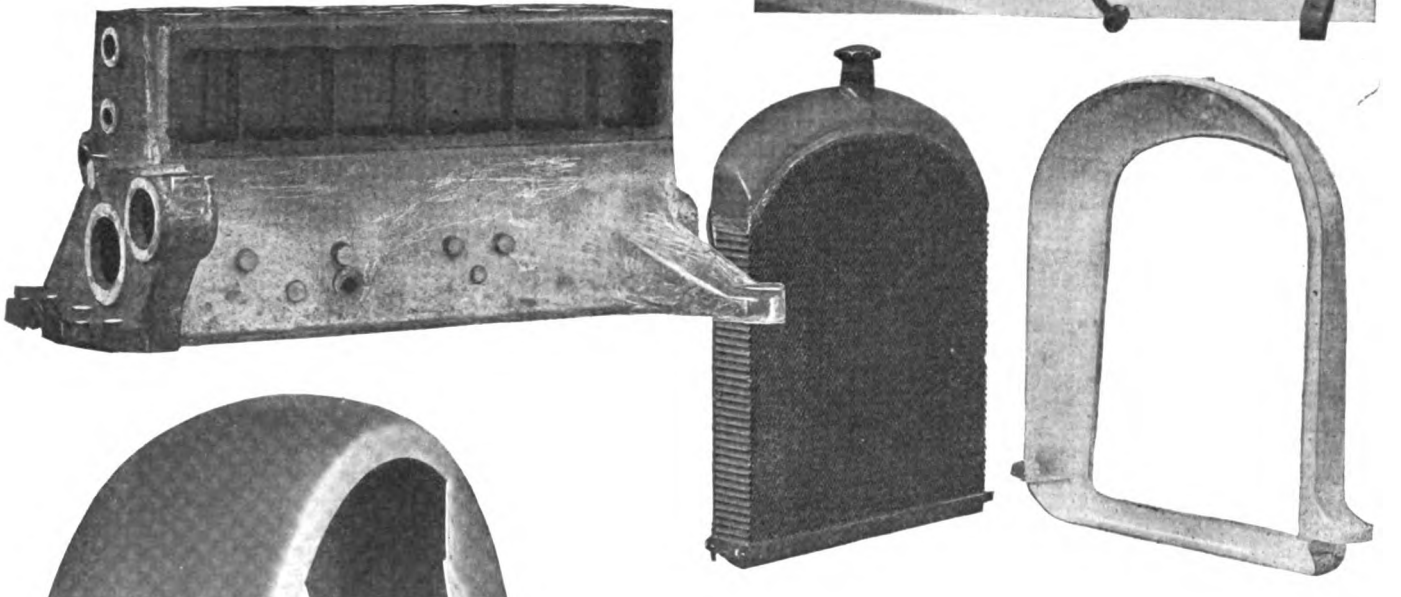
Diagram of the Marmon unit body construction. The main frame is also the body frame and there are no wood sills

Some Parts Contributing To Marmon Lightness

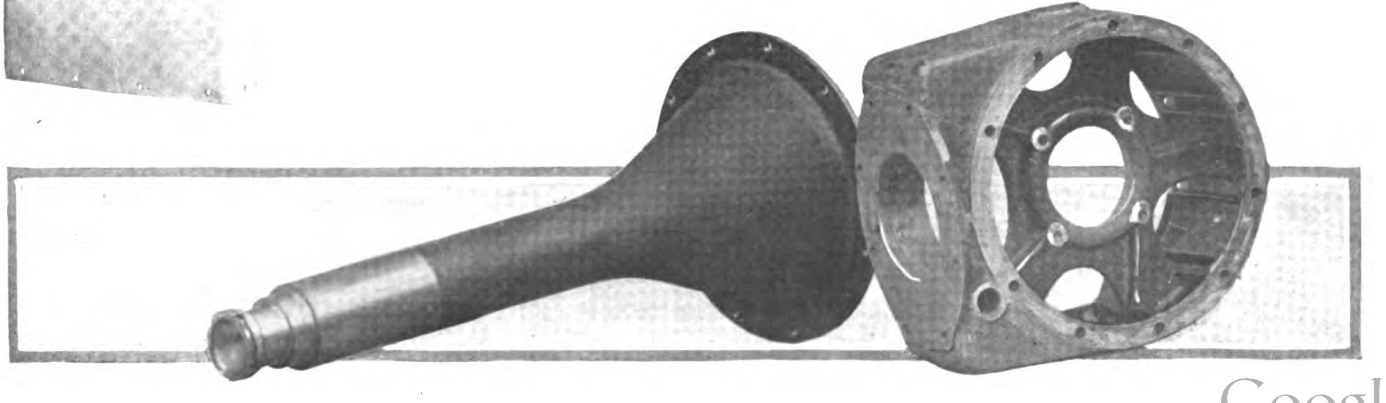


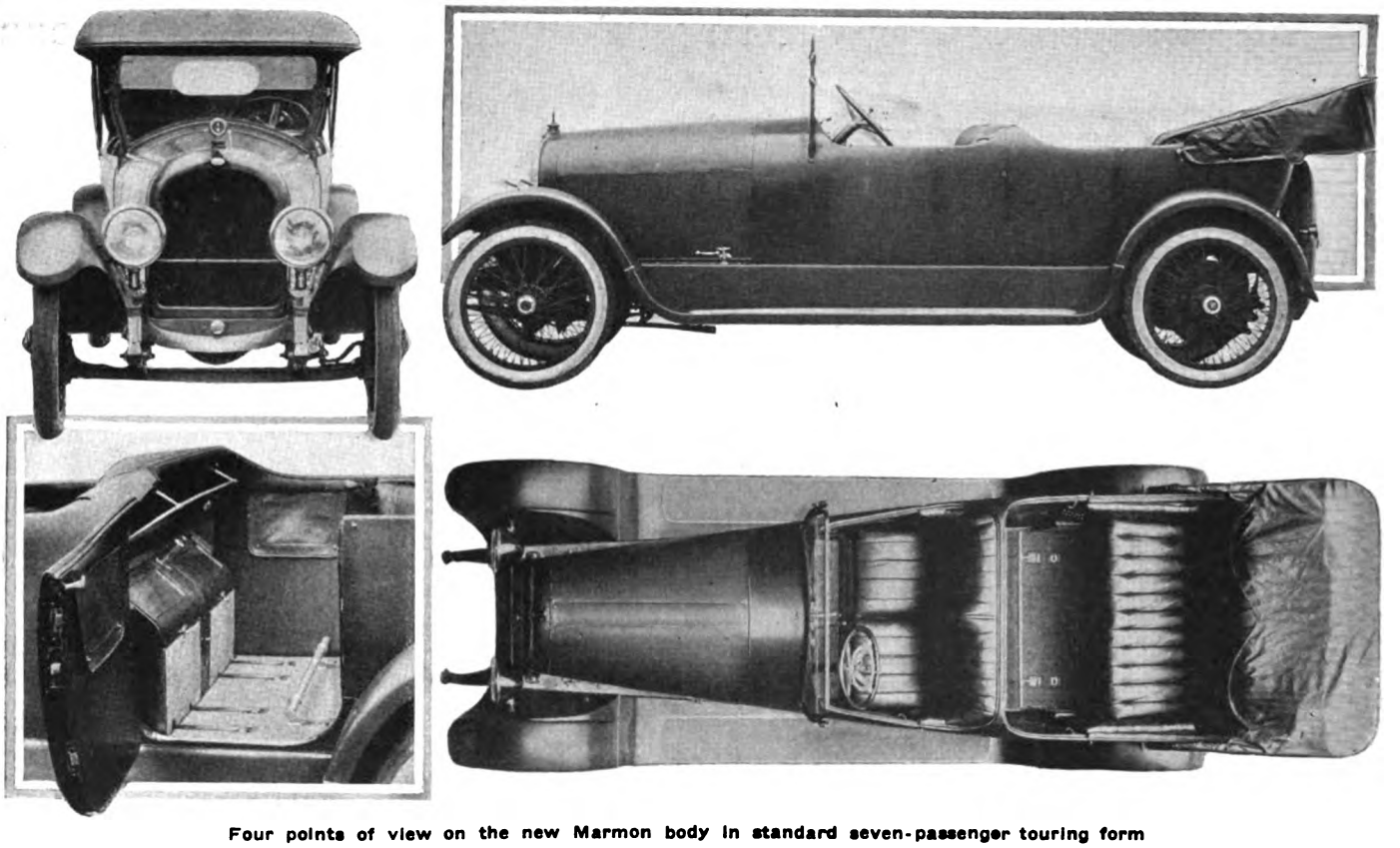
The frame is so designed that every ounce in it does work, even the running boards supply stiffness and carry weight. It is made of many pieces of thin steel and the details are carefully joined by rivets. The small view on the right shows detail of this riveting at the point where the steering gear is attached and the left running board is bent up to form a portion of the fender





The aluminum casting for the cylinders as it appears in the rough state shows the compartment in which the push rods lie. The radiator shell is an aluminum casting of great rigidity, insulating the more delicate core from shocks and strains. The fenders are made from single sheets of stout aluminum and the rear axle has an aluminum center case with thin, cold drawn steel tubes





Four points of view on the new Marmon body in standard seven-passenger touring form

medium for clutch withdrawal, the lower end of the pedal linkage pressing on this case. The plain thrust collars provide a natural amount of friction for the purpose of braking the clutch but not so much as to interfere with the ease of changing down from a high to a lower gear. A quick change down and a leisurely change up can be performed with equal ease.

Since the front coupling of the clutch shaft is held from oscillation by a spring there is no chance for the development of rattle and the universal, being so far from the axle, has a minimum of movement. Incidentally, its accessibility is enhanced by its situation in front of the gearbox, so it is far easier to replenish lubricant than if in the customary place. In designing the gearset, which provides three speeds, the aim has been to obtain the greatest possible degree of quietness, hence the countershaft is stationary and the gears revolve upon it on plain bushings. For the main shaft Hyatt roller bearings are employed with a Hyatt spigot bearing and a single ball bearing to support the front end of the constant mesh pinion and care for thrusts.

The driveshaft is tubular and contained within a drawn steel tube, having a casing at the front end to which the gearbox is bolted. Within this case is a skew gear drive for the speedometer and a disconnecting coupling which joins the driveshaft and the gearshaft. Also on this case are the ends of a pair of rods which run to the outer ends of the axle, for the purpose of triangulating and stiffening the unit. In connection with these rods is a petty detail which is typical of the care and thought displayed throughout the car, for the yoke pins which secure the rod ends to the axle and to the gearbox are taper, and fit in taper sockets, so that when driven in with a tap from a hammer all slack is taken up.

Rear Axle Light, but Strong

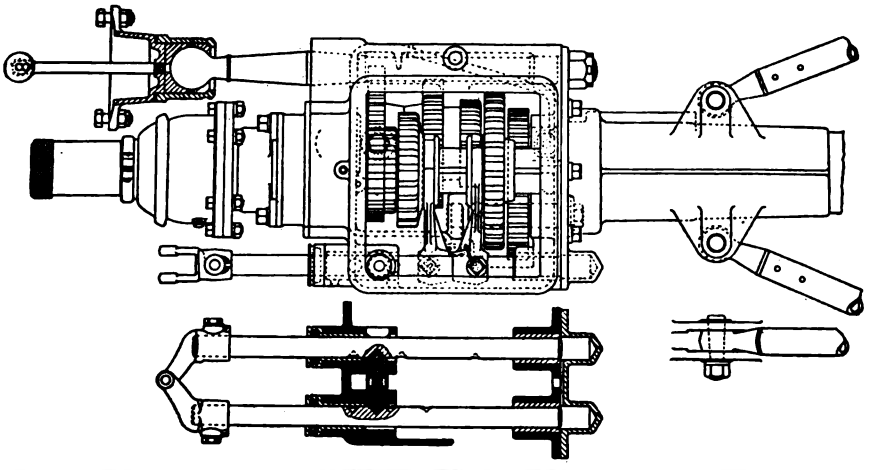
Coming to the rear axle, this contains one of the finest examples of cold drawn steel work ever found in an automobile, the tubes being each made from a single billet of steel in the Prest-O-Lite plant at Indianapolis. The center case is an aluminum alloy casting and carries everything connected with the gears. Located at the geometric center of the spiral bevels is a double row ball bearing and, being in this position, it supports all driving stresses. The other end of the differential carrier, behind the ring gear, thus requires only a steady bearing, and this consists of a large Hyatt roller set in a conical socket which takes its own natural place in the conical steel tube. The driveshafts are secured to the hubs, and can be withdrawn from the differential, while the wheels are mounted on large, single row ball bearings.

To carry these bearings a piece of steel is turned, socketed into the end of each conical tube, and then riveted in place. There are no castings or forgings to hold the brake cams; instead, dished steel pressings are used, also riveted to the main tubes, and having attached to them the necessary small bushings to carry the brake operating shafts. The brakes themselves are conventional, 17½ in. diameter and 2 in. wide, the operating toggles being of such proportions that exceptional power is provided. To prevent egress of oil through the wheel bearings, multiple felt washers are put in each end of the axle, and a screw thread cut on the driveshaft carries excess oil always inward back toward the axle center.

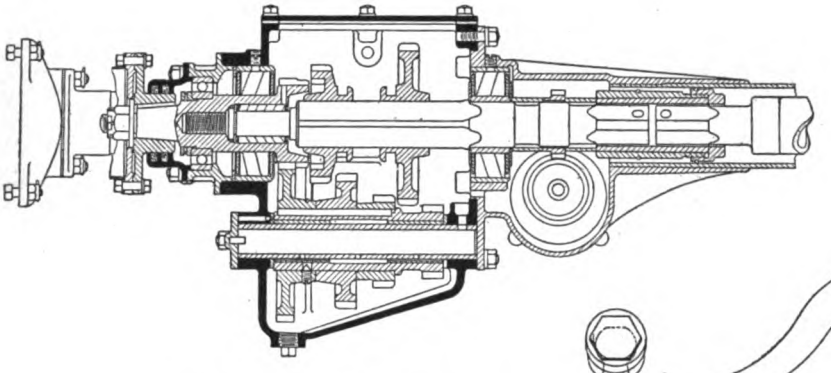
Springs Have Variable Period

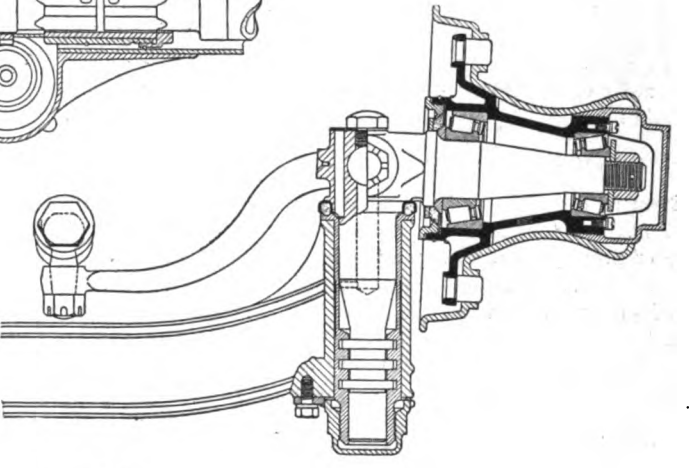
For springs the front axle is attached through semi-elliptics which have no abnormality save that some reversed leaves are placed on top, this making the spring much easier in action and taking out harshness. It has the effect of a shock absorber. At the rear the springs are unconventional, there being two of semi-elliptic form set transversely one above the other and back to back. To follow the action it is necessary to refer to the photograph which shows that the upper spring is slightly the shorter and that there is a piece of wood between the pair cut to a curve and with projecting ends.

On the right side the springs are attached to simple pins on the axle and frame respectively, while each spring is shackled at the other end. Taking a bump which is equal on both wheels both springs operate together and as they compress they come more and more into contact with the wood, which spreads the width of support and, by thus effectively shorten-

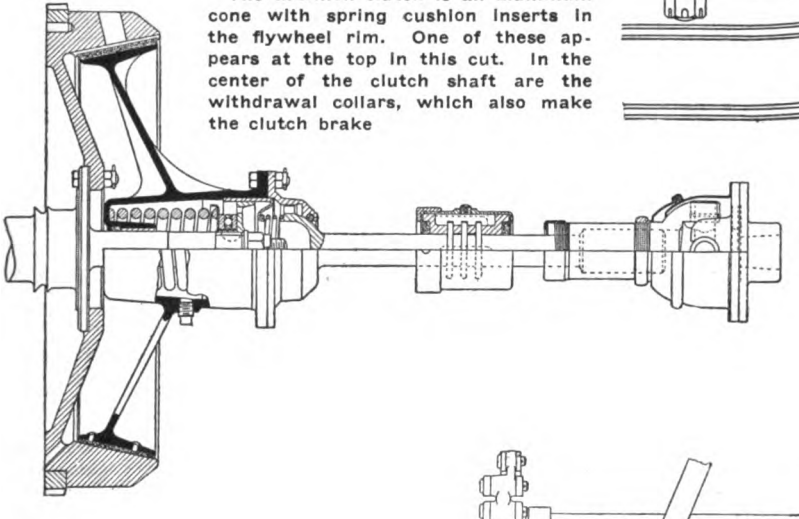


The chief points to observe in the drawing of the Marmon gearset are its method of assembly as the front end of the torque tube and its attachment to the frame. The large ball seen in the top left corner sets in a socket on a cross member of the frame and gives complete freedom of movement to the transmission assembly. Behind the gearset proper is a case which incloses the speedometer driving gear, and this forms the torque tube head. A disconnectable coupling links the gear shaft to the propeller shaft. Taper pins in taper sockets are used for the attachment of the stay rods which triangulate the axle and gearset assembly.

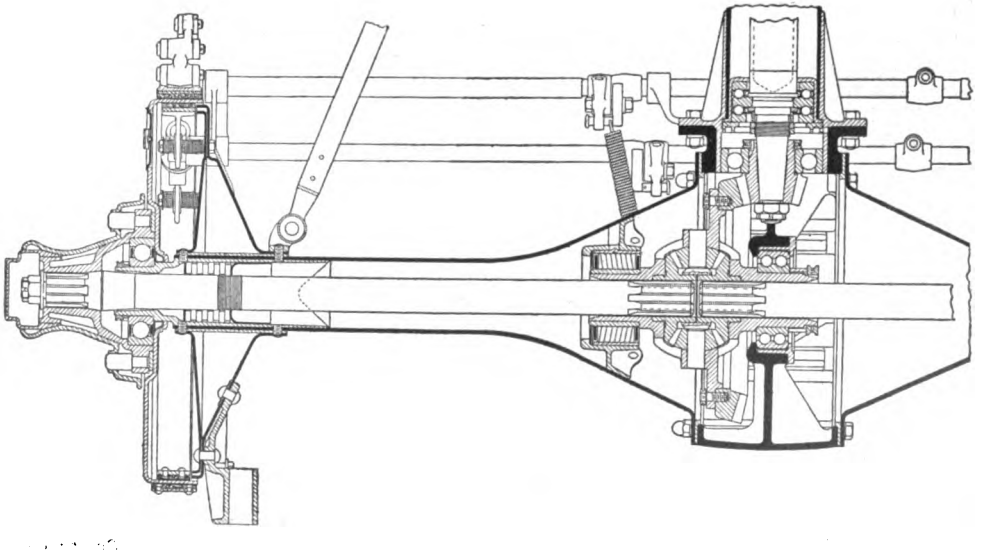




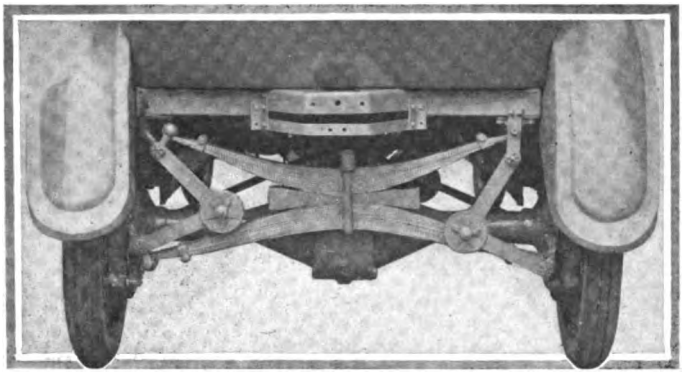
The Marmon clutch is an aluminum cone with spring cushion inserts in the flywheel rim. One of these appears at the top in this cut. In the center of the clutch shaft are the withdrawal collars, which also make the clutch brake



The front axle swivel on the Marmon is absolutely waterproof and once filled with oil it cannot escape. The weight is taken by the three collars which, being in a perpetual oil bath, move with very little friction



The differential case of the Marmon is an aluminum casting strongly webbed and ribbed. The sleeves are of thin, cold drawn steel tubes, the end pieces being put in afterward. It is a light but very strong construction



Marmon rear spring suspension

ing the spring, stiffens it in proportion to the violence of the shock. The natural expectation, however, would be that a car so equipped would be liable to roll, while in actual fact there are few cars so innocent of this fault. The explanation is that one spring being shorter than the other their periods are different and one damps out the other, which action is intensified by the effect of the wood separator.

To test this springing the writer drove the car over moderate gravel and dirt roads at speeds from 10 to 50 m.p.h. with a single 140 lb. passenger in the rear seat and no bump was sufficiently severe to separate him from the cushion. This is a rough test only, of course, but it is fairly severe.

Very Easy Steering

Even in the front axle there is novelty, and a very important novelty too, since it is a feature which improves the ease of steering and renders the improvement lasting. This is the construction of the swivel, which is absolutely waterproof and oil retaining. The swivel axle is shaped like an inverted L and the downward projecting vertical part has three integral collars turned upon it. A split bronze bushing, turned to fit the collars is then put on the spindle and pushed into the bored end of the axle forging, a large cap, something like a hub cap, is then screwed on the bottom of the split bush and locked firmly to the axle, so the swivel pin thus stands in a cylindrical container with no opening save a narrow crack at the top. This is closed by a protecting washer and the pin is drilled to hold oil which is put in through a plug in the extreme top. Since the oil cannot escape it requires replenishment at long intervals only, and the three collars provide a thrust bearing of so large an area that the pressure per square inch is low and movement consequently easy. The design is stronger than the ordinary forged axle as well as being neater and far more effective.

To mention a few other details briefly must suffice, though it would be possible to treble the length of this description. The body, the construction of which has already been described, has a unique feature in that the upholstery is all detachable, being made up in separate units, so in an hour a complete change in upholstery can be made. The finish is of an even better class than that hitherto provided on Marmon cars and the very high sides give extreme comfort. As to the appearance the illustrations are the best criterion.

It is a high-sided type, with a high hood and, if it is necessary to classify it, would belong somewhat to the Italian school of automobile engineering. The folding seats of the seven-passenger model close into a cabinet as shown in one of the illustrations and the body *looks* quite massive despite its remarkable lightness.

The car is delightful to handle. Not only does the engine possess that elasticity and smoothness which characterizes the first half dozen cars of the world but every control operates with small effort. On a rough road it is easy to steer with one hand, and then with but a light grip of the wheel. The clutch needs only a little pressure to disengage it and the service brake has leverage enough to pull the car up smartly without more force on the pedal than the average woman could easily supply. Both gearshift and emergency brake levers are positioned so that they can be grasped without moving the body.

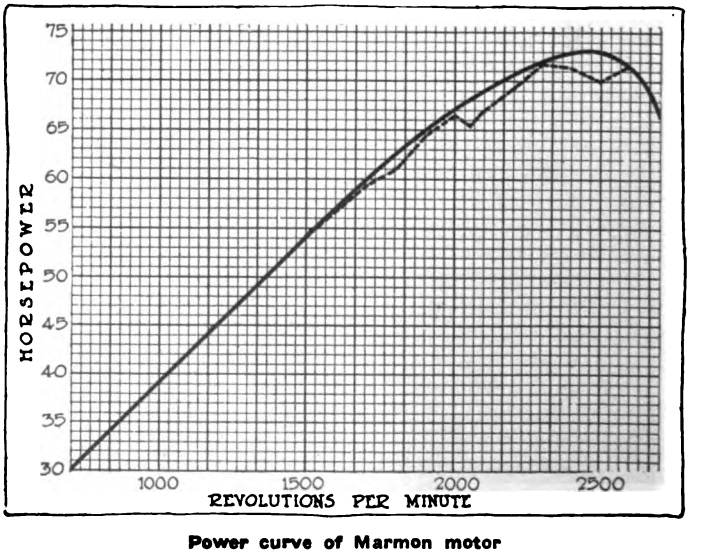
On Indianapolis speedway the mean results of a large number of tests made in both directions on opposite sides of the track showed the following accelerations: From 10 to 20 m.p.h. 3.6 sec., 10 to 30 8.0 sec., 10 to 40 12.4 sec., and 10 to 50 17.6 sec. The half mile was repeatedly covered in several seconds under the half minute. Cornering on the speedway at about 60 m.p.h. there was hardly any roll on the rear springs and the steering operated as easily as on the road at half the speed. Published on this page is the power curve pulled by the engine with which these tests were made about two weeks later, before it had been cleaned out and just as it came from the chassis. In running trim and with supplies, as tested, the weight was just over 3600 lb. but the cars now coming through in regular production are about 100 lb. or more lighter, since there remained a few places where a little more metal could be cut, and this has been done.

In conclusion it is hardly necessary to itemize the equipment which is simply what the buyer of an expensive car expects to get. Tires are 34 by 4½ in. Silvertown cord, the wheelbase 136 in. and the Hartford shock absorbers shown in the illustrations are included. The price for the seven-passenger touring car is $2,750, for the five-passenger touring car, three- or four-passenger "Club" roadster, $2,700.

This new car replaces all previous Marmon models, which are no longer to be manufactured, and since it is so novel a chassis, it should be explained that the design is the product of several years' work. Various of the features which go to make its character have been tested individually, and the complete car has undergone severe trials on road and speedway.

One of the first experimental models was taken right across the continent at an unfavorable time of year, encountering roads in the worst possible state, so the experimenting has been carried out in as thorough a manner as could be desired.

The car has been ready in its final form for several months, the manufacturers desiring to be able to commence deliveries practically as soon as the announcement was made; actually it has been in production for many weeks and some parts were coming through the Marmon machine shops as long ago as September. The car will, like other Marmons, be built entirely in the company's plant at Indianapolis, which has recently been enlarged and rearranged to suit a single model program, and the whole organization is prepared for an output considerably in excess of that of any previous model Marmon car.



Power curve of Marmon motor

The Rostrum

Requirements of Automobile Lubricants

EDITOR THE AUTOMOBILE:—Kindly tell me the necessary qualities for an oil of the first grade to meet the demands of modern high speed racing cars with forced feed lubrication, such as were used in the Indianapolis and Sheepshead Bay record smashing races? As I am interested in getting at the undeniable facts concerning the class of oils that are proving their superiority by the results in actual service of both special racing creations and modern fine motor cars for touring, I would appreciate your telling me whether Castor, Pennsylvania, Oklahoma, or Texas oils are showing any indications of individual qualifications that will be really more desirable?

1—According to the best modern experience and available data, what oil specifications of viscosity, gravity, flash, fire, cold test, and carbon residue are considered essential to an oil of the very first quality and grade for modern touring car motors, such as the Pierce, Packard, Stearns-Knight, Locomobile, National, Mercer, Chalmers, Jeffery and Hudson?

2—Do the race drivers use Castor oil exclusively in their high-speed motors with forced feed lubrication?

3—Is the castor oil compounded with any other kind of oil?

4—If it is compounded, what kind of an oil is used and what are the proportions used? Pennsylvania, Oklahoma or Texas oils?

5—Is a straight Pennsylvania oil used?

6—What are the preferred brands generally used?

7—Can you give me the viscosity, gravity, flash, fire, cold test, and carbon residue of four or five of the best oils?

8—Is a Pennsylvania oil used that is compounded with any other oil?

9—Do any of the race drivers use Oklahoma, Illinois or Texas oils?

10—Can you tell me whether such oils are ever compounded with Pennsylvania oils for the demands of the drivers?

11—Do any of the great race drivers mix an oil of one brand with another oil of lighter or heavier body to get an oil that they seem to be better satisfied with? If so, can you tell me what improvement they strive for? The results they desire might be better secured by making an oil to meet their special requirements.

Warren, Pa. J. L. S.

—It is generally accepted that an oil for use in the oiling system of modern automobiles should have a high flash point so that it will remain a lubricant and resist blackening and deterioration for the longest possible period. An oil of low flash will blacken, deteriorate and thin out quickly, losing its lubricating properties and consequently the oiling system will need to be cleaned out and replenished with fresh oil much oftener than it would be when a high flash long wearing oil is used. The requirements of different cars vary materially as motors having large bearing surfaces require different oils as far as body is concerned from those which have other areas of bearing surface.

According to oil manufacturers an oil for use on cars which have large bearing surfaces, like the Packard, for instance, should be light bodied and have a viscosity of 175 to 210 Saybolt, to work best. On cars such as the Pierce, Locomobile, Chalmers, Jeffery and Hudson a medium-bodied oil at about 250 deg. is very satisfactory. On cars like the Stearns-Knight, National and Mercer a heavy-bodied oil of about 325 deg. viscosity is most satisfactory.

In general cars which are habitually driven at a higher rate of speed should use a heavier-bodied oil than the same cars driven at lower speeds. For fast driving an oil should have a heavy body and a high flash test in order to withstand the more severe conditions.

Authorities state that gravity is immaterial except as it indicates the grade of crude from which the oil is produced. Pennsylvania oils are generally accepted as desirable for automobile lubrication and they are of high gravity.

Low cold test is not so essential in present systems although it is desirable to have the cold test as low as possible consistent with a high flash test. In other words, it is not considered desirable to sacrifice a good flash test in order to secure an abnormally low cold test. In present day lubricating systems, an oil with a cold test of 25 deg. Fahr. should be satisfactory.

2—Very few racing drivers use pure castor oil. In the big races there have not been more than one or two drivers in each instance.

3—Nowadays, if castor oil is used it is not compounded but in former years it was some times mixed with alcohol. It may be that some drivers are using a mixing process of their own which is privately kept to themselves.

4—Some of the oil companies are compounding castor oil with mineral oil, for instance Crystal Oilzum, which is used by a great many drivers is compounded by a special process of castor oil and Oilzum, mineral gas engine cylinder oil. In this case, the mineral oil used is straight Pennsylvania.

5—Yes.

6—The brands of oil used in each race can be determined by referring to the issue of THE AUTOMOBILE following each race of any importance. In this issue there is given in each instance an equipment table which mentions the brand of oil.

7—This is entirely dependent upon the car for which the oil is used and what would be a good oil for one car might be a poor one for another owing to the different areas of bearing surface and the different systems of lubrication. A few examples of what companies are using or recommending for their cars might be of interest. The Hudson Motor Car Co., uses at the present time a heavy Polarine for summer and a light Polarine for winter. The properties of these two oils are as follows:

Properties	*Light Polarine*	*Heavy Polarine*
Gravity	.901	.907
Flash Point	373°F.	385°F.
Fire Test	420°F.	437°F.
Cold Test	–2°F.	–4°F.
Viscosity (70° F.)	242.5	529.4
(Tagliabue) 212°F.	86.2	93.6

The Packard Twin Six instructions state that the oil best adapted for this car is light in color and has the following properties:

Gravity, Baumé, 28.5 to 29.5.
Viscosity at 100° F. Saybolt, 285 to 300.
Flash Deg. F. 430 to 450.
Fire Deg. F. 495 to 500.

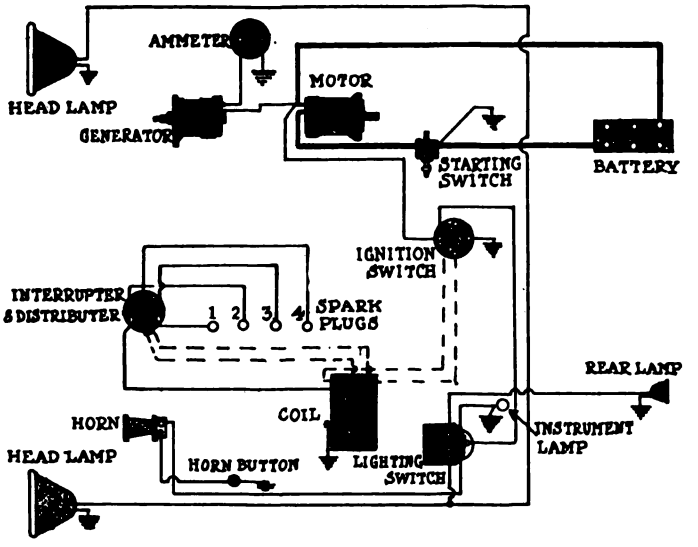


Fig. 1—Wiring diagram of Bijur lighting and starting system on 1916 Model N Hupmobile, showing ammeter installation between generator and ground

The Chalmers concern state that the viscosity for their cars Tagliabue at 70 deg. Fahr. should not be below 220, Gravity at 60 deg. Fahr., not below 29 Baumé. Flash not below 400 deg. Fahr., cold test not over 20 deg. Fahr. A large number of concerns specify a brand of oil which is marketed under the name A and B according to the grade. These properties are as follows:

Properties	*A*	*B*
Gravity	24.5	26.5
Flash Point	415	520
Fire Test	280	590
Cold Test	40	42
Viscosity (104°F.	307	1306
210°F.	49	125

8—Yes, this is done.

9—We have no record of any drivers who do this.

10—There does not seem to be any object of doing this as this would reduce the flash test and an extremely high flash test is necessary where an oil is used for racing purposes.

11—We do not know of any drivers who mix an oil of one brand with another of lighter or heavier body. In such oils as Crystal Oilzum the compounding is done to make an oil that will be faster than pure castor oil.

Mounting Ammeter on 1915 Hupmobile

Editor THE AUTOMOBILE:—Kindly give me full instructions for installing and connecting an ammeter on a present model Hupmobile equipped with the Bijur lighting and starting system, also on the earlier model equipped with the Westinghouse system. In addition, I would like to obtain the same information regarding the present model Chandler equipped with the Gray & Davis system and the earlier model having the Westinghouse system.

East Orange, N. J. G. L. C.

—The diagram which will give you full instructions for installing and connecting an ammeter on the Hupmobile is shown in Fig. 2. The diagram in Fig. 1 applies to the Chandler and Hupmobile with the Westinghouse system. An ammeter to be used in these circuits should be of the double-reading type with zero in the middle of the scale and about 20 or 30 amp. each way from zero. It is usual to mount such an instrument on the dash, but of course the position of mounting depends entirely on your desires.

On the Chandler model with the Gray & Davis equipment the ammeter should be connected in the circuit between the terminals B at the regulator cutout on top of the motor generator and the battery, but to avoid the cutting and splicing of wires, it is advised that the wire be disconnected from terminal B at the regulator cutout and connected to one terminal of the ammeter. From the other terminal of the ammeter a wire of the same size should be connected to terminal B at the regulator cutout. When the engine is at rest, light turned on, the ammeter should indicate discharge, the amount used by the lamps. If charge instead of discharge regulations are shown, reverse the ammeter connection.

The Bijur company states that in installing the ammeter in the generator circuit of the 1916 model N Hupmobile with Bijur lighting and starting, the proper way to connect it is between the generator and the generator ground terminal as shown in Fig. 1. Connecting the meter between the generator terminal and one of the motor terminals will produce the same results. Connecting it in the grounded side is simply an easier installing proposition. Connecting the meter in either one of the generator leads will cause it to show generator output only and the meter needle will stand at 0 when the car is at rest regardless whether or not the lights are in use. In other words, the meter indicates only when the engine is running and does not show charge and discharge.

Construction of High-Tension Coil

Editor THE AUTOMOBILE:—In your issue for Nov. 18, the first letter in your Rostrum is one from Mr. Allen, asking among other things several questions with regard to the spark coil. Inasmuch as all ignition, even the high-tension magneto, uses the principle of the spark coil, if not the coil itself, will you permit me to answer somewhat more fully Mr. Allen's question?

The distance that a spark will jump depends, as he suggests, on the ratio of the turns in the two windings and the voltage of the current. The higher the voltage and the greater the difference in the number of turns between the primary and secondary windings, the longer the spark. A spark, however, may be too thin, and this depends in part on the size of the secondary wire, which ordinarily should be Brown & Sharpe, No. 36. It also depends on the adjustment of the vibrator, which may be adjusted so as to permit too small an amperage of current to flow. In a negative way it also depends on the capacity of the core and on the capacity of the condenser—but this only in the sense that if there is an insufficiency on the part of either of these the spark will be under its normal size.

Makeup of the Coil

I assume that your readers all are aware of the general makeup of the coil, which consists of a bundle of soft iron wire in the center, which increases the intensity of the coil action, the winding of two or three layers of coarse primary wire over the core and then outside of the primary wire the winding of many turns of fine wire, forming the secondary wiring, and finally a number of layers of tin foil, alternating with parafine paper, and connected alternately and forming a reservoir to take up the electric current when it is broken by the vibrator or other interrupter.

In the first place the sizes of wire used in coils depends upon the number of amperes intended to be carried by the coil. The secondary wire is Brown & Sharpe, No. 36, and that is true if the spark coil is for a ¼-in. spark or one a foot long. The primary wire for the smaller sparks is No. 16. For larger sparks the wire size runs down to No. 10 for a 12-in. spark. The weight of primary wire used does not increase in proportion to the length of the spark but on a very much smaller scale. Six ounces are said to be enough for a ½-in. spark, while seven times that is used for a spark twenty-four times as long.

Inasmuch as the larger coil has heavier wire wound on a larger core, it indicates that there are comparatively few additional turns of wire in the makeup of the instrument. The weight of the secondary wire increases about in propor-

tion to the length of the spark, being for a ½-in. spark the size used in automobile work about ¾ lb.

It is optional to use a slightly heavier wire in the secondary winding, which will result in a shorter and thicker spark, or to use a slightly finer wire, which will result in a longer and thinner spark.

I believe I am correct in saying that the length of the spark for any particular coil depends on the voltage in the primary winding, while the thickness of it depends, within limits, on the amperage in the primary winding. Of course when a spark is not required to jump its full limit of distance, it becomes thicker and more flaming in character.

A spark coil may be used with an excessive voltage, but if so, it will probably ultimately break down by the spark penetrating the insulating layers in the secondary coil, in which case the coil is useless and quite beyond repair.

The condenser sheets of tin foil for a ½-in. spark consist of forty sheets of 3 by 4 in. In the larger sparks the sheets may number as many as sixty and increase in size so as to be about in proportion to the increased length of the spark.

Disadvantage of Too Hot a Spark

A very hot spark increases the strength of the explosion in the cylinder. On the other hand it eats away rapidly the electrodes of the spark plug. It is poor economy to endeavor to save a little in electric current by reducing the amperage to a minimum by manipulating the adjustment of the vibrator. It is true that one can get along with a minimum of current, but in doing so he is losing the energy which the explosion mixture would otherwise be capable of giving.

The voltage in a secondary winding for a ½-in. spark is about 10,000 and, very roughly, proportionately larger or smaller for other lengths of sparks. This, of course, does not mean that the voltage of every coil used is 10,000. It may be less or more according to the number of dry cells or batteries used in the series.

While the voltage is so high, the amperage is proportionately small, being a mere trace of current, for what the voltage gains the amperage loses. For example, if the current in the primary is five volts at 2 amp., this equals 10 watts, and if the voltage in the secondary is 10,000 the amperage is but 1/1000 part of 1 amp.

Aside from injury, due to the breaking down of the insulation in the secondary wiring, there is sometimes an injury due to a break in the condenser. This last difficulty is evidenced by excessive sparking at the vibrator. The only other difficulty to be found is the pitting of the contact points. This can be avoided if the direction of the current is changed occasionally. In many instances this is quite practicable, although not so in all. Reversing the current causes the deposit on the contacts to be reversed and to be put back where it came from.

In very rare instances and in some forms of vibrators the filings from the contact points dropping down may form a short circuit if not brushed away.

Aside from the adjustment of the contact points and the refacing of them when pitted, nothing can be done with a coil except send it back to the factory, if it is out of order. It is quite impossible to reach or repair either the condenser or the secondary wiring.

Spark at Breaking of Contact

It should also always be borne in mind that there is practically no spark at the moment of contact. The only spark worth speaking of takes place at the breaking of the contact. The reason of this is extremely simple. The induced current when contact is made is in the reverse direction to the inducing current and as every winding of the primary wire acts on every adjoining winding, to induce a current opposite to the main current which is flowing in the wire, it is easy to be seen that the current is much reduced in strength, and the same thing takes place in the secondary wiring, so that while there is a small spark it is not of a character to be useful in ignition. Its presence is witnessed by the forms of some of the parts in magneto work, the intent being to avoid the possibility of an explosion due to this unused spark, but even in this work I believe the spark has come to be disregarded.

There are two small booklets, published by Spon & Chamberlain, No. 123 Liberty Street, New York, at 25 cents each. One of these is Induction Coils, edited by Stoye, on the making of such coils, and the other contains a number of experiments possible with an induction coil, most of which I have tried and found very entertaining. It is entitled Experimenting with Induction Coils, by Norrie.

It should be well understood that even a ½-in. coil is utterly unsuited for practical jokes and the current actually dangerous to some individuals.

New York City. CHARLES E. MANIERRE.

Analyzes Gnome Rotary Cylinder Motor

Editor THE AUTOMOBILE:—I noticed in the Nov. 11 issue of THE AUTOMOBILE a criticism of an article on the Gnome rotary cylinder aeroplane engine. In this article Mr. Hartford says that the engine in question is also a reciprocating motor insofar that the pistons reciprocate in the cylinders. So far he is right, but he has failed to analyze further. The relative movement of the pistons and the cylinders is one of reciprocation, but the actual movement is rotary around a given center.

The cylinders revolve uniformly around the center of the crankshaft. The pistons revolve around the center of the crankpin. Owing to the design of the connecting-rods in the Gnome motor, the pistons do not revolve with a uniform speed exactly but in several other motors this difficulty has been overcome.

Mr. Hartford has fallen into the error of many in not appreciating the difference between relative and actual motion.

Of course, all motion is relative, but a discussion could be carried on regarding this forever and never prove anything. In the ordinary type of stationary cylinder engines, the main stresses are those of inertia; in the revolving type, the centrifugal stresses are the highest.

One pound of weight at 1 ft. from the center revolving at 1100 r.p.m., produces a centrifugal pressure of 412.6 lb.

San Francisco, Cal. A. F. B.

Sign Your Inquiries

The Rostrum is in receipt of a number of inquiries which are either unsigned or signed by initials only. All letters to be answered by this department must bear the signature of the sender as an evidence of good faith.

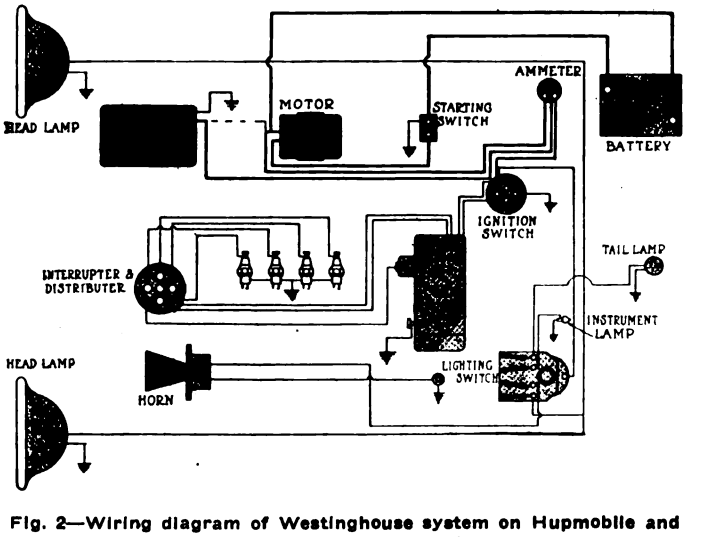


Fig. 2—Wiring diagram of Westinghouse system on Hupmobile and Chandler, showing installation of ammeter

The History of the American Automobile Industry—9

Modern Regime in Steam Construction from 1898 to 1906—Griffiths Recognition of Necessity for Comfort—Gordon's Squirrel Type—Four-Wheel Drive in 1824—Engine on Each Wheel

By David Beecroft

IN the previous eight chapters of this history has been told the early story of steam automobiles in the old world; and their origin has been traced in America from 1743, when John Fitch did his first work at Camden, N. J., up to 1890, when the pioneering work of R. E. Olds, present head of the Reo company, was outlined.

The Modern Regime

The next step in steam development in America was the modern regime dating from 1898 up to 1906, a time when over fifty American makers were building steam automobiles in great quantities and when steam led gasoline. Before taking up this last period it is necessary to devote a few chapters to a review of the most important steam development carried on in Europe from 1825 on, for 50 years, a period in which people were riding over the highways in steam coaches much as our gasoline buses cover rural routes to-day, only not with by any manner of means the same speed or comfort.

It is necessary for a correct interpretation of the steam vehicle of a few years ago, which is still green in the memory of thousands living, to go back over those 50 years and see how many problems they solved, and give them credit for what they accomplished, thereby seeing in a truer perspective the work of our own pioneers of to-day, who were responsible for the steam regime beginning in 1898.

Chronological Recapitulation

Let us briefly recapitulate the progress of steam abroad to freshen our memories with the activities of the pioneers:

In 1698 Thomas Savery, a Briton, built the first steam engine known, not in any sense an engine as we know it to-day, but a steam pump for lifting water.

In 1705 Thomas Newcomen, a Scotchman, revamped the Savery engine and made it practical enough to be the ideal steam engine for 60 years, until James Watt took it up, improved it and gave us the principles of steam as we know them to-day. Newcomen's engine was the recognized engine of the day, all others were imitations of it.

In 1769 James Watt, the Scotch engineer, added the necessary separate condenser, which was what the engine lacked, and that very year the steam engine was used to drive a vehicle.

In 1769 Joseph Cugnot, the French engineer, built the first automobile. He could not do it until Watt made the steam engine practical enough.

In 1770 Cugnot made a steam automobile that hauled 2.5 tons 3 m.p.h. and this vehicle is still preserved in the form of a model in France.

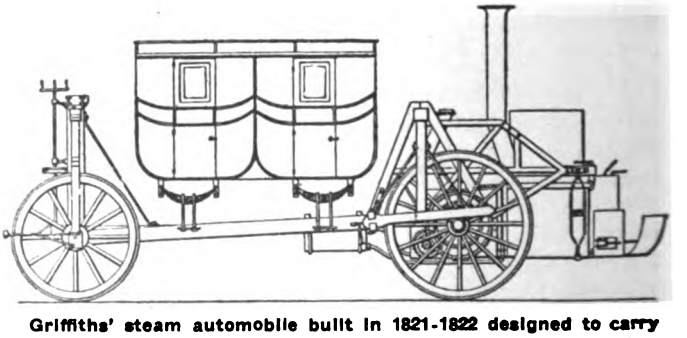
In 1802 the first practical steam automobile was built, Richard Trevithick, England, using a crankshaft for the first time and driving by gears from the engine to the road wheels.

In 1821 Julius Griffiths, England, gave us the first comfortable steam vehicle, the first vehicle to have a coach design of body with seats carried on springs as we know them to-day.

Thus was the growth of steam up to the practical, comfortable age that we must cover before completing the 1898 regime in America.

Griffiths' Semi-Elliptic Springs

Julius Griffiths was a literary man and traveler, not an engineer, which accounts for his developing a comfortable vehicle rather than working on the engineering end. He might be considered a real pioneer of the maker of to-day, who must essentially provide a comfortable vehicle. His steam automobile, built in 1821-22, was patented in several countries and designed to carry 3 tons of merchandise or a dozen passengers at 5 m.p.h. It had semi-elliptic springs under the body and the mechanism was also spring-mounted. The boiler and firebox were behind the rear axle leaving much space for passengers or goods ahead. It was built by Bramah, the leading engineer of that day. Horizontal water tubes were in the boiler, but be-



Griffiths' steam automobile built in 1821-1822 designed to carry 3 tons of merchandise or twelve passengers at 5 m.p.h. Comfort was a feature of the construction

ing small, burned out, because water could not get into them fast enough. The engine was a two-cylinder one and exhausted into a condenser cooled by air, this condenser consisting of thin flattened tubes much as some modern ones have been made. This vehicle was a failure in practical use, but stands foremost as the pioneer of the passenger automobile of to-day.

The Squirrel Steamer

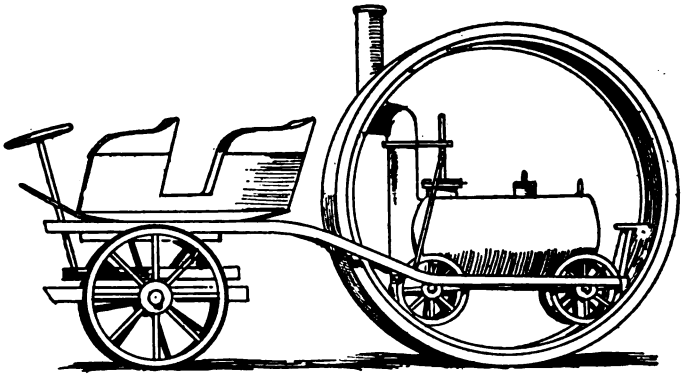
At about the same time David Gordon of England undertook a very novel plan for vehicle propulsion. His engine was mounted inside a large wide wheel, and tended to climb the wheel as a squirrel climbs up its revolving cage, the weight of the engine therefore became the propelling power, and this wheel attached behind the vehicle pushed the vehicle as it rolled. The small engine was placed inside a metal drum, serving as a wheel. This drum was 9 ft. in diameter and 5 ft. long, the smokestack being elbowed to rise at one end of the drum. The small wheels on the steam engine had teeth that meshed into two rings of internal teeth on the inside of the drum.

A Later Construction

Not succeeding in his first novel attempt at steam propulsion, Gordon began exploiting along a different line, and in 1824 obtained a patent in which pushers were the propelling means. This had the steam cylinders, two in number, in the front, horizontally placed on trunnions so that they oscillated and drove a crankshaft having eight throws. The extra six throws, three on each side, were fitted with pushing legs, having feet of considerable area so as to get a considerable grip on the ground. These feet were fitted with bristles of whalebone, which made the contact on the ground less noisy and destructive than a metal surface, but they were also fitted with metal spikes in case the load was more than the bristles could carry. These pushers were between the axles and pressed against the ground at an angle of nearly 45 deg. To stop propulsion these pushers could be lifted by ropes attached to them for this purpose and in turning a corner those on the inside could be lifted, leaving the outer ones to do the work. It worked successfully, though somewhat jerkily, but without sufficient engine power to permit much speed. Similar pushers were afterward fitted.

Four-Wheel-Drive 1824

In this same year—1824—two Scotchmen, Burstall and Hill, worked on a coach having a two-cylinder engine with boiler at the rear and with connecting rods from the walking beams direct to cranks on the axle. The particular feature was the use of two sets of bevel gears and a lengthwise propeller shaft by which the front axle was compelled to drive the rear one. All four wheels were loose on the axle, but connected by pawls and ratchets so they could drive on the straights but allow the outer ones to overrun in turning corners. In this we had the first record of a four-wheel-drive vehicle, a design so much in the public eye in



Gordon's squirrel steamer in which the engine was mounted inside a large wheel and tended to climb the wheel as a squirrel climbs in its revolving cage, the weight of the engine becoming the propelling power and pushing the vehicle as indicated by the illustration

truck work to-day, especially in the arduous service of war.

But there were many more of our so-called modern constructions in use in those days when Waterloo was as fresh in the memory as Warsaw is to-day. In 1825 H. Peto made a steam coach fitted with a two-speed gear, the pioneer of the gearbox of to-day. The automobile was a very light type, also an object of attainment to-day, but was not used much.

In 1827 James Nasmyth, the steam-hammer man, made both a model and full-sized carriage for eight passengers, but after a few months' experience this was broken up. Other experimenters of less importance were also working.

Engine for Each Wheel

W. H. James, England, turned his attention to this subject in 1824, but lacking capital accomplished little until he interested Sir J. Anderson as a partner. His car used a water-tube boiler carrying high pressure, with a separate engine for each driving wheel and with the valves connected to the steering gear in such a manner that more steam was given to the outer wheel in turning a curve. Here was another substitute for the modern differential. This carriage is said to have run over a rough gravel road at the rate of 12 to 15 m.p.h. in 1829. It carried fifteen passengers, was quite tasteful in design, and weighed over 3 tons. A second carriage was soon built having oscillating engines and the feed water heated by the exhaust. Financial difficulties stopped the work, however, which Anderson took up with a new boiler some 9 years later, forming a carriage and wagon company and building a number of vehicles in Dublin and Manchester in 1839 and 1840.

The idea of placing a separate motor on each drive wheel has been tried by several automobile concerns within the last 15 years. There are several electric commercial vehicles using it; and only 5 years ago the Daimler company in England built a gasoline-electric bus for London streets with a separate four-cylinder gasoline engine driving to each rear wheel. The individual drive idea is nearly a century old, and not an innovation of the twentieth century.

Testing Spring Suspension and Dampers

CAREFUL work is now being carried on in the industry with a view to the eventual perfecting of the spring suspension for automobiles and motor trucks. During the past four years considerable attention has been given to this subject in THE AUTOMOBILE, partly in the department entitled Engineering Digest (which, being based mainly upon technical articles appearing in the French and German periodicals, ceased to receive nourishment and began to languish when the engineers of Europe became absorbed in war problems) and partly in original articles. As an example showing how this material is followed up long after its publication, as well as the nature of the questions which arise, there is printed herewith a letter from one of the research engineers of a leading manufacturer of Detroit, and the appended answer may meet the requirements of other investigators. The letter reads in substance as follows:

Editor THE AUTOMOBILE.—I have just been reading an article in THE AUTOMOBILE, issue of June 25, 1914, page 1336, wherein mention is made of the published accounts of experiments with vehicle suspension by Lanchester in England and Bobeth in Germany. I would greatly appreciate information from you as to the names of these publications and where they can be procured.

In another article published in THE AUTOMOBILE, issue of December 18, 1914, mention is made of a recording device perfected by Dr. Bobeth. I am particularly interested in this recording device, and if you can give me any information regarding it, or tell me where I can procure information, I shall greatly appreciate it.

Detroit, Dec. 11, 1915. (Signature)

Die Leistungsverluste und die Abfederung von Kraftfahrzeugen by Dr.-Ing. Erich Bobeth was published in 1913 by M. Krayn, Berlin W. 57, Germany, and can be obtained from him or by order through any book firm dealing in European books. The accounts of the Lanchester experiments were referred to from memory and have not yet been relocated. The recording device used by Bobeth to determine the damping effect of the friction between spring leaves and that of special auxiliary dampers or shock absorbers was used in connection with the same author's arrangement for measuring and recording the shocks due to inequalities of the road surface, and to make its operation clear this arrangement must first be described.

Fig. 1 shows a rear and a side view, it being understood that the road is represented by rotatable sheaves on which projecting blocks with a rounded surface are fastened in such manner that they fall off the sheaves after impact with the wheels, so that the impact is not repeated at each revolution. Two pairs of angle irons AA are laid across the pit containing the sheaves, in the direction of the vehicle, and recesses are machined into these angle irons to afford a firm track for two sliding rails BB which are smoothly planed and on their upper face carry the long glass strips DD standing on edge and on the under side the racks CC which mesh with spur pinions EE. These pinions E on both sides are mounted on a common shaft F which is driven by sprocket chain G from the shaft H of the sheaves. A coupling J permits the release of the connection with shaft H [which is termed the brake shaft by the author, as the sheaves are used for brake tests also].

With the coupling in action the rotation of the sheaves, caused by the vehicle wheels, is transmitted to the spur pinions E, and these drive through the racks CC the rails BB with the glass strips. Their rate of movement is thus determined by the gear ratio when the revolutions per second of the brake shaft are counted. The glass strips are coated with lampblack, and the styluses K and K1, on each side, are connected with the axle and the vehicle frame, respectively, and arranged to press elastically against the glass, so that oscillations of the axle and of the frame are inscribed automatically in sharp lines in the lampblack, the ordinates representing the amplitude of the oscillations, without reduction, and the abscisse the time elapsed during oscillations on a scale depending upon the gear ratio of the drive and the speed of the brake shaft. Changes in the gear ratio (indicated in Fig. 1 by an auxiliary set of sprocket wheels) admit of getting a suitable time scale for any chosen vehicle speed. [It may be noticed in the side view of Fig. 1 that stylus K which records the axle movements and stylus K1 which records the frame movements are not shown as starting from the same ordinate on the glass strip, and it would seem that either this variation must be notably smaller in practice than it appears in the drawing or else an allowance must be made for it in transcribing the oscillation curves from the glass strip, at least when the question is that of determining accurately the time sequence of axle and frame oscillations.]

Device for Recording Damping Effects

The arrangement used for obtaining numerical values for the forces tending to reduce the amplitude of oscillations is shown in Figs. 2 and 3. The friction between spring leaves is usually considered the most important among these forces, but measurement shows that it represents only one-fourth to

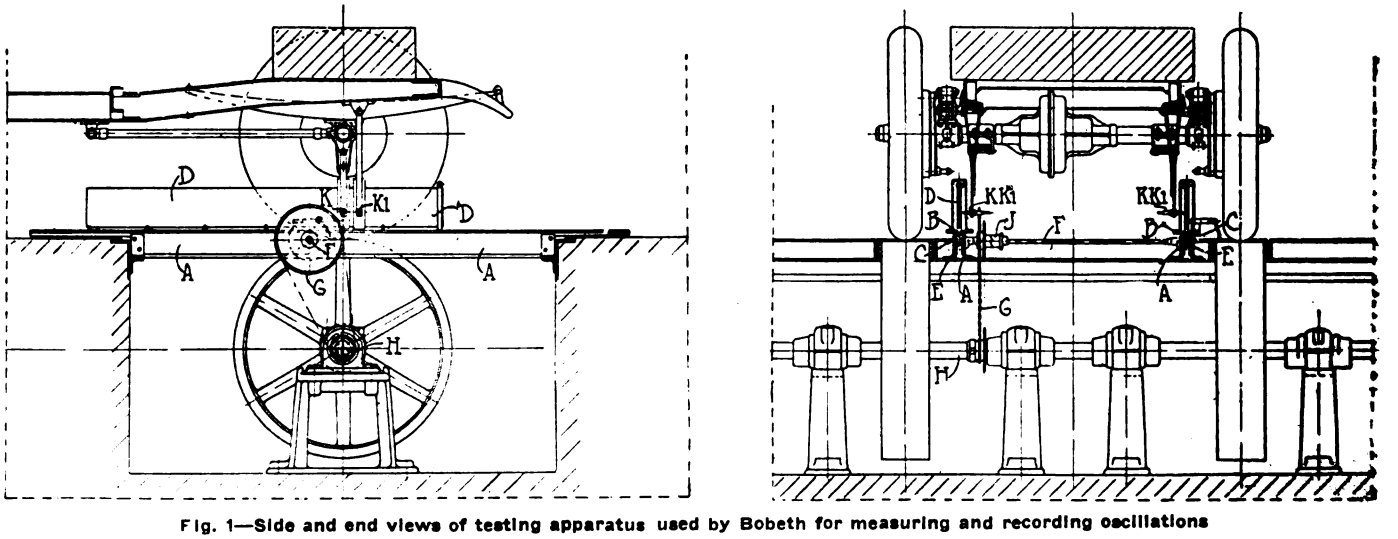
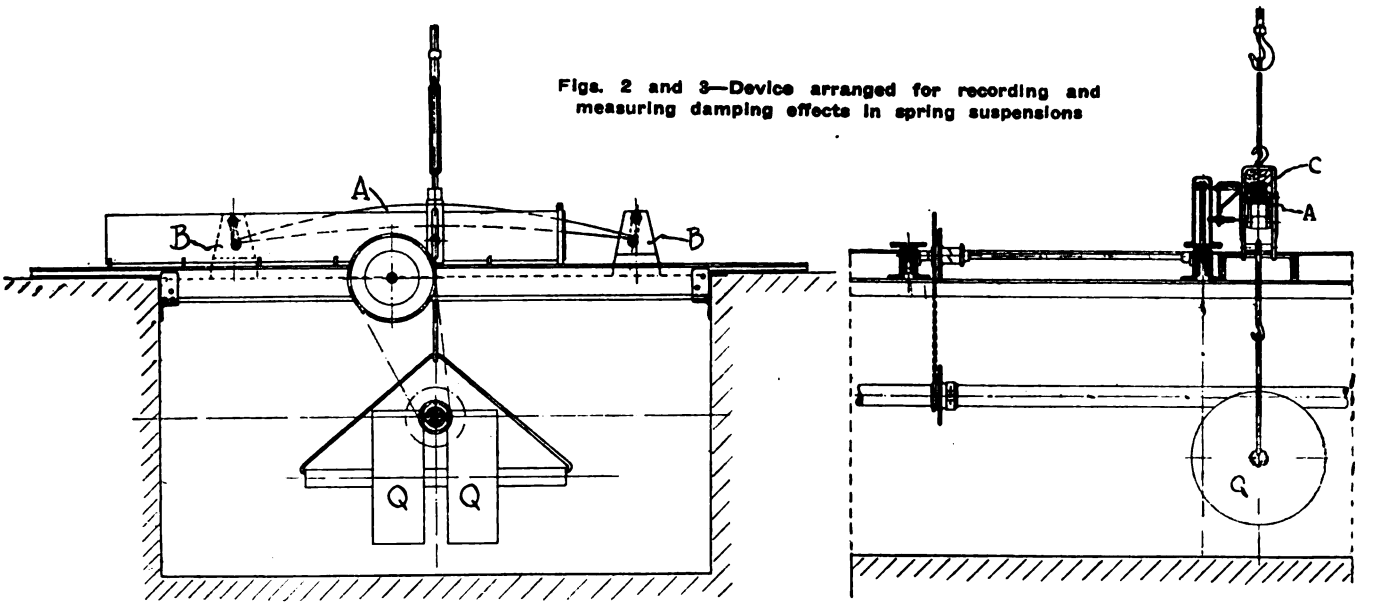


Fig. 1—Side and end views of testing apparatus used by Bobeth for measuring and recording oscillations



Figs. 2 and 3—Device arranged for recording and measuring damping effects in spring suspensions

one-third of the total damping effect produced by various resistances arising when the vehicle springs are oscillating. The movements of spring shackles and bolts as well as of torsion rods and chain adjustment stays cause more or less friction, and the changes in the angle of the power transmission, by way of the universal joints, taking place whenever the relation of axle to frame is changed by spring oscillation always operate in both directions against the oscillations which cause them, the forces required for the acceleration and retardation of the moving parts depending largely upon the rapidity of the oscillations with which they must keep time, and these are not the spring oscillations but the relative oscillations of frame and axle. These relative oscillations are very variable and at times of much higher rapidity than the spring and axle oscillations [as shown in Fig. 10, page 197 in THE AUTOMOBILE for January 28, 1915], causing correspondingly high resistances and frequently, as in case of chughole effects, bringing the spring oscillations to a much quicker stop than would be expected from their amplitude.

The spring A is hung with its shackles, in the same manner as for static determinations of leaf spring forces, in the two supports BB. Over the middle of the spring there is placed a sheet iron bow C loosely inclosing the spring leaves and fitted with a hook at the top and another at the bottom. From the lower hook there is hung a weight Q, causing a deflection of the spring. By means of the upper hook the bow strap with its load may be raised, so as to relieve the spring completely.

In order to be able to use the apparatus shown in Fig. 1 in connection with this device for the recording of the oscillations of the spring, the latter is brought into elastically maintained contact with the blackened glass strip by means of a stylus secured to the bow strap.

Tests were made by pulling the bow strap up so high that the spring was entirely relieved of load while still maintaining contact between them. By a sharp stroke the cord by which the bow strap was held up was then cut, so that the load Q had to be carried by the previously unloaded spring alone. The spring began to oscillate and, as the glass strip at the same time was moving, the oscillations were recorded on it.

In determining the value of the damping factors which bring the oscillations gradually to a stop it was assumed, in the simplest cases, that the resistances during the period of the oscillations were proportionate to their amplitude, so that the relations of the forces are represented in arithmetical progressions. With the force applied to produce the first deflection subject to measurement, the value for the damping forces may be figured from the equation: $2e = a_n - a_{n+1}$, where e is the total damping effect and equals one-half of the difference between the forces represented in two successive oscillations in the progression.

The development in details, as given by Dr. Bobeth, is in the main mathematical upon this foundation, but is supported by a large number of the diagrams obtained from the testing apparatus under different conditions of operation.—M. C. K.

Scientific and Technical Reform

OBSERVING the rapid growth of German industries and trade as well as the efficiency of German war measures many prominent Britons have been strongly moved to urge the speedy reform of traditional British methods. It is especially the science back of the industries upon which attention has been focused. Dr. J. A. Fleming in a lecture before University College, published in *The Engineer* of October 8, dwelled on the need of greater efficiency in all production in order to carry the war debt of 3000 millions sterling now accumulating. Coupling the subject with an explanation of his own scientific and inventive work for the improvement of range-finding and the use of wireless telegraphy in aeroplanes, he urged the revision of school and college plans, to compel more and better work on the part of students, and the energetic extension of co-operative research, both scientific and industrial. The scientific societies should organize and distribute work for definite and formulated problems which are too large and complicated for one man. On the whole Dr. Fleming seemed to acknowledge the superiority of German methods. Different views are represented in the presidential address before the Society of Arts, by Dr. Dugald Clerk, whose services to automobile engineering are widely recognized. The gist of his remarks—which *The Engineer* of November 26 hails as a much needed tonic for every detractor of British progress and British methods—was that "muddling through," as a term supposedly describing the average British method, is a bad misnomer, inasmuch as Britain is still the most successful nation in the world. He spoke of the difference between inductive and deductive methods, ascribing the inductive to England and the deductive to Germany and holding that the inductive or experimental processes for making progress were by far the safest, as shown, for example, by the predicament in which the Germans now find themselves for having presumed to reason out the results of a European war in advance.

Both papers are well worth reading, even though the distinction between "inductive brains" and "deductive brains," as accepted by Clerk, must fail to satisfy all scientists, since all capable persons invariably both "induce" and "deduce."

ACCESSORIES

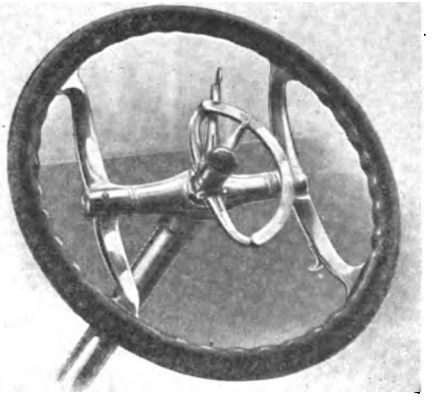
Pouvailsmith Products

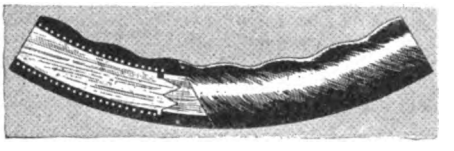
THE Pouvailsmith Corp., the formation of which was announced in THE AUTOMOBILE for Dec. 9, makes a large line of steering wheels, among which a feature is the Warm Hand construction which has been on the market for several years. This device has been greatly improved to conform with modern car design and to meet the demand for a means of keeping the hands warm in winter and on the chilly evenings characteristic of many months of the year. As now manufactured, the Warm Hand wheel consists of a wooden core with the heating coil wound spirally around it and over this is cast condensite under a pressure of 120 tons. All wiring is concealed, coming up the steering column between the rod and casing, while an ingenious commutator replaces the ordinary bushing at the top of the steering column, insuring constant electrical connection and preventing any twisting of the wires. Two quadrants of the wheel are heated, where the hands naturally fall on the rim in steering. A simple push switch is used to throw the current on and off, the red end of the button switching it off while the black turns it on. The current consumed is negligible and the device is made for cars with electrical systems of any voltage.

The Warm Hand wheels, as well as the ordinary types manufactured by the corporation, are furnished in folding form if desired. The folding wheels pivot on the diametrical crossbar, being firmly locked in place except when folded. A trigger-type lock operated by the forefinger renders manipulation easy. A button switch is provided for operating the horn.

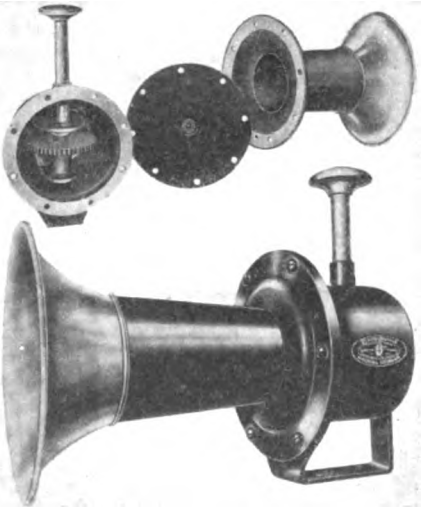
The 18-in. Warm Hand steering wheel (model G) sells for $15 and in the folding design (model H) for $20.

Other products of the corporation are radiator filler caps, gasoline tank filler caps, control lever balls, moulded electrical installation and special composition moulding.—Pouvailsmith Corp., Poughkeepsie, N. Y.





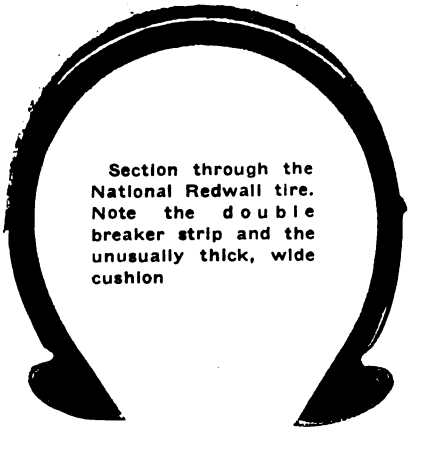
Folding type of Warm Hand steering wheel. Below, the rim construction is illustrated. Note heating coil in section



Evergood hand horn for trucks

Evergood Horn for Trucks

This hand horn operates on the cut gear and spiral principle and is claimed never to stick, the slightest tap on the plunger being sufficient to emit a warning note. In testing this horn it was placed in a power press set to give the exact limit of stroke of the hand plunger and after being operated for approximately 60,000 strokes the horn was disassembled and micrometer measurements taken. This test the manufacturer states to be equal to two years use, the horn being in perfect operating condition at the finish and the wear being less than 1/1000 in. The standard finish of this horn, which is designed throughout for motor truck use, is baked black enamel for the projector and case while the bell and plunger are polished nickel. With a 5½-in. oval bell the price is $4, while the model with 6-in. oval bell lists at $5.—Emil Grossman Mfg. Co., Inc., Brooklyn, N. Y.



Section through the National Redwall tire. Note the double breaker strip and the unusually thick, wide cushion

National Redwall Tire

The Redwall tire, illustrated in section herewith, adheres to standard modern tire construction, the manufacturers claiming no unusual features other than very high grade design, material and workmanship. The tires are built entirely by hand, square woven sea island duck fabric being used with one extra ply, while a double breaker strip is employed. The manufacturers claim that this construction practically eliminates the danger of stone bruises,. The cushion is built unusually thick and wide, extending under the tread down the side wall and well beyond any possible point of traction.

In the regular clincher and quick-detachable clincher styles, a fabric bead is used instead of the customary hard or soft rubber type, the manufacturers claiming that experience has proven the fabric bead to be practically unbreakable, even when the tire is driven flat. In the straight side type the bead consists of many strands of heavy piano wire embedded in fabric. The tread is made extra thick and very tough, the open steam wrapped tread process being used throughout. The red side wall and white tread make the tire's appearance attractive and give it the name Redwall. The tire is made in all types and sizes and with both plain and non-skid treads. It is guaranteed for 5000 miles.—National Rubber Co., Pottstown, Pa.

Indigan Fan Belting

This is a special fan belt stock, and the manufacturer is making a special campaign on belts adaptable particularly to the Ford engine. The new article is called Indigan fan belting, and is made from chrome grain leather. It is claimed by the maker that from the time this leather is started from the green hide the idea has been to produce a piece of material that will meet the conditions under which fan belts operate.

This concern also makes V-shaped fan belts, tire boots, laces for boots and hoods, crank pockets, metal hooks of various kinds, straps and round belting. —National Leather Mfg. Co., Niles, Mich.

The AUTOMOBILE

PUBLISHED WEEKLY

Vol. XXXIII Thursday, December 23, 1915 No. 26

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
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SUBSCRIPTION RATES
United States and Mexico ----------One Year, $3.00
Canada ---------- One Year 5.00
Foreign Countries ----------One Year 6.00

To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

The payment of subscriptions will be shown by stamping the date of expiration—the month and year—on the wrapper that carries your paper each week. No other acknowledgment necessary.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

1915

PHENOMENAL is approximately the only word that adequately expresses the movement of the automobile industry during the year just closing. It has been a year unequaled in production, a year in which the basic principles of vehicle manufacture have received wider attention than heretofore, several companies rather than a few entering the production field. With some increased production meant self-preservation and with others it meant vastly increased profits. With such increased production, with such simplification of chassis design, prices would naturally be reduced.

While 1915 has been spectacular in results, more cars, simpler cars, better cars and lower prices, the reasons can only be found by analyzing 1914 and 1913. The roots of 1915 are found in the two or three previous years. Production has been facilitated by the standardizing work the S. A. E. has accomplished, and which has been going on for several years. Production has been possible by a greater fulfillment of the simplification in design, a movement which has been under way for three years. Simplification has been possible by better planning of makers, by more attention to motion study in manufacture and by bringing the engineering and production departments together so that a design was not used unless it were possible to incorporate in it sound engineering and easy production.

The Light, Large Car

JUST as the Cadillac eight ushered in an epoch so, it is probable has the new Marmon, in which light weight construction has been studied with such exceptional care. Of course the Marmon is not by any means the lighest seven-passenger car ever built, but it is far lighter than the average car of the class which it represents. It is from 20 to 30 per cent lighter, to descend to actual figures. A cut of between one-fifth and one-third in weight is no small accomplishment and it is difficult to see how it could have been done without the special frame design and the aluminum motor.

Whether this is so or not, there is little doubt but that the Marmon will spur on others to attempt the same result. Light weight is the greatest factor in reducing the expense of upkeep and so is of immense importance to the owner. Except in isolated instances the automobile engineer still has a tendency to disregard the weight of his production, but once his attention is forced upon it we may expect advances as rapid as we have seen before with other engineering problems.

Removing the Glare

MORE impetus must be given the movement of eliminating glaring headlights from our cities and country roads. Much has been done during the past year, but more remains, and what is left to be done must be actively taken up. The glaring headlight is an inexcusable danger on the highway. There is no necessity for it, because very simple anti-glare measures can be adopted by practically all motorists, that will not only eliminate the glare but leave the illumination of the headlight satisfactory so far as picking up objects along the side of the road and also distinguishing objects a sufficient distance ahead of the car.

Two or three States have already laws making the glaring headlight illegal, and other States will enact laws during the coming sessions of their legislatures. The motorists should assist in this rational legislation, using their influence to see that no insane regulations are included and that the law placed on the statute book is a just one. The rational motorist is as much opposed to the glaring headlight as any one. Its elimination is more conducive to safety. What must be avoided is any State placing its mark of approval on any particular type of anti-glare device. Such would be dangerous. It is possible to dim the glare without injuring the useful illumination, and it is to this point that motorists should see that only rational action is taken.

One important matter to be decided in this respect is whether many of the present signal lights incorporated in the headlights are really glare devices or not. The police in some cities are making arrests and imposing nominal fines on these signal lights, and at a recent demonstration of anti-glare devices in an eastern State it was the general feeling that several of these are really glare types and will have to be legislated against.

Chevrolet to Increase Stock

Financial Rumors Current That General Motors Will Merge with Chevrolet

NEW YORK CITY, Dec. 22—A meeting of the stockholders of the Chevrolet Motor Co. has been called for to-morrow in this city for the purpose of amending the certificate of incorporation of the company by increasing the capital stock and to authorize the issue of such increased capital. In October the Chevrolet capital was increased from $2,500,000 to $20,000,000. This stock is largely held by W. C. Durant and his associates, Durant being the organizer and dominating spirit in the Chevrolet organization.

It is rumored in financial circles that the increase of stock to be arranged for to-morrow is a step in a large movement to merge the General Motors Co. with the Chevrolet Motor Co. It is known that Mr. Durant and his associates representing the Du Pont powder and Remington arms interests has during the past year secured enough of the General Motors stock to have control of the organization and at the annual meeting of the General Motors held in November the board of directors was increased from fourteen to seventeen and nine new names added, only eight of the old board being retained. Among the new names added were Lammont Berlin, director of Aetna Explosives Co., Pierre Du Pont, and S. F. Prior of the Union Metallic Cartridge and Remington Arms Co. and A. H. Wiggin, C. S. Sabin, J. A. Haskell and some others, many representing the Durant interests.

100,000 Shares Involved?

Should a merger of General Motors with the Chevrolet Motor Co. be contemplated, it would call for a meeting of the stockholders of the General Motors Co. at which such action could be taken. The transfer, if made, would involve over 100,000 shares of General Motors stock which the Durant interests hold and which is sufficient to control the General Motors. At the present market price these shares are worth close to $50,000,000 and represent the holdings of Durant and the Du Pont and Remington interests. The General Motors Co. has an authorized capital of $60,000,000 of which $40,000,000 is common. Of the remaining $20,000,000 preferred only $15,000,000 is outstanding, and $16,500,000 of the common is outstanding.

Should such a merger take place it would be the outcome of the financing program of the General Motors Co., going back to the difficulties of 1910 when Eastern banking interests headed by Lee Higginson and J. W. Seligman agreed to purchase $23,000,000 of the company's five-year notes, thus advancing the General Motors sufficient cash for the payment of its debts and the building up of the business. These notes have been taken up, the last being redeemed during the past fall. During the life of the notes the General Motors stock was controlled by voting trustees until the dissolution of these last October. The object of this voting trust was to prevent any coterie of interest securing control of the stock and leaving the banking organizations without protection. With the dissolution of the voting trust it left any interest free to secure control of the stock.

May Exchange Stock

In connection with the rumor for merging the General Motors it is suggested in financial circles that the present increase of Chevrolet stock is needed to effect an exchange between Chevrolet and General Motors stock, various ratios of exchange being suggested.

Irrespective of whether these rumors are true or not the facts are that the influence of the Chevrolet interests are being rapidly increased and W. C. Durant is greatly increasing his hold on affairs.

—

$500,000 Co. to Take Over Overland Sales

TOLEDO, OHIO, Dec. 20—Willys-Overland, Inc., has been organized under the laws of Virginia with a capital of $500,000 to take over and handle the sales of the entire product of the Willys-Overland Co., this city, of which it is a subsidiary. All stock of Willys-Overland, Inc., will be owned by the Willys-Overland Co. and all officers and directors of the new corporation are from the official staff of the Willys-Overland Co.

—

Studebaker To Spend $1,000,000 To Increase Production

DETROIT, MICH., Dec. 16—To-day a three-day convention of the branch managers of the Studebaker Corp. ended here. Officials of the corporation announced the plans whereby at least $1,000,000 will be spent within the next few months to provide greater production facilities. Further additions and new buildings will be put up, among them a new drop-forge plant of at least double the size of the present one.

There were morning and afternoon sessions at which many matters of interest to the branch managers concerning the Studebaker business in general, were discussed. Talks were made by many of the officers of the company and other officials of the concern.

Reo 100% Stock Dividend

Capital Increased to $10,000,000 —Officers and Directors Re-elected

LANSING, MICH., Dec. 21—A stock dividend of 100 per cent was declared at the annual stockholders' meeting of the Reo Motor Car Co. this afternoon. The capital stock of the company was increased from $3,000,000 to $10,000,000. The directors were re-elected and they re-elected the present officers of the company as follows: President, R. E. Olds; secretary-treasurer, D. E. Bates.

Of the stock, $6,000,000 is issued, the balance of $4,000,000 remains in the treasury. The company has also paid cash dividends totalling 35 per cent this year.

Sales during ten months to the end of October totaled $16,658,698 and during that period 14,693 passenger cars were delivered. Arrangements are being completed to build up a large foreign business, which had not been attempted thus far.

The affairs of the Reo Motor Truck Co. are also in excellent shape, as announced at the stockholders' meeting. Sales totaled $2,613,208, as compared with $1,306,566 to the same time last year, 1480 trucks having been delivered. Sales for October to December were 611 trucks ahead of the corresponding period last year.

—

Lenox to Build 3-Tonners

BOSTON, MASS., Dec. 18—Officials of the Lenox Motor Car Co. are about to close negotiations with one of the big contractors who has an order from the Allies to build for it 500 or 1000 vehicles capable of carrying 3 tons. They will be built at Hyde Park, Lawrence and Fall River, the company having acquired recently factories in the two latter cities following its reorganization with a capital of $1,000,000.

—

General Electric in M. & A. M.

NEW YORK CITY, Dec. 21—The General Electric Co., Schenectady, N. Y., has joined the Motor & Accessory Manufacturers. This company is now making the Entz electric transmission system.

—

Burtsell Whitney Sales Manager

HARTFORD, CONN., Dec. 21—On Jan. 1, B. W. Burtsell, assistant factory manager of the Packard Motor Car Co., Detroit, will assume the position of sales manager of the Whitney Mfg. Co., this city.

$20,000,000 Merger Reported

Cole, Inter-State, Parker Parts, Auburn, Westcott and Others May Combine.

INDIANAPOLIS, IND., Dec. 16.—That a deal is pending in automobile circles involving the merger of some ten or twelve automobile and parts makers was confirmed to-day by C. P. Henderson, sales-manager of the Cole Motor Car Co. of this city. Although Mr. Henderson admitted that the Cole company was interested in the merger and would be one of the many companies merged into a huge combine, he would not give out any particulars, saying that final details had not been arranged.

It has been known for some time that such a consolidation was pending, but so secretly have the men behind the movement worked that it was only recently the information leaked out that several Indiana firms were interested. It is stated on good authority that the Inter-State Automobile Co., Parker Auto Parts Co., Auburn Automobile Co., Westcott Automobile Co. and several Indiana parts makers will go into the combine.

It is said that the actual capital represented in the merger will run into many millions, conservative estimates placing the mark at $30,000,000. Mr. Henderson said he believed the deal would be completed within a week. The report is that the merger will be capitalized at $20,000,000.

From Peru, Ind., comes the word that the Peru Auto Parts Co. of that city, has sent letters to its local stockholders offering to buy up the stock at $200 a share, which is double its par value, or to take them into the new company.

It is said in Peru manufacturing circles the Cole, Inter-State and Auburn are some of the concerns in the reorganization. Peru Auto Parts stock, which has a par value of $100 a share, yielded 85 per cent in recent years. The Peru stockholders have until Dec. 18 to decide whether they wish to retain their old stock and enter the new company, or take the two for one.

It is not stated what and where the other concerns that will enter the new corporation are, but it is reported in Peru that the plan of the new combine centers around Muncie, with Indianapolis and Auburn concerns taking part. The Peru Auto Parts Mfg. Co. was established in Peru six years ago, coming from New York. Since then the stock has paid 85 per cent in dividends.

A Meeting at Muncie

From Muncie, Ind., comes an authentic report that a meeting was held in that city last week, at which a large number of automobile companies were represented. It was reported at the time the conference was held that a combination was in process of formation, but no member of the conference would discuss the meeting. Among those who attended the meeting were the Ball brothers, who are back of the Inter-State company; Eugene Vatet, a Muncie capitalist; B. W. Twyman, formerly of Studebaker, but now with Inter-State; John J. Jean, who has a large foundry in Muncie and at Asbury, Mass.; A. L. Johnson and Roy Johnson, and representatives of the Motor Gear Co. and other concerns interested in the plan.

When interviewed none of the men would deny that a combination was on foot, but neither would any give out information.

—

Tax on Car Manufacturers Would Net $5,250,000

WASHINGTON, D. C., Dec. 18—Secretary of the Treasury in answer to a resolution adopted by the Senate regarding the estimated revenue should taxes be laid upon automobiles and tea, has sent to the Senate a report showing a tax of 25 cents per horsepower on motor cars, the tax to be paid by the manufacturers, would bring $5,250,000. Senator Gore was the author of the resolution seeking the information. It is understood that he will make use of it later when the question of raising further revenue for the government is before the Senate.

—

Timken-Detroit Axle Co. Makes Promotions and Appointments

DETROIT, MICH., Dec. 20—The Timken-Detroit Axle Co., has appointed J. C. Regan general factory manager. Mr. Regan, who has been during thirteen years with Yale & Towne, Stamford, Conn., was until recently assistant general superintendent of that concern.

W. L. Gleason, who has been assistant factory manager of the Timken company, has been promoted assistant to the vice-president in charge of manufacturing.

The Timken-David Brown Co., has appointed C. S. Dahlquist to the position of shop superintendent. Mr. Dahlquist was during the last four years chief engineer of the Lippard-Stewart Motor Car Co., Buffalo, and previous to this connection was with the Velie Motor Vehicle Co., and the International Harvester Co., being chief engineer of the latter's automobile division. Mr. Dahlquist will specialize on worm drive for motor trucks.

W. E. Taylor, a graduate engineer of Purdue University and recently with the Ross Gear Co., Lafayette, Ind., has joined the Timken-David Brown Co., in a selling and engineering service capacity.

White Capital to Be $16,000,000

New Company Organized—Large Interests Secured by New York Capitalists

CLEVELAND, OHIO, Dec. 18—The persistent rumors that the Morgan interests had purchased a substantial interest in the White company of this city, one of the pioneers in the automobile business, were set at rest to-day when it became known that New York interests represented by Chas. D. Barney & Co., and Montgomery, Clothier & Tyler of that city, secured a very substantial interest in the White company. It is not known whether the financial control will pass from the hands of the present White organization, or whether the Whites retain 51 per cent in the new organization to be known as the White Automobile Co., which is being organized under the laws of Ohio, with a capital stock of $16,000,000.

The new stock has not yet been listed on the stock exchange, but was all subscribed through the financial houses mentioned at $51 and is now selling on the New York curb at $53. The stock was all taken up, it is stated, in relatively small subscriptions.

No Change in Organization

Although Eastern financial interests will be represented on the board of directors of the new White Automobile Co., it is stated that the present organization with Windsor T. White, president and acting treasurer; Walter C. White, vice-president and sales manager; E. W. Hulet, vice-president and factory manager, and A. R. Warner, secretary, will be continued.

All of these officials will retain their present large holdings and will conduct the business as heretofore but their stock holdings will not bear the same relation to the complete stock issue as they have in the past. Present stock owners will hold the same amount of stock in the new organization they had in the old, plus the amount of new stock subscription they have procured.

It has been rumored for some time that there was too much inactive capital in the White organization due to the founder of the company Thomas H. White, who created the sewing machine business, and also his brother Henry White, both of whom died a year ago. These brothers had large holdings which are at present in the hands of trustees and executors which lend practically no assistance in the general work of the company. It is undoubtedly realized that additional Eastern capital will considerably broaden the interests of the organization, and bring influences to bear

which should be of material assistance in many ways.

The present White organization is capitalized at $8,000,000, made up of $5,000,000 common and $3,000,000 preferred. In the new company this has been doubled, the entire additional issue being common.

During the past year the White company has had phenomenal success, particularly in its truck department, which has been the largest truck producing organization in America.

The White company took up the manufacture of steam cars in 1889, their first car being completed and put on the road April 1, 1901. It was a new type of steam vehicle using the generator instead of the conventional boiler, basic patents on which were controlled by the White company. The manufacture of steam cars was continued steadily from April, 1901, to April, 1911, when the company took up the manufacture of gasoline cars adopting a French design of motor, the Delahaye, which was a pioneer in block cylinder construction as well as using a long stroke. This type of motor has been continued unchanged so far as its basic features are concerned from that date to the present. The company is now manufacturing two four-cylinder models having discontinued its six a year ago, excepting for custom orders.

—

Nelson Heads Miller-Lillich

FORT WAYNE, IND., Dec. 21—The Miller-Lillich Mfg. Co., which will build a factory in Fort Wayne in a short time for the manufacture of non-skid devices for automobiles, has elected the following officers for the coming year: T. O. Nelson, president; William Lillich, first vice-president, St. Louis; E. G. Reed, Fort Wayne, second vice-president; W. N. Ballou, Fort Wayne, secretary-treasurer and chairman of the board of directors. The officers with Harry Miller, St. Louis, the inventor, form the board of directors. The company is incorporated for $100,000.

October Exports $8,876,395

—

1596 Trucks Valued at $4,307,190 and 3479 Cars at $2,749,255

WASHINGTON, D. C., Dec. 18.—Tremendous gains continue to be made in the export trade in motor vehicles, according to figures announced today by the Departent of Commerce. During October last 1596 commercial cars, valued at $4,307,190; 3479 passenger cars, valued at $2,749,255, and parts, not including engines and tires, to the value of $1,819,950, were shipped abroad. During October a year ago the exports amounted to 672 commercial cars, valued at $2,286,964; 731 passenger cars, valued at $678,387, and parts, not including engines and tires, to the value of $404,360. The shipments during the nine months ended October, 1915, amounted to 18,865 commercial cars, valued at $52,076,406; 34,515 passenger cars, valued at $29,543,227, and parts, not including engines and tires, to the value of $12,814,809. During the same period of 1914 these exports were as follows: Commercial cars, 1309, valued at $3,353,509; passenger cars, 20,262, valued at $17,888,351; parts, not including engines and tires, $4,855,525.

2021 Cars to United Kingdom

The United Kingdom's imports of American cars in October last amounted to 2021 machines, valued at $2,730,468, as against 415 cars, valued at $829,982, imported during October a year ago. During the nine months' period these imports rose from 5545 cars, valued at $5,111,008, in 1914, to 21,455 cars, valued at $31,379,217, in 1915.

The shipments to France amounted to 298 cars, valued at $912,139, in October, 1915, as against 108 machines, valued at $171,049, shipped there in October a year ago, while during the nine months' period the shipments increased from 1152 machines, valued at $796,685, in 1914, to 5183 cars, valued at $13,038,767, in 1915.

There were no shipments to Germany either in October last or in October a year ago. During the nine months of this year four cars, valued at $2800, were shipped to that country, as against 1063 cars, valued at $799,552, shipped during the nine months' period of 1914.

Forty cars, valued at $25,887, were shipped to Italy during October last, while in October a year ago the number was two and the value $1450. During the nine months' period the shipments to Italy amounted to 233 cars, valued at $151,698, in 1914, and to 210 cars, valued at $134,901, in 1915.

814 Cars to "Other Europe"

Under the heading, Other Europe, 814 cars, valued at $1,920,176, were shipped to unnamed countries in October last, as against 346 cars, valued at $1,461,191, in October a year ago. These shipments amounted to 2736 cars, valued at $3,357,408, during the nine months of 1914, increasing to 7502 cars, valued at $20,003,140 during the same period of this year.

During October last 189 cars, valued at $202,552, were shipped into Canada, as against 127 cars, valued at $143,916, shipped there in October, 1914. For the nine months' period the official figures shows that 3981 cars, valued at $5,024,978, were shipped to Canada in 1914, increasing to 5238 cars, but with a decreased value to $4,154,137, in 1915.

Mexico's contribution was $12,250 for thirteen cars in October, 1914, while in October last it was only $8,200 for five cars. During the nine months' period the shipment amounted to seventy-three cars, value at $87,384, in 1914, and eighty-eight cars, valued at $84,141, in 1915.

The shipments to the West Indies and Bermuda amounted to 267 cars, valued at $173,355, in October last, and in October a year ago to seventy-two cars, valued at $51,792. During the nine months' period the exports increased from 466

Exports of Cars, Trucks and Parts for October and Eight Preceding Months

AUTOMOBILES

	October				Nine months ending October			
	1914		1915		1914		1915	
	Number	Value	Number	Value	Number	Value	Number	Value
Commercial	672	$2,286,964	1,596	$4,307,190	1,309	$3,353,509	18,865	$52,076,406
Passenger	731	678,387	3,479	2,749,255	20,262	17,888,351	34,515	29,543,227
Parts, not including engines and tires	.....	404,360	.....	1,819,950	.....	4,855,525	.....	12,814,809
Total	1,403	$3,369,711	5,075	$8,876,395	21,571	$26,097,385	53,380	$94,434,442
EXPORTS BY COUNTRIES IN OCTOBER								
France	108	$171,049	298	$912,139	1,152	$796,685	5,183	$13,038,767
Germany	.....	.....	.....	.....	1,063	799,552	4	2,800
Italy	2	1,450	40	25,887	233	151,698	210	134,901
United Kingdom	415	829,982	2,021	2,730,468	5,545	5,111,008	21,455	31,379,217
Other Europe	346	1,461,191	814	1,920,176	2,736	3,357,408	7,502	20,003,140
Canada	127	143,916	189	202,552	3,981	5,024,978	5,238	4,154,137
Mexico	5	8,200	13	12,250	73	87,384	88	84,141
West Indies and Bermuda	72	51,792	267	173,355	466	394,342	2,625	1,478,360
South America	48	33,242	383	210,840	963	775,504	2,464	1,277,326
British Oceania	190	169,582	447	360,260	3,075	2,619,212	3,594	3,041,852
Asia and other Oceania	63	71,956	295	284,063	1,295	1,240,336	3,245	5,474,001
Other countries	28	22,991	308	224,455	989	883,753	1,772	1,550,991
Total	1,404	$2,965,351	5,075	$7,056,445	21,571	$1,241,860	53,380	$81,619,633

cars, valued at $394,342, in 1914, to 2625 cars, valued at $1,478,360 for the corresponding period in 1915.

South America Gains

Our export trade with South America is growing steadily. During October last 383 cars, valued at $210,840, were shipped there, as against forty-eight cars, valued at $33,242, exported in October a year ago. During the nine months' period the exports increased from 963 cars, valued at $775,504, in 1914, to 2464 cars, valued at $1,277,326, in 1915.

British Oceania is also showing a fondness for America cars, the figures showing that 447 cars, valued at $360,260, were shipped there in October last, as against 190 cars, valued at $169,582, exported there in October a year ago. During the nine months' period the exports increased from 3075 cars, valued at $2,619,212, in 1914, to 3594 cars, valued at $3,041,852, in 1915.

Asia and Oceania Buy More

Asia and other Oceania took 295 cars, valued at $284,063, from this country in October last, as against sixty-three cars, valued at $71,956, in October a year ago. The shipments for the nine months' period increased from 1295 cars, valued at $1,240,336, in 1914, to 3245 cars, valued at $5,474,001, in 1915.

Shipments to other countries increased from twenty-eight cars, valued at $22,991, in October, 1914, to 308 cars, valued at $224,455, in October last, and from 989 cars, valued at $883,753, during the nine months of 1914, to 1772 cars, valued at $1,550,991, during the same period of this year.

The table appearing at the bottom of page 1158 shows the exports by countries in more complete detail.

Insurance Rates Lower

Underwriters Adopt New Rates Effective Jan. 1— To Cancel Policies

NEW YORK CITY, Dec. 17—Automobile insurance rates are lower. At a special meeting of the Automobile Underwriters' Conference new rates were adopted for the full form of policy to be effective on all policies attaching on and after Jan. 1, 1916. Existing policies are cancelled, for rewriting must be on a short rate basis only.

The following rules and qualifications were promulgated:

REDUCTIONS—Fifty cents allowed off Class A rates, 75 cents allowed off Class B and C rates, and $1 off Class D and E rates shown on schedule, for use of the Standard fire form of policy or the Conference form with the reduced rate of indorsement (excluding theft, valuation and automatic reinstatement clauses) attached.

ELECTRIC AUTOMOBILES—This and next year models, 1¼ per cent; last year, 1½ per cent; year before last, 1¾ per cent; three-year old, 2 per cent; older models, 2¼ per cent. Amounts at option of underwriter; minimum premium, $10. A reduction of ¼ per cent allowed for restricted form; minimum premium, $10.

DEALERS' AUTOMOBILES—On new gasoline and steam cars charge 2¼ per cent in column A, 2½ per cent in columns B and C, and 2¾ per cent for all others. On new electric cars charge 2 per cent for all models. On all second-hand cars 1 per cent additional rate must be charged. No rate cancellation allowed with a minimum charge of $1, except that the minimum charge on new cars listed at less than $1,200 shall be 50 cents. Amounts insured at option of underwriters. A reduction of ¼ per cent will be allowed for the attachment of the reduced rate indorsement, but in all cases the minimum charges of $1 and of 50 cents shall apply as above indicated.

NOTE—Automobiles in the hands of dealers may be written under the ordinary form of policy at rates provided for private pleasure was subject to cancellation on a short rate basis only, except pro rata cancellation may be allowed when a new policy is issued on the same car.

THEFT, FULL COVERAGE—For $15 additional premium, the indorsement provided for this purpose may be attached to the policy, giving protection against loss by theft for the full amount.

FIRE EXTINGUISHER ALLOWANCE—An allowance of 15 per cent may be granted from the premium obtained under all rates named in this schedule (except from the $15 additional charge for full theft coverage) for the attachment of the fire extinguisher indorsement as provided under conference rules.

PERSONAL EFFECTS CLAUSE—The policy may be extended to cover personal effects, a specific amount being insured, at the same rate as charge on the automobile. Theft, robbery and pilferage not covered.

ADDITIONAL BODIES—In determining the original list price of automobiles having more than one body the list price of the automobile equipped with the higher priced body shall be taken as the original list price. No change to be made in the classification of cars during the policy period. In the case of automobiles equipped with an extra body or bodies a specific amount must be applied to the chassis and equipment and to each body, the same rate being charged on the extra body or bodies as is charged on the automobile.

New Insurance Rates in Tabulated Form

*Original list price of automobile when new.	Class A. $3,500 and up.	Class B. $2,100 to $3,499	Class C. $1,200 to $2,099	Class D. $700 to $1,199	Class E. $699 and under
This year and next year models.	Insure for not to exceed actual cost.				
	$1.50	$1.75	$1.75	$2.00	$2.00
Last year models.	Insure for not more than				
	Amount of Ins. at option of Co.	80% of original list price.	70% of original list price.	60% of original list price.	60% of original list price.
	$1.75	$2.25	$2.50	$2.75	$3.00
Year before last models.	Insure for not more than				
	Amount of Ins. at option of Co.	50% of original list price.	50% of original list rpice.	40% of original list price.	40% of original list price.
	$2.25	$3.00	$3.25	$3.75	$4.00
Three-year-old models.	Insure for not more than				
	Amount of Ins. at option of Co.	40% of original list price.	40% of original list price.	30% of original list price.	30% of original list price.
	$3.25	$4.00	$4.25	$4.75	$5 00
Older models.	Insure for not more than				
	Amount of Ins. at option of Co.	30% of original list price.	30% of original list price.	30% of original list price.	30% of original list price.
	$5.00	$5.25	$5.25	$5.50	$6 00

*Excluding cost of additional equipment and extra bodies.
Minimum premium full form policy, $10. Restricted form, $5.

Snyder Resigns from Arbenz

CHILLICOTHE, OHIO, Dec. 21—C. O. Snyder, engineer and factory manager of the Arbenz Car Co., Chillicothe, Ohio, has resigned but has not announced his plans for the future.

Mr. Snyder was one of the pioneers in designing eight-cylinder motors in America, having built one in 1906.

Bates Is Re-Elected Chairman

LANSING, MICH., Dec. 16—Don E. Bates, secretary-treasurer of the Reo Motor Car Co., has been re-elected chairman of the Manufacturers' and Jobbers' division of the Lansing Chamber of Commerce.

S.A.E. Studies Army Requirements

Tactical Methods of Handling Supplies for a Division, Metropolitan Section Subject

NEW YORK CITY, Dec. 17—At a meeting of the Metropolitan Section of the Society of Automobile Engineers, held at the Automobile Club of America, Capt. Gordon Johnson, of the 11th Cavalry, U. S. Army, delivered a lecture on the requirements of army transport service.

Captain Johnson stated that it was not his idea to outline the specifications of an ideal track for army service, but on the other hand to point out the problems with which an army transport system has to deal in maintaining supplies and performing other necessary duties. In discussing the requirements of army service, Captain Johnson pointed out that the division is the tactical part of an army which must be considered in arranging for transportation. It consists of an entire unit in itself and has its independent baggage train. It was pointed out that the 15,000 men in such a division could march only 12½ miles per day and that in marching order, the division was weak and unprepared either for offense or defense. The task of feeding a division on a march was an enormous one and also that of deploying it into battle formation is another difficult task.

Captain Johnson in his address pointed out the importance of the transport system in maintaining the morale of the troops which is all important in creating the effectiveness necessary for a successful campaign.

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Detroit Auto Products Co. Formed

DETROIT, MICH., Dec. 17—Automobile parts and accessories on a large scale are to be made by the Detroit Auto Products Co., a new concern which has been incorporated and whose capital stock is temporarily $50,000. Those interested in the company are Joseph, Eugene and Leo Siegel, respectively secretary and general manager, treasurer and assistant general manager of the American Lady Corset Co., Detroit.

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Chalmers Starts Instruction School

DETROIT, MICH., Dec. 20—The Chalmers Motor Co., recently started an instruction school for the benefit of its employees, and, according to S. H. Humphrey, vice-president in charge of manufacturing, the initiative of the company is meeting with ready response among the 5000 men now employed.

The classes which are held in the new auditorium are under the direction of C. G. Arthur, a mechanical engineer and technical writer. They meet after the regular working hours, on Tuesday and on Friday, there being two sessions, one at 3.15 and the other at 5.30 p. m. At the first sessions the instruction consisted in lessons in reading blue prints, review work in mathematics, talks on general shop practice. Gradually the members will be made familiar with every step in the manufacture of a Chalmers car, so that they can be transferred from one department to another, with practical knowledge as to the work they will have to perform in the particular department.

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Packard Truck Sales Managers Find Business Booming

DETROIT, MICH., Dec. 15—Monday and Tuesday truck sales managers of the branches of the Packard Motor Car Co., met here at a convention held at the Packard plant. They reported that the year now ending was the best they ever had and that the outlook for 1916 is such that the demand for trucks and delivery cars will be greater than manufacturers anticipate. The scheduled output of Packard trucks for next year has already been largely contracted for and it will probably necessitate an increase in production over the number originally planned. The sales managers say that the demand for the trucks has been gradually increasing all through the land, and that it will continue stronger, as business men are realizing more and more that the truck or delivery car is the means of more business and saves them money.

It was announced by the Packard officials that, beginning this week, the first deliveries will be made of the two latest models known as the light duty models, respectively of 1 and 1½ tons.

Those in attendance were: Hartley Howard, Jr., Pittsburgh; F. A. Jones, Chicago; T. P. Myers, New York; H. S. Norton, Cleveland; G. E. Pagett, St. Louis; S. L. Prime, Boston; W. F. Roth, Philadelphia; C. C. Spencer, Detroit.

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Oakland Service Managers Meet

PONTIAC, MICH., Dec. 18—About seventy-five service managers from Oakland branches and agencies throughout the country, met at the plant of the Oakland Motor Car Co., here, this week, to become thoroughly acquainted with the new Oakland eight and the service policy of the company.

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W. C. Andrews Dies

NEW YORK CITY, Dec. 21—W. C. Andrews, advertising manager of the Edison Storage Battery Co., Orange, N. J., died suddenly yesterday.

Guayule Rubber Industry to Boom

Recognition of Carranza Government by United States Gives Confidence

TORREON, MEXICO, Dec. 17—If circumstances and outward indications count for much the guayule rubber industry is on the verge of the greatest boom in its history. Immediately following the announcement that the United States had recognized Carranza and his de facto government the American representatives of a number of large synidicates flocked into this part of the country and began purchasing leases on guayule producing land. Many such leases had already been entered into with the owners of the land while the latter were refugees in the United States. It is estimated that not less than 10,000,000 acres of land upon which the guayule shrub grows profusely have been leased to Americans during the last two weeks. The leases only cover the guayule shrub, and do not interfere in any manner with any other uses to which the owners of the land may want to put their respective properties. The guayule producing region is confined principally to the highlands of the States of Coahuila, Durango, Zacatecas and Nuevo Leon.

New Factories Planned

It is stated this rush to obtain leases on land for the use of the guayule shrub that grows thereon is preliminary to the establishment of a number of new rubber factories in this section. In fact, it is known that the building of two new factories of this character will soon be started in Torreon. In both instances the principal stock will be held by American automobile tire manufacturers, it is stated. T. F. Oberton of Detroit, Mich., and Frank Serrenth of Indianapolis, Ind., are here arranging for building the factories.

New Shrubs Grown

During the five years that the manufacture of guayule rubber has been greatly curtailed on account of the revolutionary disturbances the cut-over lands have grown a new supply of the shrubs and the raw material is now in greater abundance than it was at the beginning of the industry. This is due also to the fact that large tracts of land that were seeded with guayule when it was found that the shrub was valuable are now covered with a bountiful crop of the raw material.

Extensive Experiments

For several years the Intercontinental Rubber Co. had several expert American botanists in its employ for the special

purpose of devising the best means of propagating the guayule shrub. These scientists conducted their experiments on an extensive scale upon the Cedros hacienda and were successful in proving that the shrub could be successfully grown from the seed.

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200,000 Overlands for 1916

BOSTON, MASS., Dec. 20—There were 150 dealers affiliated with the Connell & McKone Co., Eastern Massachusetts distributors of the Overland and Willys-Knight cars present at the annual banquet of the organization here this evening at the Hotel Lenox. W. J. Connell presided. There were factory representatives present to explain things to the dealers about the increased production.

Joseph McDuffie, assistant sales manager, said that the factory contemplated an increase in production of from 45,000 cars in the 1915 season to at least 200,000 cars in 1916, and perhaps 225,000.

W. B. Sawyer, was introduced as the man who is to have charge of the New England zone to be established at Boston Jan. 1 next. It will be one of thirteen such zones.

Mr. Connell said there would be something very new given out at the New York show which would create as much of a sensation as the announcement made recently of the $615 cars. Just what it was he could not state, he said, but urged all the dealers to try to go to New York to be present when the announcement is made by Mr. Willys.

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Puritan Buys Cyclecar Service

DETROIT, MICH., Dec. 18—The Puritan Machine Co., this city, has purchased the complete service and repair parts of the Scripps-Booth Cycle Car Co. and these can now be obtained from the Puritan company. The purchase makes a total of seventy-one companies whose service and repair parts have been taken over by the Puritan concern.

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Locomobile Adopts Eisemann

NEW YORK CITY, Dec. 18—The Locomobile company, Bridgeport, Conn., has adopted type EMR6 dual Eisemann magneto and type DC Eisemann coil as standard equipment on its passenger cars, which will all be six-cylinder designs for the coming season.

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Detroit Gets New Freight Cars

DETROIT, MICH., Dec. 17—The first lot of the new automobile freight cars of which the Michigan Central railroad has ordered more than 2500, are expected here Dec. 25. Probably twenty-five a day will be added to the Detroit yards, and by the end of the month it is expected that there will be considerable relief of the congestion in this district.

Gasoline Prices Still Higher

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Unprecedented Demand with Scarcity of Supply Affects Rates in All Sections

NEW YORK CITY, Dec. 18—The Texas Co. to-day raised the price of gasoline to 21 cents a gallon wholesale and The Standard Oil Co. has followed suit with a 1-cent rise making the price to owners 21 cents a gallon. Consumers last May were paying 11 to 15 cents a gallon. Then prices rose gradually at the rate of about 1 cent a month.

The reason for the advance given by the oil companies is that the demand has exceeded the supply. Experts say 30,000,000 barrels will be consumed in the United States in 1916. There is an unusual shortage of crude oil from which to refine the gasoline, and hauling facilities for the crude product to the Eastern terminals are anything but the best.

General Advance in East

A general advance, following New York prices, has occurred in the East. All points in New York and Connecticut are on 21 cents a gallon basis; other New England States 22 cents. At Washington, D. C., and Alexandria, Va., the advance was 1½ cents, making present price 19½ cents.

Gasoline, tank wagon basis, has been advanced 1 cent at all stations in South Carolina. At Charleston, S. C., the price is now 21½ cents.

The Atlantic Refining Co. has advanced the price in Pittsburgh, tank wagon basis, 1 cent to 20 cents. The prices at the service stations range from 20 to 24 cents a gallon.

St. Louis gasoline is now quoting at 14.9 cents a gallon by both Standard Oil Co. and Independents. Denver prices have been raised 1 cent to 21, the highest there in two years.

Gasoline in Minneapolis has advanced at the filling stations to 16½ cents. This is a total of 6 cents since last summer. The last previous advance was Nov. 23. At Duluth the price is 20 cents. Last summer the price was 10 cents.

Gasoline in Texas took another leap, going from 19 to 21 cents, the highest price for gasoline in recent years. It is predicted by oil dealers that the price will go to 25 cents.

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Boom in Tampico Oil Fields

TAMPICO, MEXICO, Dec. 21—Industrial affairs and business conditions generally in Tampico and the adjacent oil fields are rapidly getting back to normal. American well drillers and other skilled laborers from the United States are flocking into the different oil camps in large numbers. New arrivals are coming in on every boat and train and there are already strong evidences of a revival of the oil boom that was in existence here when revolutionary events put a stop to development and promotion operations. New rigs for boring wells are being sent into the different oil fields daily and the work of exploitation will be in progress on an extensive scale within a few weeks. Much new tankage is being received and all of the tank farms in the vicinity of Tampico are to be enlarged.

The present steel storage tank facilities of the Tampico territory are approximately 18,000,000 barrels, and earthen tanks perhaps 2,000,000 barrels. It is said that the existing stocks are nearly equal to the storage capacity. If things go as well with the industry during the coming year as is now indicated the storage facilities of the producing districts and Tampico at the close of 1916 will probably be three times what they are to-day. Unless wonderful improvements and additions in transportation and marketing facilities are obtained meanwhile so that the product can be moved more promptly than in the past.

It is expected that with a further improvement of conditions here in the matter of pipe line and tank-steamer transportation the Pierce Oil Corp. will open its 30,000-barrel refinery at Vera Cruz. The plant has been closed for several years. It is also reported that the company will enlarge its refinery at Tampico during the coming year. The refining and asphalt plant of the Mexican Petroleum Co. at Ebano which was built in the early days of oil development in the Gulf coast region will be either greatly enlarged, it is said, or the Doheny interests which own it and the Huasteca Petroleum Co. will build a new plant of large capacity at Tampico. The Huasteca Petroleum Co., recently finished building a 10,000-barrel topping plant here, and the Standard Oil Co. of New Jersey began operating a new 4000-barrel plant of similar type in the suburb of La Barra. The new refinery of the Eagle Petroleum Co. at Tampico is also in operation. The same interests own the refinery at Minatitlan, on the Isthmus of Tehunatepec.

Among the larger companies that are said to have under consideration plans for the building of refineries at Tampico or in this vicinity are the East Coast Oil Co., which is understood to be owned by Southern Pacific interests; the Corona Petroleum Co., a subsidiary of the Dutch-Shell Trading and Transport Co., the Penn-Mex Fuel Co., the Magnolia Petroleum Co., The Texas Co., the Gul-Refining Co., and the Mexican Oil Co. Most of these companies have large quantities of oil in storage here at this time.

Briscoe Capital to Be $6,000,000

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Swift Interests Behind New Co.—Lewis Plant Bought—30,000 Cars Planned

JACKSON, MICH., Dec. 17—Final arrangements for the reorganization of the Briscoe Motor Co. and its affiliated concern, the Argo Motor Co., both of this city, were made to-day whereby the Swift interests of Chicago are to back the greatly enlarged organization originally brought to this city by Benjamin Briscoe and his associates. The deal means an increase in the capital stock of the Briscoe Motor Co. to $6,000,000, of which $4,500,000 is common and the balance preferred.

Coincident with the perfecting of this enlargement, it becomes known that the large and modern plants of the Lewis Spring & Axle Co. here have been bought by the Briscoe combination, as well as some of the equipment in them. These plants have been occupied in the production by the Lewis concern of the Hollier eight, but the purchase does not mean that Lewis will go out of business. On the contrary, the plant at Chelsea, Mich., which Lewis bought in August, will be used for the making of the Hollier eight, according to Fred Lewis. This is the old Flanders plant and is a large four-story structure. It has been fully equipped with all the necessary machinery and equipment by the Lewis company and has been in operation for some time. Its production capacity is 20,000 cars or more.

Some time ago this movement of providing greater production facilities was begun by the Briscoe concerns, and as was reported in THE AUTOMOBILE for Nov. 11, the Jackson Motor Parts Co. was formed with a capital of $200,000 to make parts for Argo and Briscoe cars. More recently, the machinery and equipment of the new defunct Mason Motor Car Co., Waterloo, Iowa, was bought and has been brought to Jackson for installation in the motor parts plant. The plant of the Jackson Metal Products Co. has also been taken over to give added production facilities.

Benjamin Briscoe is still the head of the reorganized company; Frank Briscoe, who only recently became general manager of the old company, appears in the new as vice-president in charge of manufacturing; L. E. Wilson of Chicago, who recently became associated with the Briscoe concern as general manager, has the title of vice-president in charge of sales and advertising in the new combination.

The result of all these added production facilities is said to be a schedule of 30,000 cars for the first year, of which 5000 are to be light deliveries, 10,000 the present models, and 15,000 a new four-cylinder design at low price.

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Market Prices Higher

NEW YORK CITY, Dec. 21—With the exception of a 2-cent drop in aluminum, market prices last week were higher. Copper, both electrolytic and lake, went up to 20 cents a pound and tin closed yesterday at $40 per 100 lb., just $2.25 higher than the opening price on Tuesday. Steel prices remained constant throughout the week.

Gasoline prices last week resumed their upward movement with the fuel growing scarcer each day.

Fine up-river Para again went up, reaching 77 cents yesterday. It is expected that the high price of rubber in all grades will have a material effect in a general rise in tire prices in the near future.

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National Acme Mfg. Co. to Increase Capital $6,500,000

CLEVELAND, OHIO, Dec. 20—Stockholders of the National Acme Mfg. Co. have received notice of a prospective increase in the capital stock from $2,500,000 to $9,000,000.

This increase is said to presage the consolidation of the Windsor Machine Co. of Windsor, Vt., with the National Acme Mfg. Co., which would require approximately $3,500,000, but this deal at the present time is only in the tentative state.

Should the present plans go through the company's stock will consist of $1,500,000 of 6 per cent preferred stock and $7,500,000 common stock. A portion of each issue would be sold to provide funds to take care of the purchase of the Vermont company.

The National Acme Mfg. Co., among other things, manufactures machine tools and automobile and electrical parts.

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Ajax Rubber Co. Formed with $5,000,000 Capital

TRENTON, N. J., Dec. 18—To refinance and increase its output the Ajax Rubber Co. has been incorporated with a capital of $5,000,000, of which $3,000,000 will be issued. The par value of the stock is $50 a share. The new company will take over the business and good will of the Ajax-Grieb Rubber Co. and the stock of the latter company canceled is acquired by the new company. The stock has been underwritten at $65 a share.

A new plant, 200 by 350 ft., three stories, is at present being built. The foundations will permit the building of three additional stories.

Beginning with a cash capital of $18,500, to which no future cash investment was added, except the sum of $100,000 during the year 1911, the present net assets of over $2,000,000 represent an accumulation of surplus profits after payment of dividends. The net earnings for the last four fiscal years ended Aug. 31, 1915, averaged over $430,000 per annum, equivalent to over 14 per cent on a par value of $3,000,000. The purpose of the present financing is to retire all the outstanding preferred stock of the Ajax-Grieb Rubber Co., and to finance the contemplated extension of its factories, which will materially increase its output.

The net sales, it is predicted, for the current year based on actual earnings of 3½ months and contracts closed should approximate $750,000, or 25 per cent on the $3,000,000 stock to be issued.

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Hercules Elects Directors

CANTON, OHIO, Dec. 16—Following the organization of the Hercules Motor Mfg. Co. last week, it has been announced that operations will be started in February. At a meeting of those interested in the plant, the following directors were elected: H. H. Timken, J. G. Obermier and O. J. Strayer, of Canton; G. M. Mather, of Cleveland; L. Pulcher of Detroit, and Charles Balough of Springfield.

After the election of directors Charles

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat	Mon.	Week's Ch'ge
Aluminum	.58	.58	.58	.58	.58	.56	—.02
Antimony	.38½	.38½	.38	.38	.38	.38	—.00½
Beams and Channels, 100 lb	1.97	1.97	1.97	1.97	1.97	1.97	...
Bessemer Steel, ton	30.00	30.00	30.00	30.00	30.00	30.00	...
Copper, Elec., lb	.19½	.19½	.19½	.19½	.19½	.20	+.00½
Copper, Lake, lb	.19½	.19½	.19½	.19½	.19½	.20	+.00½
Cottonseed Oil, bbl	8.34	8.34	8.35	8.35	8.35	8.60	+.26
Cyanide Potash, lb	.28	.28	.28	.28	.28	.28	...
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl	.20	.20	.20	.20	.20	.21	+.01
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb	5.40	5.40	5.40	5.40	5.40	5.40	...
Linseed Oil	.61	.61	.61	.61	.61	.62	+.01
Open-Hearth Steel, ton	31.00	31.00	31.00	31.00	31.00	31.00	...
Petroleum, bbl., Kansas, crude	1.20	1.20	1.20	1.20	1.20	1.20	...
Petroleum, bbl., Pennsylvania, crude	2.10	2.10	2.10	2.15	2.15	2.15	+.05
Rapeseed Oil, refined	.88	.88	.88	.88	.90	.90	+.02
Rubber, Fine Up-River, Para	.72	.73	.74½	.74½	.75	.77	+.05
Silk, raw, Italian	...	...	5.25	...	...	5.25	...
Silk, raw, Japan	...	...	4.70	...	...	4.65	—.05
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb	37.75	37.75	38.50	38.50	38.50	40.00	+2.25
Tire Scrap	.05½	.05½	.05½	.05½	.05½	.05½	...

Balough was elected president; Gordon Mather was elected vice-president and O. J. Strayer, secretary and treasurer.

The location of the plant will be near the Aultman group and 5 acres of ground have been purchased. The first building will cost $75,000. The building will be 65 by 400 ft. of reinforced concrete and two stories high. New machinery will cost over $75,000.

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Gier & Dail Capital $500,000

LANSING, MICH., Dec. 16—The Gier & Dail Mfg. Co., manufacturer of sheet metal stampings has increased its capital stock from $300,000 to $500,000 of which $400,000 is paid in, and will soon begin making automobile bodies, besides increasing the production of its other lines. A new plant is to be put up for the body department. W. K. Prudden is president of the company; Harry E. Bradner, vice-president; B. S. Gier, secretary and manager, and H. F. Harper, treasurer.

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Franklin Capital Now $2,600,000

ALBANY, N. Y., Dec. 15—The H. H. Franklin Mfg. Co., Syracuse, has increased its capital from $1,500,000 to $2,600,000.

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Dividends Declared

Electric Storage Battery Co.; 1 per cent from net earnings on both common and preferred, payable Jan. 3, to holders of Dec. 21.

Firestone Tire & Rubber Co.; quarterly of 1¾ per cent on preferred and 5 per cent on common, payable Jan. 15.

Security Prices Lower

General Motors Drops 37 Points—Packard Features with 25-Point Rise

NEW YORK CITY, Dec. 21—Automobile and accessory securities were dull and lower in price last week, a number of the prominent issues showing losses. A reaction set in on a number of the stocks which heretofore have shown strength on the exchange. General Motors broke around the latter part of the week, said to be due to a readjustment of the price at which it has been carried in banking loans. The closing price yesterday was 501, just 37 points under last Monday's price. Chevrolet dropped 10 points and the new White stock went down 58 points. The New York Curb Market Assn. has approved for temporary quotation and trading 320,000 capital shares of the White stock, par value $50, to be traded in when-as-and-if-issued.

Notwithstanding the general dullness of the market, several of the issues showed considerable strength. Packard common went up 25 points and closed yesterday at 175. Studebaker common showed a gain of 3 points. This stock went up on heavy buying on Wednesday and while speculative attention centered upon it the stock was nevertheless very strong, but when another stock came to the fore, the rise petered out. What happened to Studebaker was typical of the whole market and revealed its professional character. Willys-Overland common rose 5 points. A preliminary estimate of the Overland earnings for the fiscal year show net profits around $15,000,000, a figure which would equal better than 65 per cent on the present $21,000,000 of common stock after taking out the 7 per cent dividend on the $15,000,000 preferred.

Issues on the Detroit Exchange were in sympathy with the local markets. General Motors went down 25 points and Paige dropped 15 points. Packard featured the market with a 32-point rise, the closing on Saturday being 184.

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Akron Rubber Co.'s to Pay $800,000 in Dividends

AKRON, OHIO, Dec. 18—Payments of dividends announced by the large rubber companies of Akron, Ohio, will total more than $800,000 Jan. 1. It is believed that about half of the amount will be paid to stockholders living in Akron.

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Lee Tire Incorporated for $750,000

ALBANY, N. Y., Dec. 16—The Lee Tire & Rubber Corp., has incorporated with a capital of $750,000. The directors are R. E. Corcoran, Brooklyn; Edward Roeder, Ridgefield Park, N. J., and James Gru, Brooklyn.

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H. A. Lozier Co. Incorporated

CLEVELAND, OHIO, Dec. 20—The H. A. Lozier Co. has been incorporated with a capital of $10,000 to manufacture and deal in automobiles. The incorporators are: H. A. Lozier, A. W. Foote, E. G. Tillotson, Frank G. Ginn and R. B. Sheridan.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
†Ajax Rubber Co.	..	..	69	69½	..
Aluminum Castings pfd.	95	100	..	..	..
J. I. Case pfd.	..	..	83¼	88¼	—4¼
Chalmers Motor Co. com.	..	90	150	160	..
Chalmers Motor Co. pfd.	87½	92½	100	103	—1
Chevrolet Motor Co.	..	..	136	137	—10
Electric Storage Battery Co.	..	..	64	66	—4
Firestone Tire & Rubber Co. com.	350	360	690	705	..
Firestone Tire & Rubber Co. pfd.	110	111	112	..	..
General Motors Co. com.	79	83	501	510	—37
General Motors Co. pfd.	90¾	95	120¼	121	—8¼
B. F. Goodrich Co. com.	24½	25	72½	73	+ ½
B. F. Goodrich Co. pfd.	93½	96	113½	114	+ ½
Goodyear Tire & Rubber Co. com.	188	191	336	339	+2
Goodyear Tire & Rubber Co. pfd.	100	102	113	114	..
Gray & Davis, Inc., pfd.	..	..	..	..	..
International Motor Co. com.	..	..	30	33	..
International Motor Co. pfd.	..	..	50	60	—5
Kelly-Springfield Tire Co. com.	65	68	*290 † 72	300 74	—5 —2
Kelly-Springfield Tire Co. 1st pfd.	79	80	95	98	—3
Kelly-Springfield Tire Co. 2d pfd.	95	97	†72	74	—3
Maxwell Motor Co. com.	14½	15	75¼	75½	+ ¼
Maxwell Motor Co. 1st pfd.	43½	45	101½	101¾	+1½
Maxwell Motor Co. 2d pfd.	17	19	55¼	56	+ ¼
Miller Rubber Co. com.	..	..	235	243	..
Miller Rubber Co. pfd.	..	..	110	111	..
New Departure Mfg. Co. com.	..	..	..	..	..
New Departure Mfg. Co. pfd.	..	..	..	..	..
Packard Motor Car Co. com.	..	100	175	200	+25
Packard Motor Car Co. pfd.	90	..	100	102	+1
Paige-Detroit Motor Car.	..	..	..	725	..
Peerless Motor & Truck Corp.	..	..	38½	39½	+2¼
Portage Rubber Co. com.	25	30	60	65	..
Portage Rubber Co. pfd.	80	85	99	100½	— ½
Regal Motor Co. pfd.	..	..	18	22	..
‡Reo Motor Truck Co.	10½	11½	21½	..	..
‡Reo Motor Car Co.	21¼	22½	54	57	..
Solitdorf Electric Co. pfd.	..	..	..	..	..

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Stewart-Warner Speed. Corp. com.	51½	53	86	87	—1
Stewart-Warner Speed. Corp. pfd.	98½	101	108	..	..
Studebaker Corp. com.	32½	33	168	168½	+3
Studebaker Corp. pfd.	86½	88	111	113½	—3
Swinehart Tire & Rubber Co.	69	71	85	86	..
Texas Company	..	..	230¾	231	+17¼
U. S. Rubber Co. com.	52½	53½	54	54¼	+1
U. S. Rubber 1st pfd.	101½	102¼	107½	108½	— ½
Vacuum Oil Co.	..	..	238	242	+12
White Motor Co. (new).	..	..	52	52½	—58
Willys-Overland Co. com.	83	85	243	245	+5
Willys-Overland Co. pfd.	90	95	114¾	115	+ ¼

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com.	..	88	..	158	—2
Chalmers Motor Co. pfd.	87½	92½	..	102½	—1½
Continental Motor Co. com.	155	180	248	257	..
Continental Motor Co. pfd.	..	75	92	..	..
Ford Motor Co. of Canada, Ltd.	..	..	400	425	..
General Motors Co. com.	85	86	490	510	—25
General Motors Co. pfd.	89	91	119	121	—4½
Maxwell Motor Co. com.	13¾	14½	75	77½	+1¼
Maxwell Motor Co. 1st pfd.	43	46	100	102	+1¼
Maxwell Motor Co. 2d pfd.	16	18	55	57	+1
Packard Motor Car Co. com.	..	100	184	..	+32
Packard Motor Car Co. pfd.	90	..	102½	..	+2
Paige-Detroit Motor Car Co.	..	..	..	720	—15
‡Reo Motor Car Co.	21¾	22¼	58	60	+4
‡Reo Motor Truck Co.	10½	11½	..	23⅛	+ ⅝
Studebaker Corp. com.	..	..	168	171	+4
Studebaker Corp. pfd.	..	..	113	115½	—1½

INACTIVE STOCKS

‡Atlas Drop Forge Co.	..	25	28½	31	..
Kelsey Wheel Co.	185	..	265	..	..
‡W. K. Prudden Co.	..	20	24½	27	..
Regal Motor Co. pfd.	..	25	..	22½	..

*Old. †New. ‡Par value $10.

No Tire Famine in France

Manufacturers' Difficulty Is Irregular Delivery of Materials —Metric Sizes Used

PARIS, Dec. 10—While there is nothing approaching a tire famine in France, manufacturers are meeting with unusual difficulties in keeping their establishments running regularly. Raw rubber is obtainable in as big quantities as can be desired, but the various materials and compounds required in tire manufacture are delivered in a very irregular manner. First one material, then another, is found to be short, or to have been delayed in transportation, thus throwing departments or even the whole factory out of gear.

"We have always managed to make good on deliveries," declared the head of a leading factory in France, "but so many unexpected difficulties crop up every day that the life of a tire manufacturer is full of trouble. At one time it looked as if we might be held for lack of coal; that difficulty was overcome, and we now hold stocks for some months ahead. Benzol can only be obtained through the government, and as supplies are given out very economically, any delay in delivery is liable to put a factory out of gear. We have been able to deliver all the stocks of tires that the armies could possibly use, but it has been a more difficult task to keep the factories running regularly than the public has any idea of.

"According to a neutral tire manufacturer who has been able to make a trip into Germany, the most rigid economy is being exercised in that country, and by reason of this and the huge reserve supplies laid in before the outbreak of war, the Germans expect to keep going two years more before their tire supply fails entirely."

Inch Sizes Abolished

The use of inch size pneumatic tires in the French army has been entirely abolished. Some time ago the Jeffery company received a big order for ¾-ton chassis to be used as ambulances, and equipped with twin and single pneumatic tires. All these were delivered with millimeter size rims, to take French size tires. Trucks are being delivered with solid tires in inch sizes, but whenever replacements are needed, conversion is made to millimeter sizes. A sufficient stock of spare wheels is kept on hand so that changes can be made without holding the truck out of service; the wheels taken off are sent to have their rims transformed and when fitted with the millimeter size tires are used on the next set of trucks coming in for re-tiring.

The demountable solid tire has been received in France with a certain amount of suspicion. However, it is being given a genuine test on Pierce and Packard trucks, and up to the present no serious fault has been brought against it.

Manufacturers in France are not able to handle much private business, owing to the difficulty in getting labor and supplies for more than army requirements. There is a demand for tires, and some makers would like to meet it, for they state that it would be more profitable than fulfilling army contracts. Since the outbreak of war the price paid by the army has decreased, owing to a cut by one of the leading French manufacturers. As the cost of all raw material has increased enormously, army contracts are no longer money making propositions. The leading maker of solid tires is now Bergougnan; Michelin is the biggest single maker of pneumatics, and is making this type of tire only. Goodrich is manufacturing pneumatics and solid tires, and is importing also; the French Dunlop factory is not making tires, but the English factory of this company is running strong. Pirelli is importing some tires from Italy into France. The United States Rubber Co. has a representative in France at present and is investigating the market. It is declared by the French trade that the high duty on American tires makes it impossible for any American firm to sell tires profitably in France.

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Hillclimb Event for Pike's Peak in Sept.

NEW YORK CITY, Dec. 20—A hillclimb will be held over the Pike's Peak highway next September. Up to September last, only 12,000 ft. above sea level of the roadway was completed. The road has since been completed right to the top.

The hillclimb will be for cars of every class, both touring and special, and also for motor trucks, both with and without loads. A trophy for the free-for-all contest will be of Cripple Creek gold and will be a replica of Pike's Peak in solid gold with a roadway which will be a duplicate of the Pike's Peak way leading to the top.

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Motometer Adds Midget Model

NEW YORK CITY, Dec. 21—The Motometer Co., this city, is placing on the market a new model Moto-Meter, styled the Midget which is to sell for $2.50. Except that it is smaller in diameter than the two existing models and measures 2¼ in. as compared with 3¼ for the others it is exactly similar in principle and practically the same in construction. Like the Junior model, it has no glass over the thermometer scale. It is inserted through a ⅞-in. hole in the radiator cap and bolted in place.

Paris Fuel Shortage Hits Taxis

Army Supply Adequate But Private Motorists Buy ½ Gal. at a Time

PARIS, Dec. 9—Owing to the gasoline shortage the Paris taxicab service has been disorganized and friction has arisen among the public, taxicab drivers and the municipal authorities. The shortage is only relative. Supplies are coming through in sufficient quantity and with sufficient regularity to satisfy all the requirements of the army. But the same does not apply to supplies for civilians, and for reasons which are variously attributed to actual shortage, lack of cans, and absence of river tank steamers, the private motorists of Paris have been reduced to buying gasoline in quantities of ½ gal. at a time. The persons most severely affected are taxicab drivers. Before the war these men obtained gasoline and benzol from their own co-operative supply societies. Benzol has been taken off the market in order to make explosives. The co-operative societies have had great difficulty in getting supplies of gasoline, and the ordinary dealers and garage proprietors who are living on a day-to-day supply, are not at all anxious to receive taxicab drivers as temporary clients. The situation has thus arisen of taxicab drivers being unable to get fuel, or obtaining it in such small quantities that they cannot remain on the streets as long as usual. As the motor bus service of Paris has been suspended since the first day of the war, and as electric trolley cars never have been very plentiful in the central parts of the city, the general public is seriously inconvenienced by the reduction of the number of cabs.

Drivers' Supply Limited

A few of the big taxicab companies now sell their drivers 2.6 gal. of gasoline per day for $1; the men have to pay 40 cents city tax to take this amount of gasoline into Paris. To buy in the open market, this quantity of gasoline would cost $1.20, plus city tax. As 2.6 gal. of gasoline are not sufficient for a full day's work, the drivers working for the big companies prefer to return to the garage as soon as they have used up this amount, rather than buy an extra supply from the dealers or garages. In consequence it has become a very difficult matter to get a taxicab in Paris after 9 o'clock in the evening. The theatrical profession, restaurant proprietors and the general public are angered at the shortage of taxis and have appealed to the chief of police, who has reluctantly had to admit that he has no power to make drivers

stay on the streets longer than they desire. Most of the men would be willing to stay out if they could get extra pay after 9 o'clock, but the public who do not understand the details of the case consider that they are being cheated if the driver does not operate at the normal tariff indicated on his instrument.

It has to be admitted that the taxicab driver's lot is not a happy one. Before the war he could buy unlimited quantities of benzol at 23 cents a gallon. Now, if he belongs to one of the big companies he can buy a limited supply of gasoline at 38 cents a gallon, while if he runs his own cab, or belongs to one of the smaller companies, he has to pay from 40 to 45 cents a gallon. In addition to this he has to pay a local tax of approximately 3 cents per gallon on benzol and 4 cents per gallon on gasoline taken into the city of Paris. In other words drivers are using gasoline at 49 cents a gallon where they were formerly running on benzol at 26 cents a gallon. Calculating on a consumption of 5 gal. per day, the extra cost to the driver is $1.15. As the men buy their own fuel and take a percentage of the total earnings of the cab, all the extra cost of operation comes out of their pockets.

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25,254 Fords in Kansas

TOPEKA, KAN., Dec. 18—Over one-third of the cars in Kansas are Fords, 25,254 out of 61,000 cars being of this make. Sedgwick County, with 1131 cars leads in number, while Grant County is at the bottom, with but eleven. The average to a county is about 1340. March 1 there were 61,000 cars listed for taxaxtion, but at present more than 70,000 cars have been licensed.

The list of automobiles in the State by makes includes:

Auburn	652
Buick	5,998
Cadillac	855
Chalmers	732
Dodge	551
E. M. F.	699
Ford	25,254
Hudson	879
Hupmobile	755
Jackson	512
Maxwell	3,026
Mitchell	707
Oakland	720
Overland	5,115
Regal	523
Reo	2,389
Saxon	378
Studebaker	3,427
Velie	406

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Ford Gains 66 2/3 Per Cent

DETROIT, MICH., Dec. 17—During the first four months of the fiscal year of the Ford Motor Co., that is from August to the end of November, the production and sales were approximately 66 2/3 per cent larger than during the similar period in 1914, when, according to figures then furnished by the Ford company, 76,906 cars were made and sold.

$13,140,000 Upkeep in Kansas

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73,000 Cars Cost Owners That Total Annually—Car Value $75,000,000

TOPEKA, KAN., Dec. 18—C. W. Myers, head of the State Motor Car License Department, has just compiled a set of figures showing that Kansas owners expend $13,140,000 a year on the maintenance and upkeep of their cars. His figures are based on the license record, showing ownership of 73,000 cars, exclusive of those in the hands of the dealers, within the State.

Mr. Myers has taken an average of $15 a month as the upkeep cost and thus worked out his findings. It shows a cost of $180 a year a car, divided equally between gasoline and oil, tires and accessories and labor and repairing. The value of the Kansas owned cars is given at $75,000,000.

"The motor not only has converted blacksmith shops into garages, but also has driven the old-fashioned livery stables out of business," Mr. Myers explained. "Rarely indeed now can a livery stable be found in the small towns, and they are getting scarce in the larger places. For instance, Topeka has only two now, whereas a few years ago there were a dozen or more. The jitney, the bus and the truck have absorbed the livery field."

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To Handle Madison Car and Batavia Tire in Mich.

DETROIT, MICH., Dec. 20—A new company, known as the Madison Motor Sales & Service Co. has been organized, with W. D. Block as president, to handle the State of Michigan for Madison cars and Batavia tires. Quarters have been taken at 1425 Woodward Avenue, Detroit, Mich.

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Huff Laboratories, Inc., Formed

DETROIT, MICH., Dec. 17—The Huff Laboratories, Inc., has been incorporated with a capital stock of $20,000. Its headquarters are in the Garfield Building, here. Those interested are E. S. Huff, formerly of the research department of the Maxwell Motor Co.; H. L. Cunningham, of the Cunningham Auto Co., and Orvice La Bounty. The corporation will do general research work.

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Newmark Writes a Book

DETROIT, MICH., Dec. 17—J. H. Newmark, former advertising manager of the Oakland Motor Car Co., Pontiac, Mich., and now with the Apperson Bros. Automobile Co., Kokomo, Ind., in a similar capacity, has written a book entitled Automobile Business: A Guide, which comes as the result of his varied experience in the sales and advertising fields. In his introduction Mr. Newmark points out that the book is for those who are already engaged in the automobile business, or who are thinking of entering this field of activity in any capacity, either as dealer, salesman, in garage work, or the business as a whole. Helpful inspiration and suggestion of better ways of doing business are the basis on which the writer attacks his problem. The publisher is the Automobile Publishing Co., Detroit.

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New $110,000 Automobile Building for Boston

BOSTON, MASS., Dec. 20—Ground was broken this week for the erection of a new building at 683 Beacon Street, near the junction of Commonwealth Avenue, to be occupied by the Oakland Motor Car Co., Pennsylvania Tire & Rubber Co., and the John L. Judd Co., agent for Lewis VI, Allen and Auburn cars. The structure will be ready in April and will cost about $110,000. It will be three stories and basement of reinforced concrete, with all the modern devices for motor and tire business. It will be close by the Marmon, Hupmobile, Reo, Pathfiender, Regal, Peerless, Maxwell, Hudson, King and Autocar buildings.

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N. A. C. C. Banquet Jan. 4

NEW YORK CITY, Dec. 22—The annual banquet of the National Automobile Chamber of Commerce, Inc., will be held Jan. 4 during show week at the Waldorf-Astoria.

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M. & A. M. Banquet Jan. 5

NEW YORK CITY, Dec. 20—The Motor and Accessory Manufacturers has announced the date for the eighth annual banquet of the accessory organization. The affair which promises to excel its predecessors will be held on Wednesday evening, Jan. 5 at the Waldorf-Astoria.

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Mt. Pleasant Co. May Move

MT. PLEASANT, MICH., Dec. 16—The Mt. Pleasant Motor Car Co., which was organized here in 1914, and which has been making the M.P. four- and eight-cylinder cars, is negotiating to remove either to Saginaw, Alma or some other city where a plant and other manufacturing facilities will be offered. Representatives of the Board of Commerce of Saginaw, were here and made some attractive propositions to have the company locate in that city, it is said.

Breaks Non-Motor-Stop Record

Maxwell at End of 672 Hr. Goes 14,261.7 Miles—21.2 M. P. H. and 22.3 M. P. G.

LOS ANGELES, CAL., Dec. 20—Stock Maxwell under A. A. A. sanction number 888, breaks world's non-motor-stop record at end of 672 hr. with a total mileage of 14,261.7 miles. The run started Nov. 22, with an average of 21.2 m.p.h., and 22.3 miles to a gallon of gasoline. Former record to be raised to 20,000 miles if motor which is now running in perfect shape can be kept running.

Chicago Fender Law Invalid

CHICAGO, ILL., Dec. 21—The Corporation Counsel of the city of Chicago told the city council that the ordinance requiring fenders on motor trucks is invalid. For several months the council has been urging the enforcement of the ordinance, which has been opposed by the Illinois Manufacturers' Association, the Chicago Automobile Trade Association, and other organizations.

It was pointed out to the general superintendent of police that the ordinance was clearly invalid because it contained a delegation of power that could not be sustained by the court.

In the law department it was found that no type or types of fenders could be definitely described for use, and the only course left was to provide by ordinance for a standard type arrived at by uniform tests. The committee will take up the preparation of a new ordinance.

36,000 Sq. Ft. Taken at Detroit

DETROIT, MICH., Dec. 17—At the meeting of the members of the Detroit Automobile Dealers' Association, space aggregating over 36,000 sq. ft. was reserved by them for their exhibits at the coming Detroit automobile show. Nonmembers will draw for space in a few days, 23,000 sq. ft. being available. Exhibitors to date total sixty-nine.

Reliance Takes Michigan Crank Shaft

LANSING, MICH., Dec. 20—The Reliance Engineering Co., which recently took over the Seager Engine Works, has now also taken over the Michigan Crank Shaft Co., which started in business here in 1907 and the Emergency Forge Co., which was started in 1910.

Decision in Tire Cover Suit

NEW YORK CITY, Dec. 20—A decision has been issued in the case of the Allen Auto Specialty Co., against E. G. Baker, alleging infringement of patent No. 799,662 on a tire cover construction, the court of appeals reversing the decision of the district court and ruling that the patent is invalid for lack of invention. The district court decision held the patent to be valid and infringed by Baker. The construction at issue applies to a tire cover in the shape of an annular tube receiving the tire from the front and having all exposed edges of the cover overlapped in the same general direction to shed water. The natural next step on the part of the Allen Auto Specialty Co. is to apply for a writ of certiorari.

Jitneys Cost Massachusetts Trolley Lines $700 a Day

BOSTON, MASS., Dec. 18—President Gordon Abbott of the Massachusetts Electric companies, which control the Bay State electric street railways and several others in eastern Massachusetts, Rhode Island and New Hampshire, has just filed his annual report in which he states that the jitney bus business is costing his roads about $700 a day. The coming of the jitney has meant a loss in net operating revenue over last year of $445,634.99.

Moline Plow's Experimental Cars Near Completion

FREEPORT, ILL., Dec. 18—The experimental work upon the automobiles to be manufactured in Freeport by the Henney buggy branch of the Moline Plow Co., is about completed. The models are under construction in Detroit and will be shipped to Freeport shortly for assembling and painting. By Jan. 1 the cars will be ready for testing upon the street. It is presumed that some changes will be made following the tests. Material is being purchased and efforts will be made to place cars upon the market early next summer. J. T. Trumble of Detroit has been secured as chief engineer.

Brennen, Hale & Kilburn Mgr.

DETROIT, MICH., Dec. 18—C. H. Brennan has been appointed manager of the Detroit branch of the Hale & Kilburn Co., North Philadelphia, Pa., with headquarters in the Garfield Building, Woodward Avenue. The Pennsylvania company makes fenders, axle housings, frames and more recently has placed upon the market a steel automobile body, also a composite automobile body.

New Jobbing House in Milwaukee

MILWAUKEE, WIS., Dec. 21—The Shadbolt & Boyd Iron Co. of Milwaukee, Wis., is entering in the automobile accessory business and is purchasing a complete stock of automobile accessories. They request catalogs, price lists, etc. from reliable manufacturers of automobile accessories. This department is to be in charge of F. H. Suter, formerly with the Chicago Rubber Co.

Russell Amalgamation with Canadian Overland Ratified

TORONTO, ONT., Dec. 21—The shareholders of the Russell Motor Car Co., at a special meeting in this city, confirmed the amalgamation of the automobile business with the Canadian business of the Willys-Overland Co., Toledo. The assets transferred to the new company were valued on the books of the Russell company at $1,000,000. For this the company receives $1,000,000 preferred stock in the new Willys-Overland, Ltd., $1,000,000 in cash and $200,000 in common stock.

To Act on Ajax Dividend

NEW YORK CITY, Dec. 22—The directors of the Ajax Rubber Co. will meet next month for the purpose of considering the declaration of a dividend.

The Ajax Rubber Co. of Millbrook, was incorporated at Albany, for $5,000,000 by C. F. Lynch and W. J. Jackson, New York, and C. L. Morris, of Jersey City.

Saxon Has 2300 Orders

DETROIT, MICH., Dec. 18—According to R. C. Getsinger, sales manager of the Saxon Motor Car Corporation, the concern had orders on hand at the beginning of December for 2300 Saxon cars for immediate delivery. It is expected that the production will be more than 2000 cars for the month, or at least 500 more than originally expected.

Oakland Salesmen Meet

PONTIAC, MICH., Dec. 16—A convention of salesmen of the Oakland Motor Car Co., is being held at the plant here this week. Between thirty and forty men from all over the country are here and will be kept busy getting posted on the Oakland sales campaign for next year, its production arrangements, and other matters concerning the Oakland company, until Saturday.

Maxwell Dealers in Session

ST. LOUIS, MO., Dec. 16—Maxwell dealers from eighteen towns in southern Illinois and eastern Missouri braved the first sleet storm of the year to-day in order to attend the annual Maxwell meeting here. The entire sales force of the George C. Brinkman Motor Car Co., Maxwell distributors in this district, acted as host to the visitors.

New York Rotarians Invite Motor Men

NEW YORK CITY, Dec. 21—The Rotary Club of New York has sent invitations to the Rotarians throughout the country to join them at luncheon Tuesday, Jan. 4, at 12.30 p. m., at the Imperial Hotel. Speakers will be chosen from the automobile industry.

Factory Miscellany

Warner Co. Adds—The T. W. Warner Co. is constructing two additions to its plant at Muncie, Ind. The estimated cost is $100,000.

Western Auto Co. to Build—The Western Auto Co., Bremerton, Wash., contemplates purchasing a site for the construction of an automobile assembling plant.

Wichita Falls Motors to Build—It is reported that J. G. Culbertson, manager of the Wichita Falls Motor Co., Wichita Falls, plans to build a factory at Dallas for the manufacture of trucks.

Wheeling Co. to Build—The Wheeling Motor Car Co., Wheeling, W. Va., recently incorporated with $25,000 capital, will establish a plant for the manufacture of its specialty. G. M. Ford is interested.

Standard Crucible Adds—The Standard Crucible Steel Casting Co., 719 Thirtieth Street, Milwaukee, will erect a foundry addition at once to keep the production commensurate with orders. The building will be 40 by 80 ft., of brick and reinforced concrete. It is to be ready about Dec. 1, at which time the foundry force will be increased to thirty-five men.

French Battery Plant Fire Damaged—The plant of the French Battery & Carbon Co., 120 South Dickinson Street, Madison, Wis., was almost totally destroyed by fire on the night of December 1. The loss is in excess of $100,000. The company is a large manufacturer of dry cells, fuses and similar material, and has been filling large contracts both for domestic and export shipment. It is considered certain that the plant will be rebuilt at once to take care of a large volume of unfilled orders.

Milwaukee Ford to Open Feb. 1—It was announced on Dec. 1 by A. W. L. Gilpin, manager of the Milwaukee branch of the Ford Motor Co., Detroit, that no further applications for employment in the new Milwaukee plant will be considered under any circumstances. There are 400 positions to be filled by the time the new shops open on Feb. 1, and up to Dec. 1 the number of applications exceeded 3100. The Milwaukee plant is five stories high, 300 by 120 ft. in size, and will have a capacity of seventy-five cars daily. It will represent an investment of $385,000.

Bates Tractor to Add—Extensive additions will be made to the plant of the Bates Tractor Machine Co., located at the corner of Henderson Avenue and Jackson Street, Joliet, Ill. It is estimated that $100,000 will be expended upon new buildings and machinery. Orders now on hand aggregate 1000 machines and it is anticipated that next season's business will aggregate $1,000,000. By increasing the capacity of the foundry, sufficient steel castings can be produced to triple the output.

Goodrich Warehouse in Kansas City—The B. F. Goodrich Rubber Co. has obtained a lease on the five-story and basement Terminal Warehouse at Twenty-fourth Street and Broadway in Kansas City, Mo., and will immediately start alterations on it for immediate occupancy. This warehouse and storage will furnish the output for the entire Central Western business of the company and will be one of three new auxiliaries to the main plant at Akron, Ohio. All business in this Western territory will now come to Kansas City instead of Akron, a total yearly of about $2,000,000. The sales headquarters here will be under the direction of F. A. Oberhue.

The Automobile Calendar

31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; N.A.C.C.

1916

1.....Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.

-9.....Importers' Salon, Hotel Astor.

.....New York City, N. A. C. C. Annual Banquet, Waldorf-Astoria.

.....New York City, Motor and Accessory Manufacturers' Banquet in Evening at Waldorf-Astoria.

5.....New York City, S. A. E. Winter Session, Standards Committee Meeting.

8, 10, 11...New York City Convention National Assn. of Automobile Accessory Jobbers.

8.....Milwaukee, Wis., Show, Auditorium.

.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.

.....Philadelphia, Pa., Show, Philadelphia Auto Trade Assn.

.....Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.

.....Fort Wayne, Ind., Show, Auto Trade Assn.

.....New Bedford, Mass., Show, State Armory.

.....Detroit, Mich., Show, Detroit Automobile Dealers' Assn.

.....Rochester, N.Y., Show, Exposition Park, C. A. Simmons, Mgr.

.....Wilmington, Del., Show, Wilmington Automobile Show Assn.

Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.

Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.

Jan. 22-29.....Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.

Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.

Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.

Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.

Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.

Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.

Feb. 1-3.....Frederick, Md., Show, Armory.

Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.

Feb. 9-12.....Peoria, Ill., Show, Coliseum, Peoria Automobile and Accessory Assn.

Feb. 12-19.....Hartford, Conn., Show, First Regiment Armory, Hartford Automobile Dealers' Assn.

Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.

Feb. 14-19.....Winnipeg, Man., Show, Ford Plant, Winnipeg Motor Trades Assn.

Feb. 19.....Newark, N. J., Show.

Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.

Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.

Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.

Feb. 21-26.....Portland, Me., Show, Exposition Bldg.

Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.

Feb. 28-Mar. 3....Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.

Feb. 29-Mar. 4....Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.

March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.

Mar. 9-11.....Mason City, Ia., Show, Armory.

Mar. 21-25.....Deadwood, S. D., Show, Auditorium, Deadwood Business Club.

Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros. Academy.

May 13.....New York City, Vanderbilt Cup, Sheepshead Bay Speedway Race.

May 20.....Chicago, Ill., Amateur Drivers' Race, Chicago Motor Speedway.

May 30.....Indianapolis Track Race.

June 17.....Chicago Track Race.

June 28.....Des Moines, Ia., Track Race.

July 4.....Minneapolis Track Race.

July 4.....Sioux City Track Race.

July 15.....Omaha, Neb., Track Race.

Aug. 5.....Tacoma Track Race.

Aug. 18-19.....Elgin Road Race.

Sept. 4.....Des Moines Track Meet.

Sept. 15.....Indianapolis Track Race.

Sept. 16.....Providence Track Race.

Sept. 30.....New York City Sheepshead Bay Race.

Oct. 7.....Omaha Track Race.

Oct. 14.....Chicago Track Race.

The Week in  the Industry

Malany Is Worcester Chevrolet Sales Manager.—H. E. Malany has been appointed sales manager of the Marcy Motor Co., Worcester, Mass., which recently took over the agency for the Chevrolet.

Hebert Studebaker Supervisor—J. M. Hebert, formerly of San Francisco, has become Studebaker supervisor at Portland, Ore.

Dealer

State California News Items—The Chandler Motor Car Co. of California has opened branches and service stations at 125 East Third Street, Long Beach, Cal., and 317 East Colorado Street, Pasadena, Cal.

Negotiations are now under way for the establishment of a branch of the Ahlberg Bearing Co., Los Angeles, Cal., in Sydney, Australia. It is planned to ship machinery for regrinding bearings under the Ahlberg system to Sydney and supply the entire Australian trade from the factory branch.

$100,000 Overland Station in Toledo—The Willys-Overland Co. will erect a service station at Adams and Fourteenth Streets, Toledo, Ohio, which will be four stories high and will cost more than $100,000.

Cleveland Changes—The Poulson Rubber & Tire Co. of Kansas City has leased a manufacturing plant at Doan Avenue and the Nickel Plate tracks, East Cleveland, where it will manufacture tire supplies. Its removal to Cleveland is for the purpose of securing a good market for its product and because of better labor conditions. It is said the company will bring 200 families with it.

The Hills Motor Car Co., 6110 Euclid Avenue, has contracted to handle the Pathfinder cars in that city and the northern section of the State.

The U-Auto-Varnish Co. has moved its general offices from the Arcade building to its new quarters at 1027 Chestnut Avenue, where an entire building is occupied. The company operates a service station in the building where automobiles are painted and varnished.

The Ris Motor Co., handling the Dort, has leased space for an additional service station, which was occupied Dec. 10.

Fisk in Rockford—The Double-Tread Tire Co., located at 319 Cedar Street, Rockford, Ill., has added car repair work in addition to vulcanizing and general tire attention. The company has taken the agency for the Fisk tires.

Motor Men in New Roles

Hawley Branches Out.—P. E. Hawley, formerly manager of the Boston branches of the Studebaker and the King, has branched out for himself as a dealer and he has taken the Saxon for Eastern Massachusetts with headquarters at 889 Boylston Street, Boston.

Henshaw Adds Territory.—C. S. Henshaw has been so successful with the Dodge Brothers' line at Boston and Worcester, standing second on the factory books in total sales, that the company has allowed him to acquire Plymouth County also. This gives him nearly all of Eastern Massachusetts from Worcester to the ocean.

Porter Resigns.—J. S. Porter, formerly factory representative for the Regal Motor Car Co., Detroit, Mich., and who formed the Porter Motor Sales Co. at Boston, Mass., to handle the Regal and Pathfinder, has resigned from the company, and W. E. Cottrell is now in charge of it.

New Men for Stewart-Warner.—L. G. Reynolds, Jr., formerly of the National Cash Register Co., Dayton, Ohio, and Ralph Kaye of New York City, have joined the advertising department of the Stewart-Warner Speedometer Corp., Chicago., Ill., to assist Advertising Manager Gridley Adams.

Eads Goes to New York.—R. I. Eads, manager of the New England branch of the Premier Motor Co. until it was given up at Boston, Mass., has gone to New York, where he will enter business with an automobile company.

Coleman, Dallas Goodrich Manager.—G. P. Coleman has been appointed branch manager for the B. F. Goodrich Rubber Co. of Texas, with headquarters at Dallas.

Hendrick, Fisk Publicity Manager.—G. B. Hendrick of Winthrop, Mass., has been appointed manager of the newly created publicity department of The Fisk Rubber Co., Chicopee Falls, Mass.

Graham Gets Detroiter Appointment.—M. A. Graham has been appointed assistant to the advertising manager, F. M. Eldredge, in the advertising department of the Detroiter Motor Car Co., Detroit, Mich.

Pacific Coast Changes.—L. B. Merton of the Pacific Coast accessory firm of Hughson & Merton has been appointed general manager of that firm, and will hereafter be located in San Francisco.

Edward Johnstone, of the same organization, has been promoted from the managership of the Portland branch to the post as manager of the Northwest territory, including Oregon, Washington, Idaho, British Columbia and Western Montana.

Hughson & Merton will shortly add another branch to their chain of stores, at Spokane, Wash., which will distribute Ajax tires and accessories throughout the Inland Empire.

Dealer

Philadelphia Jackson Moves—The Jackson Automobile Co., 822 North Broad Street, Philadelphia, has moved to larger quarters at 933 North Broad Street.

Toledo Tire Co. Enlarges—The Toledo Tire & Supply Co., Toledo, has leased additional space on Madison Avenue and by means of an archway the new store room will be connected with the present quarters on Erie Street. The basement of the two buildings will also be connected.

New Washington Tire Co.—A new company has been formed in Washington, D. C., under the name of the Ramsdell Two-in-One Tire Co., with offices at 1802 Fourteenth Street, N. W. E. H. Ramsdell, president and general manager, was formerly general manager of the Double Mileage Tire Co., Buffalo, N. Y. The company will make a specialty of making a good tire out of two old ones. The process consists of sewing two old tires of the same size together. The bead or rim of one tire is cut off, and these tires, after being cemented together with a special compound, are stitched by a patented lockstitch process.

New Simms Service Stations—The following concerns have been appointed service stations for Simms magnetos and Simms-Huff electric starting and lighting systems: The Magneto Repair Co., 32 Tennyson Street, Boston, Mass.; Brown & Caine, 1517 Michigan Avenue, Chicago, Ill.; La Fer Instrument Co., 321 Frankfort Avenue, Cleveland, Ohio; Lord Motor Car Co., 1101 S. Hope Street, Los Angeles, Cal.; Stewart Automobile Supply Co., 247 Monroe Street, Memphis, Tenn.; Wisconsin Ignition Co., 509 Cedar Street, Milwaukee, Wis.; United States Automobile Supply Co., Thirteenth and Harney Streets, Omaha, Nebr.; Carlile & Doughty, 846 N. Broad Street, Philadelphia, Pa.; Seery & Morton, 201 East Sixth Avenue, Topeka, Kan., and S. G. Hoffman of 3937 Olive Street, St. Louis, Mo.

VOL. XXXIII NEW YORK—THURSDAY, DECEMBER 30, 1915—CHICAGO No. 27

The AUTOMOBILE

NEW YORK SHOW ISSUE

TRANSCENDENCY

¶ This word of Latin origin best expresses the progress the automobile industry has made during the past year. It has been a year of unparalleled accomplishment, a year that has brought about the full realization of those many factors that have been at work during the past years—a year that has bridged the gap between theory and practice.

FOR the first time since the automobile industry attained national stature has the average price of all of the automobile models for a given season fallen below the $2,000 mark. The 1916 average is $1,600, based on 108 different makers, producing approximately 99 per cent of the output and building all told 169 different chassis models, an average of practically 1.56 model per maker.

This is an amazingly low average, one that strongly impresses itself when contrasted with an average of $2,005 for 1915, obtained by averaging the prices of practically the same number of manufacturers and approximately the same number of models. It is a reduction of $400, or 20 per cent per car.

This $1,600 average, this $400 reduction, this 20 per cent cut, is the most radical downward revision of annual automobile prices on record. The industry has known no parallel. So radical is it that we see between the figures equally radical revisions of the manufacturing processes which are necessary to accomplish such extremely mystifying results. To further grasp the magnitude of this reduction contrast it with annual reductions of the last 6 years: In 1915 the average price was $2,005; 1914 was $2,635; in 1913 it was $2,585; the average in 1912 was $2,508; in 1911 it was $2,560, and in 1910 $2,214. The latest reduction is revolutionary. These are averages not based on guesswork but on actual figures from all of the makers. The variations in price and the things which affect its use are shown in the supplemental chart bound in at page 1180.

Every engineering triumph has its reflection in the market price attached to the work upon which the concentrated thought and manual skill of the craftsman have been bestowed. It is a recognized law of evolution that one of the highest and most valuable achievements that man can rise to is to bring some hitherto unattainable article of value into the hands of hundreds of thousands of people, whose positions in life did not permit them to purchase it previously.

Last year, which yesterday passed into history, saw the vindication of many advanced ideas that have been established in the laboratory and on the floor at engineering sessions. The connecting link between sound engineering theory and practice has been forged with the result that the automobile of 1916 is a better car and costs less than ever before. And the greatest, the most valuable phase of the successful application of the principles which have been used for the past three years, is that the automobile is now within the easy reach of thousands who formerly desired, but dared not buy.

1916 Car Better Equipped

The 1916 car is more fully equipped than ever before and yet, taking the average of all those on the market, it is 20 per cent less in price. Behind this statement of facts stands a list of significant improvements in the three big branches of the automobile industry, design, manufacture and merchandising. Not only is the car a more efficient vehicle of transportation, but when sold, it is complete and equipped for any emergency that may arise. The accessories are better and, although included in the purchase price, are superior to devices of a similar nature costing two to three times as much only two or three years ago.

Prices Highest in 1914

In 1914 the peak of the price curve was reached. It was then that makers first fitted electric starters and lighting systems as regular equipment even to the lower-priced cars. These had a direct bearing on the price, and the average American car for 1914 was listed at a higher price than ever before or since—$2,635. Yet, the average car of 1916 is better than the average car of 1914 because it is better, if not more fully, equipped, it is more efficient in regard to power plant, power transmission and general design, it is more economical to the owner because it is more accessible, considerably lighter and therefore, demands far less in up-keep and running expense.

Competition the Stimulant

Competition has been the stimulant that wrought these changes. With production of many of the leading companies far up into the thousands the matter of cost per unit has had potential bearing on the success or failure of a manufacturing enterprise. Concentration on the problems of production has probably been responsible for the greatest part of the reduction in price. This concentration has meant that makers have reduced the number of models and focussed every thought on making what they did produce the best possible manufacturing proposition, as well as the vehicle which would appeal most strongly to the purchaser.

Big production of few models is the keynote of reduced price. For 1916 the number of chassis per maker is 1.56. In 1912, the number of chassis per maker was 2.17 and this has been dropping steadily ever since, as makers have come more and more to realize that efficiency in factory work means the concentration on as few parts as possible.

Standardization also has had its effect. Not only has it reduced the costs in the drafting room, but these reductions have extended to the purchasing of materials. It may be that the war will have some effect later in the year on the costs of material. It is a fact, however, that the Society of Automobile Engineers standards have reduced in so many instances the amount and variety of stock to be carried, that the price to the manufacturer has fallen.

Table of Models Listed by 97 Different Manufacturers in 1916 and in 1915, Showing by Comparison the Changes in Proportion of Sixes, Fours and Other Motor Types

Car	VARIETIES OF MOTOR MANUFACTURED					
	1916			1915		
Abbott		6	8	4	6	
Allen	4			4		
Apperson		6	8	4	6, 6, 6, 6	
Arbenz	4			4		
Argo	4			4		
Auburn	4	6, 6		4	6, 6	
Bell	4					
Biddle	4					
Brewster	4					
Briscoe	4		8	4		
Buick		6, 6		4, 4	6	
Cadillac			8			8
Case	4			4, 4, 4		
Chalmers		6, 6, 6			6, 6	
Chandler		6			6	
Chevrolet	4, 4, 4, 4			4, 4		
Cole			8	4	6	
Crow-Elkhart	4			4, 4	6	
Daniels			8			
Davis		6, 6		4	6	
Detroiter	4			4		
Dispatch	4					
Dodge	4			4		
Durris		6, 6		4		
Dort	4					
Empire	4	6		4		
Enger			12		6	
Farmack	4					
Flat	4	6		4	6	
Ford	4			4		
Franklin		6			6	
F.R.P.	4			4		
Glide		6		4		
Grant		6		4	6	
H.A.L.			12			
Halladay	4					
Harvard	4					
Haynes		6, 6		4	6, 6	
Herff-Brooks	4	6		4	6	
Hollier			8			
Hudson		6			6, 6	
Hupmobile	4, 4			4, 4		
Interstate	4			4		
Jackson	4		8, 8	4	6	
Jeffery	4	6		4	6, 6	
King			8, 8	4		8
Kissel	4	6		4	6, 6, 6	
Kline		6			6, 6	
Lenox	4	6		4	6	
Lexington	4	6, 6			6, 6	
Locomobile		6, 6			6, 6	
Lozier	4	6				
Luverne		6			6	
Madison		6				
Marion		6				
Marmon		6			6, 6	
Maxwell	4			4		
McFarlan		6, 6			6, 6	
Mecca	4					
Mercer	4			4		
Metz	4			4		
Mitchell		6	8	4	6, 6, 6	
Moline Knight	4			4, 4		
Moon		6, 6		4	6	
Morse	4			4		
National		6, 6	12		6	
Oakland	4	6	8	4	6	
Oldsmobile	4		8	4	6	
Overland	4, 4	6		4, 4	6	
Owen Magnetic		6, 6			6	
Packard			12		6, 6	
Paige		6, 6			6	
Partin-Palmer	4, 4		8	4, 4		
Paterson		6		4	6	
Pathfinder		6	12		6	
Peerless			8	4	6, 6	
Pierce-Arrow		6, 6, 6			6, 6, 6	
Pilot		6, 6, 6	8		6, 6	
Premier		6			6	
Pullman	4	6		4	6	
Regal	4, 4		8	4		
Ree	4	6		4	6	
Republic		6			6	
Ross			8, 8			
Saxon	4	6, 6		4	6	
Scripps-Booth	4		8	4		
Simplex	4, 4	6		4, 4		
Singer		6			6	
Spaulding	4			4		
Standard		6	8			
Stearns-Knight	4	6	8	4, 4	6	
Studebaker	4	6		4	6	
Stutz	4, 4			4, 4, 4	6, 6	
Velie		6, 6		4	8, 6	
Vixen	4			4		
Westcott		6, 6		4	6	
White	4, 4			4, 4		
Willys-Knight	4			4		
Winton		6, 6		6		

Another important factor in the reduced cost of manufacture is special machinery. The adaptation and use of multiple and automatic machinery has had such a marked influence on the cost of making different parts, that it is not unusual to find where certain installations have been made, it is possible to make parts for the 1916 car for half as much as they cost in the 1915 car. The special machinery has been able to attain its utmost effectiveness because the designer has shaped the parts to be able to meet the requirements of the machine design. This is noticeably true in the handling of large or intricate castings like cylinders and crankcases. These parts, which formerly required a large number of operations in the shop, now need but very few before they are ready for the assembly bench. Cost cuts of 20, 30 and even 40 per cent in the handling of these castings, due to better design and to the use of machinery which is practically semi-automatic in its methods, are reported on every side.

Power Plants Unified

Unification of the power plant has been a potent factor in lowering the cost and reducing the price to the final purchaser. The block-cylinder casting is now used on more than three-fourths of our cars, and the unit-power plant, which for 1916 will be found on two-thirds of the chassis models, has had its effect on cost. The plain, simple exterior of the power plant means much more than accessibility and neatness of design to the owner. It is one of the big factors of the work which has cut one-fifth of the price from the 1915 car. This unification goes beyond the inclusion of motor, clutch and gearbox in one housing and extends to the auxiliaries constituting a part of the power plant. The simplification of the electric equipment, carbureter attachment, motor support and control features, is part of the movement toward making the actuating parts of the car one simple, compact and accessible unit.

For convenience in studying trends in price reductions in the complete car field, it is divided into four divisions: first, below $1,250; second, $1,250 to $1,999; third, $1,999 to $3,000, and fourth, over $3,000.

A Multi-Cylinder Epoch

One year ago, the lowest price six was placed on the market and established the beginning of a new epoch for sixes. While for 1916 the lowest price six is still the same as for 1915, $785, new epochs have again been introduced in the prices of multi-cylinder cars. For 1916, we have eight-cylinder cars selling as low as $950 and twelve-cylinder cars as low as $1,095. Below $1,250 the purchaser can select from five different chassis models of eight-cylinder cars. In this price classification, there are twenty sixes; forty-two fours and one twelve.

Although, when the average for all American cars is considered, the number of sixes remains practically the same as a year ago, the percentage of fours has dropped from 51 to 29.2 per cent and the place of those which have fallen off has been taken by eights and twelves. Nowhere is this evidenced more forcibly than in the price zone between $1,250 and $1,999, since cars selling between these figures include but five four-cylinder models, while there are eleven eight-cylinder models, and thirty-three sixes.

The fact is that, exclusive of the low-priced cars where the matter of cost of making is of paramount importance, there are more fours in higher-priced classification than in the medium. With touring models as a basis, listing between $1,250 and $1,999 there are five fours. Between $2,000 and $2,999 there are six, and above $3,000 there are nine. No other conclusions can be taken from this than that in order to make the four measure up to the high standard set by the motors of more cylinders, the maker is compelled to go to the extreme in materials and workmanship.

Both in formula horsepower and in wheelbase the 1916 car is lower than the 1915. The trend toward lower formula horsepowers has been continuing since 1912. In wheelbase the average car has remained quite stationary since 1912 until this year was reached. The average for 1912 to 1915 varied between 121 and 122 in. For 1916, it is down to 119.5. Shorter wheelbases are possible on chassis with V motors, a movement which explains the wheelbase reduction.

The horsepower change during the last year has not been so pronounced. In 1915, it was 29.97, for this year it is 28.28. In 1912 and 1913 it was 33.60.

In the lower-priced cars, wheelbase has been climbing steadily since 1910, 1916 showing a marked continuation of the trend. The average wheelbase of cars selling for less than $1,250 was 106 in. in 1915. For 1916 it is over 111 in.

While horsepower shows a slight drop, taking all chassis together, if we break up the field into sections it is seen that the cheaper cars have increased in formula horsepower while the more expensive cars have fallen. For cars costing less than $1,250 the average horsepower is now 23.67 hp. as compared with just under 20 hp. a year ago. For cars costing over $1,250 and under $2,000 the present average is 28.68 hp., a drop of a little less than six-tenths of a horsepower during the year. Above the $2,000 mark the changes have been very slight indeed. On the whole field the actual drop is a trifle over 1 hp.

Tires Are Smaller

The tendency toward lighter weight is reflected in the tire size better than anywhere else. Taking the average for all the cars, the nearest size corresponding to the figure found is the 33 by 4½. This average is due largely to the extended use of the popular 34 by 4 and 32 by 3½ sizes. Tires are smaller now than at any other time of which there is record. In 1910 and 1911, the average size was 34 by 4. This increased along with the tendency of adding more equipment to the car with the result that in 1914 the average was 35 by 4½. This has dropped in all four price classes since that time, and now the 33 by 4½ represents the average.

Another powerful influence in reducing price has been the general simplification of chassis design. By eliminating parts altogether, and by making one part do the work previously performed by several, some material has been saved, and a great deal of work. To cite a specific instance, the use of Hotchkiss drive eliminates a torque stay and all the fitting and attaching operations in connection therewith. Again, block castings save manifolds and the assembling thereof, and the details of electrical equipment have been unified and collected together into a set of parts requiring perhaps six attachments to the chassis instead of thirty-six a year ago. It might be said that while previous automobile development has consisted mainly of adding things, this year the reverse is the case.

Assembly Costs Lower

One of the conspicuous examples in which the reduction in cost during the year has exhibited itself is in the assembly department. Here the development of scientific handling of material and the application of manufacturing skill have enabled manufacturers, who are putting through their products in tens of thousands, to cut high percentages from the cost.

The number of makes included in the list this year from which our deductions have been made is 108. For 1915 it was 119 and for 1914, 133. The maximum number of makers was greatest in 1911 when there were 270. The scythe of time and competition have gradually cut the list until there are now fewer than half the number that were in business five years ago. The fact that there are fewer makers and fewer chassis models per maker, has enabled production to increase to figures that would have been impossible with conditions as they existed five years ago, and this, of course, has had a potent influence on price.

The number of chassis models on the market for 1916 is 169. In 1915 it was 200; in other words, the number is decreasing at a rate much more rapid than the decrease in the number of manufacturers. This drop in the number of chassis has been pronounced during the past year, and while there are only eleven makers less than there were a year ago, there are thirty-one fewer chassis models.

In the number of chassis produced by American manufacturers the drop between 1914 and 1915 was thirty-six. The trend toward fewer chassis however can be most marked in its early stage, when between the years of 1913 and 1914 the number of chassis decreased 103, dropping from 339 to 236.

Graphic Representation of Trends

Between pages 1180 and 1181 there is bound a folding supplement which bears curves showing all the principal trends in American automobile development since January, 1910. In this the rise and fall of the price curve is emphasized by printing it in red, and the curves showing the fall in four cylinder chassis alongside the rise in sixes are also printed in color.

Many Important Curves

The many other curves have each a relative importance. On the right half of the supplement everything illustrated has a definite bearing upon the price question. The price curve is really the result of all the others, plus increasing production.

On the left half there is a lesser correspondence between the curves, as some of them represent things which have little to do with price, but the whole series considered together give a vivid picture of American automobile development in the past six years.

Conclusions

To recapitulate: Of the factors which have made the year 1916 the greatest yet reached in price reduction, the most determining are increased production, standardization of parts, reduction in number of chassis models per maker, the use of special machinery, unification of power plant, elimination of parts by the adoption of combined units and cost cutting in manual proceses in the manufacturing plants; the last named being particularly important.

A feature which should be mentioned in conclusion is the possibility for small manufacturers to reap the benefits of large producers by purchasing parts from the prominent parts makers. Here advantage is taken of the low prices due to large production, and standardization has been carried to such an extent that these various parts can efficiently be linked together. The assembled car is thus enabled to reach the market at a practicable price figure.

Comparison of Features of the Average American Car for 6 Years

General Averages	1916	1915	1914	1913	1912	1911	1910
Horsepower, S. A. E. rating	28.66	29.97	33.2	33.60	33.60	32.7	31.5
Bore	3.57	3.82	4.12	4.19	4.34	4.42	4.85
Stroke	4.97	5.10	5.28	5.15	4.97	4.46	4.68
Stroke bore ratio	1.39	1.33	1.28	1.23	1.09	1.01	1.03
Piston displacement	278.87	307.38	349	345	316.2	313.2	281.5
Wheelbase	119.56	122.19	121	122	121	114	112
Gear ratio	4.08–1	3.88–1	3.6–1	3.57–1	3.62–1	.....	.....
Tires	33x4½	34x4	35x4½	35x4½	35x4	34x4	34x4
Number cars	519	535	607	.....	.....	.....	.....
Number chassis	176	200	236	339	381	393	364
Number makes	108	119	133	156	193	270	239
Price	$1600	$2005	$2635	$2585	$2508	$2560	$2214
PERCENTAGE							
Number of Cylinders							
One cylinder	0	0	0	0	1	1	5
Two cylinders	0	.5	1	1	1	2	3
Four cylinders	39.2	51.0	54	62	78	80	82
Five cylinders	0	0	0	1	1	0	0
Six cylinders	45.8	47.5	45	36	19	17	10
Eight cylinders	12.6	1.0	0	0	0	0	0
Twelve cylinders	2.4	0	0	0	0	0	0
Shape of Cylinders							
I cylinder type	13.7	16.5	30	31	30	22	20
L cylinder type (V motors 11.2 Other L types 62.1)	73.3	70.0	59	56	55	60	56
cylinder type	13.0	8.5	6	9	9	14	18
Knight type	3.6	3.0	3	3	2	1	0
Two cycle	0	1.0	1	1	4	3	6
Mondex Magic type	0	0	1	0	0	0	0
Gasoline electric	1	0	0	0	0	0	0
Cylinder Arrangement							
Cylinders cast separate	4.8	4 0	6	15	22	28	39
Cylinders cast in pairs	10.2	27.0	42	48	58	60	53
Cylinders cast in block	78.4	67.5	39	29	18	12	8
Cylinders cast in threes	6.6	10.5	13	8	2	0	0
Cooling							
Air cooled	.6	.5	2	4	5	6	7
Thermo syphon	38.2	27	19	17	19	28	23
Pump circulating	61.2	72.5	79	79	76	66	70
Ignition Systems							
Single ignition	76.0	56	23	15	14	18	25
Dual ignition	19.2	36	59	68	63	53	40
Two spark ignition	1.2	1.45	4	2	0	0	0
Double ignition	1.8	4.55	11	15	23	29	35
Duplex ignition	1.8	2.0	3	0	0	0	0
Motor Lubrication							
Splash oiling	52.7	46 5	42	53	68	81	0
Splash pressure oiling	23 35	16	39	32	20	0	0
Oil in fuel	0	0	1	1	2	3	6
Pressure oiling	23.35	37.5	18	14	10	19	0
Splash gravity	.6	0	0	0	0	0	0
Engine Starting							
Electric starter	98.8	94.5	87	37	2	0	0
Acetylene starter	0	0	1	14	0	0	0
Air starter	0	0	4	9	2	1	1
Optional starter	0	1.5	2	5	0	0	0

General Averages	1916	1915	1914	1913	1912	1911	1910
Mechanical starter	0	.5	1	4	0	0	0
No starter as stock	1.2	3.5	5	31	98	99	99
Fuel Feed							
Gravity fuel feed	31.8	57	58	65	75	81	82
Gravity pressure fuel feed	2.4	.5	1	0	0	0	0
Pressure fuel feed	12.0	22	41	35	25	19	18
Vacuum feed	53.8	20.5	0	0	0	0	0
Gas Tank Location							
In cowl	No 1916	27.2	13	.....	.....	.....	.....
At rear	Figures	51.1	41	.....	.....	.....	.....
Under seat	Available	21.2	46	.....	.....	.....	.....
Type of Clutch							
Disk clutch	53.4	51	48	52	44	51	49
Cone clutch	45.6	44	41	45	52	47	39
Expanding band clutch	0	.5	3	1	3	2	6
Contracting band clutch	0	4.5	5	2	1	1	3
None	0	.....	3	.....	.....	.....	.....
Electric	1.0	.....	.....	.....	.....	.....	.....
Type of Gearset							
Selective	96.5	91.5	95	94	92	90	85
Progressive	1.7	3.5	1	2	5	1	8
Planetary	.6	1.0	1	1	2	4	4
Friction	1.2	2.5	3	3	1	5	3
Location of Gearset							
Amidship	20.6	32.5	39	46	55	67	75
Unit with axle	15.3	18.2	15	20	20	17	15
Unit with motor	63.5	49.3	43	34	25	16	10
None	0	.....	3	.....	.....	.....	.....
Infinite	.6	.....	.....	.....	.....	.....	.....
Steering and Control							
Right steering right control	6.8	9.5	24	58	70	81	93
Right steering center control	2.2	3	10	13	15	11	4
Left steering center control	87.1	79.5	57	25	13	6	2
Left steering left control	1.1	3.5	2	4	2	2	1
Optional steering	2.8	4.0	4	0	0	0	0
Electric gearshift (left steer)	0	0	3	0	0	0	0
Wheels							
Wire wheels, demountable	6.5	7.0	4	3	0	0	0
Wood wheels	82.5	88.5	96	96	100	100	100
Optional	11.0	4.5	0	0	0	0	0
Final Drive							
Shaft and bevel	41.0	84.5	93	94	92	91	89
Chain	1.7	4.5	4	4	6	8	11
Shaft and worm	.5	1.5	1	1	1	0	0
Roller	0	0	1	1	1	1	0
Shaft and spiral bevel	56.8	9.5	1	.....	.....	.....	.....
Type of Axle							
Floating	51.8	56.5	65	67	50	0	0
Semi floating	23.6	23.0	17	26	49	0	0
Three quarter floating	22.8	18.5	14	4	0	0	0
Seven-eighths floating	0	0	1	0	0	0	0
Dead rear axle	.6	2.0	3	3	1	0	0
Timing Gear Drive							
Spur gear	8.4	16.1	13	83	.....	.....	.....
Helical or spiral gear	73.0	73.7	77	10	.....	.....	.....
Silent chain	18 1	9.1	10	7	.....	.....	.....
Worm	.5	1.1	0	0	0	0	0

Power Plants Are Simpler

The Trends Observed Last Year Mostly Are Continued Throughout the Period Herein Reviewed—Higher Efficiency Motors Running at Higher Speed—Detachable Cylinder Heads—Aluminum Pistons and Integral Manifolds Are High Spots—Few Motors of Old Fashioned Design Are Left—V Motors Now 12 Per Cent. of Models Listed

THE past year has been one of rapid development in design, especially among the manufacturers who make the whole of their chassis. All the twelves and most of the eights have been developed during 1915, but there are many other new motors as well, as instance the Marmon six, with aluminum cylinders, Overland model 75, the Hudson Super-Six, which is the first engine to be made in the Hudson factory, the light six Chalmers, the Buick light six, Mitchell, King and many others.

Motor Efficiency Rising

In the four-cylinder field activity has been almost as great, as motors of higher efficiency are now being made by both automobile manufacturers and engine specialists. There is the new small Overland, and many other large producers are increasing output with improved models. In 1916 as in all previous years, there will be many more four-cylinder cars made than of all other types put together.

Knight Motor Expands

Another sphere of great activity has been the Knight motor field. In the Stearns we have the first Knight engine of eight cylinders ever marketed. The Willys-Knight is the first low-priced car with a sleeve-valve motor, and Moline has put out a small four which, added to the small Stearns, new last year, makes the Knight motor output quite large, six different models.

Specialization Increasing

One of the outstanding features of the year is the increased specialization on single types of motor. There are now nine firms making only cars with V engines, including Packard, Cadillac, Cole and King, Enger, Peerless, Daniels, Standard and Ross. A much larger number now specialize on sixes, having dropped fours, such as Buick, Mitchell, Haynes, Grant, Moon and Velie. Where the greatest number of fours has vanished is from the list of cars selling at prices between $1,250 and $2,000; in this range there are more than twice as many eights as there are fours while the number of fours is less than one-sixth of the number of sixes.

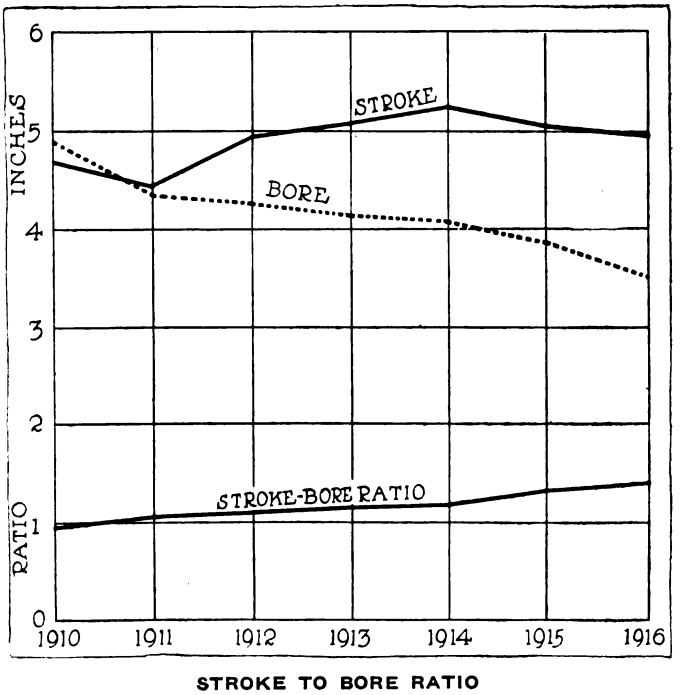
Taking the whole field of the total number of cars on the market nearly half are sixes still. In 1915 the percentage of sixes was 47.5 per cent while at present it is 45 per cent. Fours meanwhile have dropped from 51 per cent to 40 per cent and the balance, of course, is composed of eights, 12 per cent, and twelves, 3 per cent.

It is particularly remarkable that while till January, 1915, there was but Cadillac alone making an eight, there are now twenty-one different eights on the list; and with the first twelve announced in May last we have now five different cars of this type, with a promise of several more soon to appear. National and Packard appeared almost together, Pathfinder and Enger soon followed, and recently the H. A. L. has been announced.

Coming down to exact figures the average horsepower of 112 different chassis models is now 28.66 as compared with about one horsepower less a year ago. This horsepower figure means very little though, as the efficiency of motors has risen so much since the time when the formula was instituted. Probably the brake horsepower of the average motor to-day is considerably higher than it was three or four years ago. That stroke has not gone up proportionally is shown by the fact that the average piston displacement is also down a little, being now 278.87 cu. in., but stroke in proportion to bore has increased, being now 1.39 as against 1.33 last year. There are no "square" engines left as all now have a stroke in excess of the bore dimension.

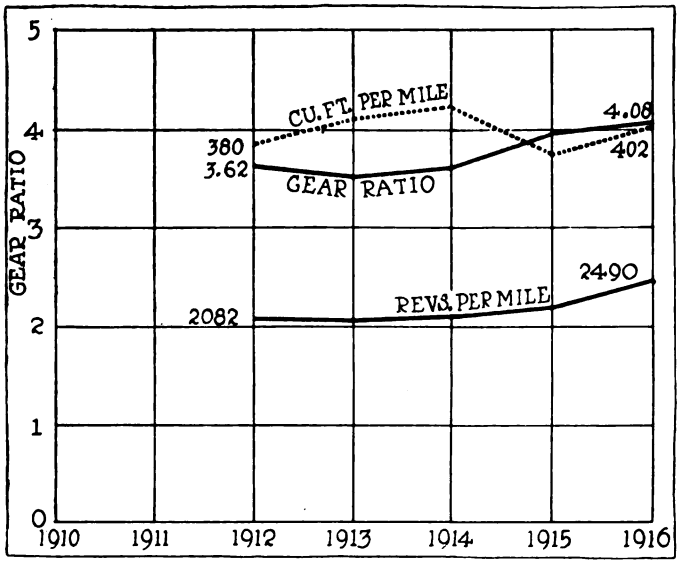
No Sign of Standard Cylinder Size

We seem to be still a long way from standard cylinder sizes, though 3 in. by 5 in. is a very popular proportion, being used on a good many sixes, and for some other types,



STROKE TO BORE RATIO

Since the average stroke of American gasoline motors first exceeded the average bore, in 1911, the two curves have grown wider and wider apart, stroke to bore ratio showing a regular and steady rise. The greatest increase in stroke-bore ratio took place during 1914 and the curve has flattened a little during the past twelve months



MOTOR SPEEDS AND SIZES

Average motor speed is best studied by working out the revolutions per mile with the average size of motor and the average gear ratio for several successive years. This process can be extended by multiplying the results so obtained by the piston displacement in cubic feet; this final figure showing the gas passed through the motor per mile of travel. It is seen that this reached a zenith in 1914, dropped heavily to last January and has risen again, by virtue of lower gear ratios, during the year of 1915. The average motor today has a piston displacement of 400 cu. ft. per mile on high gear

notably the Packard twin-six and the King eight. There are more 3 by 5 sixes on the market than there are engines of any one other size; the motor has a rating of 21.6 hp. and a displacement of 212 cu. in.

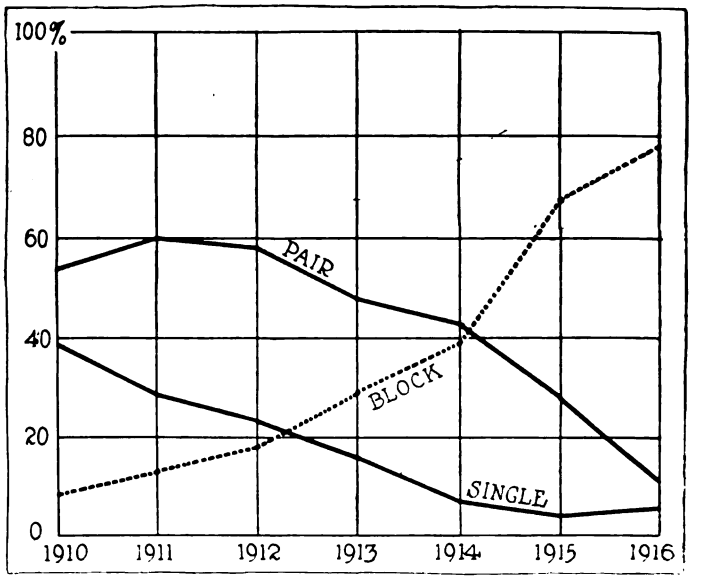
The eights vary considerably, the smallest being the Sterling motor of the Scripps-Booth which is 2⅝ in. by 3¾ in., and the largest the big Northway power plant used on several cars, notably the Cole, which is 3¼ in. by 4½ in. Still smaller eights than the Scripps may be expected and several diminutive twelves are also likely to appear during the year. It is perhaps interesting to note that the Pierce-Arrow 5 by 7 six remains the largest engine.

Certain manufacturers have made but small changes in their power plants and retain the same dimensions for the motor, prominent names in this list being Cadillac, Reo, Chandler, Chevrolet, Dodge and Maxwell. The only air-cooled car, the Franklin, has an unchanged engine, and the big sixes of Pierce and Locomobile retain the same dimensions as they had in 1914.

In all, 23 out of 108 manufacturers have not changed the motor dimensions or roughly one-fifth of the whole; many of these though, made radical changes in the fall of 1914, were in fact, pioneers in the changes that have since become general throughout the field.

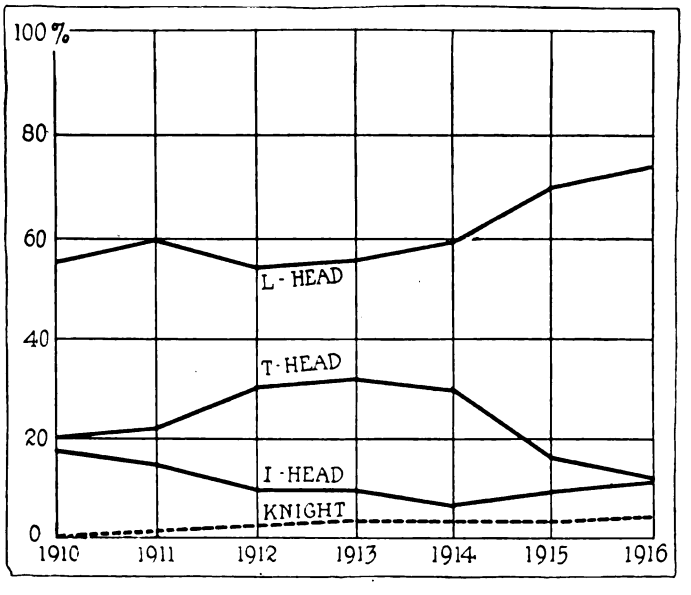
The changes in motor size are a rather interesting study, because it seems that the growing popularity of the light six has been the chief cause of the general drop in dimensions. Among the fours we have a good many examples of increased size, as instance the Hupmobile, Briscoe, Empire and some six or eight others. Meanwhile the light six which offsets these increases is characterized by the small Buick, Paige, Chalmers and Oakland sixes, there being many other examples.

Altogether there would seem to be a tendency to reduce the average difference in piston displacement between fours and sixes; eights and twelves cutting into the big six field and causing the removal of several models of large dimensions. Large individual cylinders are more common with four-cylinder cars than with cars having a greater number of cylinders.



CYLINDER CASTING

The block cast cylinder now rules four-fifths of the field. Casting singly or in pairs is almost never used for any new motor though there are a few new engines using this form of casting



VALVE ARRANGEMENT

With the Knight motor not yet a disturbing factor, it can be seen that I-head and T-head motors are now almost equal in number, while L-head is gaining on even the high spot reached last year

Few New Fours

It is noteworthy that there are very few instances of new four-cylinder models being added to any existing program, Overland and Regal being the most prominent examples, and in both cases the reason was the desire to enter a lower price field. In several cases a light six has been substituted for a four, Buick being the leading instance.

Turning to smaller detail and taking the broad average of trends as shown by specifications it is noticeable that the main tendencies follow those of last year closely. We have a distinct increase in thermo-syphon cooling, in block-cast cylinders, in unit power plants and in single ignition, while vacuum fuel feed, now a year old, has taken hold rapidly and assumed a large importance.

In valve arrangement there has been but little change, but a good deal in valve size, this being demanded by the in-

creased revolutions and increased power per cubic inch. Much lighter reciprocating parts are almost universal and aluminum pistons have been adopted by many manufacturers, Moline, Packard, Marmon, White, National, King and Cole being some who consider the advantages worth the present phenomenally high price of the light alloy.

Valve-in-Head Losing

A year ago it was expected that there would be many converts to overhead valves, but statistics do not bear this out, the I-head motor gaining but few fresh adherents, notably Marmon and Oakland, the latter with a new Northway motor. L-head construction is used by nearly three-quarters, the actual figure being 73.7 per cent, a gain of 3 per cent during the year. The popularity of the T-head motor is still on the wane, showing a drop from 16.5 per cent to 13.7 per cent during the year.

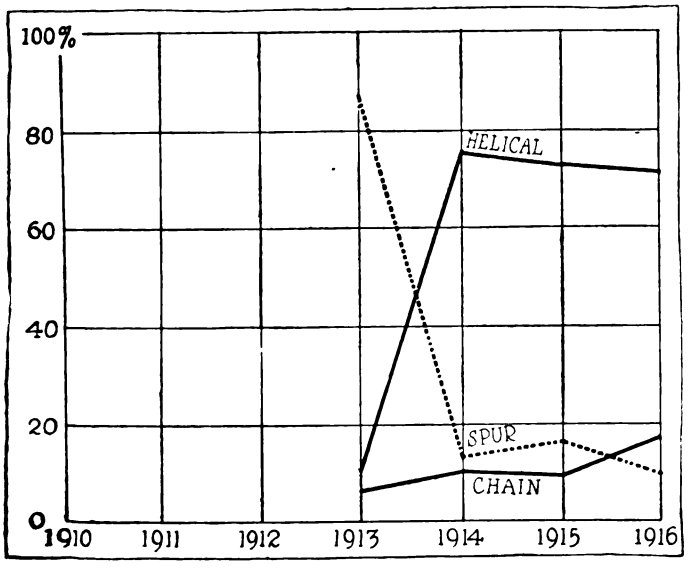
Big Increase in Syphon Cooling

Thermo-syphon cooling was a thing that was bound to increase, as it is a means for saving some cost in production. Most engines still have a circulating pump and syphonic cooling is commonest on cheap cars, but the total proportion using it is 38.2 per cent now as against 27 per cent last year. This leaves pump circulation with nearly double the number of adherents, and but very few cars are to be found with thermo-syphon that cost more than $1,250.

Single Ignition 56 per Cent

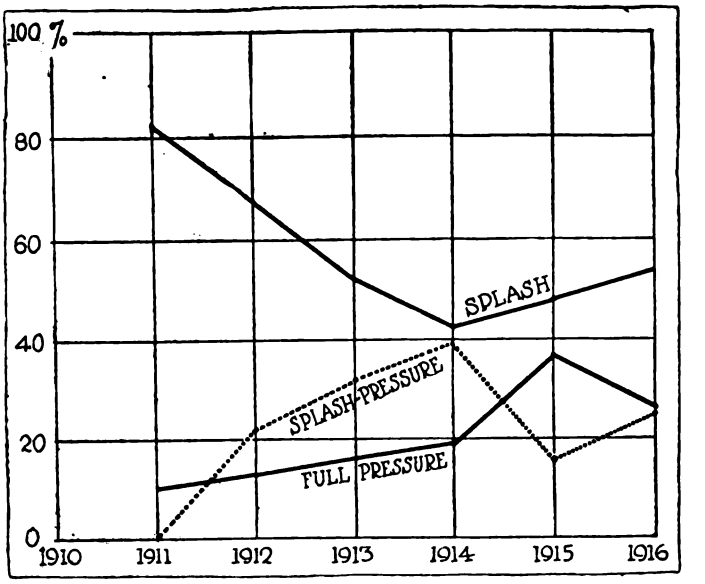
Far more striking in its way is the growing popularity of single ignition, for we note such converts as Cadillac, Buick, Hudson, Marmon, Oldsmobile, Maxwell and Stearns. The growth of single ignition shows a striking curve, since in 1913 it was used by only 15 per cent of manufacturers, in 1914 by 23 per cent, in 1915 no less than 56 per cent and to-day it is used on 76 per cent of all the cars on the American market.

More remarkable still is the fact that double ignition which was used on 68 per cent of the 1913 models now appears on only 1.8 per cent and dual ignition is consequently employed by but a fifth of the total. This is a direct testimony to the improving quality of ignition apparatus, which is all the more striking when it is remembered that electrical equipment of every kind is much cheaper to-day than ever before.



CAMSHAFT DRIVES

Though chain camshaft driving has gained 100 per cent in favor during 1915, it is still little used by comparison with helical gearing. It is interesting to notice that chain driven camshafts outnumber those using plain spur gearing, helical gears holding the bulk of the field



LUBRICATION

Last year saw full pressure lubrication at its zenith, plain splash and compound splash-pressure systems having taken away from the full pressure systems during the past year to a considerable extent. This proves splash lubrication capable of caring for the higher speed motors satisfactorily

Lubrication, classified by systems, also shows a continuance of former trend. Last year it was predicted freely that increasing motor speeds would result in a growth of the full pressure system in which oil is pumped to the main bearings and also through a hollow crankshaft to the crankpins. The percentage of chassis having force fed oiling of this sort jumped suddenly from 18 per cent to 37.5 per cent between January, 1914, and January, 1915, but the latest figures show a drop back to 23.35 per cent, so it appears that the typical American system of dip troughs for the connecting rods, in which the main crankshaft bearings are the only parts to have a direct pump supply, is capable of satisfactory working under much more arduous conditions than was at first anticipated.

Pressure feed remains most popular for V motors, but many of the high speed sixes do without it.

Though exact figures are not available, it is undoubted that crankshafts and bearings are, on the whole much larger, which means that increased rotative speeds have been offset somewhat by lower bearing pressures per square inch.

Chain Camshaft Drives Gain 100 per Cent

If the predictions concerning oiling failed to come true, those regarding the use of chain front end gearing have been fully justified, as there has been a 100 per cent increase in the number of chassis to which it is applied. The total percentage is still small, being only 18 per cent, but some of the converts are important firms such as Packard, Winton and Overland.

The condition is particularly noteworthy because whereas most of the chain employed used to be imported, scarcely any is now coming in, and the new converts to chain front ends are mostly supplied by American manufacturers.

Vacuum Feed Makes Meteoric Rise

Vacuum fuel feed, though hardly a feature of motor design, has had an effect, in that by allowing the carbureter to be placed high it has encouraged the adoption of integral manifolds which are a simplification making for efficiency and convenience in equal ratio. When using block-cast cylinders an integral manifold costs nothing extra and eliminates several parts and machining operations.

Block casting extends somewhat beyond the mere cylinders, as there are more cars than ever now w[illegible]ylinder

and crankcase in one piece, this having been encouraged greatly by the desire for rigid crank mounting and by the soaring price of aluminum. Though not yet used on a chassis the twelve-cylinder Ferro engine deserves mention as being the largest block casting yet made for automobile work, and the Northway eights in which the cylinders are in block with the two vertical halves of the crankcase. Another tendency in casting, which is of paramount importance to the user, is the detachable cylinder head, which is part of almost every motor added to the list during the past six months.

Detachable Cylinder Head Improved

In early days the detachable head was a nuisance because the gaskets gave trouble, but the creation of the modern copper and asbestos gasket has solved the problem and allowed the advantages of the separate head to be obtained without any drawbacks.

Accessibility Much Better

Very much improved accessibility is also to be observed, this being due first to simplification of the main parts of the powerplant and secondly to much better arrangement of the accessories. High placed carbureters have helped a great deal, and smaller electrical units have also assisted to no small degree.

Three-Point Suspension Gains

Among ways for attaching the motor to the frame, three-point suspension is almost always used when the motor is a specialist's production and assembled by the chassis builder, but rigid attachment that makes the crankcase a strength-giving part of the frame is still common with the expensive cars, particularly when the motors are very large.

Unit Power Plant on Packard

Following the trends of several years there is a continued increase in the use of unit power plants, the most noteworthy fact in this connection being the conversion to this system of some of the manufacturers who have held out longest. Packard, Winton and Peerless are three prominent examples.

Packard, having been so consistent a supporter of the rear axle transmission is a specially prominent example of modern trend in this respect.

The form of transmission unification where the gearset is located at the *front* end of the torque tube has one new adherent in Marmon.

Some New Materials

The growing use of aluminum pistons has been mentioned, but this commentary would be incomplete without mention of the aluminum cylinder which makes its first appearance on the actual market at the New York show. That there would have been many such motors had the price of aluminum not soared so high is unquestionable, that there will be many when the price drops again is assured.

The aluminum piston has, by its success on road and speedway, silenced talk about the steel piston, at least for a time, and it has had the effect of causing engineers to pay close attention to the weight of iron pistons, so that many cast-iron designs are now extremely light in weight.

Tungsten Shortage Serious

In the steel world the outstanding thing which has affected engine construction is the shortage of tungsten, which has made it difficult to extend the use of tungsten steel for valves. Thus some makers are using tungsten steel for the exhaust valves and nickel for the intake valves while others are using various sorts of nickel for all valves. Crankshaft and connecting-rod steels have changed but little.

It is notable that brass has almost vanished from the power plants of 1915, integral manifolds, block cast cylinders, cast-iron cylinder headers, and the wider use of aluminum has cut down the brass parts to a minimum. On many motors practically the only piece of brass is the carbureter. Even water pumps are being made in aluminum now in fair quantity, so cast iron and aluminum may be said to have absorbed the brass between them.

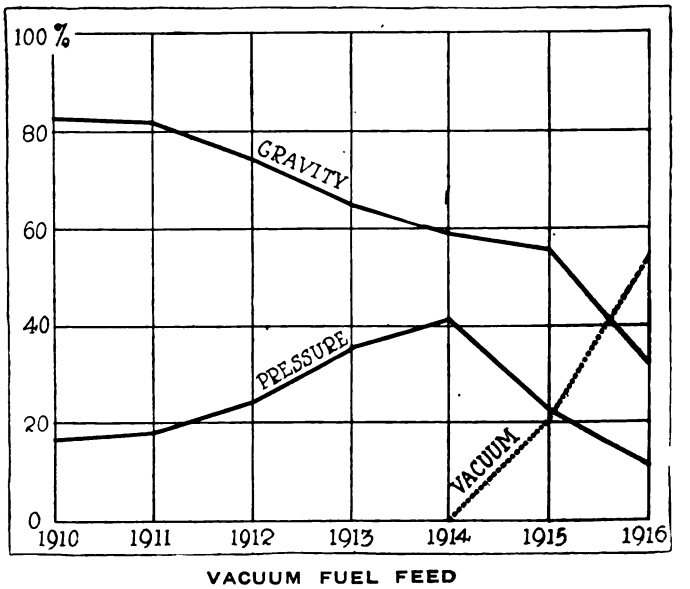
Owner's Convenience Studied

Partly owing to its greater accessibility, partly to its better simplicity and partly to the greater durability given by better materials and better proportions, the engine of 1916 is likely to be distinctly less trouble to maintain in good condition than its predecessors. In one respect it probably has not gained anything, and this is in liability to deposit carbon. When the efficiency of a motor is increased its liabilty to carbonize is increased also, because the temperature of combustion is greater, but this is offset by the much better piston design that is now the rule. Simultaneously the use of smaller cylinder bores makes it less work to remove a set of cylinders for scraping, and the motors with detachable cylinder heads can be dealt with very quickly and effectively.

Probable Future Developments

On the whole, it is hardly likely that the designs of 1917 will show, on the average, so much difference from the present ones as do the latter from those of 1915. The year just closing has seen a general levelling up to a high standard set by sundry pioneers in 1914, factories have been reorganized to suit the new designs, and large outputs planned for the 1916 models. Under such circumstances it is not likely that the main features of next year's motors will differ very greatly from the characteristics here reviewed. Of course there will be changes, and it may be that they will transpire more important than present conditions suggest, but the general advance has been so immensely rapid in the past twelve months that it is unreasonable to expect a continuance of development at anything like the same pace.

In conclusion, the one big trend is to simplification. Reduction in the number of parts, simplification of the parts themselves, and better arrangement of everything. The gasoline motor is an agglomeration of pieces which have become co-ordinated but slowly; to-day the process has advanced much further than a year ago, though there is no statistical method for showing it.



VACUUM FUEL FEED

These curves show how pressure fuel feed that was gaining rapidly in 1913 and 1914, was dispossessed by the vacuum system; the latter gaining support in so vigorous a way that pressure feed has fallen to an extremely small proportion

Spiral Bevel Features Transmission

Coming of New Type Drive Gear the Outstanding Happening of 1915—Clutch Changes Little, But Disk Now Well in Lead—Fewer Four Speed Gearboxes—Hotchkiss Drive Gaining Fast

PIRAL bevel drive is no doubt the big feature of development for the 1916 transmission system. Other features of the driving units have not shown any very ked trend except perhaps the Hotchkiss system which is gaining rapidly in popularity. Although with the two ible exceptions noted, there has been no radical develop- t in driving and torque systems, still the transmission 916 is more efficient than that of 1915, due to improve- ts in manufacture and to the better application of ma- ery in particular instances.

ıe manufacture of spiral bevel gears calls for expensive ıinery which was in its early development in 1914. This now passed its preliminary stage and 1916 cars which fairly low on the price scale are using it. The big gain ıpiral bevel drive may be appreciated from the statement fifty-two makers are using it this year who did not em- it for 1915. The percentage of cars using it is now 56.8; than half, whereas, for 1915 the percentage was only Some of the cars which used it for 1915 and may be ed as among the pioneers of the movement are Cadillac, ɔon, Franklin, Marmon, Packard, Peerless, Jeffery, Kline Stearns.

Spiral Bevel Converts

nverts have been made to the spiral bevel system because quiet, but nevertheless efficient. Tests made by repre- ıtive concerns have failed to show any appreciable loss ɔwer through employing it, and those changing to its ;his year include many well-known names such as Ap- ɔn, Buick, Chalmers, Chandler, Cole, Haynes, Hupmobile, ɔon, King, Locomobile, Mitchell, Moline, National, Oak- Reo, Saxon, Scripps-Booth, Velie and Winton. The list of those who have changed to this type of drive s this one of the big movements of the year.

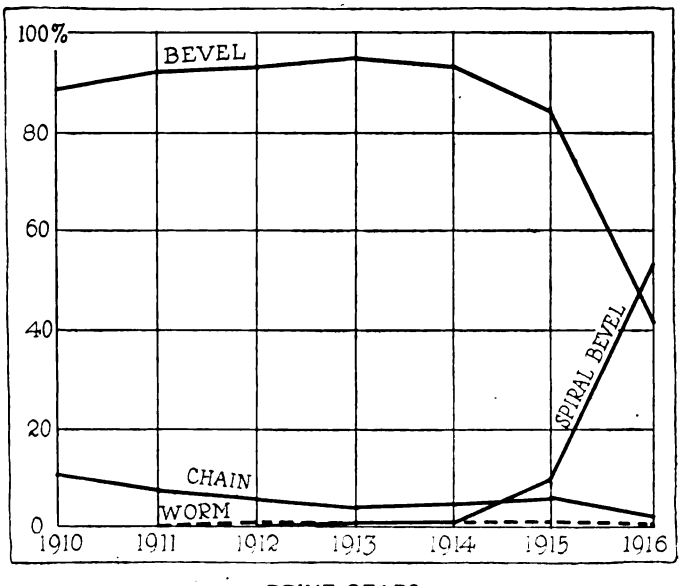
e development of the clutch shows that we have reached re or less stationary period. Since 1913 there has been change, the disk clutch percentage since this time hav- emained somewhat in the ascendency over the cone, but ery far from it. Perhaps the abandonment of the band- of clutches is about the most interesting. Apperson ı contracting band clutch which was fitted to their cars period of several years. This season the Apperson is with a plate design. Haynes, another pioneer, which ɛmployed the contracting band type has also used the design for 1916. These two concerns which are among ldest in the country have brought the percentage of ıcting band clutches down to 0 by making the change. ɛxpanding band clutch which was used by Peerless on f their models for 1915 has also been abandoned and in ıce the disk alone is used. The total percentage of disk ɛs of all types for 1916 is 53.4. For 1915 it was 51, for it was 48 and 52 for 1913. The cone clutch percentage 3 for 1916 and was 44 for 1915, 41 for 1914 and 45 for In 1912 the cone clutch led the disk clutch, having 52 ɛnt to its credit while the disk had but 44. The Owen- ɛtic drive introduces for the first time the electric or ɛtic clutch feature.

The increase in the use of unit power plants has been mentioned, but it has another effect in the promotion of accessibility in the gearbox control lever. This can now be mounted on the cover of the gearbox and when this is done provides a simple and accessible layout which results in a neat appearing driving space in the car. The shifter lever projecting through the floorboard close to the front seats is not coupled to a mass of linkage which promotes noise, but, on the other hand, forms a solid unit which is very much favored on 1916 cars.

Gearsets Little Changed

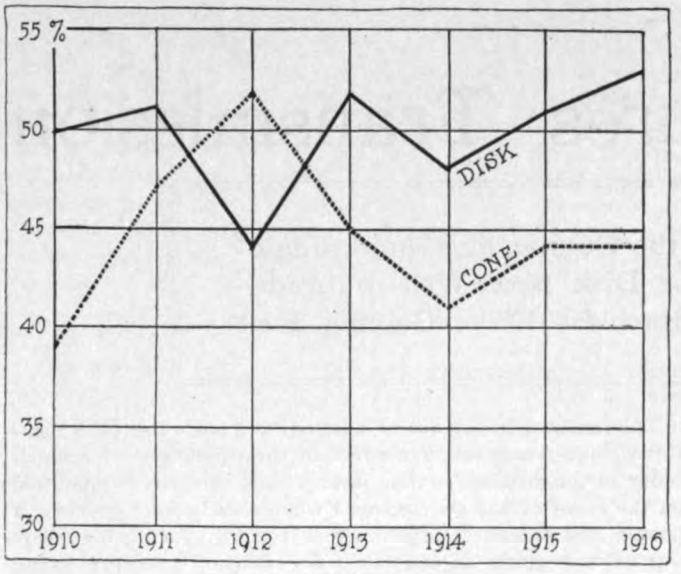
Although the trend is toward unit power plant, the assembly of the gearset in itself has not changed very radically. Shorter shafts due to more compact design is noticeable in a few of the standard designs and the decrease in four-speed drives has also been responsible for a smaller and more compact average gearbox. The number of four-speed gear boxes reached its highest percentage in 1914 when 29.5 per cent were so equipped. For 1916 the percentage dropped to 23.5 and for 1916 it is down to 15. The three-speed gearbox is used in 82 per cent. Some of the cars which during the year have abandoned the four-speed gearbox are Abbott, Davis, Hudson, Kissel, Pathfinder, Peerless, and Willys-Knight. Beside these, there are other companies such as Chadwick and S. G. V. which are no longer listed.

Hotchkiss drive, in which both the driving stresses and the torque are taken through the springs, is now used on 37 per cent of American cars. Some of those who used the Hotchkiss drive in 1915 are Oakland, Stearns, Apperson, Hudson, Haynes, Cadillac and Mitchell. For 1916 some important



DRIVE GEARS

The spiral bevel drive looks to be well on its way to become universal. Worm gearing on gasoline passenger cars has never taken hold, and the straight tooth bevel is being displaced just as fast as the machines for cutting spiral bevels can be delivered



CLUTCH VARIATIONS

These curves of cone and disk clutch proportional representation exhibit a slight trend toward the disk, but they also show that there is no settled opinion. It is not possible to account for the variations by any engineering reason, and the only reasonable conclusion is that either type gives perfectly satisfactory service

names have been added to the ranks, among these being Chalmers, Hupmobile, Maxwell, Peerless and Stearns. This type of drive dates back in America to the Savannah race of 1908 when Apperson had a car using semi-elliptic rear springs in which both the drive and torque were taken through these units.

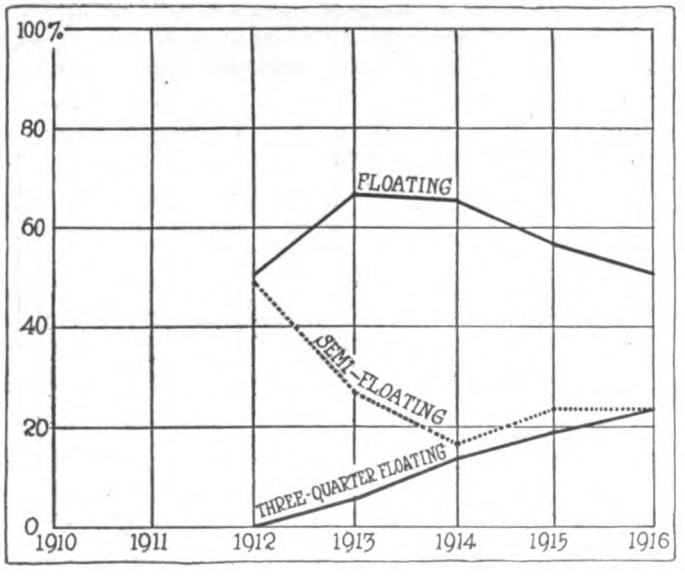
Rear axle design presents an interesting study. There has been considerable argument during the year regarding the merits of semi-floating and floating types, but the ideas of makers are not changing very rapidly as is shown by the fact that no wide variations are to be noted in the number of percentages of installation. However, the three-quarter floating axle which had its inception in 1913 continues to gain and is now used on 22.8 per cent of all makes. The floating design still is by far the most popular having 51.8 per cent. This is less than last year by 5 per cent and much less than in 1914 when 65 per cent of all axles were floating. The peak of the floating axle curve was in 1913 when 67 per cent were so equipped.

Better materials are used in axle construction than ever before. The alloy steels are employed in cars of lower price classification than in previous years and it is not exceptional to find cars listing at less than $1,000 fitted with chrome-nickel and vanadium steel shafts and gears.

Left steering with center control continues to progress in popularity. The percentage of chassis having this type of drive and control is now 87.1 or in other words about seven-eighths of the total. Right steering and right control is used on 6.8 per cent. Concerns which continue to employ the latter are falling off year by year and whereas in 1910, 93 per cent used right drive and right control, the makers who employ it now are reduced to seven. They are Dispatch, Fiat, F. R. P., Morse, Pierce, Simplex and Stutz. Several of the makers who are doing an export business make a practice of putting out a model with right drive and right control to meet the needs of foreign trade, and there are a few also who offer an option to the purchaser in the matter of steering wheel location. Briscoe and Saxon are examples of such. The little Vixen car has center steering.

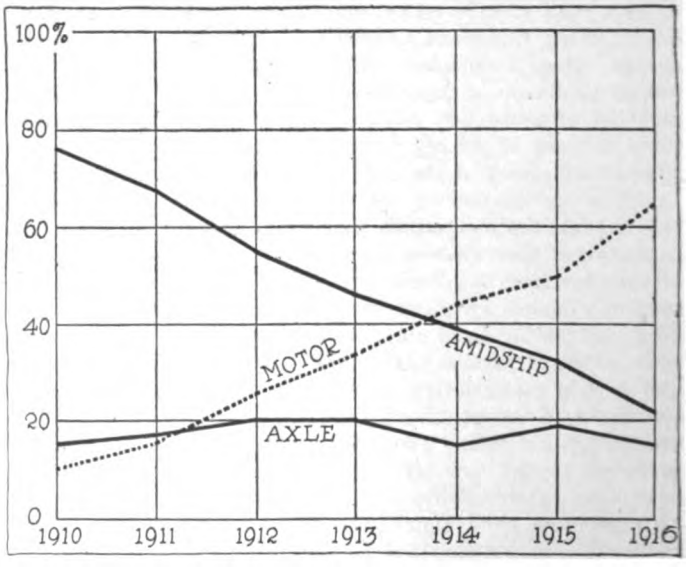
The wire wheel position is not shown properly by statistics. During the year there has been a very large number of wire wheels fitted to high class cars, and they have been standardized by such firms as Marmon and Stearns. On many other good cars they are optional equipment and the option is being exercised by a fair proportion of buyers. The use of wire wheels on small, low-priced cars is decreasing, for the time, but the gain in the better class field much more than compensates for this. The position has been created by the coming of really good wire wheels with a satisfactory demountable hub design.

One of the features of the 1916 car is the neat arrangement and accessibility of the control mechanism, both the electrical and mechanical. Manufacturers have simplified the arrangement of the instruments on the cowl board. The manufacturers of electrical apparatus have improved the appearance of the switches during the year and in some cases have brought out simplified models.



TYPES OF AXLE

The full-floating axle now holds just about half the field of American made cars, and the remainder is divided between the semi-floating and three-quarter-floating designs. The rise of the three-quarter type is most remarkable, and it appears, from the curve, that the semi-floating type is on its way back toward the position occupied in 1912. The most interesting field for speculation is the future of the three-quarter-floating design



GEARSET LOCATION

Rear axle transmissions have never held a large part of the field, and the percentage they occupy has changed but little during the past five years, though there is a distinct drop in the past twelve months. The rise in unit powerplant construction and fall in amidships location for the gearset have continued in an almost straight line curve since the crossing point in 1914. Now, approximately two-thirds of American chasses have unit powerplants

Electrical Systems Simplified

Single Ignition and Two-Unit Lighting and Starting Equipments Are the Big Trends Seen in the 1916 Models—Generators Are Simpler and Neater—Attachment to Motor Is Being Brought Towards Standardization

WITH the advent of electric starting and lighting a part of the equipment of every car, regardless of price, the electrical phase of car design took on an im-tance which has grown constantly during the past three rs. It was in 1912 that automobiles first began to be ipped with electric lighting and starting as standard. ong the 1912 cars but 2 per cent were so equipped. The owing year, 1913, saw the commencement of the landslide ard electric lighting and starting. In that year 37 per cent starting and lighting systems operated by electricity. years of 1914 and 1915 brought the percentage of in-ase rapidly upward, the steps during these two years being 7 per cent and then 94.5 per cent. Finally, for 1916, 98.8 cent have electric lighting and starting. Ford, Vixen Woods Mobillette are those without.

uring this rapid fire development of electrical equipment, e have been two outstanding features upon which it has n necessary constantly to work in order to make the im-vements of the utmost value to the automobile manu-urer and the car user. First, the systems themselves e had to be rendered more efficient and simple and sec-ly, the application of the electrical equipment of the car had to be more workmanlike and rendered more a part of complete unit than simply an added set of accessories d ever be.

elopment In Four Years

he first lighting and starting systems which appeared at show in New York in 1912 were merely tacked on after car itself had been completely built. Even the small ıber shown there were sufficient to cause an immediate lic demand that cars be equipped with lighting and start-systems. The result was that, although motors had not viously been designed for electric lighting and starting, endeavor was made to put on the devices in the quickest easiest way. Ever since that time, the trend of develop-t has been toward not only improvement in the devices nselves, but to improve the rough and ready installation hods which were but natural when the hurried manner in ch the first applications were made are considered.

n other words, development in electrical equipment has n along mechanical and electrical lines, and this has not been confined to electric lighting and starting, but also gnition. Principally in the battery ignition field which re-ed an impetus with the installation of the generator as dard equipment.

-Unit Systems Gain

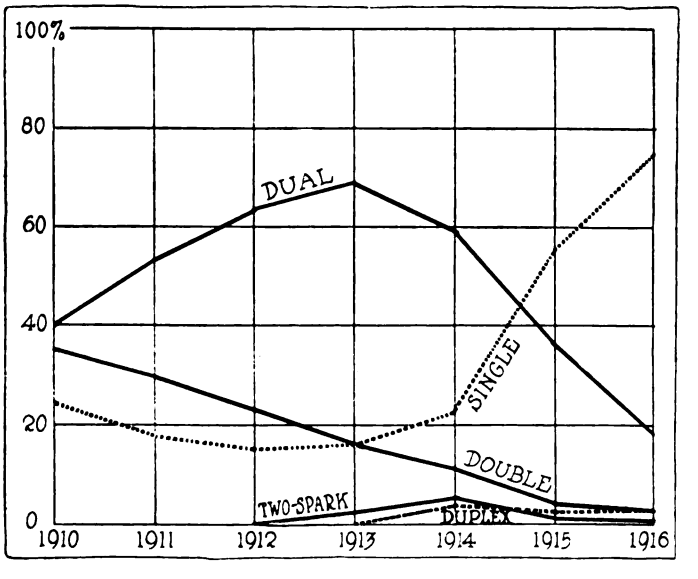
robably no phase of electric lighting and starting sys-s is more noticeable than the tendency toward two-unit ems, in which the generator and starting motor are sep-e for the smaller and lower-priced cars. The single unit em has been developed to a high state of efficiency, but he whole, the trend is strongly toward two units.

echanically, the most noticeable change for the better has been in the connection between the starting motor and the engine. The Bendix gear has proven to be a success and many other and more complicated methods of connection between the starting motor and the engine have been abandoned during the year.

Lack of standardization has been one of the stumbling blocks over which electric starting and lighting manufacturers have had to fall in the past three years, and it is only this year that some workable basis of standardization is beginning to shape itself. Better wiring and less attention on the part of the driver are the two aims for development as far as the user is concerned, and along the line of better wiring, the tendency toward the single wire or grounded return system, has reduced the trouble and expense of upkeep materially.

Single Ignition 75 Per Cent.

The development of ignition has gone hand in hand with the simplification of other parts of the electrical system. Single ignition is now used on more than three-quarters of all chassis, the actual percentage being 76. Dual ignition, which at one time was far in advance of all others in popularity, is now down to 19.2 per cent and the small balance is made up by two spark ignition, 1.2 per cent, double ignition, 1.8 per cent and duplex, 1.8 per cent. In 1911, 1912 and 1913 the percentages for dual ignition were respectively, 53, 63 and 68 per cent. In 1914, it dropped to 59 per cent and 1915 it was down to 36 per cent.



SINGLE IGNITION GAINS

Single ignition has made a seven-league stride for a second year, though the pace has now dropped a little. Double and two-spark ignitions are now hardly used at all and the popularity of the dual system is on the wane. This is the most striking testimony to the reliability of single ignition systems, whether magneto or battery

Stutz and F. R. P. are the exclusive examples of two-point ignition, and double ignition is used by Pierce. The Bosch vibrating duplex system is coming in for some attention and one of the cars which has adopted it is the Winton. Although dual ignition is falling off in the percentage table there are still a number using it. For example: Apperson, Case, Cole, Fiat, Haynes, Locomobile, Moline, Oakland, Peerless, Simplex, Stearns and Velie.

Generator installation has greatly increased the use of battery ignition system, and it is now used on 62 per cent of all makes. All the eight-cylinder cars have battery ignition and three of the twelves. Typical examples of new adherents to battery ignition are Packard, Abbott, Apperson, Briscoe and Chevrolet.

The steps by which single ignition has increased are shown by the respective percentages for 1912, 1913, 1914 and 1915 which are 15, 23, 56 and 70 per cent.

Mechanical and electrical efficiency in ignition systems have been made extremely necessary by the increased speeds of rotation of motors and by the increased number of cylinders. Both factors which are interpreted to the ignition manufacturer in the terms of more sparks per unit of time. The big tendencies in ignition improvement are faster breaker mechanism, more rapid coil action, better timer mounting, ignition for motors up to twelve cylinders, perfected synchronism, short high-tension leads, neater and more compact switches and better protection against water.

Another development which has been continued by practically all the leading battery ignition manufacturers, is automatic advance. Realizing the wide speed ranges of present day motors, ignition manufacturers have been driven to the belief that it is impossible for the average driver to keep the spark position continually at its most efficient location. In order to compensate for the spark changes necessitated by the rapid acceleration, it has been felt by the majority of these manufacturers that the answer lay in the use of automatic advance.

Where it has been necessary to provide ignition for twelve-cylinder motors which are run at high speed, the skill of the ignition manufacturer has been taxed to a greater extent than ever before, but success has been met in this field by the use of double breaker boxes or by breaker mechanism in which the inertia element has been overcome to such an extent that the critical speed of the ignition instrument is in excess of the utmost demands of the multi-cylinder V-type motor.

Carbureters Meet V-Motor Requirements

Side Outlet Types Conform to Block Cylinder Design—Vacuum Feed Allows Higher Mounting—Quick Acceleration

BROADLY speaking, the biggest factors in the carbureter industry for the year 1915 have been in the developments necessary to meet the demands of the big production companies and at the same time meeting the difficult requirements necessary in handling the present day fuel and still supplying the quick acceleration now demanded. Vacuum feed, higher rotative speeds, the extended use of eight and twelve-cylinder motors and the integral manifold have all been developments of the year which have had their effect on carbureter design. The side outlet carbureter which has now been standardized by the Society of Automobile Engineers has also been developed and has found favor with car manufacturers who desire a clean motor exterior.

Vacuum Feed a Factor

Vacuum feed and the integrally cast manifold have gone hand in hand in permitting the carbureter to be mounted higher on the motor than ever before. This shortening of the intake manifold has eliminated the question of condensation which with the heavy grade of fuel has bothered both carbureter and engine manufacturers. With the question of condensation removed it has not been found as necessary to waterjacket the carbureter as formerly predicted and the hot air intake pipe has been relied upon to perform the work.

The concerns which make their own carbureters for 1916 are Cadillac, Cameron, Fiat, Franklin, Hudson, Kline, Lenox, Locomobile, Peerless, Packard, Pierce Arrow and White. This list is about the same as for 1915 the notable addition being Hudson which in the new Super-Six makes its own carbureter. The Kline is also now equipped with a carbureter made by the Kline concern. There are several concerns, also, like Dodge, which have special carbureters made to their own design in carbureter works.

During the year the Zenith company brought out a new model designed particularly for eight-cylinder cars. This is a duplex design which follows closely the ordinary Zenith construction but has two mixing chambers, two outlets to the intake manifold and two inter-connected throttles. This specialization has had good effect as may be noted from the fact that the Zenith is used on the Briscoe, Daniels, King, Mitchell, Ross, Scripps-Booth, Standard and Stearns eights and on the Enger twelve. The Stromberg carbureter is used on the Cole and Oakland eights and on the Pathfinder twelve. The Partin-Palmer eight uses a Rayfield as does the National twelve while the Oldsmobile uses the Johnson carbureter, the Cadillac on its eight uses its own carbureter and Packard on the twin six uses a Packard carbureter.

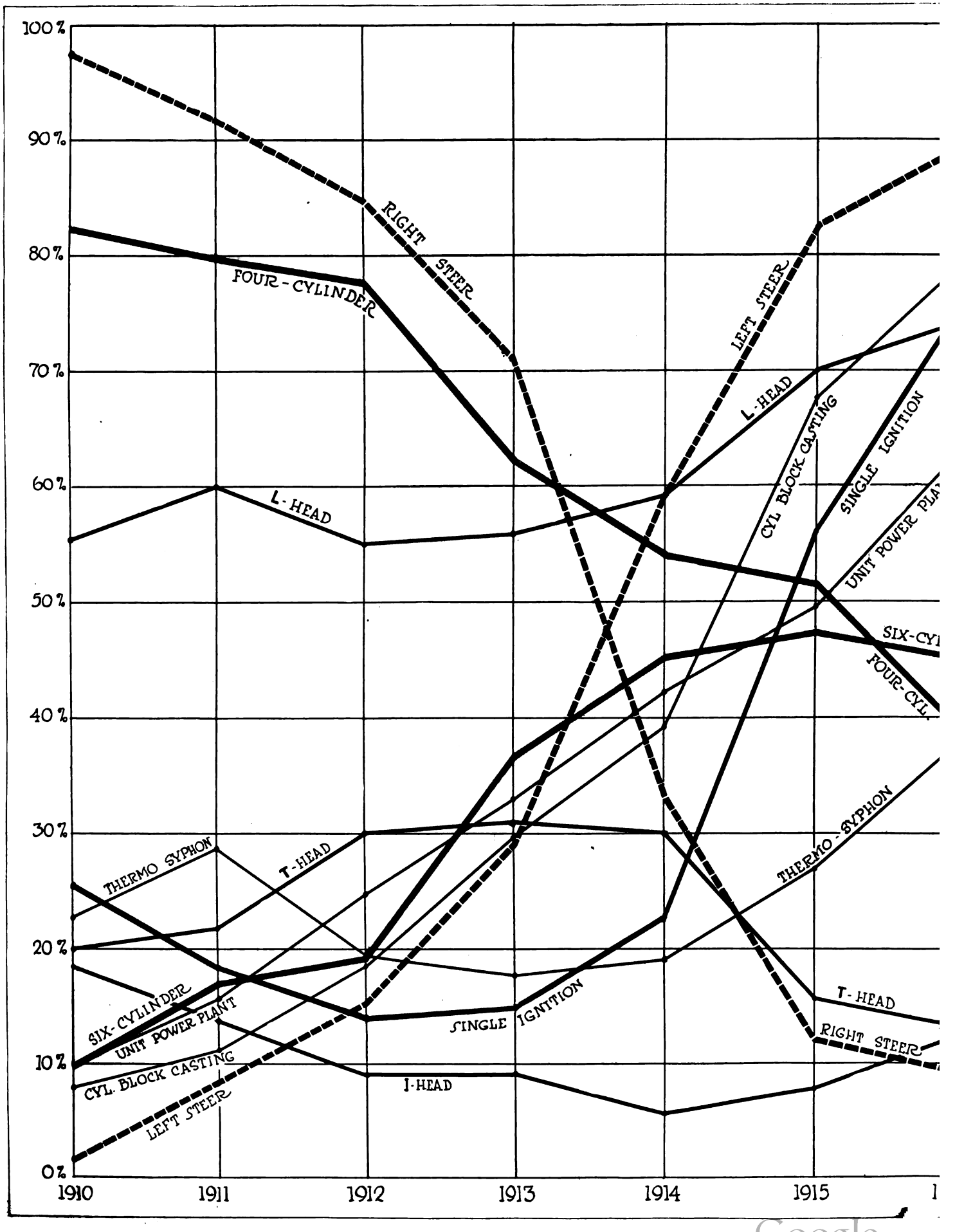
In March, Schebler brought out a new carbureter to succeed the model R which differed from the previous design in that the metering pin opens the jet by moving downward instead of upward. The carbureter is also featured by a long extension on the venturi which is new practice for the Schebler company.

Greater Gas Velocities

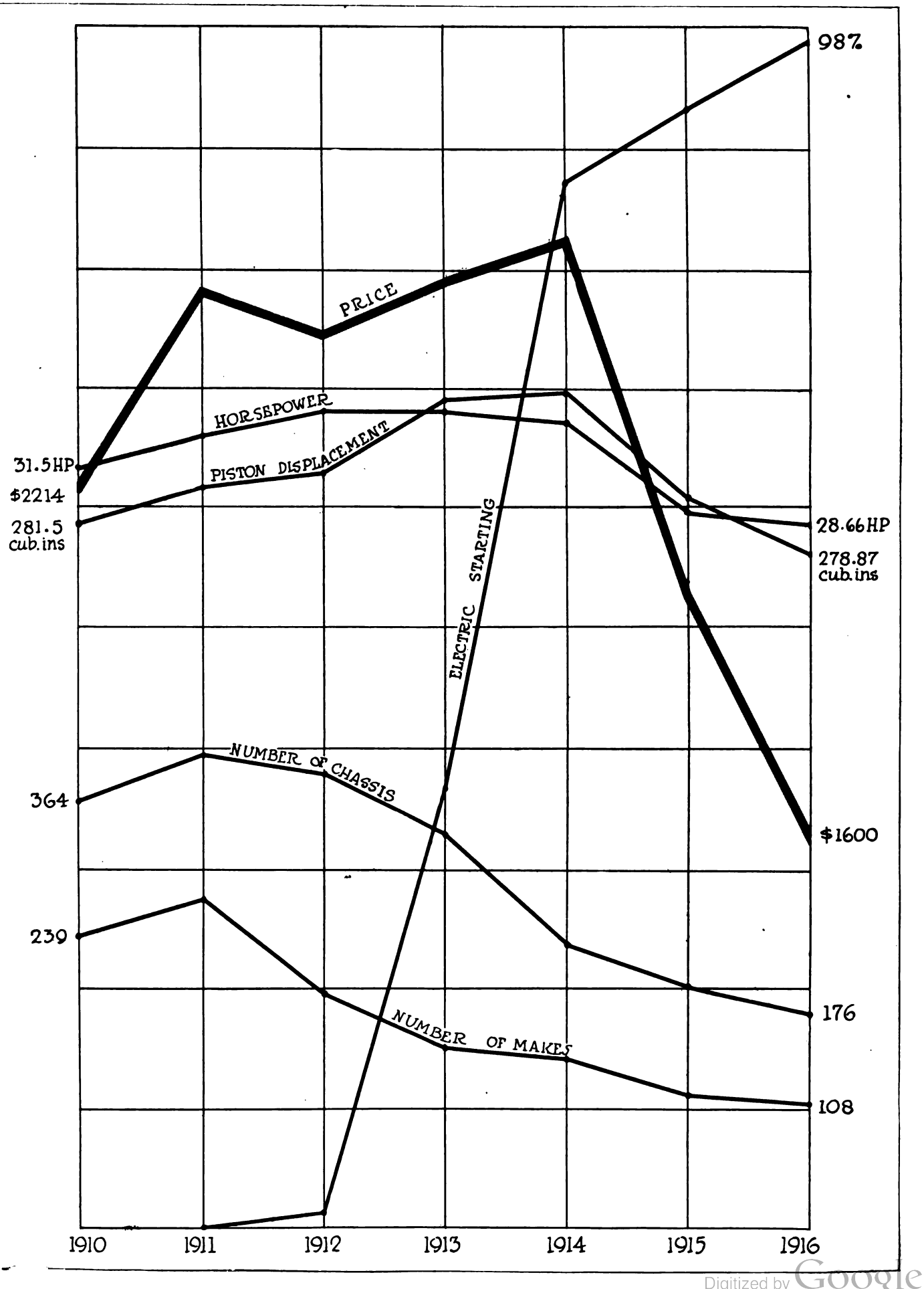
The higher speeds of motors have called for greater gas velocities in order to accomodate the increased displacement per minute in the cylinder. In order to meet the requirements of the greater volume of flow per unit of time without reaching prohibitive speed in the ports it will be found that port areas are larger than a year ago. As the manufacturers gain experience with the block casting, it is possible, without sacrificing metal, to secure wider port areas and better waterjacketing facilities for the same weight.

The effect of the cored-in manifold on carburetion should be mentioned under this general head. In the first place, the intake gases are hotter than they are with the exterior manifold, because it is quite possible to extend the waterjacket around the integral passage so that in some castings it is almost completely covered. The difference between the temperature of the water and the outside atmosphere, under ordinary conditions, is very close to 100 deg. and this naturally has a considerable effect on the density of the gases and hence on the heat value of a given volume of charge.

Trends of the American Automobile for Six Years, Showing V



Tions of Most Important Factors In Design and Manufacture



Average Spring Types Show Changes

The Cantilever Spring Now an Established Type—Few Platform Springs Remaining—Frames Are Stronger and New Design Is Used on Two Cars—Tire Size Touches Low Water Mark

'N frame design there is but one really new thing this being the Brush frame used on the Moline and the new Marmon. This frame is a scientific construction wherein 'ery portion is made to do work. For example the width of ction of the side rails is so small that they would have no easurable resistance to whipping, and stiffness is obtained using a steel running board, bent up at the ends and atched by rivets so that it provides the essential lateral stiffss. The one piece of steel is both frame stiffener, running ard and part fender, as the bent up portions form the rear d of the front and front end of the rear mudguard.

This frame is raised at the rear so high that it forms the lge for the rear seat cushion, and so cuts out a portion of body and it can be made both stronger and lighter than usual frame though it is not greatly more expensive.

With ordinary, conventional frames, there has been a idency to increase the depth, to make them stronger in t, the chief idea being to eliminate body stresses and leaks. More makers are using frames with straight sides, l there is a small increase in taper frames, that is frames which the sides are straight, or almost straight, but the k is wide and the front narrow. This construction gives ood body support and is cheaper than the bent frame.

ıtilever Springs Established

'he cantilever spring now has been accepted as a standard e, to be used where its shape is convenient to other chassis siderations. It has proved in practice at least as good as other form, and a long spring can be employed without ıng frame, which is sometimes an advantage. As many 8 per cent of the cars on the American market now have type of spring; the three-quarter elliptic remaining the t popular type with 42 per cent. Semi-elliptic, is found ınly 15 per cent of chassis while platform springs have ıped to under 6 per cent.

ndoubtedly the introduction of the cantilever has led to h spring discussion that has had the effect of improving r forms of spring, and the suspension of the 1916 chassis stinctly better than that of any previous year. Lessenweights make the spring man's task the harder. One g which has helped is the realization that good steel has ı to do with the matter, and buyers are a little less ind to be swayed by price to the detriment of quality.

heelbase has varied quite a little in the past six years, g to an average maximum of over 122 in. in 1915. This it has lessened on the more expensive cars and lengthon the low price ones, the effect being to bring about a t reduction on the average, the 1916 figure for all cars ; 119.5 in. The changes are due in the main, to the ine of low price seven-passenger cars, and to the introon of the many light sixes costing between $1,200 and 0, while the eights also have had something to do with ıatter.

'es are smaller than for many years, the popularity of 2 x 4 without doubt having had much influence on this. again, the increase in the number of light cars has allowed a drop in tire dimensions. Smaller wheels mean an opportunity to cut the length overall a little, and so have helped the wheelbase reduction perhaps to a small degree, though not to any great extent.

Hotchkiss Drive More Favored

In transmission the trend toward simplicity is very marked. Hotchkiss drive, or that form of drive in which the rear axle is clipped rigidly to the springs and the latter take all driving stress, is on the increase, torque rods are falling off, and radius rods have almost vanished. This is an effect of increasing spring knowledge, for it is easy now to make a spring that will do double duty.

The Hotchkiss drive can be employed only with an open driveshaft that has two universals, so the inclosed propeller shaft has few new adherents, but there are many who like it because it gives protection to the universals, always awkward things to grease, and so does away with a point that needs attention.

Suspension Generally Better

Undoubtedly the average automobile of 1916 is much better sprung than any of its predecessors, and this is due to the great wave of interest in spring design that occurred about a year ago. Spring making and spring designing have both become more scientific and the amount of data now available makes it easy to find the proper spring proportions to give a desired effect. Different spring engineers go to work in different ways, but this year they seem all to have been extremely successful. It only needs a ride in almost any car of three or four years old to bring home how greatly more comfortable are the springs of the new chassis.

Spring Bushings Improved

A detail of spring design which has also improved quite considerably is the eye bushing. Much greater bearing surface is the rule and on many cars the self-lubricating bushings which are a compound of brass and graphite are employed, these rendering the application of grease unnecessary. In other cases there are substantial bronze bushes with good provision for the easy supply of oil or grease, and the accessibility of these lubricators has been studied in making the body attachment.

Left Steering Prevails

Not absolutely universal, but almost so, is left steering, since but 9 per cent of manufacturers still make right hand cars while 2 per cent have an option of left or right. Left control with left steering is also very rare indeed, center control being used upon 90 per cent of present day chassis. There has been no change in the general layout of steering, and no entire novelties, except a couple of new swivel heads on the Overland little four and the Marmon six. Folding steering wheels have gained no fresh supporters, and the King which has used one all the year has dropped it on the new model just added to the line.

Many Changes in Body Design

The Bodies of the 1916 Cars Differ Largely from Those of Last Year—The Most Advanced Designs of 1915 Are To-day the Average of Good Practice—The Great Increase in Seven-Passenger Equipment Is Offset Partly by the Introduction of Three and Four-Passenger Roadsters by Many Manufacturers

At the shows a year ago it was very noticeable that the new bodies were a feature of many exhibits. Extremely handsome streamline types appeared on the stands of the leading manufacturers, and internal comfort was developed along with external good looks. During the year body engineering has advanced almost as much as chassis design, and the bodies of 1916 are improved out of all recognition by comparison with those of three or four years ago.

Streamline Is Cheaper

The body with the smooth exterior that is now considered the proper form has taken a long time to develop, the trend toward simplicity of outline being traceable for ten years or more, but it is not always appreciated that this desire for simple lines and few corners and curves, has a very good reason for its existence apart from any canons of beauty.

Speaking broadly, the fewer panels there are to a body the cheaper it is to make, the fewer junctions and corners the easier it is to paint, the simpler the outline the easier is the making of the frame. Added together these things mean that the body which is now the common form, and which we mostly regard as the proper thing for an up-to-date automobile, is considerably cheaper. Reduction in car price has been due to reduction in body price to quite an appreciable extent.

More Metal and Less Wood

Originally the automobile body was built of wood and had the panels of steel attached to fill in the gaps in the frame, so to speak. To-day the steel of the panels is frequently used for its strength, and the wood cut down accordingly. Thus we have the instance of the Dodge car wherein the body is a complete steel shell before any wooden parts appear. This particular example is worthy of special mention because it seems likely that it contains a principle which may become important. In making this body the steel panels are set in a frame which is a sort of jig, and when in position are welded together electrically, the jig being furnished with the necessary contacts and terminals. This produces a steel shell inside which the seat frames, etc., are afterwards erected, it makes a body in which the exterior surface has no joints in the ordinary sense of the word.

For a long time the Pierce-Arrow cars have had bodies of cast aluminum which are made from pieces bolted together, thus making a stout aluminum shell similar to the sheet steel shell produced by the Dodge process, the Pierce system makes excellent bodies, but is expensive, and the Dodge system seems to be the start of a cheaper and lighter construction having many of the same advantages.

Of course this is partly speculation, as the majority of bodies are still made on the old principle, but the idea is entirely in keeping with other automobile engineering developments of the past year or two.

With the ordinary body built up on a wood frame, the panels are now frequently devoid of double curves which necessitate hammering or die-pressing the sheets of steel. Many of the bodies which are regarded as particularly good in appearance are made from sheets of steel which are simply cut out and bent in one direction. Thus many bodies have one piece of steel extending from one tonneau door to the other, being simply bent round to form the back.

Still, these cases are fewer than where the back panel has a double curve, and in such instances simplicity of manufacture is obtained by the use of large presses which perform the bending operations much more cheaply than the hammering of years ago.

A petty detail that saves much work is the abandonment of beading which used to be employed to so large an extent in the decoration of bodies. The present growing habit of bending over the top edges of the panels to form the top edge of the body, making a flush joint with the upholstery, is not only neater in appearance, but considerably cheaper than the old style of finish with a bead nailed on.

Elaborately buttoned upholstery is also slowly giving way to the smooth finish, partly because this saves money in the factory but more because of the undoubted advantage in the greater ease of dusting and cleaning the cushions.

Probably the most important development of the year in body manufacture has been in the painting processes evolved. First we have new methods for applying the paint to both body and chassis, and second, new ways for drying the paint after application. In painting the air brush has cut enormous numbers of hours from the labor needed to paint the output of a factory, and in drying the progressive system of oven treatment has turned days into hours.

Great Changes in Painting

It is in painting awkward shaped pieces, such as go to make up a chassis that the air brush shows to the greatest advantage, perhaps. A block of cylinders, for example, can be painted all over, completely and better than with a brush in a matter of seconds, actually in considerably less than a minute. The paint is also laid on more evenly, and more economically, there is less waste, better work and much less labor, all combined in one process.

Then in drying the paint after application, the larger factories now mostly have installed a series of ovens like great rooms, through which the bodies and sometimes the complete cars, pass slowly, entering one end of a sort of tunnel when painted and emerging a few hours later at the other end, completely dried. This system has cut out completely all uncertainty due to weather or to time of year; it has removed a really serious trouble. In the words of one manufacturer "it enables an absolutely standard excellence of finish to be guaranteed" a thing which was previously almost impossible with a commercial process of manufacture. Let it be clearly understood, too, that the work done this way is better.

This year there are upon the market quantities of inex-

pensive seven-passenger cars, and the average cheap car has a much larger body space than ever before. Many manufacturers have gone to the most elaborate trouble to accommodate a large body; dealers have demanded it and the engineers have accommodated the dealers.

But, together with this tendency to make the five-passenger car of 1915 into a seven-passenger car for 1916, there is to be noticed a very strong demand for roadsters, for three-passenger roadsters particularly, and now many manufacturers are coming forward with roadsters to seat four. It is difficult to believe that the average man who buys an automobile really needs a seven-passenger car. It is but seldom that a seven-seated car is seen on the road with all its capacity occupied, so if it is granted that a seven-passenger body is wanted by many people there must be many others who are satisfied with something considerably smaller.

Undoubtedly one fault of automobile bodies has always been the separation of the front and rear seat passengers; it is a fundamental fault of the tonneau style of design, and it is not easy to see how else the same number of people could be accommodated, but the close coupled, small tonneau car, the four-seated roadster as it is sometimes called, and the clover leaf three-seated body are all companionable. They are cars in which the whole complement of passengers can comfortably converse together, and being so they are ideal forms for everyone except the man who expects always to be chauffeur driven and the man who wants to transport the maximum number of passengers.

Divided Front Seats Popular

The same idea is expressed in the larger body which has divided front seats, since for some indefinable reason, it seems to bring the front seats and the rear one closer together, even if it does not do so actually. This was a new type last year, but it will be seen on many stands at the 1916 shows, and in not a few instances the individual front seats are adjustable to suit the convenience of the persons who usually will occupy them.

The body with individual front seats is a little more costly to build than the conventional type, because it lacks the bracing which the front seat frame normally supplies, but this difficulty is not hard to overcome if a little more is spent upon the framework. A very rigid type of body of the divided front seat sort can be made by using only one door, this being on the right side as a rule, and this is a cheaper form than one with four doors. It is almost as convenient and distinctly stronger, being less liable to develop squeaks, because of the rigidity given by the continuous, unbroken left side, but it is so far quite uncommon and it depends upon public taste to say whether it will come into greater favor or not.

Closed Bodies in Many Types

The tendency to add closed bodies to the list of available models, which was observed last year has continued for 1916, with the result that bodies which entirely protect the driver and passengers are now obtainable on a very great number of chassis. Closed bodies are called by many names of a more or less meaningless character which have grown from French carriage nomenclature, but the principal forms are now fairly well defined and fairly well known. The great trend of the year has been the production of much cheaper sedan and coupe types so that a closed car can now be bought for very moderate expenditure.

Demountable Top Established

Hand in hand with the production of cheaper closed cars comes the vogue of the convertible body, which can be either open or closed. Commencing a year or two ago with some rather cumbrous designs, progress with this style of body has been extremely rapid. At first a detachable top proclaimed its detachability to all beholders, but to-day there are many which are hard to distinguish from the regular closed car. Hardly any of the new designs call for any feature of the open body that is different from standard, which means that the convertible car is a normal touring car when open and an almost normal closed car when the top is on.

Whether this type of body is to become widely used depends upon the public. It may be that the man who buys this design of body will find the closed setting so comfortable that he will buy a permanently closed car next time. It is a very interesting field of speculation, and development during the next twelve months will show what is to happen. Meanwhile the advent of a new and apparently remarkably attractive style of body has to be chronicled.

It is particularly striking to notice how many manufacturers have designed their 1916 open touring body so that it will conveniently convert to a closed car, in many cases the irons which support the top are screwed into sockets so that they can be removed to give place to attachments for the permanent style of roof. Door hinges are set so that the upper part will swing properly if it is afterwards desired to attach it, and the windshield is arranged so as to be suitable for forming the front of a closed body.

Altogether, what with many new seven-passenger bodies, with the demountable top or convertible car, the divided front seat, the clover leaf roadster for three or four, and the return of the close-coupled tonneau form, the buyer of an automobile to-day has such a choice of bodies as never before has been offered to him. There seem to be at the moment an almost needless number of designs, it is as if in reducing the variety of the chassis produced the manufacturers were offsetting the advantage by increasing the number of bodies.

Names of Automobile Bodies

The increasing number of styles and the constantly changing design of automobile bodies, has created some confusion in the minds of the general public, as to just what is the correct name to apply to the various body models. This confusion is partly due to the rapid changes in design, and partly to the manner in which the cars are advertised as the advertisements often feature the car by playing on the name and in some cases, manufactured names are substituted for the standard ones.

It is not intended in this article to enter into a full description of all the styles of bodies used, but simply to outline the most common types and concisely index them. Briefly it might be well to state that the names of bodies are coming to have a national meaning rather than an international one, and the meaning conveyed by a few of the names now have a different sense in Europe than in this country. The names given below each illustration, are those used by the majority of the best body builders and ranged alphabetically they are as follows:

The *brougham* is a small town car, the name is very often misapplied as the true brougham does not have a window in the quarter back of the door.

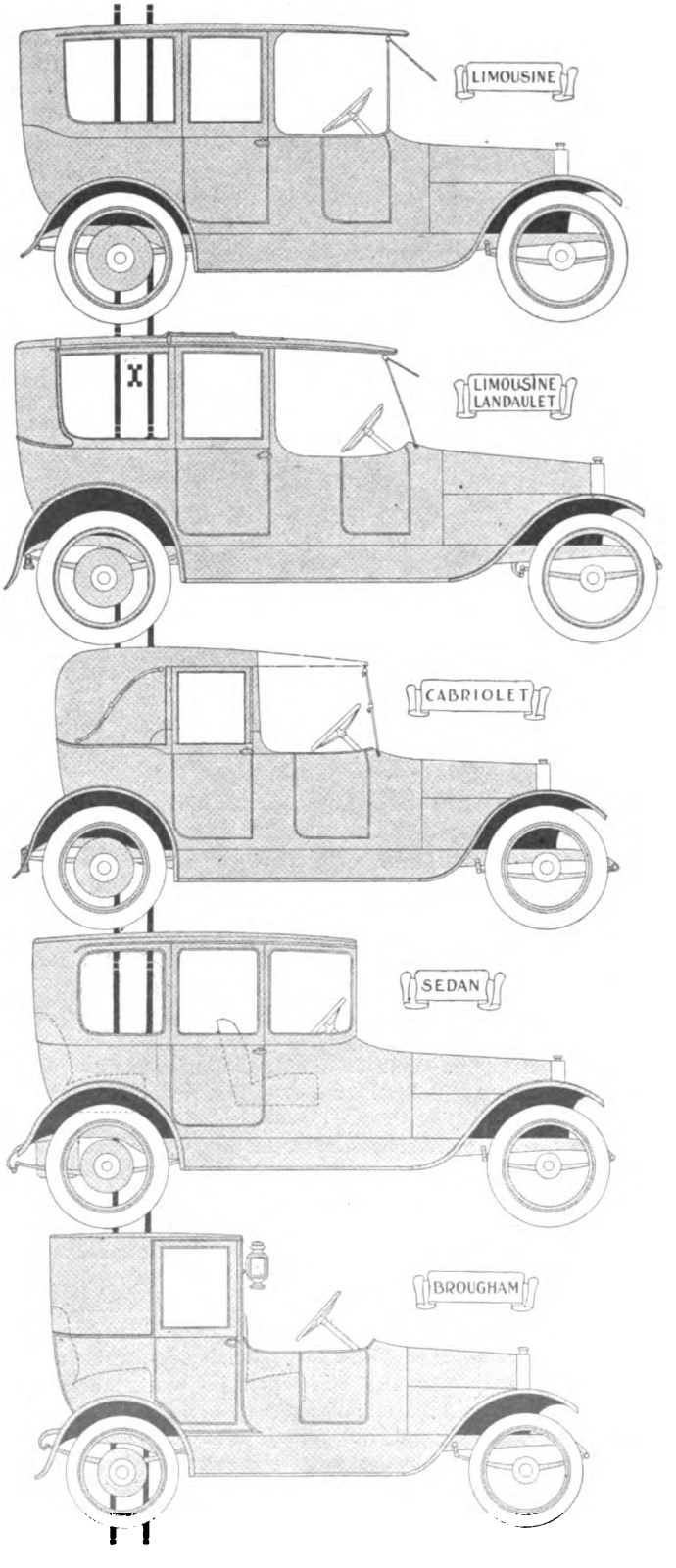
The *berline* is an inclosed body, having a separate compartment for the driver, virtually it is a limousine with the driver inclosed.

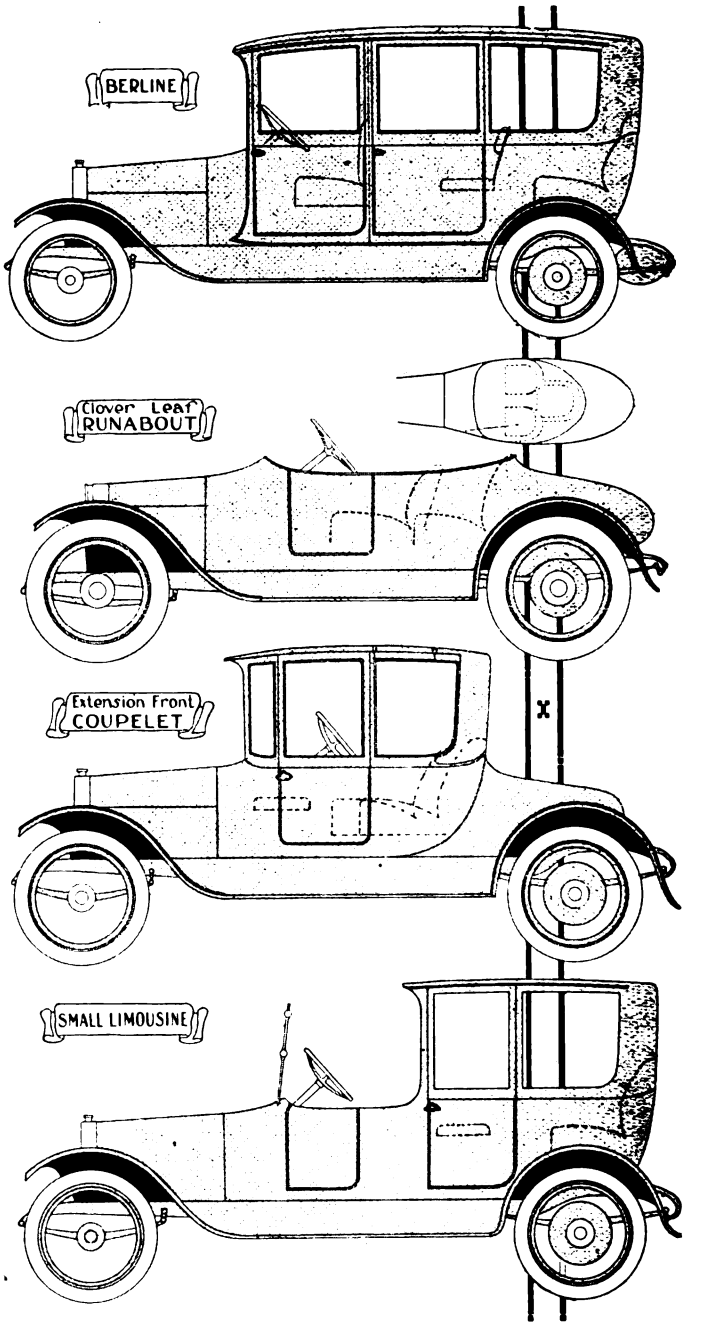
The *cabriolet* is also of the town car class and is generally understood. There is a larger type cabriolet, but it is not much used in this country.

The *coupelet* here shown is made with an extension or window forward of the driver, and the title is amplified to make it understood, in designs where the extension is not included, the name is simply "coupelet" and where the top is stationary (does not fold down), it is called a *coupé*.

The word *coupé* is used to designate a small inclosed drive body and is, in winter bodies, what the runabout is for summer use. It has a meaning slightly different from the horse-drawn vehicle of the same name, and "coupelet" is a manufac-

MODERN BODY NOMENCLATURE





tured or modern word applied to the same style of body, but having the folding top.

The *limousine* is too well known to need a description, and the small limousine is the "town car" size.

The *limousine-landaulet* is the most popular type of falling top body and comprises the essential features of the limousine with the added feature of an openable top.

The *clover leaf* runabout is the name applied to this body on account of the seat arrangement being in the form of a three-leaf clover, the two views of this design conveying the meaning.

The *sedan* is the most general word used to designate the inclosed drive body having the doors one each side and about the middle of the body. Various names are applied to this type, as single compartment, inside drive, inclosed drive, etc., but the name sedan will be the one most generally accepted, as it is a single word and conveys the meaning to the majority of the buyers definitely.

The conventional touring body is so well known that it is not deemed necessary to illustrate it, and the same applies to the runabout.

The Automobiles of 1916

With Fewer Makes of Car and Fewer Designs of Chassis, the Choice Is Wider Than Ever Before By Reason of the Many New Types Now Offered

Section I—Cars Made Only with Four Cylinders

IN describing the automobiles of 1916 it is noticeable that specialization is greatly on the increase in manufacturing. Many makers produce nothing but four-cylinder cars; an almost equal number manufacture six-cylinder cars exclusively. Next in order, but a smaller list than either of the first two, come the makers of more than one type, a four and a six, a six and an eight, and so on. Last we have the nine firms who have concentrated upon the V-motor, seven of them on eights and two of them on twelves.

Thus the short descriptions of the cars listed as 1916 models by the manufacturers group themselves well into this classification. In the following pages cars made exclusively with four cylinders form Section 1. Section 2 is composed of cars which are only to be had with six cylinders. Section 3 is the V-motor division of eights and twelves, and Section 4 the cars made with various sorts of motor. In this last section, of course, will be found fours, sixes, eights and twelves.

That there should be nine manufacturers devoting all their energies to V-motors is a remarkable fact, when it is remembered that a year ago there was but one such. It is perhaps equally remarkable that there should be so many makers who scheme to produce nothing but sixes, and of these many are sixes of most moderate price.

In the field of the fours there remain a few of high price, and there are still a fair number commanding moderate prices, a little above those demanded for the least expensive sixes. In this field, too, we of course, find all the very cheapest cars.

In the six field are the cars of highest price, since no V-motor chassis has yet been offered for more than $3,000 in standard form, and there are several sixes costing much more than this.

In the unspecialized class, it is noteworthy that the majority of the chassis are assembled.

SECTIONS OF DIVISION

Cars Made Only with 4 Cylinders	Cars Made Only with 6 Cylinders	Cars Made Only with 8 or 12 Cylinders	Cars Made with Various Numbers of Cylinders
Allen	Buick	Cadillac	Abbott
Arbenz	Cameron	Cole	Apperson
Argo	Chalmers	Daniels	Auburn
Bell	Chandler	Enger	Briscoe
Biddle	Davis	Hollier	Empire
Brewster	Dorris	King	Fiat
Case	Franklin	Packard	Herff-Brooks
Chevrolet	Glide	Peerless	Jackson
Crow	Grant	Ross	Jeffery
Detroiter	Halladay		Kissel
Dispatch	Haynes		Lenox
Dodge	Hudson		Lexington
Dort	Kline		Lozier
Elkhart	Locomobile		Mitchell
Farmack	Luverne		Monitor
F. R. P.	Madison		National
Ford	Marion		Oakland
Harvard	Marmon		Oldsmobile
Hupmobile	McFarlan		Overland
Interstate	Moon		Partin-Palmer
Maxwell	Owen		Pathfinder
Mecca	Paige		Pilot
Mercer	Paterson		Pullman
Metz	Pierce-Arrow		Regal
Moline	Premier		Reo
Monroe	Republic		Saxon
Morse	Singer		Scripps-Booth
S. J. R.	Stewart		Simplex
Spaulding	Sun		Standard
Sterling	Velie		Stearns
Stutz	Westcott		Studebaker
Vixen	Winton		
White			
Willys-Knight			
Woods			

Allen Has Enlarged Motor

Only one Allen chassis is now being made as compared with five last year. The motor has ⅛ in. more bore being now 3¾ by 5 in. and is made in the Allen plant, being of a highly modern design and conspicuous for compactness. It is a particularly short four-cylinder engine considering the size of the bore.

Simplicity is served by the use of thermo-syphon cooling and lubrication is a combination of splash and pressure.

The rear axle is a floating pattern made specially to Allen design; it has straight bevels and a pressed steel housing. Another feature is the use of long, semi-elliptic rear springs underslung and very flat, the end of the frame being brought down in a sweeping curve. The propeller shaft is inclosed in a torsion tube, but the drive is through the springs, Hotchkiss fashion.

The brake operating rods are conspicuously straight and have few links or connections, in fact the whole rear part of the chassis is devoid of any joints needing attention. Features of the body are the wide doors

with concealed hinges and high sides with flush upholstery; both a five-passenger and a roadster are supplied on the same chassis.

Arbenz Is New Model

A new, and very inexpensive, model Arbenz is being made with five-passenger touring body only. It has a conventional design generally, with Aplco two-unit starting and lighting equipment, and Connecticut ignition. A floating type rear axle used has double internal brakes of large size and the equipment is inclusive of 30 by 3½ in. tires. The specifications are those of a thoroughly well proportioned, light car.

Argo Considerably Improved

It is evident from an examination of the Argo cars that they were designed to give reliability along with simplicity and lightness of construction, these things making possible their low prices.

Both roadster and five-passenger body types are built upon the one wheelbase of 96 in., and in the general scheme of the layout the engine and clutch form the front unit, the gearset and universal another, and the rear axle with its inclosed drive shaft a third. The engine is a conventional four with dimensions of 2¾ by 4½ in., developing 17.5 brake hp. and having a rating of 12.1 Cylinders are block-cast, and bolt to the aluminum barrel crankcase which carries the two-bearing crankshaft.

Again, simplicity is fostered by making the clutch a reversed cone, bolting the female portion to the outer part of the flywheel and then forcing the cone inward to release. This also greatly simplifies the clutch throwout mechanism. Just back of the gearbox, there is still further evidence of simplification, for the universal joint also is a transmission brake. The outer part of the joint takes the form of a drum, and a band contracts around it when the lever is applied.

Instead of the regular form of gear differential, the Bailey gearless type is employed in the rear axle. To simplify the control, the service brakes are applied by the same pedal that releases the clutch, they coming into action after the clutch. In either touring car or roadster, the front seat is adjustable for height and leg room.

Bell Has Full Equipment

This chassis, with wheelbase of 112 in. carries either a roadster or five-passenger touring body and is a soundly designed inexpensive car without any very remarkable novelties. For an inexpensive machine it has a very complete equipment including such useful accessories as a gasoline gage, while the 31 by 4 in. tires are non-skid on the rear wheels.

Spiral bevel drive in a Hess floating type axle is used and the unit powerplant has a Disco single-unit lighting and starting outfit operating at 12 volts.

Biddle Is Large Four

A newcomer among automobiles, the Biddle, has a motor 3¾ by 5⅛ in., and so should have plenty of power. The motor follows usual lines and is fitted with Westinghouse electrical equipment. A point about it which is uncommon is that the chassis only is obtainable, for special body equipment, or there is a choice of three standard bodies of five-, four- or two-passenger capacity.

Another unusual detail is the provision of four speeds in the gearset, which is in unit with the engine this giving a high gear ratio of 3.2 to 1. The direct gear is the third speed which is 4 to 1. Both straight and spiral bevel drives are supplied.

Brewster Lists Only Chassis

The Brewster car which has been expected for some time and only recently announced, is a Knight-engined four of high grade design and workmanship which is to be sold for custom-built body equipment. The motor is 4 by 5½ in. and has the U. S. L. flywheel starter. Forced lubrication is used and a special model Zenith carbureter fitted.

The gearset is located amidships and gives three speeds, while the rear axle is a special design with spiral bevel drive, the propeller shaft being inclosed in a torsion tube which also takes the driving effort.

New Case Has Long Stroke

With 3⅝ by 6 in. bore and stroke the Case four has plenty of power. In the motor a silent chain drive is used for the front end, but otherwise the design is conventional, including splash-pressure lubrication with a piston pump to force oil to the main crankshaft bearings. Large valves and a special carbureter are claimed to give the motor every opportunity to make use of its capacity to best advantage and it is a fairly high speed engine for so long a stroke, developing maximum power at 2100 r.p.m.

The three-speed gearset is in unit with the motor and the clutch a reversed cone that sinks into the flywheel to disengage. The rear axle is equipped with spiral bevel drive and the wheelbase is 120 in., the tires being 34 by 4 in. Two body styles are offered, a seven-passenger touring car and a roadster, the price being the same for either.

Chevrolet Baby Grand Unchanged

The past year has been one of huge production in the Chevrolet plants, the Baby Grand having proved one of the most successful small fours of the year. The small, high speed motor with its overhead valves has proved a favorite. This engine is extremely neat in appearance, the rockers being inclosed by an aluminum cover, and valves are all laid bare by detaching the cylinder head. There are no valve cages, which fact assists the proper cooling of the valves.

Lubrication is on the controlled-splash system, oil being pumped from the crankcase to a sight feed on the cowl board, whence it passes to the main distributing pipe which feeds the troughs into which the connecting-rods dip. There are pockets over each main bearing and thence wicks carry a supply to each of the three camshaft bearings.

The Autolite electrical system usually supplied is not stock equipment as it bears a small extra charge. It is a two unit system, with Bendix gear for the starting motor. Ignition is by magneto, if the starting system is not taken.

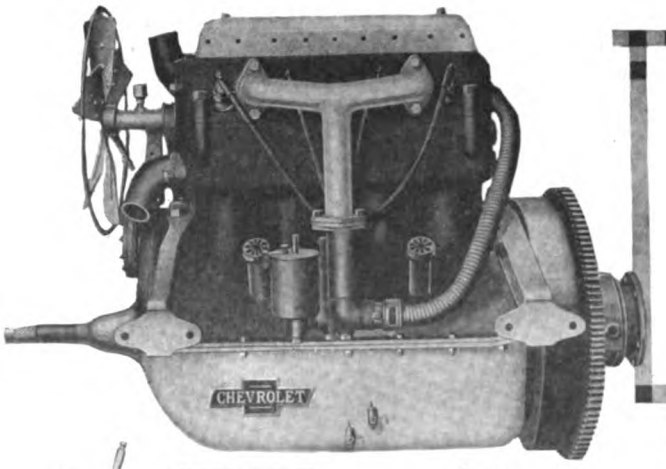
Another instance of the individuality of Chevrolet design is found in the midships location of the gearset, Chevrolet being practically the only inexpensive car to use this design. It is a neatly designed transmission with ball bearings. The driveshaft is of the open type fitted with two universals; drive is transmitted through the springs and torque taken by a special stay. A semi-floating rear axle is used with straight bevels and Hyatt roller bearings. It is provided with a 4 to 1 gear ratio and the brake equipment is conventional. A distinct feature of Chevrolet cars is their smart appearance, the five-passenger body being of neat outline without going to extremes of fashion.

It is noteworthy that the Chevrolet line has been altered somewhat, as the six-cylinder car is not being continued for 1916. There are now only the four with either the five-passenger body (The Baby Grand) or a roadster which has the name of "Royal Mail," and the "Four-Ninety" which is a cheaper modification with slightly smaller motor, unit powerplant and some other small chassis differences, the main lines, however, being identical for all models.

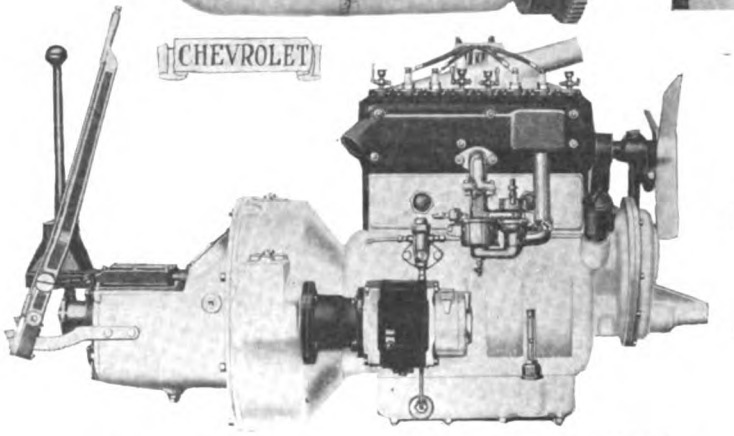
New Crow Elk-Hart

This new model is the largest which will be produced this year and follows the same lines as previous Crow cars. The motor has a detachable cylinder head and is intended for high speed work; it is possible to remove any connecting-rod and piston without disturbing a main bearing. The body is a new design with built-in windshield. The new car is much the same in general specification as the previous model which

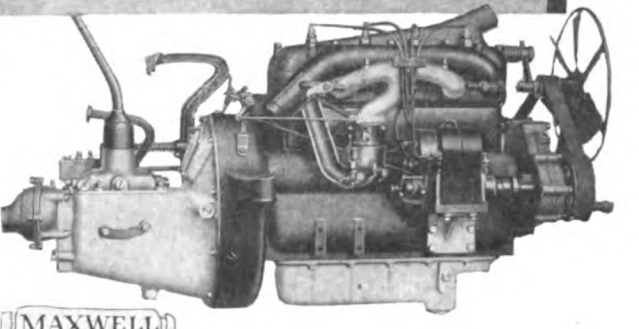
EXAMPLES OF FOUR CYLINDER MOTORS USED ON 1916 CHASSIS



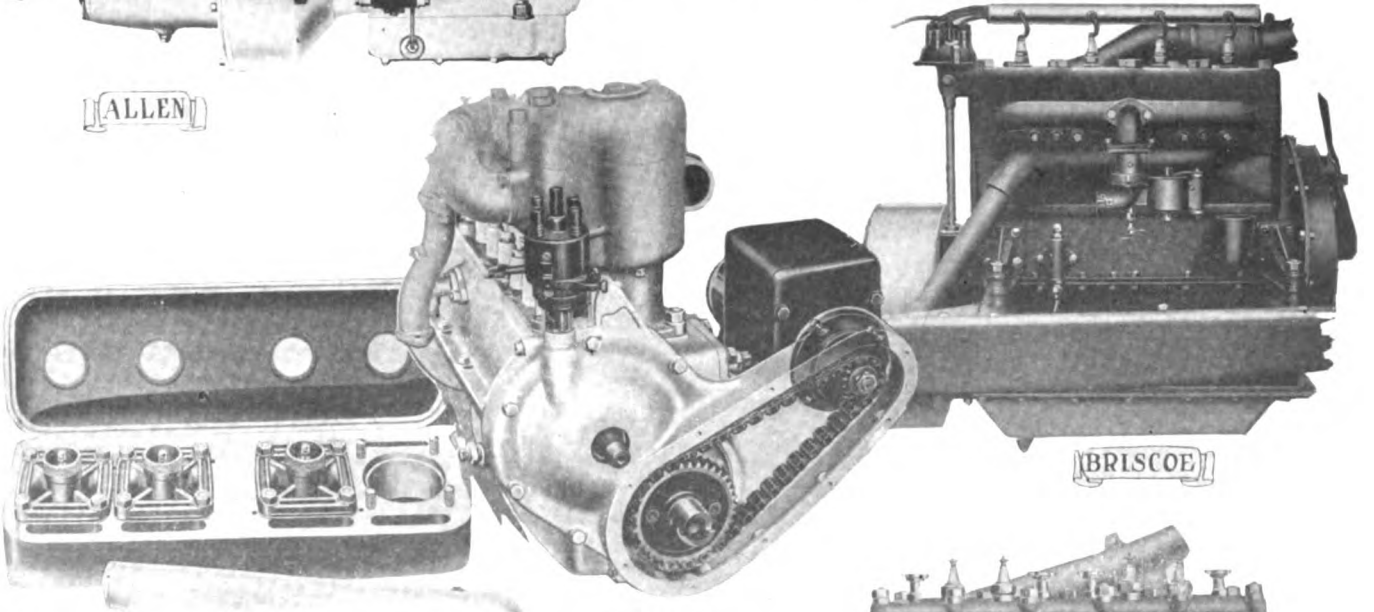
CHEVROLET



ALLEN

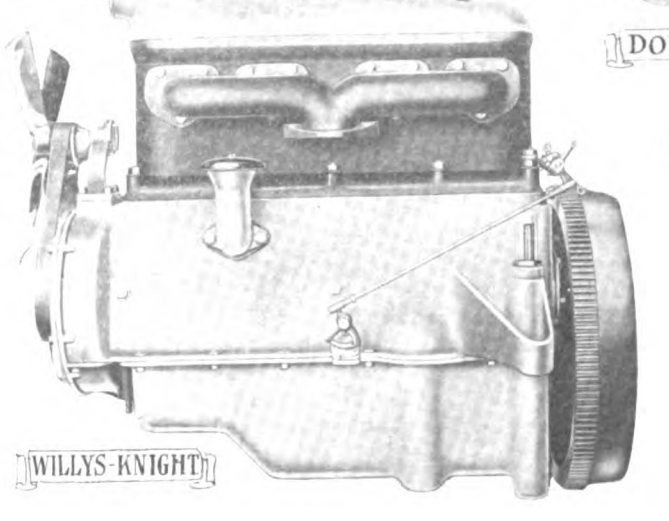


MAXWELL



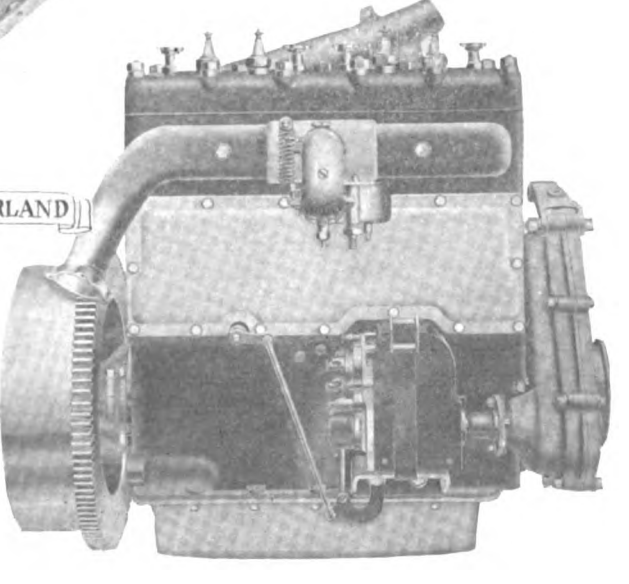
BRISCOE

DORT



WILLYS-KNIGHT

OVERLAND



it replaces, but a very substantial reduction in the price has taken place.

Detroiter Has Good Equipment

The 1916 Detroiter while not departing from the conventional in design to any great extent is well cared for in detail. For instance, the tires are 33 by 4 in., front and rear, and ignition is performed by high tension Dixie magneto. This is one of the cars using the Dyneto single-unit lighting and starting dynamo. It is a substantially built car with ability to carry a roomy body, and has platform rear suspension.

Dispatch Has Unique Transmission

The Dispatch chassis consists of a motor, which is a conventional four of excellent quality with pressure lubrication, and a part that the makers describe as a "control unit." This takes the place of clutch, gearing and differential and provides four speeds with direct drive on all four. Power is transmitted by friction, but the construction is unusual, containing many details of great ingenuity.

Dodge Makes No Changes

Carefully designed before it was introduced, and made by manufacturers of experience, the Dodge occupies an almost unique position by having had no alterations since its first appearance. The only real novelty is a neat detachable upperstructure, which renders the open car convertible into a closed carriage, and these are being turned out rapidly at present.

As a peculiarity the most striking feature of the whole chassis is a device which renders the countershaft in the gearset quite stationary when the high gear is engaged, the the "constant mesh" pinions if they may be so called in this instance, unmeshing as high gear is engaged. This device has been tried several times but the Dodge is the first instance of successful manufacture.

The unit powerplant with its cone clutch entirely inclosed is part iron and part aluminum while the cylinder head is removable, the valves being arranged in conventional L head manner.

The body is remarkable as an engineering product, for it is all-steel being made in a wonderful electric welding apparatus. All the body plates are held in a gigantic jig furnished with the necessary electrical connections and the passage of the current then spot welds the panels along every junction line. The result is a body in which strength and lightness are combined.

On the rear axle the brake rods and the equalizing links are laid out in a very neat way, there being only two long pull rods needed, these running forward along a line just above the torsion tube which incloses the drive shaft.

Electrical equipment consists of the North East single-unit machine which operates at 12 volts and is driven by silent chain from the camshaft. Every part of the car, barring a few accessories, is made in the parent factory which is one of the largest in Detroit and ranks among the biggest in the world.

Dort Has Original Motor

Although both roadster and touring types follow the same general idea of design, the latter is a longer chassis and the motor larger. It has a wheelbase of 105 in., and the motor is claimed to have 28 hp. as a maximum with 3¼ by 5 in. dimensions. The roadster is built on a wheelbase of 92 in. and possesses a 3 by 4 in. engine. It has very evidently been the aim of the designer of the Dort engine to give it moderately high speed possibilities very smoothly, for with an exceedingly heavy crankshaft in a motor of its size, large valves with a good lift and double exhaust manifold, everything seems to have been done to prevent vibrational troubles. Special attention has been given to the matter of equal water jacket spacing around all the cylinders, this making for uniform cooling. The double exhaust manifold feature is unusual in four-cylinder construction. The manifold is internally divided into two passages, two cylinders discharging into each passage, this preventing any overlapping.

To make maintenance of the cars as simple as possible, the Dort designers have seen to it that the oil holes are in convenient places. For instance, in the side of the gearbox there is placed a small elbow which aids in the filling of the gearset with oil. Axle bearings are made easy of adjustment by external openings and pins passing through the housing to the bearing carriers.

Cantilever rear springs are featured on the Dort. The clutch is a light cone, with six spring plungers pressing the under side of the leather facing. These springs are inclosed in little pressed steel cups that prevent dirt from getting to them.

Elcar Is Improved

This car is a model of Elkhart under which latter name previous models were known and is one of the very few machines of which the price has been raised a little, this being due to several improved features.

It is a conventional type of four-cylinder chassis with five passenger or roadster body and a high speed motor with what has been called an F head cylinder; that is the intake valves are in the head with the exhaust valves in the customary position. There is a unit powerplant with cone clutch and a special type of rear axle having double internal brakes.

Farmack Has Overhead Valves

This is an entirely new car made by a new company and has a distinctive engine with not only overhead valves, but an overhead camshaft also. Three chains are used at the front end, one a triangular drive including the crankshaft, an adjustable pinion and an intermediate, the second from the intermediate to the camshaft, and a third for connecting crankshaft and generator direct. All the valves seat directly in the detachable head and are fully inclosed. Oiling is by controlled splash with a separate feed to the camshaft.

The rest of the chassis follows conventional practice and the car is sold at present with only a five-seated touring body.

F. R. P. Has Valve-in-Head Motor

A new F. R. P. car is now ready with an overhead valve engine with four cylinders. It will be made in small quantities in three models, the motor bore and the wheelbase being the chief variations. The chassis only will be sold and at a high price, the car containing a quantity of very costly steel and much fine workmanship.

It is a chassis intended to have a capacity for high speed, the motor being very highly efficient, and weight has been studied closely. In many respects the design savors of the European school, having amidships location for the gearbox and a transmission service brake while there are four speeds with a high gear of 3 to 1.

Ford Still Model T

At this time there is no inkling that Ford intends to make any alteration in the model T as it is known the world over. The performance of the car and the low prices for both the touring and roadster models still prove sufficient attraction to the buyer. New prices have been put on the three closed body types that Ford turns out, the coupelet, the town car and the sedan.

It is scarcely necessary to go into any lengthy description of the Ford because its general design is well enough known to make that unnecessary. Since the rounding of the cowl to replace the straight dash and the enlarging of the magneto so that it would care for the electric headlights as well as the ignition, there have been no mechanical or body changes.

Briefly, the Ford chassis has a wheelbase of 100 in., and is fitted with 30 by 3 front and 30 by 3½ rear tires. The characteristic front and rear transverse springs, planetary

gearset in unit with the 3¾ by 4 in. L-head motor and simple drive through inclosed shaft are examples of the unity of purpose that has amassed the great fortunes of Henry Ford and the others in the company. Few, if any, other car makers of the world have so designed their chassis in the first place that change was unnecessary for so long a period of years.

Very attractive body work has been put on the sedan and coupélet models. Cloth upholstery is used in the sedan, which has individual front seats, the right one folding to allow entrance to the rear seat. There is a single wide door on either side, and the finish is excellent.

Harvard Is Smart Roadster

The Harvard program consists of a soundly constructed chassis free from peculiarities with a good appearing roadster body and an equipment that makes for the permanent comfort and convenience of the user. The seat is supplied with deep upholstery and the Pantasote top fits snugly on the windshield when erected.

On the same chasis a coupé body is also fitted and sells for a very moderate price. The car is geared rather higher than the average and should be capable of a fair speed on the road.

Hupmobile Is Larger

By enlarging the powerplant from a bore of 3⅜ in. to 3¾ in., the 1916 Hupmobile has been given 46 cu. in. more piston displacement, and with the stroke still 5½ in., the engine is now possessed of 243 cu. in., this, together with the large valves and direct gas passages giving the car an engine that is able to handle it in excellent shape with good accelerative ability.

The Bijur lighting and starting equipment replaces that used last year, and this change, in conjunction with the motor increase, are practically the only alterations in the mechanism, although the body design is different from the previous car in some respects, and the price has been brought down.

A short and a long chassis are offered, the former having a wheelbase of 119 in. and taking the five-passenger touring and roadster bodies, whereas the 134-in. chassis is called upon to carry the eight-passenger body. This is a body in which the folding auxiliary seat has been so constructed that it is wide enough to seat three if necessary. Practically the only difference in the two chassis other than strengthening the long frame wherever necessary, is in the spring length. Still adhering to the long underslung semi-elliptics in the rear, they are 60 in. overall on the larger chassis and 52 in. on the shorter.

One feature for comfort in the Hupp cars is in the low placing of the seats with the backs of the seats lower than the fronts so as to give a comfortable position to the occupants. A point in the body work that is appreciated, is the overlapping of the upper windshield glass over the lower for about an inch, this preventing water or cold air from getting into the front compartment.

The Hupmobile motor is of the block-cast type with silent chain drive for the camshaft and fan. Ignition is by Atwater-Kent system, and oiling by the characteristic Hupp method whereby the flywheel is used to pump it.

Interstate Has Axle Gearset

The use of a rear axle gearset is becoming less common, but having used this type successfully, by reason of proper proportionate design, the Interstate company is continuing its use. The motor of this car is a long stroke engine with large, overhead valves; it is made by the Beaver company and has conspicuously good pulling power on high gear. The price has been reduced for 1916 without affecting the equipment or any other quality. There is a Remy lighting and starting equipment which also cares for ignition and a Schebler carbureter, bolting direct to the cylinders, since all manifolding is internal. A decided feature of the Interstate four is the great accessibility of the motor and all connected with it.

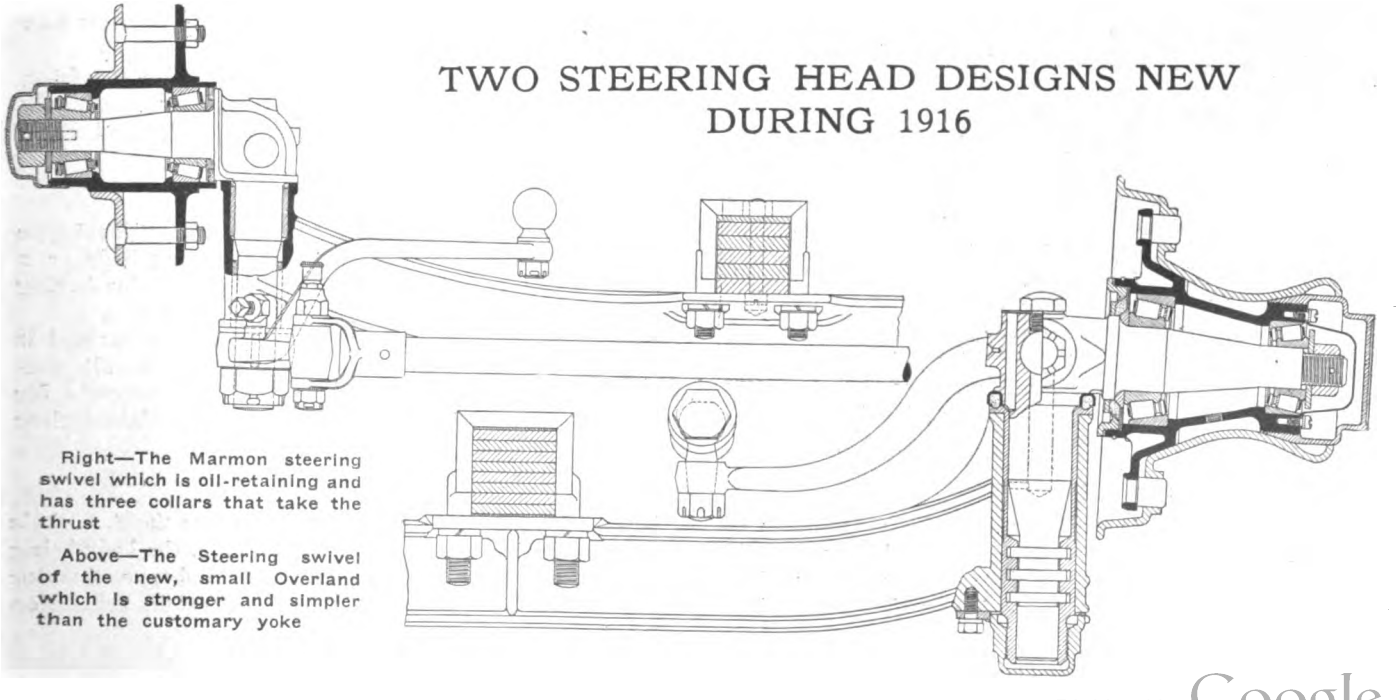
The bodies offered include a five-passenger touring and a roadster model the former holding its rated capacity without any crowding. It is nicely proportioned being a very handleable length over-all. Quiet running and good acceleration are other characteristics.

Maxwell Improved in Detail

The main idea of the Maxwell designers was to produce a car of better appearance for 1916, at the same time including in its make-up many of the things that had heretofore not been given for the price. For instance, electric starting and lighting are now standard for the touring car, and the roadster also has both at lowered prices. Due to the narrowing and raising of the radiator and the sloping of the bonnet smoothly to the cowl, the car has a larger outward appearance, though still built upon the chassis of 103 in. wheelbase.

The Maxwell engineering staff also had an eye for the matter of repairing, for they have kept the wiring to the chassis wherever possible, bringing to one central terminal block all that have to go on the body. To remove the body,

TWO STEERING HEAD DESIGNS NEW DURING 1916



Right—The Marmon steering swivel which is oil-retaining and has three collars that take the thrust

Above—The Steering swivel of the new, small Overland which is stronger and simpler than the customary yoke

it is only necessary to disconnect the terminal plug, when body and chassis wiring are separated.

In striving for better operation, the clutch has been inclosed so as to permit it to run in oil. Though a cone, it is faced with an asbestos fabric that is not harmed by the lubricant, and this gives it a very soft action. Better engine lubrication is also accomplished by distributing the oil to each of the connecting-rod splash troughs instead of the old way of introducing the oil at the front end and letting it work its way back to the other troughs. This gives more uniform oiling. To make it easy to put in the oil, the breather has been conveniently placed on the left side of the motor.

Other evidences of the improvement of the car are the use of linoleum-covered running boards instead of the former corrugated metal type; the fitting of demountable rims for the 30 by 3½ in. tires and the enlargement of the body. Three inches is added to the seat width and there is more leg room.

The Maxwell 3⅝ by 4½-in. motor is of the type in which cylinders and upper part of crankcase are integral, with the head detachable. Thermo-syphon cooling is efficiently used, and starting and lighting are by the Simms-Huff system. A motor-generator is carried on the motor's left, with the generator drive by a belt under constant spring tension, and starter drive through the flywheel. Twenty-five horsepower is credited to the engine, which drives a three-quarter floating axle, with a ratio of 3.6 to 1. The car has three-quarter rear springs and three speeds.

Mecca Has Gearless Differential

A new car this year the Mecca follows the lines of standard practice in most respects but it uses the "Gearless" differential and has a type of single plate disk clutch that is rather interesting. This has toggle lever operation and is intended to run in oil. On the rear axle are double internal brakes instead of the usual pattern.

Mercer on European Lines

In general the design of the Mercer chassis which made its first appearance at the 1915 shows has not been changed. As a high priced, originally designed four of large dimensions and the best of workmanship it stands in a class which is now very small. Perhaps the leading feature of the car as a whole is the bodywork, which is the smoothest possible streamline, combining the best of both French and German practice, even the six-passenger touring car gives a proper impression of the car's extreme speed ability as the top and windshield are made to suit the body lines.

In the chassis the U. S. L. flywheel dynamo and starting motor is found, this being entirely inclosed, and the gearset is amidships, connected to the dry disk clutch through a short universal shaft.

The motor follows the principles of racing engine construction, save that it has L-head cylinders. It is capable of high speed and gives a high mean effective pressure at low speeds, so that the car has plenty of ability even on the somewhat high, direct fourth gear. On the back of the gearbox there is a large internal brake this being the service brake, and very powerful indeed. Hotchkiss drive is used, with the semi-elliptic springs very long and flat.

There are four body styles; touring cars with six- and four-passenger capacity and two roadsters of two passenger size, one of the latter being classed as a raceabout, specially geared, without self-starter and capable of extremely high speeds.

Metz Continues Friction Drive

Consistently the Metz company have been upholders of friction transmission for their small car and they are still adhering to it after several years' experience during which very many cars have been put into the hands of the public. There is nothing simpler than friction drive and whether it gives good or bad service depends mainly upon the care with which the design is performed. Friction drive has many little points which only experience can teach and the Metz engineers seem to have thoroughly mastered the special problems in this connection.

The motor has been increased in size to 3⅞ by 4 in. and a five-passenger touring car is now supplied as well as the roadster. Also the original acetylene lamp equipment has been replaced by a Gray & Davis complete outfit for lighting and starting, which is stock equipment. Ignition is still by high tension magneto, however.

From the frictional transmission, with its seven forward speeds, the drive passes to the rear axle through a single chain. The tires, being 32 by 3½ in. are large for the size and weight of the car. Either wire or wood wheels are supplied according to the choice of the customer.

Moline Knight Enlarges Motor

The Moline Knight motor was always one of the neatest designs, and deserves the credit for having aluminum alloy pistons nearly two years before they became common. The larger four which is made by the Moline company has not been altered this season, but the small four has an extra ¼-in. of bore being now 3¾ by 5 in.

Apart from the Knight motor the Moline chassis is very interesting as it uses the Brush special frame construction and rear spring suspension. The frame is so made that the running boards, which are steel, form a vital part of the side members, their strength being used fully. The rear end of the frame is raised in such a way as to eliminate a large part of the body, the rear seat setting directly on the side rails. At the rear, the springs are transverse and there are two of them back to back and one above the other. They are of slightly different length and so of different period. The upper has a shackle attachment to the frame at one end and a pin at the other, and the lower has corresponding attachment to the axle. The effect of these two springs is to provide a very easy suspension and yet roll is eliminated by the difference in period. One spring damps out the other so to speak, when a severe shock is encountered.

Touring and roadster bodies are fitted to the smaller chassis and a wide range of all types for the larger.

Monroe Adds Electrical Equipment

A small car selling for a very low price the 1915 Monroe did not have a lighting and starting outfit, but this has been added for 1916 without alteration in price. It is a true light car with a neat little unit powerplant and a floating rear axle. The generator and starting motor are of Auto-Lite make and the carbureter a Zenith.

There are two sorts of body, a roadster and a speedster, both listing for the same price. The roadster is a nicely designed streamline form with top, side curtains and windshield complete.

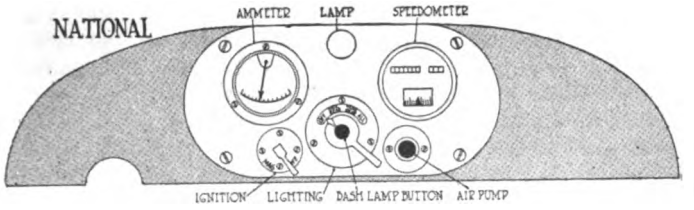
Morse Is Large Car

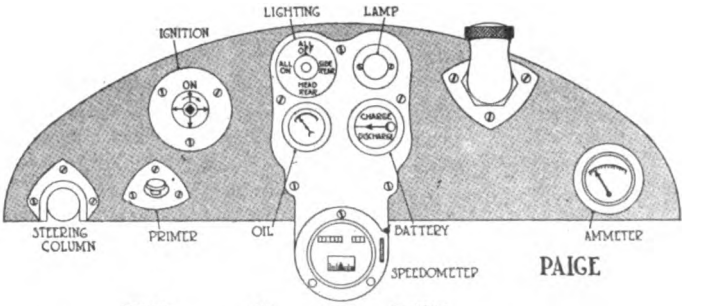
A big four-cylinder car, the Morse has a conventional type of chassis for five- or seven-passenger touring body or a roadster. It is one of the few cars with an engine having singly cast cylinders and amidships gearbox location.

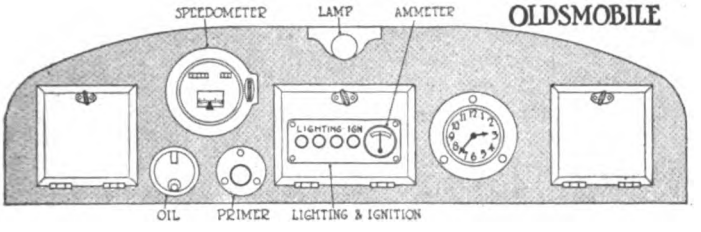
Having a 129 in. wheelbase it is quite a large car and is of substantial construction. Gray & Davis two-unit electrical equipment is employed with Eisemann magneto for igintion. The accessory equipment is of the highest class and most extensive.

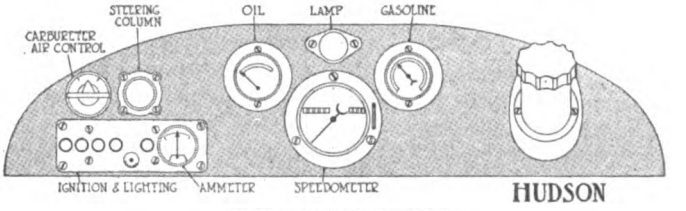
S. J. R. Is New Roadster

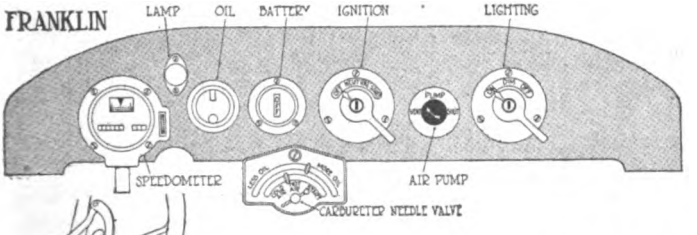
An addition to the list of four-cylinder cars the S. J. R. is made in three-passenger roadster form only, the body being steel, with a special dull finish. A high-speed type of motor is used and a high power output is claimed in proportion

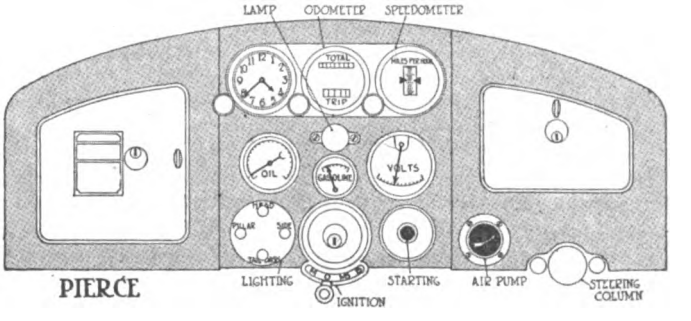


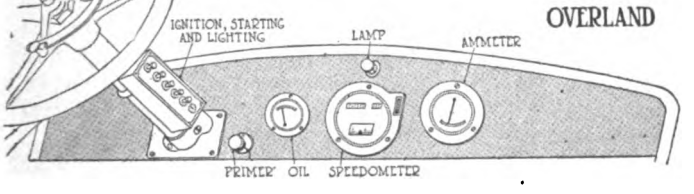


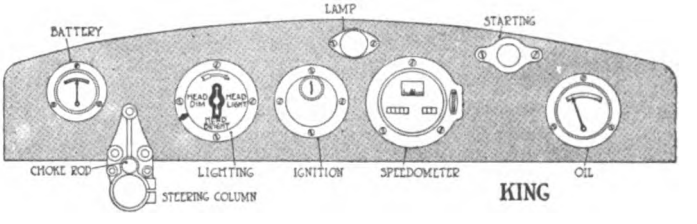


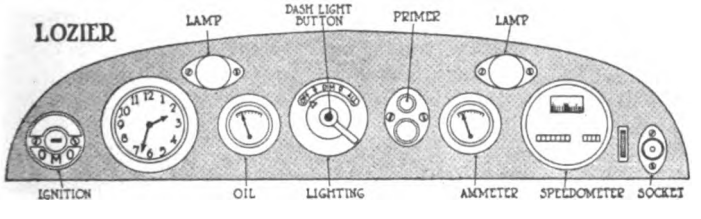


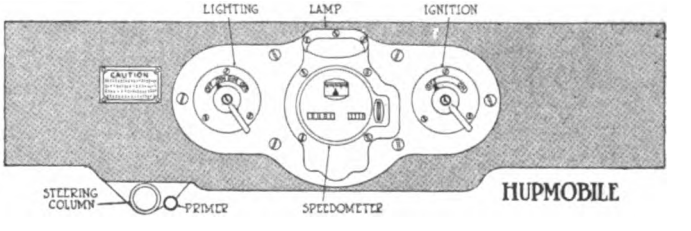


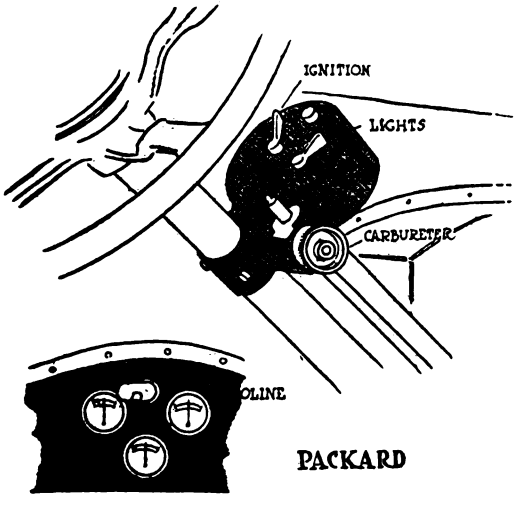












SOME TYPICAL COWL BOARDS

There is still great variation in the arrangement of accessories on the cowl board, different manufacturers having different ideas concerning which disposition is most convenient for the driver. Broadly, there seem to be two layouts; the grouped form wherein all fittings are concentrated at the center, and the spread form where everything is arranged in a line right across the board. It seems there should be some opportunity for standardizing work in this connection.

It is a little surprising that the undoubted convenience of steering post control units for switches and carbureter adjustment has not caused a greater number of manufacturers to adopt this style of design, and there would seem to be an opportunity for some of the electrical firms who make cowl board fittings to add a steering post unit as an alternative. The tendency to concentrate fuses in a readily accessible compartment or plate on the cowl board is noteworthy, and greatly to be commended, since it facilitates the tracing of a fault.

to the displacement. Ignition is by high-tension magneto, and lubrication maintained by a plunger pump, while a special design of carbureter is employed.

Special attention is given to comfort, the rear springs being chrome-vanadium steel cantilevers 48 in. long, and the upholstery leather. An original shape of radiator and domed fenders add to the appearance.

Spaulding Has Special Body

A thoroughly well made four-cylinder chassis with plenty of power and high class components the Spaulding has been improved only in minor detail. A special feature of this car is the supply of a touring body for five passengers which can be converted into a sleeping place by dropping the back of the front seat. This is done in a few moments and the cushions are so shaped that a comfortable bed can be fixed up.

Magneto ignition and the Entz system of single unit lighting and starting are fitted to the Buda motor, and the three-speed gearset is situated amidships, while the floating rear axle has exceptionally large brakes.

Sterling Is Newcomer

This is one of the most recently announced new cars and will be made in roadster form to sell at a very moderate price. The motor is a Sterling 2⅞ by 4 in. with overhead valves and splash-pressure lubrication. There is a cone clutch and three-speed gearset in unit with the motor, and the axle is a floating type supported on cantilever springs. Two bodies, a five-passenger and a roadster, are provided.

Stutz Sticks to Fours

Improvement in body design is the most striking change in the Stutz cars for 1916. The new bodies are fitted to a single chassis which is made in two lengths, 120 in. and 130 in. wheelbase. Probably by far the most attractive car the Stutz company have ever produced is the "Bulldog Special," which is a very low built touring car with seating accommodation for four. There is also a touring body for six passengers on similar lines. This body has no rear doors, passengers reaching the tonneau through the aisle between the front seats, and this, added to the elimination of side lamps, makes the outline of the car extraordinarily smooth.

In the "Bulldog Special" there is a tonneau cowl this being divided into two compartments one fitted to take a lunch kit and the other for two Thermos bottles.

The motor is still the well tried and proved T-head type four, but it has been improved by the addition of a good deal of space to the crankcase so that the latter now holds 2½ gal. of oil and replenishment is only needed at long intervals.

The operation of the accelerator pedal has been rendered easier by adding a heel cavity in the foot board, and a hint of racing experience is seen in the adoption of racing type Hartford shock absorbers as standard equipment. Another racing feature now standard on Stutz cars is the Moto-Meter which will in future decorate every Stutz radiator cap. The Stutz company offers a wide choice of coloring, paintwork in a series of greys, reds and yellows being available. There are three colors of upholstery to choose from, red, green and black.

Vixen Has Friction Drive

A small car with narrow tread, the friction driven Vixen has been little altered this year. The drive incorporates a friction set at the rear end of the chassis with a friction driving disk for each rear wheel, the connection between either disk and its respective road wheel being by side chain. The motor is a small four-cylinder and the body has the two seats arranged tandem fashion.

White Program Two Fours

A large and a smaller four are being made by the White company, there being very little difference between the present series and that of 1915. Sane design with the very best procurable materials and workmanship are the chief White features, in fact the White gasoline car has changed mainly in body equipment since its first introduction.

Both chassis have block motors with passages cored in the casting and combined pressure and splash lubrication fed by a plunger pump. A special lighting and starting apparatus is used and single, Bosch magneto ignition. On both the large and small chassis the gearset is located amidships and has four speeds, but the smaller car has the direct drive on third while the larger has a direct high gear. A remarkably easy action single disk clutch is used.

The White electric equipment stands almost alone by operating at 21 volts, this same potential being used for all the lamps.

Body styles have been brought up-to-date and a very handsome series are now being supplied, they include almost every conceivable type, touring, town car, roadster, landaulette and limousine. Long, three-quarter elliptic rear springs are used and these are relieved from all stresses save those arising from the weight of the car as both radius and torque stays are fitted.

Willys-Knight Entirely New

To the Willys-Knight belongs the distinction of being the first car equipped with the Knight engine to be built in quantity. In fact, the car brought out last July under that name is not like the previous Willys-Knights at all, and though the motor follows the latest ideas in Knight construction, the car sells for very much less.

In its new form, the car adheres strictly to standard Overland construction in the chassis, and in the general outward appearance, and due to the standardization that this makes possible, the price at once is explained. The axle design, the incorporation of the gearset as a part of the rear unit, and the layout of the springs and frame members are well known in the design of Overlands. There are two open and two closed bodies, all fitted to the one wheelbase of 114 in.

The Willys-Knight engine as now built is a four-cylinder block construction with a cover plate going over the top of the individual cylinder heads proper. The cover plate forms the top of the water space, and it incorporates a water outlet to the radiators, the cooling being by thermo-syphon. This construction allows the water to circulate entirely over the heads, and is an advantage over the former method of casting the Knight cylinders separately with no intercommunication for the water.

A two-part aluminum crankcase is used, and it has the unique feature of including a water passage from the radiator inlet pipe, carrying the water across from the right side to the left where it is introduced into the cylinder block by a connection at the bottom center of the cylinder casting. This is conducive to equal water distribution from a central point. There is nothing unusual in the working out of the details of the two sliding sleeves, and their actuation in the regular way by connecting rods operated by an eccentric shaft.

As in other Knight types, the oil supply regulation is interconnected with the throttle so that the amount supplied is in relation to the throttle opening. Simplicity has been aimed at in the system of lubrication by forcing oil to the main bearings, eccentric shaft bearings and driving chains at the front. The crank webs are drilled to send it to the rod bearings, from which it is thrown to the other surfaces.

Woods Mobilette Refined

A small, light car with low built two-passenger body, the Woods has been neatened here and there and made even better value for the money. It has a 36 in. tread and 104 in. wheelbase, thus being well proportioned, and the passengers are accommodated side by side by means of staggering the seats a little.

Section 2—Cars Made Only with Six Cylinders

The Number of Makes in This Section Is Considerably Larger Than a Year Ago

Buick Makes Two Sixes.

BUICKS are all sixes this year, the announcement being somewhat of a surprise in view of the poularity which the four-cylinder Buicks of previous years had attained. The new models have been produced with the main idea of standardizing parts wherever possible, while improving the design and efficiency, this, together with the greater output being responsible for a reduction in the price of the larger car and the appearance of the new small size at a price under $1,000.

Similarity of design is found in the two chassis, except in the motors. The little six uses a 3¼ by 4½-in. engine with the cylinders cast in a block, while the larger six has a 3¾ by 5-in. motor with the cylinders in pairs. Otherwise the design of both is very much the same, the characteristic Buick overhead valve construction being adhered to. The valves are each carried in individual cages, making it a comparatively simple matter to take out one or all when occasion demands, and the valve rods are adjustable at the top in convenient manner. In the Buick design of head, the gas passages are very direct.

Buicks this year have a new type of aluminum cone clutch with a clutch brake that facilitates gearshifting. There are three small engagement springs to equalize the action instead of a single spring. The old form of clutch coupling has also been abandoned for a shaft that is a single piece of steel integral with the constant-mesh pinion of the gearset.

In the gearset special mention is made of the interlocking device which prevents any possibility of simultaneous engagement of two gears by improper or careless handling of the gearshift lever. The gearset bolts to the rear of the engine, forming the familiar unit-powerplant construction.

One of the 1915 models was fitted with cantilever rear springs and both the 1916 cars are so supported. These springs are diamond pointed and of such length as to promote easy riding. As in previous Buick design, the drive shaft is inclosed in a torsion tube, the front end of which is yoked to the back of the gearbox in such a manner as to give universal action.

The wheelbases are 115 and 130 in. for the small and large sixes, respectively, and while only roadster and seven-passenger touring bodies may be secured on the larger chassis, the smaller model includes sedan and coupelet types as well.

Cameron Still Water-Cooled

The Cameron company, having made one of the few air-cooled cars of America, last year changed over and adopted water cooling, turning out a light car of a generally conventional design. For 1916 this new model is being continued in five-passenger and two- or four-passenger roadster form with a 3 by 5-in. six-cylinder motor of the high speed type. Only the one model chassis is being produced with plenty of body space.

Chalmers One New Model

At the last New York show the Chalmers 6-40 with overhead valve, overhead camshaft motor was one of the novelties and it has been one of the cars of the year in that large numbers have been sold. Recently, a light six has been added of less unconventional design, and the two models together form the 1916 Chalmers program. The Chalmers Master Six, will also be made, but this is a very large car and is only expected to sell in small quantities.

At the present time the factory is very highly organized for the production of the two principal sixes and undoubtedly more of the light six will be made than has ever before been the case with any Chalmers design of the past.

The car has an L-head motor with detachable head and externally it is just a neat, simple looking job. Internally immense pains have been taken with the valves, the gas passages, the reciprocating weights and the lubrication, so that the engine is capable of high power for its size and a very high rate of speed. The crankshaft is literally enormous for the size of cylinder, so there is practically no vibration at any motor speed. The pistons are aluminum alloy, with special detail designed to prevent smoking and the connecting rods are very light forgings finished very highly.

An interesting detail is the peculiar fan, which is made from one piece of sheet steel and has two blades, and another is the separate unit assembly made of the oil pump and ignition distributer. The oil pump is external to the crankcase, where it has a chance to keep reasonably cool.

The dry disk clutch has a very light internal member which makes greatly for ease in gearshifting, and the gearset has exceptionally large roller bearings with a roller spigot bearing. Thence there is an open propeller shaft to the semi-floating Timken rear axle. The frame has a very wide and deep section for a car of this size, furnishing a very rigid support for the body.

In the body equipment modern outline is combined with ample space, but the body is well proportioned and not too big for the chassis. It holds its five passengers comfortably with plenty of extra space. High finish, and excellent quality fittings are characteristics. It is a peculiarly attractive car in appearance both as to the complete machine or as to the chassis alone.

Chandler Has New Light Chassis

For some considerable time the Chandler company have been upholders of the value of light weight in reducing running cost, and their chassis has been designed with a view to weight reduction wherever possible. For 1916 they will make but a single chassis in which the same principles will be observed.

An interesting feature of the motor is that the six cylinders are cast in two sets of three, a design which has many advantages and has been somewhat neglected by manufacturers. Also this is one of the new engines with silent chain front end drive. It is essentially a high speed motor since its maximum power is developed at a speed of about 2400 r.p.m., and a maximum car speed of 60 m.p.h. is expected of each car with standard bodywork.

The Chandler company make their own rear axle, which is a three-quarter floating type with spiral bevels, giving a 4.4 to 1 ratio.

It is perhaps worthy of remark that the manufacturers recently announced the close of a business year of unusual prosperity and plans for a large increase of output next season. A very substantial reduction in the price has been made. Bosch magneto ignition with a hand spark control is still used, but the lighting and starting equipment is new, being now supplied by Gray & Davis. Another small change is the substitution of semi-elliptic rear springs for the three-quarter pattern used last year.

Bodies include both touring or roadster types at the same price, and the equipment is in keeping with the general character of the car.

Davis Has Swing Seat

Moderate-priced cars, constructed of excellent components, the Davis chassis are conventional in design. The two power plants, differing slightly in size, are both Continental, Warner supplies the gearsets and Weston-Mott the rear axles. A feature is the use of a frame with perfectly straight side members.

With the bodies very special pains are taken, and the Davis designs are original. The touring bodies for either five or seven passengers have divided front seats which are entirely independent of the body sides, so that the driver's seat can be adjusted fore and aft over a good range. The seat for the front passenger revolves, so that the occupant can face either forward or can turn the seat round and face the tonneau passengers. Another style of Davis body is a clover leaf type of four-seated car, and in this also both the front seats slide so that the passengers in the rear seat have exceptionally easy access thereto.

Dorris Drops Four

In April, 1915, the first Dorris six was announced, this being an overhead valve motor with a peculiar starter drive, since the starting motor was arranged to operate through the front end gears, by means of a special intermediate gear. This model is being continued and a second six, of smaller dimensions now replaces the four. The latter is a more expensive car with a much higher speed engine, but the design generally is similar.

The dashboard in these cars is a part of the chassis and not a body piece, so all wiring, etc., becomes a chassis assembly. Another feature is locating the gasoline tank beneath the driver's footboards so that the filler and gage come flush with the floor where they are always visible, a Stewart vacuum tank being used to supply the carbureter. A full range of bodies is available for either chassis.

Franklin Features Lightness

The only car in the world with an air-cooled motor, save some quite small machines, the Franklin is but little changed for 1916. Air cooling, light weight, and full elliptic springs are the three main characteristics of this highly original chassis. This from the owner's viewpoint. To the engineer the car is doubly interesting because it is designed and made unconventionally, there being a very large number of individually small parts joined together by welding and riveting. For instance the flywheel, which is also the fan that draws air over the cylinders to keep them cool, is made up almost entirely from small pieces of sheet steel, the building process being rapid and easy with the special tool equipment used for the job.

This year the weight of the car has been cut still more by increasing the amount of aluminum used. The fenders are now aluminum and so is the hood, thus saving quite a considerable number of pounds. A detail which is also interesting is that the bevel used is neither straight nor spiral, but is a "skew bevel," the teeth being straight in themselves, but angular to the diametral line of the gear. The effect is much the same as is obtained with the spiral bevel with its curved teeth.

Franklin uses the Dyneto single unit starter system and the wiring is carried out rather more neatly than usual, every essential terminal being very accessible, in fact accessibility is markedly good throughout the car. Yet another originality in the chassis is the wood frame at either end of which the springs, which are of the full elliptic pattern, are attached by powerful clips.

Hotchkiss drive is employed, both torque and propulsive stresses being supported by the rear springs, and the flexibility of the spring is such that a very soft start is obtained even should the clutch be handled roughly; the bevel pinion can make half a turn or more without doing anything except compress the spring.

Glide Substitutes Six for Four

Throughout 1915 there has been but one model Glide, a four, and for 1916 there will again be but one car; this, however, is a six. It has a Rutenber, high speed motor with Westinghouse electrical equipment, unit power plant, an open type driveshaft and long, three-quarter elliptic rear springs with Hotchkiss drive.

A strong feature of the car is the equipment, which is quite extensive for a moderate priced car. A special type of sedan body is also available, which is convertible into an open touring car by detaching the upper structure. This operation is easily performed and the attachments such that both open and closed bodies are complete in appearance individually.

Grant Is Larger

The Grant six is a bigger and better car for 1916, but there is no difference in the price. Improvement has chiefly been in the power of the motor, and in the outward lines of the body, although there are a number of lesser mechanical refinements that add to the dependability and performing qualities.

The new body lines are the first thing to be noticed on inspection of the car. Cowl and body sides have been raised, and the slope of the bonnet conforms to the general line, with the radiator, still of the rounded form, of larger size. Increase of cylinder diameter from 2⅞ to 3 in., with the stroke remaining at 4¼ in., gives about 10 per cent more power, the displacement profiting by the enlargement to the extent of about 15 cu. in.

Instead of continuing to use the former mushroom type of valve tappets, the motor now has tappets of roller design, this change being made to eliminate the side thrust component on the valve rods, thus preventing wear and noise. Looking to the matter of accessibility, the method of assembling the tappets into the crankcase has also been changed so as to allow their removal without disturbing the camshaft or its bearings.

Overhead valves are used in the Grant engine, the head being detachable and carrying the rockers, springs and valves. In the cooling system, the only change is in the radiator, which is now of the form in which the shell and core are separate, the frame supporting the more delicate core against weaving or other causes that might spring leaks.

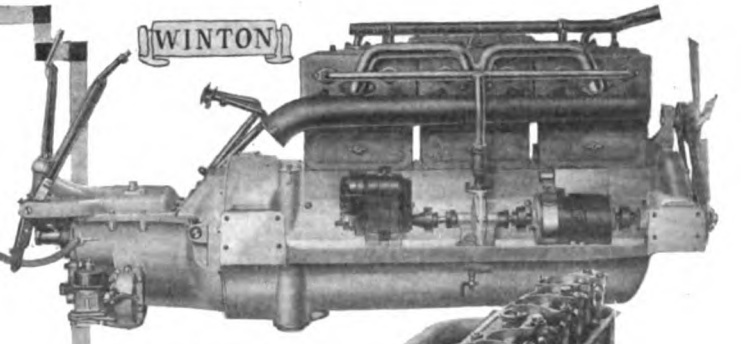
The design of the chassis is quite conventional and follows recognized good practice. The rear suspension is by well attached cantilevers, with the drive taken through a torsion tube that surrounds the driveshaft. Relief from somber hue is given by painting the cars in Brewster green this year, with only fenders and running gear in black.

Halladay High Speed Six

A new car, again with the very popular 3 by 5-in. six-cylinder engine, the Halladay is a soundly constructed chassis with good body equipment and fittings, selling for a moderate price. It has unit power plant, with Westinghouse lighting, ignition and starting apparatus, and Hotchkiss drive through long, three-quarter elliptic springs. There is

TYPICAL SIX CYLINDER MOTORS PRODUCED DURING 1915

WINTON



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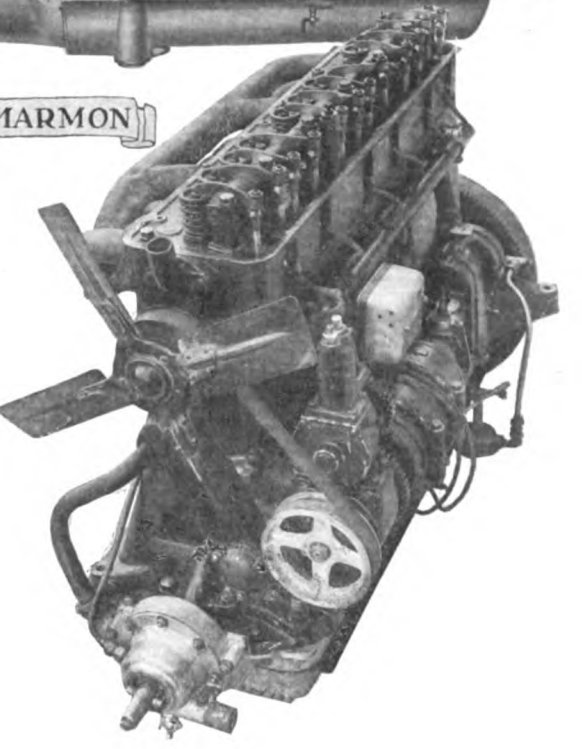

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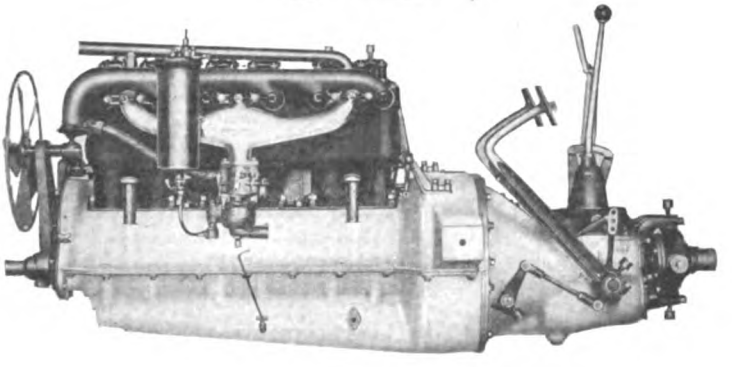
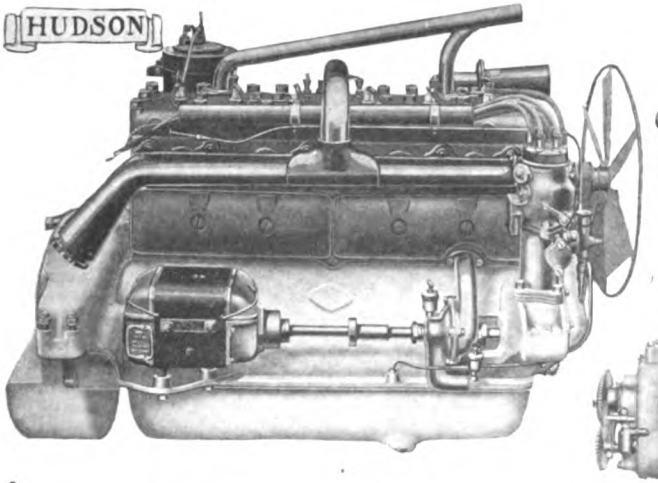
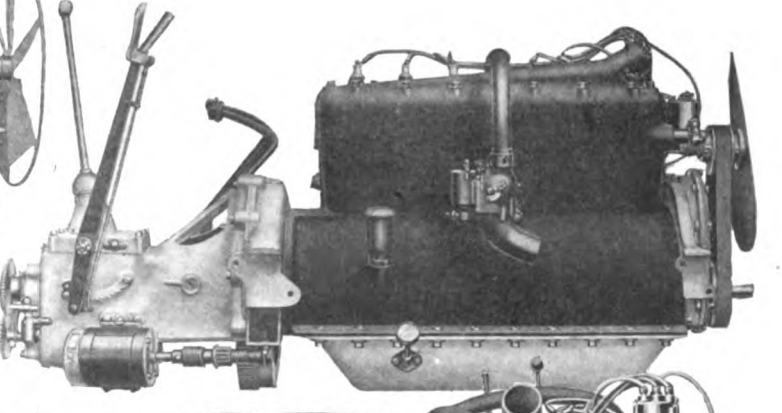
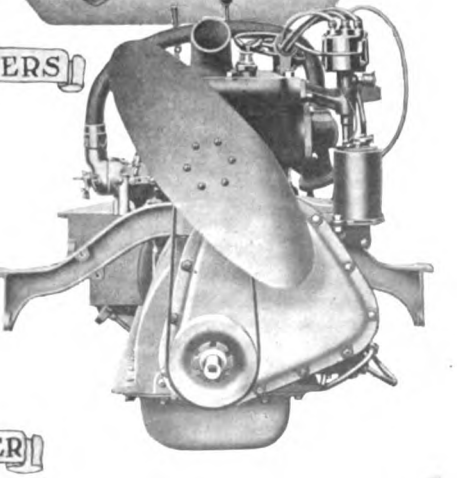


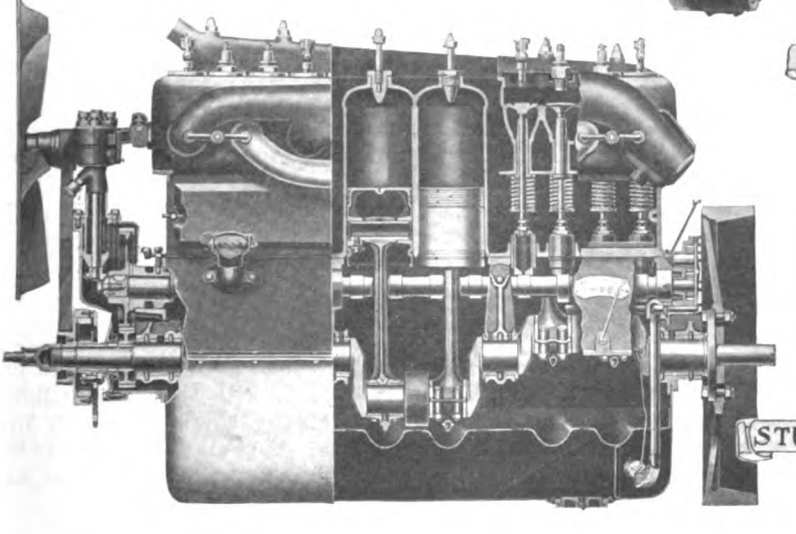
HUDSON





CHALMERS





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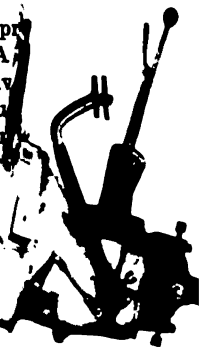
Halladay High Speed Six

A new car, again with the inder engine, the Halladay is with good body equipment a[t] erate price. It has unit po[wer] lighting, ignition and start[ing] drive through long, three-qu[arter]



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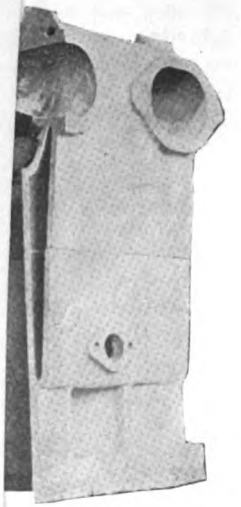

a Wisconsin aeroplane

as typical

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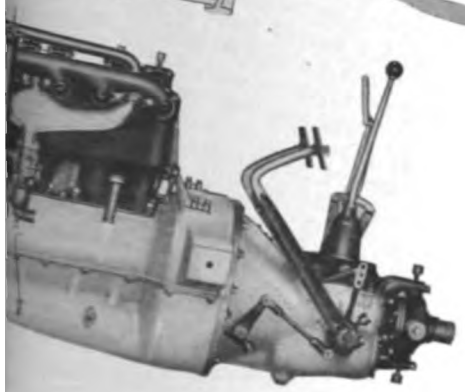
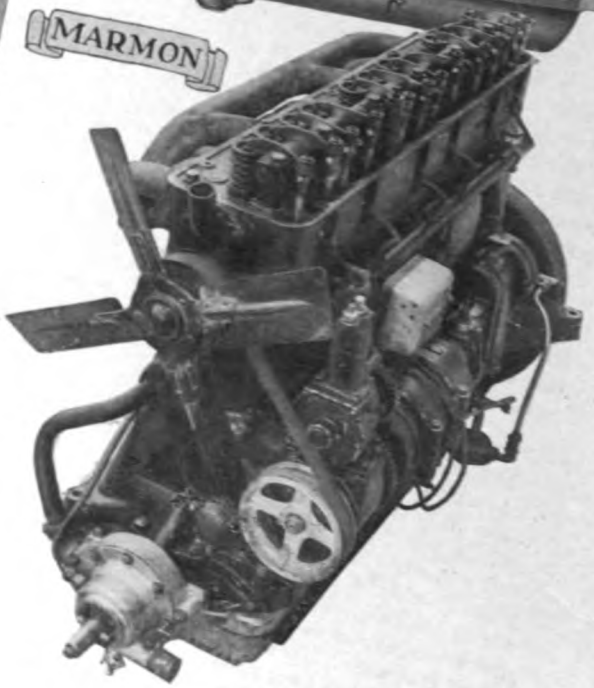
TYPICAL SIX CYLINDER MOTORS PRODUCED DURING 1915

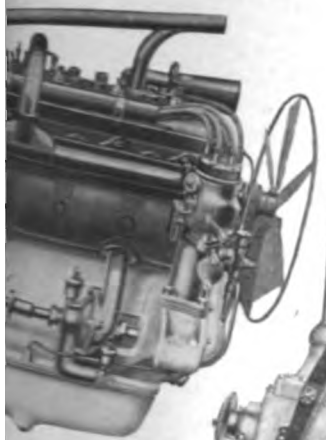
WINTON

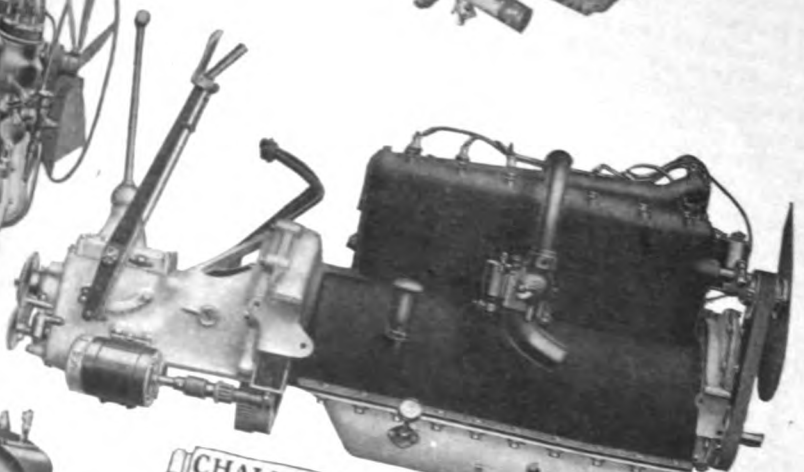
BUICK

MARMON

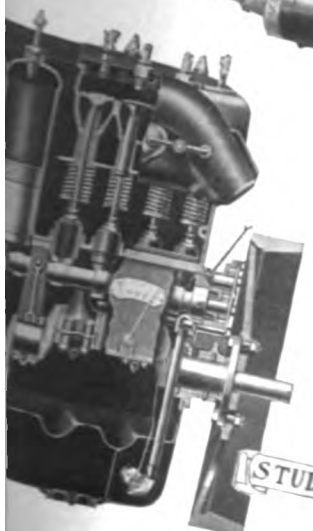




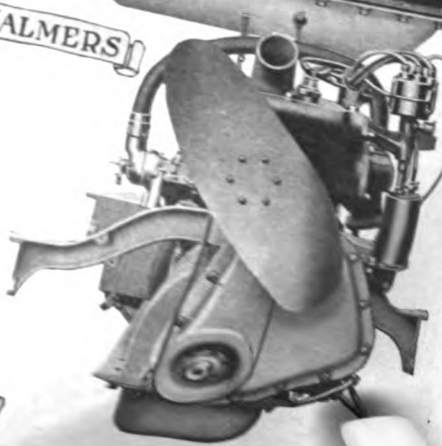




CHALMERS



STUDEBAKER



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It is perhaps worthy of remark that the manufacturers recently announced the close of a business year of unusual prosperity and plans for a large increase of output next season. A very substantial reduction in the price has been made. Bosch magneto ignition with a hand spark control is still used, but the lighting and starting equipment is new, being now supplied by Gray & Davis. Another small change is the substitution of semi-elliptic rear springs for the three-quarter pattern used last year.

Bodies include both touring or roadster types at the same price, and the equipment is in keeping with the general character of the car.

Davis Has Swing Seat

Moderate-priced cars, constructed of excellent components, the Davis chassis are conventional in design. The two power plants, differing slightly in size, are both Continental, Warner supplies the gearsets and Weston-Mott the rear axles. A feature is the use of a frame with perfectly straight side members.

With the bodies very special pains are taken, and the Davis designs are original. The touring bodies for either five or seven passengers have divided front seats which are entirely independent of the body sides, so that the driver's seat can be adjusted fore and aft over a good range. The seat for the front passenger revolves, so that the occupant can face either forward or can turn the seat round and face the tonneau passengers. Another style of Davis body is a clover leaf type of four-seated car, and in this also both the front seats slide so that the passengers in the rear seat have exceptionally easy access thereto.

Dorris Drops Four

In April, 1915, the first Dorris six was announced, this being an overhead valve motor with a peculiar starter drive, since the starting motor was arranged to operate through the front end gears, by means of a special intermediate gear. This model is being continued and a second six, of smaller dimensions now replaces the four. The latter is a more expensive car with a much higher speed engine, but the design generally is similar.

The dashboard in these cars is a part of the chassis and not a body piece, so all wiring, etc., becomes a chassis assembly. Another feature is locating the gasoline tank beneath the driver's footboards so that the filler and gage come flush with the floor where they are always visible, a Stewart vacuum tank being used to supply the carbureter. A full range of bodies is available for either chassis.

Franklin Features Lightness

The only car in the world with an air-cooled motor, save some quite small machines, the Franklin is but little changed for 1916. Air cooling, light weight, and full elliptic springs are the three main characteristics of this highly original chassis. This from the owner's viewpoint. To the engineer the car is doubly interesting because it is designed and made unconventionally, there being a very large number of individually small parts joined together by welding and riveting. For instance the flywheel, which is also the fan that draws air over the cylinders to keep them cool, is made up almost entirely from small pieces of sheet steel, the building process being rapid and easy with the special tool equipment used for the job.

This year the weight of the car has been cut still more by increasing the amount of aluminum used. The fenders are now aluminum and so is the hood, thus saving quite a considerable number of pounds. A detail which is also interesting is that the bevel used is neither straight nor spiral, but is a "skew bevel," the teeth being straight in themselves, but angular to the diametral line of the gear. The effect is much the same as is obtained with the spiral bevel with its curved teeth.

Franklin uses the Dyneto single unit starter system and the wiring is carried out rather more neatly than usual, every essential terminal being very accessible, in fact accessibility is markedly good throughout the car. Yet another originality in the chassis is the wood frame at either end of which the springs, which are of the full elliptic pattern, are attached by powerful clips.

Hotchkiss drive is employed, both torque and propulsive stresses being supported by the rear springs, and the flexibility of the spring is such that a very soft start is obtained even should the clutch be handled roughly; the bevel pinion can make half a turn or more without doing anything except compress the spring.

Glide Substitutes Six for Four

Throughout 1915 there has been but one model Glide, a four, and for 1916 there will again be but one car; this, however, is a six. It has a Rutenber, high speed motor with Westinghouse electrical equipment, unit power plant, an open type driveshaft and long, three-quarter elliptic rear springs with Hotchkiss drive.

A strong feature of the car is the equipment, which is quite extensive for a moderate priced car. A special type of sedan body is also available, which is convertible into an open touring car by detaching the upper structure. This operation is easily performed and the attachments such that both open and closed bodies are complete in appearance individually.

Grant Is Larger

The Grant six is a bigger and better car for 1916, but there is no difference in the price. Improvement has chiefly been in the power of the motor, and in the outward lines of the body, although there are a number of lesser mechanical refinements that add to the dependability and performing qualities.

The new body lines are the first thing to be noticed on inspection of the car. Cowl and body sides have been raised, and the slope of the bonnet conforms to the general line, with the radiator, still of the rounded form, of larger size. Increase of cylinder diameter from 2⅞ to 3 in., with the stroke remaining at 4¼ in., gives about 10 per cent more power, the displacement profiting by the enlargement to the extent of about 15 cu. in.

Instead of continuing to use the former mushroom type of valve tappets, the motor now has tappets of roller design, this change being made to eliminate the side thrust component on the valve rods, thus preventing wear and noise. Looking to the matter of accessibility, the method of assembling the tappets into the crankcase has also been changed so as to allow their removal without disturbing the camshaft or its bearings.

Overhead valves are used in the Grant engine, the head being detachable and carrying the rockers, springs and valves. In the cooling system, the only change is in the radiator, which is now of the form in which the shell and core are separate, the frame supporting the more delicate core against weaving or other causes that might spring leaks.

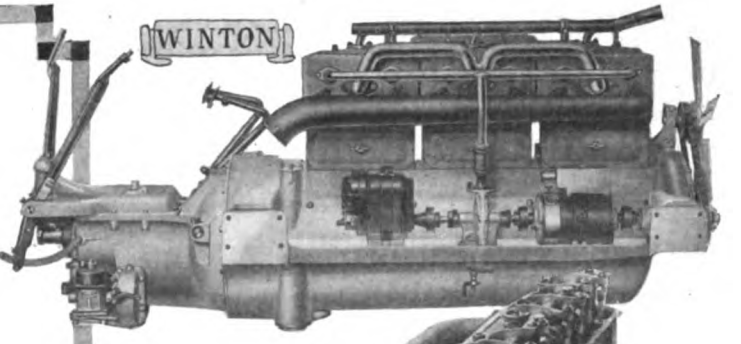
The design of the chassis is quite conventional and follows recognized good practice. The rear suspension is by well attached cantilevers, with the drive taken through a torsion tube that surrounds the driveshaft. Relief from somber hue is given by painting the cars in Brewster green this year, with only fenders and running gear in black.

Halladay High Speed Six

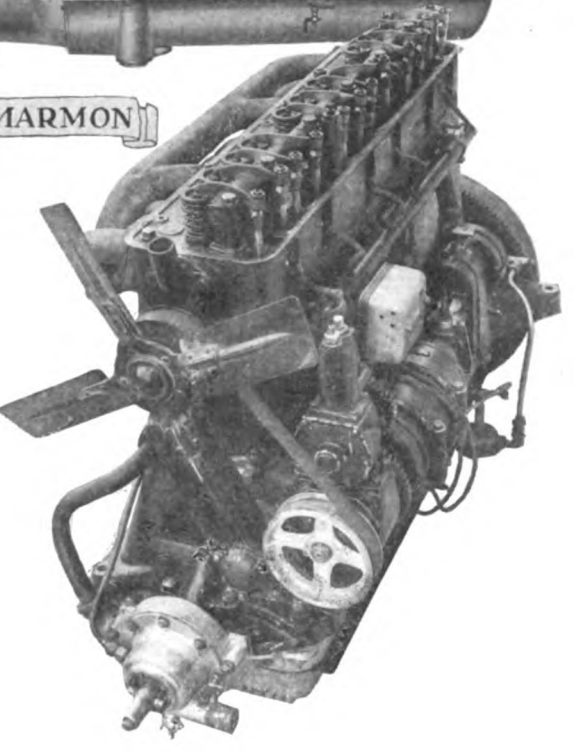
A new car, again with the very popular 3 by 5-in. six-cylinder engine, the Halladay is a soundly constructed chassis with good body equipment and fittings, selling for a moderate price. It has unit power plant, with Westinghouse lighting, ignition and starting apparatus, and Hotchkiss drive through long, three-quarter elliptic springs. There is

TYPICAL SIX CYLINDER MOTORS PRODUCED DURING 1915

WINTON



MARMON



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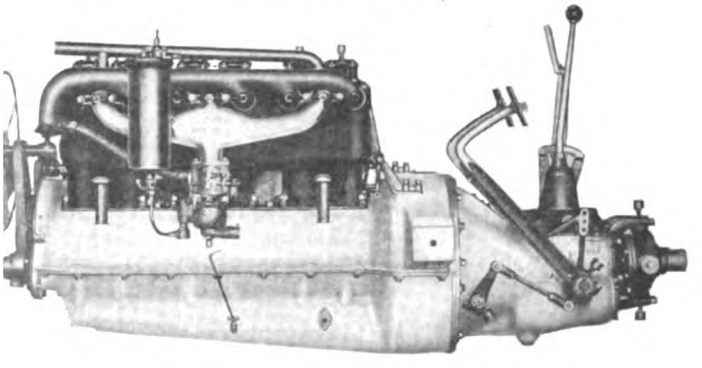
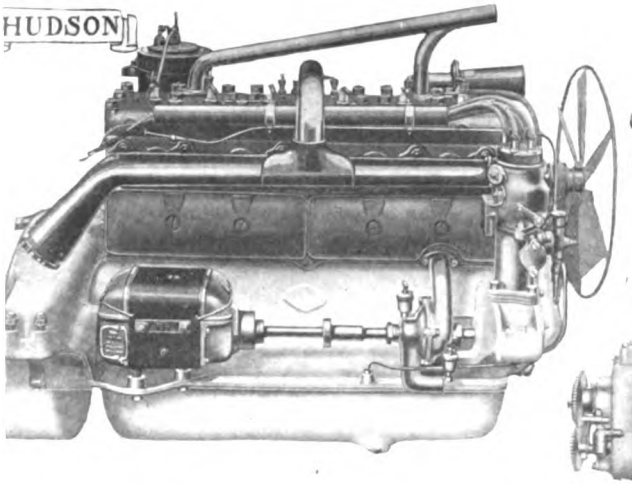
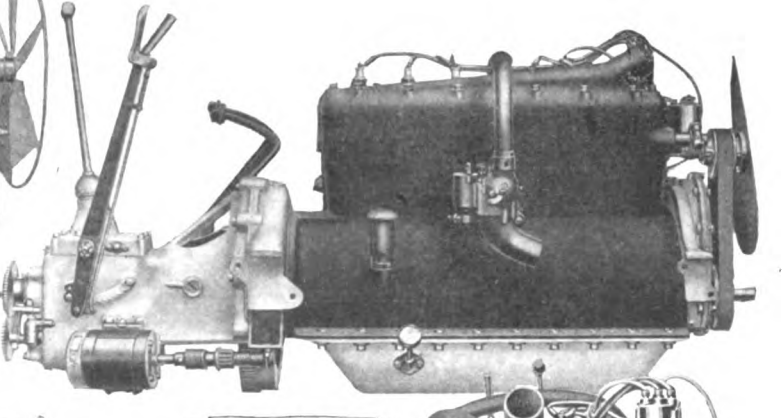


HUDSON





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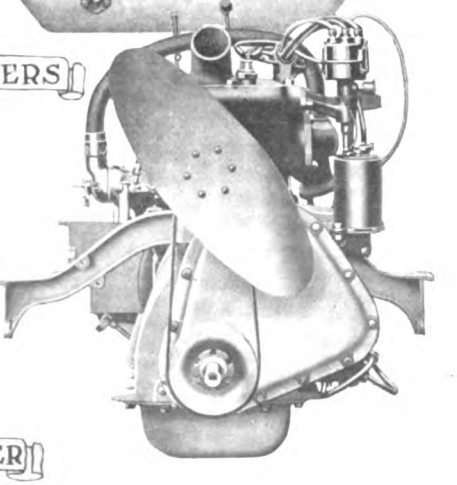
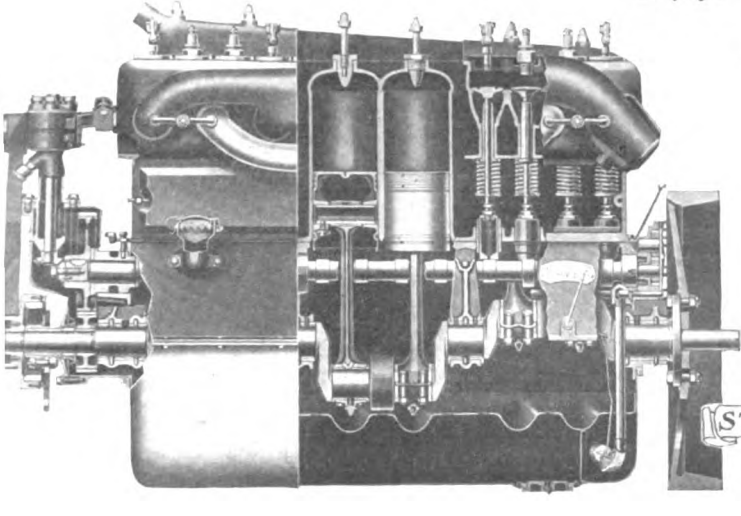




STUDEBAKER

a wide range of open and closed bodies, the standard touring car being for five passengers.

Haynes is Light Chassis

Last year Haynes introduced a new light six car of which large numbers have been sold in 1915, and for next year the same chassis will be continued with but small alteration. The four-cylinder car listed last year has now vanished from the company's catalog. The Haynes is a distinctive car in that it is manufactured almost entirely in the Kokomo factory, motor, axles, gearset and so on being designed and built under the same roof.

In a general way the chassis follows conventional lines, having a very neat engine with the accessories neatly and accessibly disposed, a special detail being that the front end of the motor is hung from a shackle at the center of a forged cross member of the frame. For lubrication there is a combination splash and pressure system operated by a plunger pump. The carbureter bolts direct to the cylinder casting, as the intake manifolding is internal.

A large crankshaft is used and particular care is taken in fitting the bearings, the Haynes Co. being justly proud of the amount of skilled attention given to this important detail of manufacture. Light reciprocating parts assist the general rigidity of the design in keeping down vibration.

Hudson Entirely New

The 1916 Hudson is an entirely new chassis which will be known as the Hudson Super-Six. Enormous pains have been taken in developing this motor and the continued use of six-cylinders decided upon after many experiments with eight and twelve. Externally, the new motor has no striking peculiarities, being a block-cast six with 3½-in. bore and 5-in. stroke which is exactly the same size as last year. The power developed is stated to be 76 hp. maximum as compared with 42 of last year. To obtain this much higher power the principal alterations have been in reducing the friction resistance of internal parts of the motor and enlarging the gas passages and valves. Higher speed of rotation is rendered possible by the larger valves and vibration at the higher speed is prevented by the large dimensions of the four-bearing crankshaft. This new motor has been subjected to very severe tests and the new Hudson car has accomplished some remarkable speeds under official observation. The motor is claimed to develop greater power in proportion to its size than any other stock car motor ever built.

In developing the new motor a special type of carbureter has been designed, the ambition being to produce an instrument which will give rapid acceleration without delicate manipulation of the throttle.

The supply of oil is regulated by the speed, the throttle being connected to the oil pump in such a way as to regulate the stroke of the oil pump plunger. There is an eccentric in connection with the throttle which controls the distance between the pump plunger and the cam which operates it, reducing the clearance as the throttle is opened, and so giving more oil.

While interest naturally concentrates upon the motor, the chassis has received attention and is neater than ever. Hotchkiss drive is used with long semi-elliptic springs and the frame has straight sides which taper slightly toward the front.

Hudson has always taken care that the body work shall be expressive of the greatest comfort and the most modern ideas as regards outline and this principle has persisted in the design of the new car. Even better appearance and even greater comfort are to be found in the Super-Six.

Kline Kar is New Model

A six of rather shorter stroke than usual but otherwise on conventional lines is the 1916 Kline. Actually the motor dimensions are 3¼ by 4½ in., and 46 hp. at 2200 r.p.m. is the motor performance claimed for the standard product. The electrical equipment is all Westinghouse, lighting, starting and ignition. Two bodies, a five-passenger touring and a roadster for either two or three are offered at the same price and the tires are of good size, being 34 by 4 in.

Locomobile Has No New Chassis

Making some of the most costly cars now sold and specializing upon the most elaborate and beautiful bodies the Locomobile Co. but rarely introduce a chassis that is entirely new. At present they have two sizes of six-cylinder motor, the chassis being similar and not greatly different from former chassis of the same make.

Still there have been detail changes and for 1916 the Locomobile chassis are quieter, lower and better sprung. Great pains have been taken to eliminate any possibility of rattle, throughout the car, and the engine has been quieted by inclosing the valves and paying more attention still to the front end gears.

In the chassis there is one entirely new part, this being the dry disk clutch which now has sixteen plates and engages more easily than ever. The frame of the car has been lowered 3 in., and the running board brought down about half this amount.

Sundry improvements have been made in the dashboard fittings and switches, many of the latter now being arranged so that they may readily be operated by the driver's foot, fresh lamps have been added, one to illuminate the tonneau, and another lights up directly the door is opened, casting its rays upon the step.

For supplying electricity special machines are made for the Locomobile Co. by the Westinghouse Co., and the latter's magnetically operated pinion shift is used for the starting motor. This has a switch which is operated by a relay, so only a light push button has to be touched in order to start the car. Magneto ignition is adhered to, the system employed being Bosch dual.

In the gearset four speeds are provided, and the drive is the furthest possible removed from Hotchkiss driving since there are radius rods as well as a torsion member, and all braking stresses are resisted by the radius rods. An interesting detail is the use of two concentric brake drums.

There is a choice of either standard or custom built bodies, the finish in either case being the highest obtainable and the appointments of the greatest luxury.

Luverne is Large Car

Called by its makers the "big brown Luverne" this car is essentially a large machine with plenty of power and a roomy seven-passenger body of touring type. Large tires and a full equipment, including such desirable accessories as a power tire pump, are given. This is one of the largest cars using a single unit lighting and starting machine, a Splitdorf-Aplco unit caring for the 4 by 5 in. engine.

Madison Uses Rutenber

The Madison chassis is another in which the 3 by 5-in. Rutenber motor makes its appearance and is entirely conventional except that the rear springs which are three-quarter elliptic are really much above the average length. Seven, five and four-passenger touring cars are made, and a two-seated roadster, all mounted upon the same chassis.

For electrical equipment Remy apparatus is used, the generator being combined with the ignition distributer and the motor a separate unit. The chassis has a very clean outline and is singularly free from small attachments.

Marion Light Six Unchanged

The new series Marion was announced last May and has been a very successful car in 1915. It is considerably different from previous Marions, being a light chassis with 3 by 5 in. motor of high-speed type. It is an assembled car but one containing plenty of character, for the units are well

chosen to suit each other, and the arrangement is of thorough engineering character.

On the unit power plant the accessories, notably the Westinghouse generator and ignition unit are accessibly disposed, being mounted high up. The starting motor is also set on a level with the cylinders, the carbureter bolts direct to the cylinder block and the oil filler cap is brought up on the carbureter side close to the starting motor. The valves are on the right and the cylinder head detachable.

The axle is built up with a cast center case and tubular sleeves, and the differential can be removed by taking off the cover plate and then unscrewing four bolts. The three-quarter elliptic rear springs are taken beneath the axle and are extra long and wide to enable them easily to care for the Hotchkiss drive stresses.

The five-passenger body is kept reasonably short, so the back seat is not too far over the rear axle, a point which makes for easy riding. It is a streamline design with concealed hinges and flush upholstery. A distinctive shape of radiator casing and a low set top gives individuality to the front view of the car.

At the back of the body there is a very strong and rigid spare tire carrier of the internal type that supports the demountable rim without anything coming in contact with the tire itself. This carrier is so disposed as not to interfere with the gasoline filler cap of the round tank which is slung from the rear of the frame, a Stewart Vacuum tank being used to transfer fuel to the carbureter.

Marmon Has Aluminum Motor

There is not a detail of the new Marmon that is not new, though the car, which was described fully last week, has been in process of design for several years. It is a high quality, moderately high-priced car, about 1000 lb. lighter than the average of its class, and tests have proved it a remarkable performer on the road.

The engine, which is a six, has aluminum cylinders and pistons, overhead valves, and a detachable head. It combines efficiency and quietness with complete freedom from vibration to a very remarkable degree. In a brief review it is difficult to pick out specific details, but mention must be made of the oil throttle which is linked to the gas control and varies the oil pressure in accordance with the work the engine is doing at the moment. It is one of the neatest large engines ever made and there is not a single detail of it or on it that is not instantly accessible, the electrical equipment being particularly easy of access.

Then, the frame is a novel type, made of very thin steel and with the steel running boards used for their strength as part of the frame section. Each portion of the frame is calculated to be in the proper place to take the stresses on it and the waste material is thus cut to a minimum while the rigidity is aided.

In spring suspension, the rear end of the frame is connected to the axle by a pair of superimposed transverse springs which are set back to back with a device in mounting which eliminates all roll and also varies the period of the spring according to the nature of the shock encountered. The rear axle is built up from cold drawn steel tubes which are the last word in the art they represent.

The gearset is located on the front end of the torque tube and is so mounted on a ball joint that perfect freedom of motion is given the axle and yet the gear control lever is unaffected.

Then again, the body is built up in sections of aluminum, the frame being used as the base. There are no body sills. The upholstery of the body is detachable by detail so that a complete new set of cushions and seat backs can be put in in an hour. It would be possible to have a summer set of leather cushions and a winter set of cloth for example, and anyone could make the change.

The car has lines which will appeal to many as typical of the chassis and the high sides combined with low build give unusual comfort inside either driver's compartment or tonneau. The top is low set, and appears as an integral part of the design when erected, its lines harmonizing with those of the body. Altogether the car is one which every engineer show visitor will study closely.

McFarlan One Chassis Two Motors

One chassis with two motors of similar design but different size is the 1916 program of the McFarlan Co. The chassis is fairly costly and is a high class design made with the best workmanship, intended for the support of heavy bodies of luxurious character. The principal innovation this year is the adoption of very heavy, flat cantilever springs which have improved the riding quality.

The motors differ in little besides dimensions, both being T-head with very large valves. The speed capabilities have been increased by the adoption of aluminum alloy pistons and improving the lubrication by adding a plunger pump giving a pressure supply direct to the main crankshaft bearings.

Moon 6-30 and 6-40

Both these models are new this year. The chassis, which follow convention in general, are strongly similar, the main difference being in the size of the motors which are 3¼ by 4½ in., and 3½ by 5¼ in. respectively. The larger is very much like the 1915 model, the smaller having the new Continental light six engine, with a Delco starting, lighting and ignition system.

Hotchkiss drive is used for both chassis, a difference being that the larger has three-quarter and the smaller semi-elliptic springs. Full floating axles are fitted. The new bodies are full streamline form and the folding seats on the seven-passenger models are arranged to disappear completely when out of use.

Owen Magnetic Enters Second Year

When the Owen Magnetic with electric transmission was put fully on the market last year there were not wanting critics who predicted a speedy return to oblivion, but they have been utterly confounded, for the car has sold very well indeed, for a costly machine. During the year many tests and trials have demonstrated the practicality of the Entz system of transmission in which there is no positive gear connection between the engine and rear wheels. The 1915 chassis will be continued and a new, smaller one added, intended especially for town work.

The principle of the transmission is best explained in a few words by saying that there is a magnetic field created and rotated by the engine. This rotating field drags an armature around and so drives the propeller shaft. When running on "high gear" there is a very small slip, just sufficing to maintain the magnetic grip, but when the controller is moved toward a lower "gear" the slip increases and the electric current generated thereby is used in a second armature and a stationary set of field magnets to help drive the car. Transition from one step to another is by gentle gradation and the effect is that of providing an infinite number of speeds.

The mechanical portion of the chassis is of high quality and the manufacturers have produced some very attractive special body designs.

Paige Has Two Models

Early this year the Paige Co. announced a new series light six, 3 by 5 in., which would sell at a very moderate price, and the factory has been kept continuously busy ever since, at high pressure. The car is efficient, having plenty of power and running smoothly. Apart from the qualities of the chassis the body and hood together make an appearance which is almost universally approved, and the comfort suggested by

the outside is discovered to be a very definite fact as soon as a test is made.

The engine is a very neat block-cast six with a detachable head and two-unit Gray & Davis electrical equipment. The carbureter bolts directly against the cylinders without any manifold, the generator and water pump being driven in tandem on the opposite side. A high mounting is used for the starting motor which locates alongside the carbureter on the left side, and oil is circulated by a vane pump which is integral with the crankshaft, being situated at the extreme front end thereof.

Between the engine and the gearset of the unit power plant is a multiple disk clutch which runs in oil, and so operates with the maximum of smoothness. The rear axle is provided with a torsion tube, inclosing the propeller shaft, and this tube is used both to resist the torque and to transmit the drive, so relieving the rear springs of all stresses save those due to the load.

These rear springs are cantilevers of substantial dimensions and are credited with very satisfactory performance. Only the five-passenger touring body is supplied on this chassis, and it may be added that the high radiator, which is slightly pointed, is very distinctive indeed; the car is instantly recognizable.

The larger six has a similar chassis to the small one, differing mainly in the motor which has somewhat similar outline but a few internal differences, notably the use of a plunger oil pump instead of the vane type. The wheelbase is 11 in. longer and the tires 34 by 4 in. instead of 32 by 4 in. Like the smaller car the large chassis is supplied with only one body, this being a seven-passenger touring type.

Paterson Concentrated on Six

A new Paterson six with the Continental high-speed motor appeared in August and it is the maker's intention to carry on with this model. It is a conventional type of chassis with Warner gearset in unit with the motor and a Weston-Mott rear axle.

In designing the five- and seven-passenger bodies the Paterson Co. has provided extra width on all seats, and there are various neat details. One is the method for folding the extra seats into the back of the front seat, another the utilization of the left front door as a tool kit, all the more important spanners, etc., being neatly arranged in holders just beneath the leather flap on the door.

Pierce-Arrow Continues Three Chassis

Without substantial change the Pierce-Arrow 38, 48 and 66 six-cylinder cars will be continued for next year. In detail there have been some changes, however, and on lifting the bonnet the average man who knew the 1915 car would think that the motor was new altogether. This is because considerable trouble has been taken to smooth out details. For example the tops of the cylinder castings, which are still made in pairs, have been rounded off in a very neat way, making the motor look pounds lighter, and various small alterations of a similar nature have made for accessibility as well as for improved appearance.

The cone clutch interconnected with the gearshift lever so that gears can be moved only when the clutch is disengaged is used as before, and all models have four speeds with direct on high gear. Drive is taken by the springs with a torsion tube to care for stresses of that nature.

A very wide range of bodies is available for either of the three chassis these all being made on the Pierce-Arrow principle of cast aluminum units. These thin castings make panels and joints of a rigidity rarely obtainable by any other process, and the closed bodies can be subjected to the severest road conditions without any possibility of warping.

With these bodies the development of a rattle is practically impossible and the cast aluminum provides an ideal surface for taking the best class of paint, as it has a natural "tooth." The woodwork is just sufficient to support the upholstery and is attached to the aluminum panels rather than the other way about as in the ordinary body. The large number of limousines made by the Pierce-Arrow Co. five and six years ago, and still in service is proof of the lasting qualities of this special body system.

Premier Has Many Bodies

One chassis with a wide choice of bodies, six in all, is the 1916 Premier scheme. The chassis has a 4 by 5½ in. motor with cylinders cast in blocks of three apiece, a multiple disk clutch in unit with motor and gearset and a Timken full-floating rear axle. Delco or Remy electrical equipment is fitted and the tires are large, being 36 by 4½ in.

The bodies include the conventional types such as seven passenger touring and roadster patterns. Then there is a speedster, a clover leaf three seater and a coupélet, while a special four-passenger called the "yacht" body is supplied also. Particular care has been taken in designing these bodies which appeal to almost all tastes and one or another can be found to suit almost any conditions.

Republic Is Large Car

Almost unchanged in design the Republic 1916 series retains the T head motor with pair cast cylinders. It has a 133-in. wheelbase so is able to take large, roomy bodies. There are but few cars remaining with four speed gearsets and fewer still with four speeds and direct third, but the Republic still is provided with this equipment, the gearbox being mounted amidships.

Another departure from ordinary practice is that the service brakes are internal on the rear wheel drums, and the emergency brakes external.

Singer Has Large Powerplant

The Singer car which appeared on the market toward the end of 1914 is to be continued with but small changes for next season. It has one of the largest unit powerplants made, the motor being 4 by 5½ in. Four speeds with direct on fourth are provided and the big engine is tuned to run up to 2000 r.p.m. or over and it is claimed to develop in excess of 100 hp.

It is a large, fairly high priced car and seven different bodies are offered, a runabout, two touring models and two inclosed.

Stewart Is Neat Chassis

The Stewart car is the product of a firm who specialized on light commercial vehicles up to the present year when they commenced to make a passenger car. It is an assembled car using Continental motor and Timken axles, but it has a character all of its own, the chassis being laid out with quite exceptional neatness and convenience.

The radiator is located against the dashboard and the hood of the sloping pattern like the original Renault or the Franklin. The manufacturers pride themselves on the good finish of the bodies and on the springs, in the selection of which they went to great trouble to acquire exactly the right strength. The finished car is very distinctive in appearance.

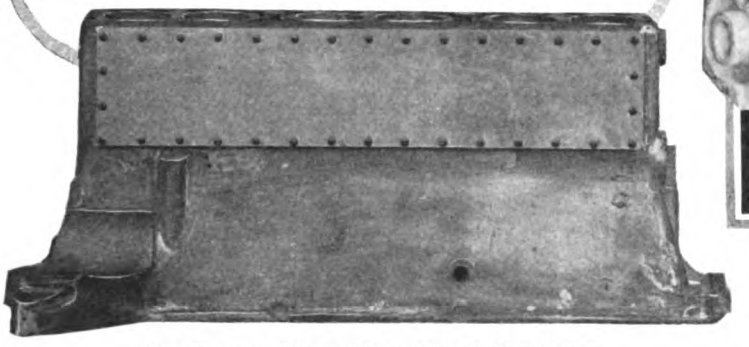
Sun Is New Car

A new light six with the popular 3 by 5 in. cylinder dimensions, the Sun is an assembled chassis which will make its first public appearance at the New York show. It has Remy electrical equipment, dry plate clutch and Hotchkiss drive, while the rear axle has double expanding brakes in the rear wheel drums.

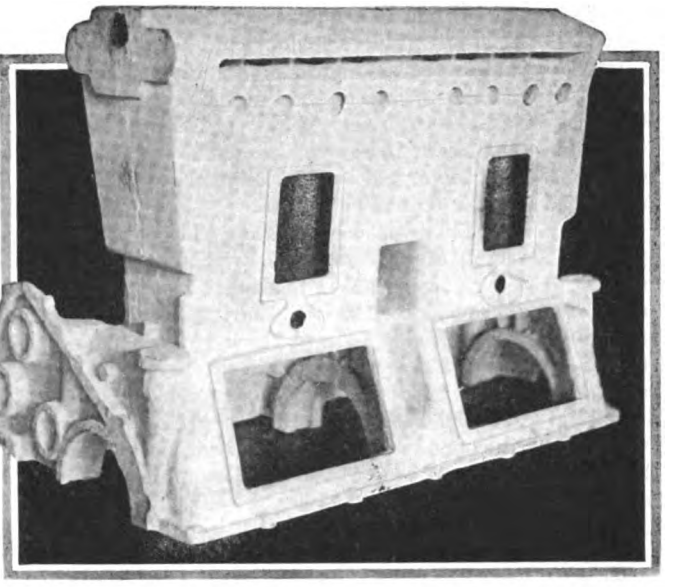
Velie Has One New Model

The Velie program for 1916 includes one continued chassis, the 3½ by 5¼ six of 1915, and one new car which is a lighter six with motor 3¼ by 4½ in. This engine is the very

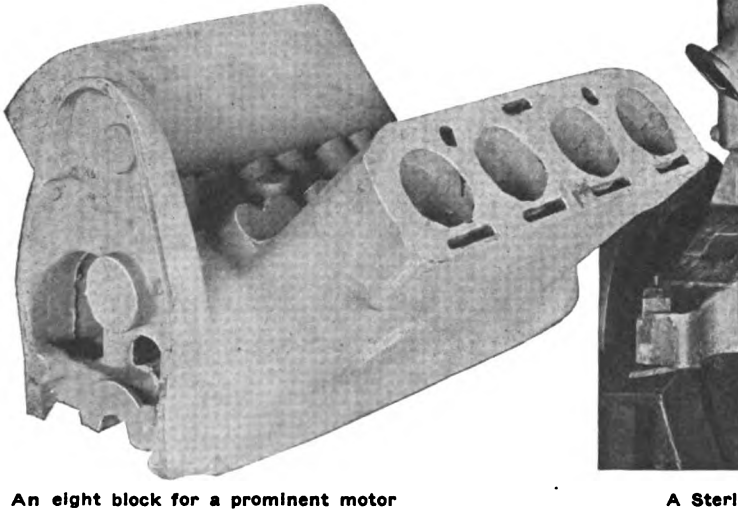
EXAMPLES OF ALUMINUM CYLINDER CASTING—FIVE EXPERIMENTAL—ONE PRODUCTION



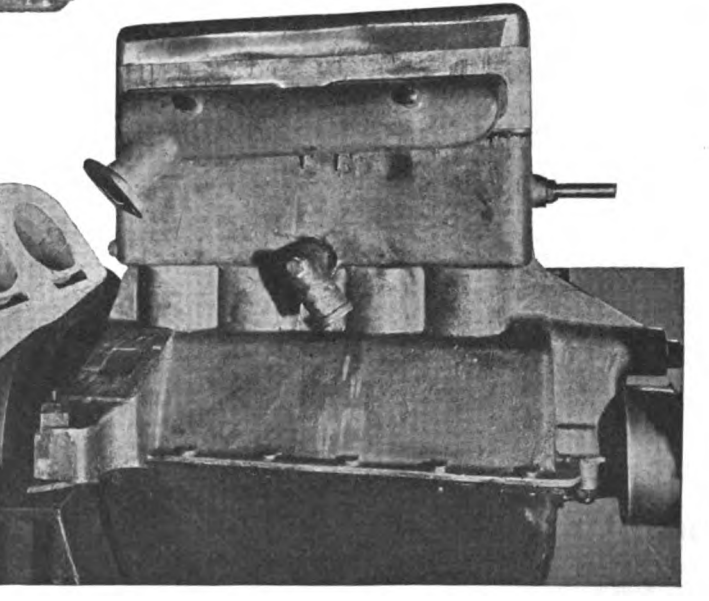
The rough casting of the new stock Marmon



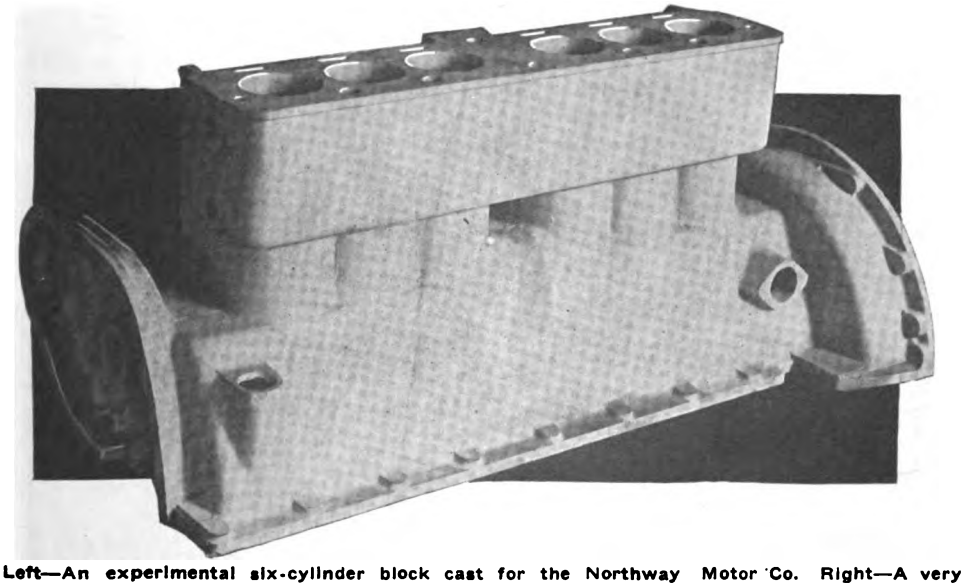
An elaborate casting for Louis Chevrolet's racing car

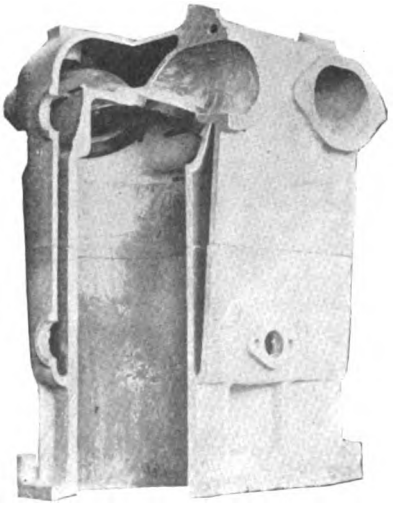


An eight block for a prominent motor manufacturer



A Sterling four which has been running six months





Left—An experimental six-cylinder block cast for the Northway Motor Co. Right—A very large cylinder for a Wisconsin aeroplane engine

latest Continental and is a high speed motor. It has several typical Continental features in lubrication and detail design.

On both chassis the unit powerplants are supplied with the same clutch, a three plate pattern dry disk which is operated by exceptionally light pedal pressure. There is an easily accessible adjustment for spring pressure and there are two adjustments on the clutch pedal, one where it is keyed to the shaft and another on the pedal pad.

A very wide frame is used so that the body can be supported on a base of its own width without overhang at the sides, this being considered an insurance against the appearance of body squeaks. The rear springs come beneath the frame instead of beside it, and these springs pass beneath the axle; they are the only attachment between frame and axle, taking all torsional and driving stress.

Special care has been taken with the electric wiring, all wires being in conduits and the Remy equipment is used. The body is described as a boat shaped streamline of good width and generous proportions.

Westcotts Feature Bodywork

The Westcott novelties are two chassis which differ only in length and tire size, and a range of new bodies. The latter include a convertible sedan which is claimed to be one of the most perfect examples of this kind of body. With it comes a special windshield of limousine pattern, which can be substituted for the touring car shield when changing to the winter equipment. Another style of Westcott body is the three-passenger roadster with clover leaf seating, and this is also made as a cabriolet.

A very strong feature of Westcott construction is the adjustment provided on the pedals and also on the steering wheel. The pedals can be lengthened or shortened 6 in. and the steering post moved over a wide range, giving the effect of an adjustable seat, without the extra body weight and complication introduced by such a fitting.

The cars use Continental motors and a multi-disk clutch with a large number of plates. The gearset is in unit with the engine, and drive to the rear axle is by open type shaft with two universals and a torque stay. Cantilever rear springs are employed, these having extra short shackles at the front ends which is said to eliminate roll or side sway.

Many Options on Wintons

Making one chassis with two motors and of two wheelbases, the Winton Co. specialize in giving their customer a wide choice in luxurious bodies and in many smaller matters. For instance, each owner of a Winton is encouraged to choose the color scheme that he prefers for his car, and he may have either wood wheels or wire wheels as he may like.

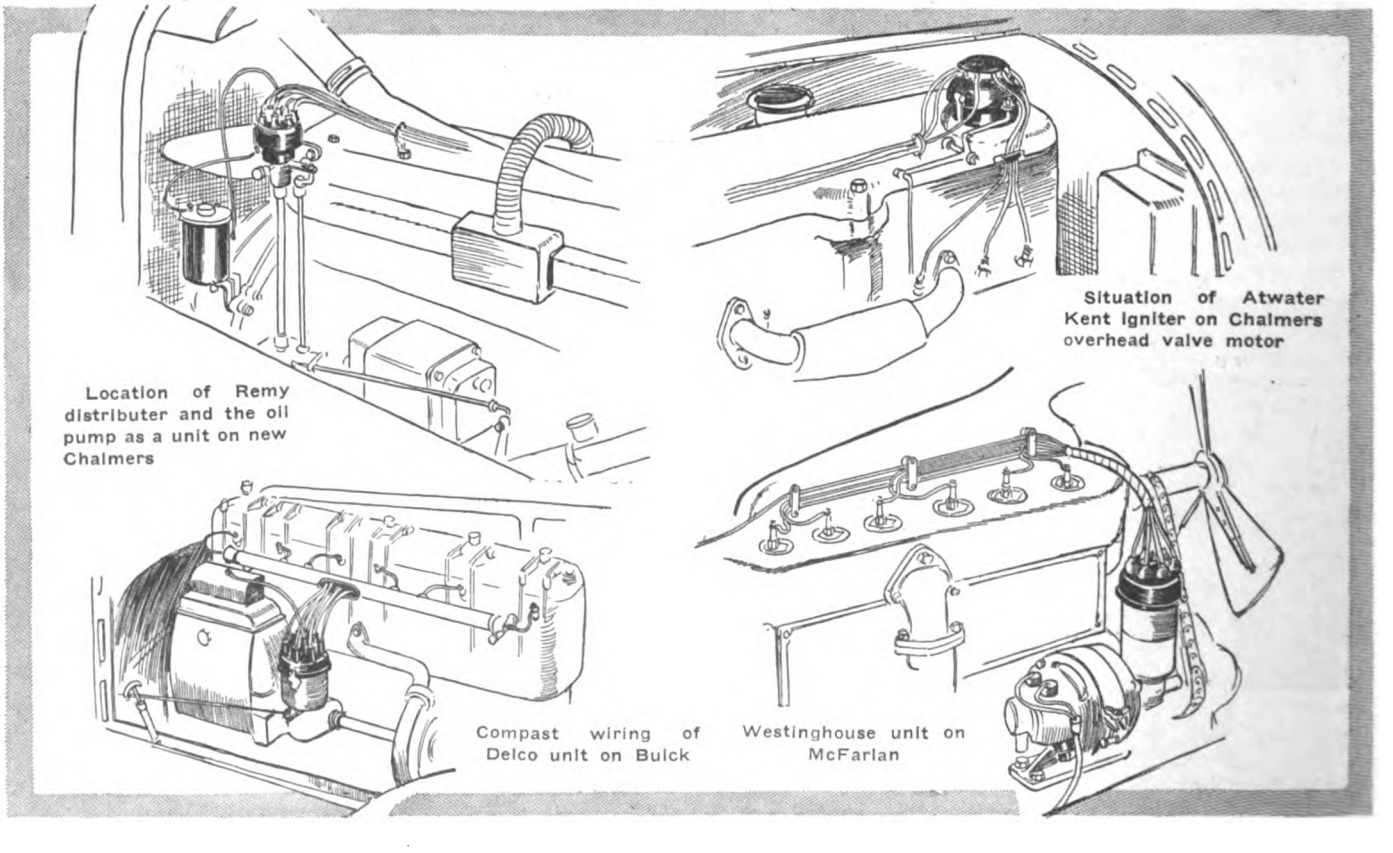
A rather unusual feature is the listing of cars with two bodies, say a limousine and a touring type, interchangeable on the same chassis, the price being less than for the second body as an extra if bought separately. All wiring is brought to a single connection on the dashboard so as to render interchange as simple as possible.

The power plants of both cars are distinctive in design, being of great robustness. Cylinders are cast in pairs and the crankcase has pans integral with it that completely fill the front end of the frame, excluding dirt and water and serving as a base upon which to mount the electrical units and the carbureter.

There is a multiple disk clutch which operates with light pedal pressure and both clutch and brake pedals are adjustable. Quick acting brake adjusters are provided by large self-locking thumb nuts.

A special point is made of the low suspension, the frame being dropped deeply in front of the rear axle, and the three-quarter springs slung beneath the axle. In all springs the Dann insert is used for the purpose of maintaining their original freedom of action, and it is claimed that the low setting of the car makes greatly for steadiness. Both motors are of large displacement and well able to take care of big bodies. Nine different body styles are available for either the large or small chassis, or the chassis can be bought alone for fitting a custom built body.

Four Comparative Studies in Wiring on New Cars



Section 3—Cars Made Only as Eights or Twelves

This Section Last Year Would Have Contained But a Single Name

Cadillac Shows Small Changes

PERHAPS the most striking thing about the Cadillac eight of 1916, is the absence of material change as compared with the 1915 model. A slight alteration in the body lines and a cleaning up of the V between the cylinder blocks so as to make the tappets more accessible are the two outstanding differences in a design which only the year before struck out on a new course as compared with previous practice in powerplant design in this country. It would not have been surprising if the Cadillac designers had found it necessary to make considerable change in the engine, in view of the fact that it was a design never before attempted by an American maker, but no fundamental thing was found wanting, and such differences as the type 53 engine shows are of a superficial nature.

With a great deal of frankness, the Cadillac company explains the increase in the price of the car from $1,975 to $2,080, on the ground that the original price was fixed before the production cost was definitely known, and later when it was found that this price did not give a reasonable profit, it was found necessary to raise the 1916 figure.

Chief among the motor changes are those which have to do with rendering the valves more accessible. This is done, first by moving the motor-generator back somewhat, and then by removing the power tire pump from the front end of the generator drive shaft and putting it on the left side of the gearbox. The ignition distributer, which was formerly in unit with the motor-generator is placed where the pump used to be, this shortening the motor-generator, and leaving more space on both sides of the carbureter. Further to aid the accessibility, the exhaust manifolds have been upswept instead of running straight back in line with the exhaust openings, bending away from the space between the cylinders instead of protruding into it.

A refinement of the ignition wiring adds to the dependability of the ignition. An aluminum cover goes over the distributer, and a wiring manifold runs from either side of it to carry the wires to the spark plugs. The distributer cover and wire tubes are held in place by spring clips.

Other mechanical changes include reducing the second speed gear ratio to give greater pulling power on intermediate; moving the brake and clutch pedals 2 in. forward to give more leg room; increasing the radiator height, and fitting mud splashers to the lower part of the radiator and along the inside of the frame front ends. The 1916 hood is higher and wider, and the sides of the body are also higher, giving the appearance of a larger car, although the wheelbase remains 122 in.

Cole Continues Successful Model

The Cole company have been so successful with their eight that it will be the only model this coming year. The motor has been improved by the adoption of a balanced crankshaft and will have a little more power, though of the same dimensions. The Cole was the first chassis to employ the Northway powerplant with the eight cylinders cast in two blocks each integral with one vertical half of the crankcase, the left portion bearing the crankshaft bearings, and this engine has proved itself so good that it is being continued as originally laid out.

A novelty in the motor since the summer is the introduction of aluminum alloy pistons of the "hourglass" type, which are particularly effective in preventing smoke. The pistons have also reduced vibration and given the motor still more "life." The Cole eight was also the first car to have a two unit electric lighting and starting system of Delco manufacture, and this they adhere to, it having proved highly satisfactory.

The Cole company pride themselves upon the high finish of their bodies and the quality of the leather upholstery used. The seven-passenger car with divided, individual front seats is above the average of comfort and there is still plenty of room even when the full complement of passengers is aboard. Not only internally, but externally also the finish is extra high so the Cole is generally reckoned a very handsome machine. Simple design has enabled the weight to be kept down and this, combined with the high engine power, makes the car very lively on high gear, official tests having shown that its accelerative power is decidedly good.

The wheelbase has been increased so giving 3 in. more length to the rear compartment, and the frame is of stronger section, so as to provide a body support of great rigidity.

Daniels Eight Robust Job

A robust chassis of simple outline with an equally robust Herschell-Spillman motor, is the briefest description of the Daniels eight, which is a new car only announced quite recently. The H-S eight has many special points of design, one being the use of the oil pressure relief valve to turn a stream of oil on the timing gears. Cylinders are staggered so as to allow the use of side by side connecting rods.

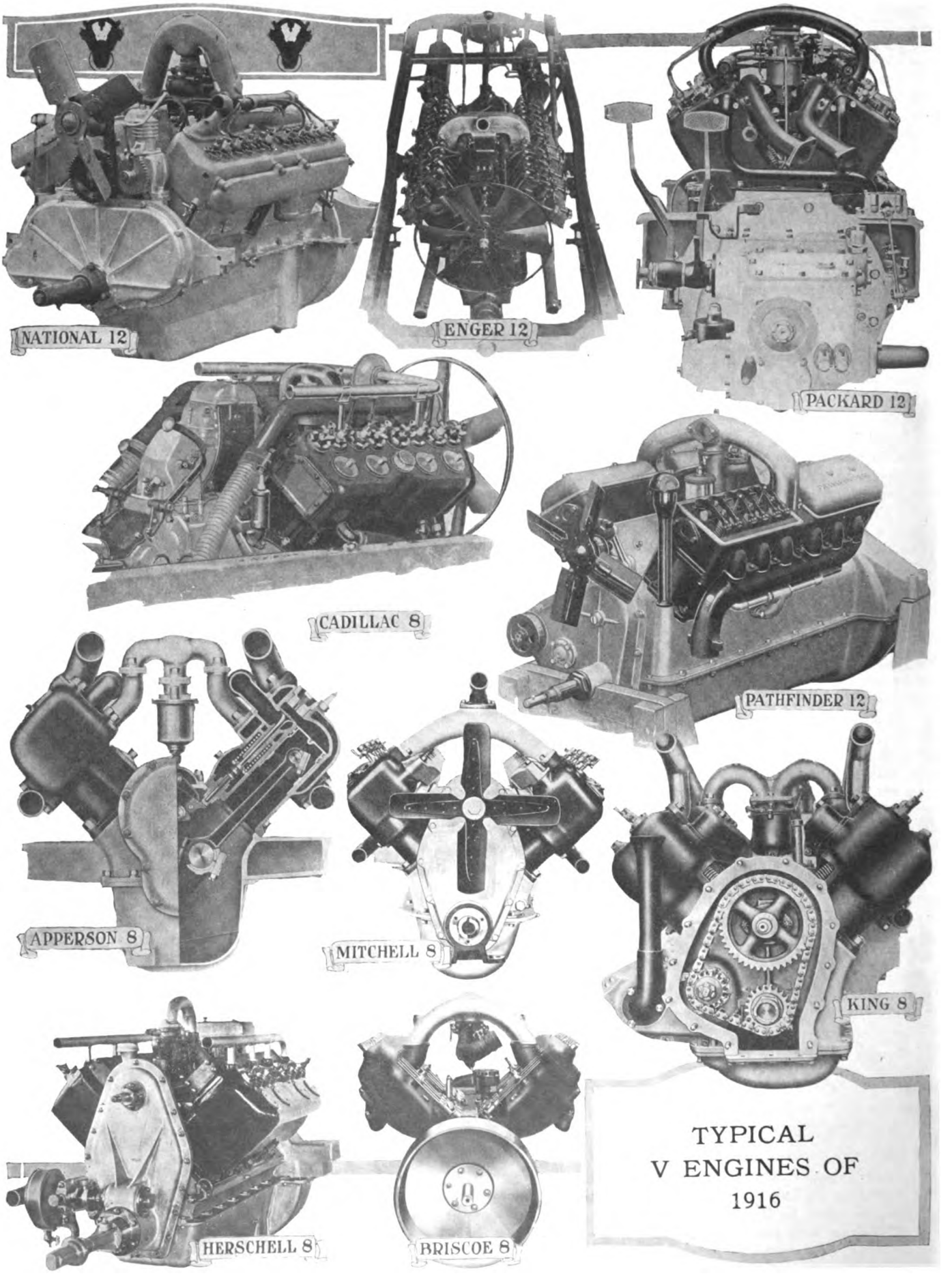
On this motor a Zenith duplex carbureter is mounted and the valve alley is otherwise clear of all incumbrance as the Westinghouse starting motor is removed to the crankcase side, the timer being arranged vertically at the rear end of the camshaft where it is very accessible and yet out of the way. For driving the Westinghouse generator a cross shaft is arranged at the front end of the camshaft, this cross shaft having the generator at one end and the water pump at the other, and the layout is almost ideal from the viewpoint of accessibility.

Being a fairly costly car the bodywork is of a high order of merit and the finish and fittings of the very best quality.

The chassis follows conventional lines and is entirely suitable for the heavy bodies which the motor power is well able to handle. A large choice of bodies is offered including two touring cars, a roadster, landaulette, limousine and sedan.

Enger Twin-Six Has Overhead Valves

The Enger Twin-Six is the only twelve cylinder specialized upon by any manufacturer save the Packard which was the first of this type. The Enger is distinctive in that it has overhead valves, operated from a camshaft located in the usual place, by long push rods and rockers, the valve tappet adjustment thus being made very accessible as it consists of



TYPICAL V ENGINES OF 1916

cap screws in the rocker ends. All twelve cylinders are cast in one single block with the upper part of the crankcase, and the cylinder rows are staggered to admit side by side connecting-rods.

Lubrication is thorough, oil being pumped through the hollow camshaft to the tappet mechanism and through the crankshaft for the other bearings. For the camshaft a chain drive is used and the fan is also operated from the camshaft. Short ignition wires are obtained by locating the distributer upon the camshaft at the upper end of a vertical shaft which drives the oil pump, this being situated in the crankcase near the center of its length. As there is no valve adjustment save that on the rockers the space in the V is utilized for the Westinghouse generator which is driven off the same shaft that carries the fan.

Another unique feature for a V motor is the use of the water-jacketed intake manifold as the outlet pipe from the cylinders, the middle of the manifold having the hose connection for the radiator. This is very neat and simple.

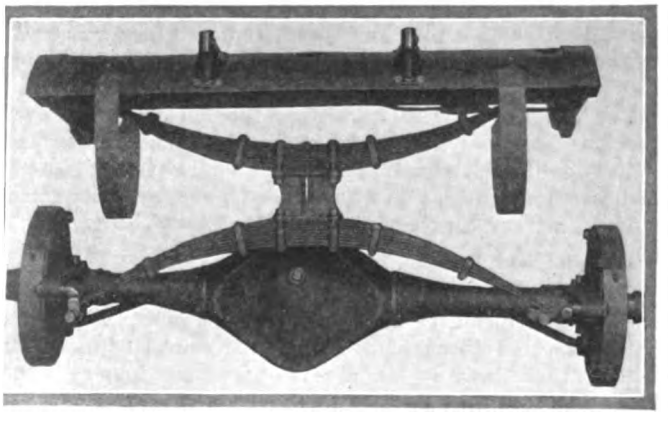
Hollier Is Small Eight

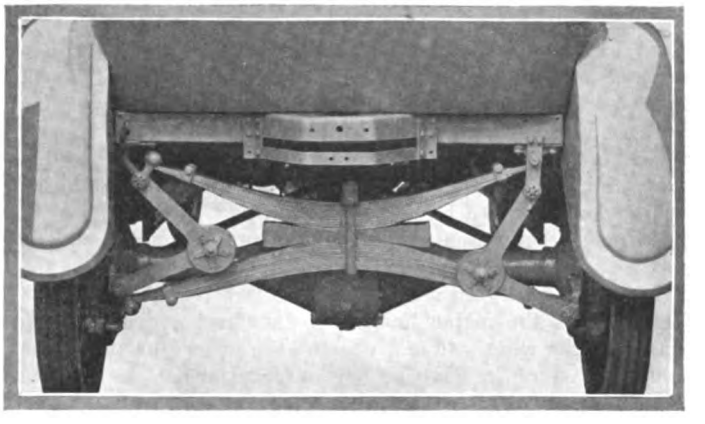
Long a maker of parts for other cars, the Lewis Spring & Axle Co. early in 1915 decided to stop working for others, and the result was the announcement of a new eight.

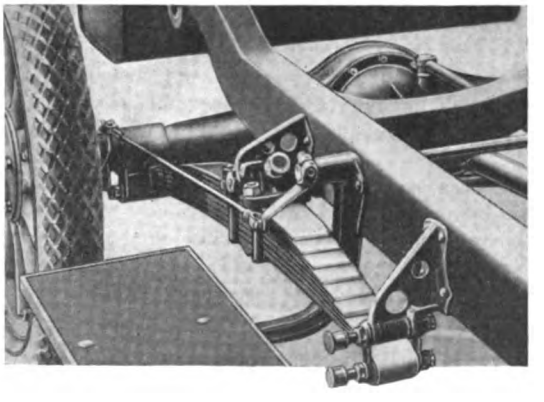
In the Hollier, simplicity has been aimed for without sacrificing stamina, and the car is a good example of what can be done in the manufacturing of a low-priced car with a multi-cylinder engine. Accessibility to the valves is specially noteworthy in this engine, because there is nothing in the V between the two blocks of cylinders save the carbureter and the combination oil filler and breather pipe. The starting and lighting unit is attached to the yoke passing around the flywheel, at the right of the gearset, and is thus out of the way, though readily accessible.

Unlike most connecting-rod constructions whereby either the forked-end design or the side-by side arrangement are

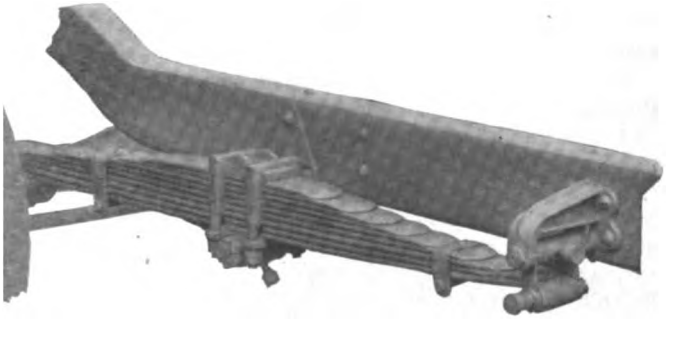
Some Novel and Contrasting Rear Spring Suspensions

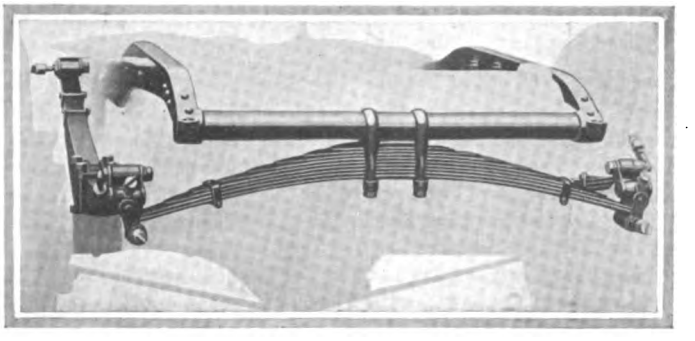






Top, Left—The rear springing of the Moline-Knight. Top, Right—That of the Marmon. These two systems are essentially the same in principle, being the latest development of transverse springing. In both cases the two springs differ in length, which means that the upper spring has a faster period of vibration than the lower and is consequently affected by shocks to a different extent. In both cases the springs are attached rigidly to frame and axle at one side by simple bolts through the eyes, and are shackled to axle and frame at the other side. In the case of the Moline there is a rigid separating piece between the two springs, but the Marmon has a wood separater which is cut to a curve as shown. This has the effect of spreading the base of support on the spring centers as the springs give under load. The effect of this spreading is to shorten the spring and make it increasingly harder as the depression due to shock increases





Left—The National cantilever spring which is particularly free from roll, this being said to be due to the high mounting and the nearly flat shape. Center, Above—King cantilever shackled to axle and with middle clip well forward. Right—The Cadillac platspring suspension

used, the Hollier designers chose what is termed the Gnome form of rod attachment. One rod has its entire bearing on the crankpin, but it has forged on its side a knuckle or boss that takes the other rod. The valves are operated by a single camshaft, which, together with the rockers, is assembled to a plate that bolts to the top of the crankcase between the blocks of cylinders. Drive is by helical gearing. The timing gear housing also acts as a mounting for the fan, and for the fan driving pulley, as well as a support for the front end of the engine and the mounting of the starting crank.

As standard bodywork a very neat five-passenger equipment is supplied, this being nicely proportioned to the chassis. There are not many unconventional points in the design aft of the motor except the cantilever rear springs. Also the rear axle has two sets of expanding brakes, there being two drums one within the other.

King Has Two Eights

The King eight introduced last year is being continued with a few small refinements, these being mainly in the body. The motor is of the type in which forked connecting-rods are used and another feature which has proved its satisfactory nature is the cantilever rear suspension.

A new model, also an eight has just been announced, this being intended for seven-passenger bodies; it is a slightly more costly car and the motor is quite different in detail. Instead of the forked connecting-rods the side-by-side pattern are employed, and the cylinders are staggered slightly to permit this. Light aluminum pistons, of a special design which prevents any possibility of smoking, are used, and the engine is intended to have a high speed capacity.

Geared rather lower than most, the careful engineering is apparent in the lack of vibration when running fast and the makers are justly proud of the accelerative ability. The front end of the motor has chain distribution gearing, one chain for the camshaft and one for the generator the latter being driven off a double idler sprocket which is used to adjust the camshaft chain.

High pressure lubrication of the most modern sort is used and the engine is conspicuously clean in appearance there being no accessories in the valve alley. This is done by placing the vertical timer shaft at the rear end of the camshaft and locating the generator low down on the crankcase. The starting motor is mounted on top of the clutch housing, and the tire pump on the side of the gearbox. As a result the valves are perfectly accessible.

Another point of peculiarity is the use of a transmission shaft brake, just aft of the gearbox, this being connected to the emergency lever. The cantilver springs used on the earlier model are again employed for the new car, but a modification in the mounting has allowed the frame and body to be lowered quite perceptibly without affecting the clearance.

The folding steering wheel used on the other King cars is continued for the smaller car, but is not used on the other, as the greater amount of space permits an easy entrance on the driver's side without a special wheel. The King company is one of the two firms making V type motors only that has two sizes available.

Packard the Original Twelve

As the first twelve-cylinder automobile ever put on the market the Packard will be one of the newest things in the show and ranks as one of the most important engineering accomplishments of the year. It is the first Packard car with a unit powerplant also as this firm hitherto adhered to rear axle transmissions.

The engine teems with novelty for besides being a twin-six it has a chain front end with a particularly ingenious adjustment, one of the most elaborate lubrication systems ever devised for an automobile engine and a Lanchester vibration damper which eliminates the last trace of quiver from the motor at any speed, from the lowest to the fastest. Every portion of the motor where there is motion is lubricated from the pump, even the spindle of the little air pump which supplies air for the fuel feed is lubricated positively. A robust crankshaft, large valves, and light aluminum pistons, together with the efficient Packard carbureter give this motor a very wide range of speed so the car is one of the most speedy on the market. The car can be started from rest on the starter, with high gear engaged and will pick up without hesitation once the motor is warm.

Despite a substantial drop in price the quality of the chassis detail, of the body and the equipment has been kept well up to Packard standard, and even improved upon in some respects. A very wide choice of bodies is available and the body fittings are most luxurious.

The left hand steering wheel and extreme left hand gear shift and emergency brake levers, now used by Packard for some years, are retained for the twin six, the engineers believing that this makes for comfort, and it certainly does allow the wide front seat to be used comfortably for three passengers abreast.

Another leading feature of the Packard is the centralized control upon the steering column, everything being brought to the one spot. One switch controls the lights and it is the work of an instant to change over from full headlight power to the smaller lamps which are made up integral with the large ones, but with separate reflectors.

For the first time in its history the Packard company is specializing on only one model of chassis, though this is made with two different wheelbases; on the long chassis the standard seven seated body is fitted, and the short chassis accommodates a very cosy close-coupled five seated body.

Peerless's New Eight

The recently reorganized Peerless company will make but one passenger car for 1916 this being an eight, which is to be constructed throughout at the Cleveland plant. There will be three body styles, a seven-passenger touring car, a limousine with the same seating capacity and a roadster for three. Being 3¼ by 5 in. the motor should have plenty of power and it is neatly laid out having all the qualities of design dictated by sound engineering practice. Lubrication is full pressure, with no splash, and dual ignition is provided with an automatic spark advance having a hand control superimposed.

The powerplant is a unit, with a multiple, dry disk clutch and three speed gearset and the rear axle a Timken semi-floating pattern. One point in the design which is less common to-day than some years ago is the use of a platform spring at the rear and it is also noteworthy that the drive is taken through the springs, there being no torque or radius rods. Lighting and starting is performed by Gray & Davis units and a special design of carbureter is fitted.

Being a moderately priced car the equipment is thorough, and includes tires 35 by 4½ in. on all four wheels. It is the intention of the manufacturers that the new model shall in every particular be suited to the maintenance of the company's name in the automobile world.

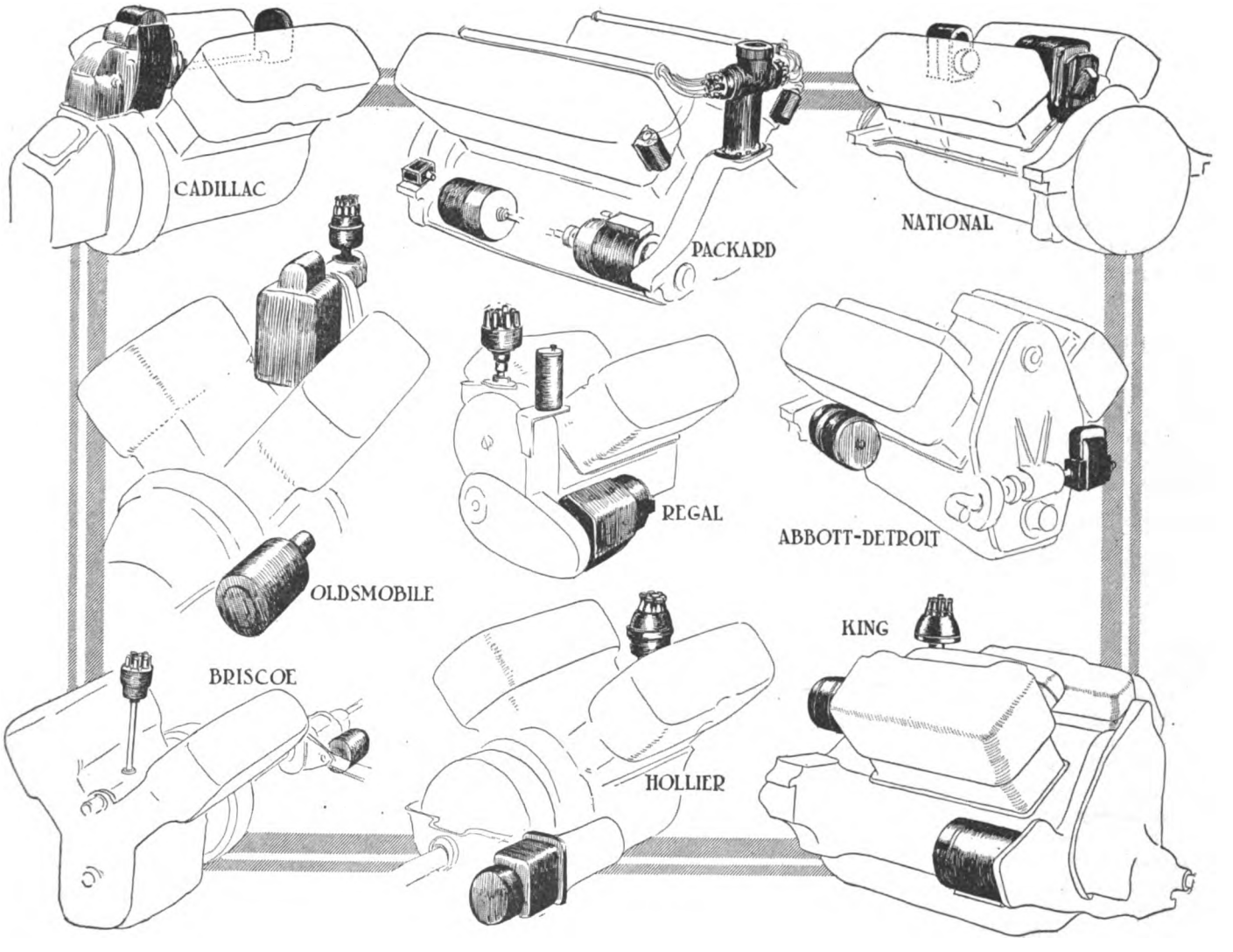
Ross Has New Model

There are now two models of Ross eight, one 3 by 4½ in. the other 3¼ by 5 in. Both motors have chain front ends and the smaller thermo-syphon cooling, the larger engine being provided with a centrifugal pump. Full pressure lubrication is used for both models. Touring bodies of five and seven-passenger capacity are fitted. The two chassis are generally similar, but the larger has three-quarter rear springs as compared with semi-elliptic on the smaller. A Detroit Starter Co. electrical equipment has been fitted in place of a special design used previously.

Another feature of the smaller car is a multiple disk clutch running in oil this excellent type being now somewhat rare.

Location of Accessories on V Motors

A Comparison of Accessibility of Electrical Units



THE accessibility of the accessories on V motors has been a cause of much discussion during the past year, and the various manufacturers claim special points of advantage for the arrangement they adopt. In the sketches above nine different ideas are displayed, the generator, the starting motor and the ignition distributor being indicated by diagrammatic forms in each instance. In every case the carbureter, which is not shown, is situated at the center of the V and midway of the cylinder length.

A little amplification of the sketches is necessary. The Cadillac has a single unit electrical equipment, with the distributor the only separate part, so all the electrical apparatus is in the V. In the case of the Packard the generator and the starting motor take a normal placing on the crankcase, and the ignition unit is in the same place as the Cadillac. The National, having the valves outside, has the magneto and the starting motor in the V, the generator, not shown, being on the opposite crankcase side.

Oldsmobile has a one-piece generator and ignition unit at the front end of the V, with a starting motor on the bell housing, and Regal uses a single unit generator and starting motor, with the distributor mounted extra high in front of the cylinders. The Herschell-Spillman motor of the Abbott-Detroit has a magneto on the cross shaft in front and no apparatus in the V, which assists the valve accessibility.

Briscoe has taken the single unit generator and motor back to the gearset, where it is entirely out of the way, leaving the distributor as the only electrical fitting on the engine, and Hollier uses very much the same design. King, on the other hand, uses a normal placing for the generator and mounts the motor on top of the clutch casing, having the distributor at the back end of the V close to the dashboard.

Section 4—Cars Made with More Than One Type of Motor

This Is a Rapidly Decreasing Class Though Still Containing Many Names

Abbot-Detroits Both New Models

A SIX and an eight form the Abbot-Detroit 1916 line, the former made with touring, roadster, speedster and sedan bodies and the eight with either touring or speedster equipment.

These are not one chassis with two different motors, but are two totally separate designs, even the starting and lighting outfits are different, being Remy on the six and Auto-Lite on the eight. In wheelbase there is but an inch of difference, but the piston displacement of the eight is a good deal the greater. Both are robust chassis with good equipment, thoroughly up-to-date in detail but with no especial peculiarities of design.

On the eight, large tires and big brakes are features and the electric storage battery has a capacity a little above the average, which is always advantageous.

Apperson Has Six and Eight

One of the fine old firms of the industry, the Apperson products have always been free from experimental engineering. The factory, though not very large, is one of those in which almost every part of the car is made and in consequence the Apperson cars are distinctive in every detail. In the eight care has been taken to make the crankshaft and its supports so stiff that periodic vibration is impossible, and the smaller detail of the motor is well thought out and carefully arranged. The oil indicator, for example is a particularly simple and effective adjunct.

The six is similarly well thought out, both cars displaying, by their design, that the engineers responsible for it are men with long road experience, since the convenience of the driver is studied throughout. Touring bodies and a very neat four-passenger roadster are made, the latter being a development of the clover leaf, three seater. All four passengers are in close proximity and can converse together, while each has plenty of room for comfort. Also the body is usually considered very attractive in appearance.

Auburn Line Is Two Sixes and a Four

Though not having a very large output the Auburn Co. ranks high among the older firms of the industry. Their chassis are always eminently sound in design and in workmanship and free from any doubtful features. Reliability is a keynote of Auburn workmanship. The three 1916 cars rank in the medium price class, the four is a very handy size of machine with a motor possessed of plenty of power. It is made in five-passenger and roadster form and has large tires with a cantilever rear suspension. The two sixes are generally somewhat similar, both being of 5-in. stroke, the smaller of 3-in. bore and the larger 3½ in. There is also a difference in the electrical equipment as Delco is used on the big six with Remy on the small six and the four.

All three models are new this year, and the cantilever springs which last year were not employed are now used on all models. Floating rear axles are now fitted to all three cars and on each the drive is through the springs with a torsion tube in addition. Last year the body lines were modernized and improved very greatly and this characteristic holds good for the coming season.

Both the sixes have L-head motors and integral intake manifolds, but the four is still a T-head, though the manifold is integral on this motor also, rather an unusual feature for a T-head construction, by the way. There has been a price reduction on the four, and the big six is also cheaper than the 1915 six. The light six comes between the two and is not directly comparable with either 1915 model.

Briscoe Is Four or Eight

Briscoe is one of the manufacturers who has so designed its 1916 chassis that either a four- or an eight-cylinder motor is interchangeable in it. The idea is to furnish the customer either an eight or a four as desired, and if he chooses a four and within 30 days decides he would prefer an eight, the Briscoe company will replace his four with the eight for $200 additional. In order to make this possible with the least amount of trouble, the gearset has been separated from the engine and placed amidships so that only the power unit itself has to be taken out, either motor coupling to the drive shaft ahead of the gears.

A new design of four-cylinder motor is used in the 1916 car, 3 7-16 by 5 1-8 in., which gives a horsepower of 38 at 1700 r.p.m., it is claimed. The eight that is supplied is the Ferro, which has overhead valves and the upper part of the crankcase in unit with the two blocks of cylinders. Its dimensions are 3 by 3 1-2 in., which give a displacement of 198 cu. in., as compared with 190.4 cu. in. in the four.

In outward appearance the 1916 Briscoe is readily distinguishable from the previous model. This is principally due to the larger body and wheelbase increase to 114 in. from 107 in.; the fitting of two headlights instead of the former unique method of placing one headlight in the top of the radiator; the use of domed fenders and the suspension of the rear by cantilevers instead of semi-elliptic springs as used in 1915. Tires have been enlarged to 32 by 3 1-2 from 30 by 3 1-2, and the old design of double internal expanding brakes has given way to the more conventional internal and external form, these being considerably larger and more powerful.

Empire Adds Six

Never till recently has the Empire company built a six-cylinder car, but for 1916 they have a light chassis of this type in addition to their well-known four, which has been largely remodelled. The new four has a T-head motor in place of the L-head type used last year, and a greatly increased power is claimed, since the new engine has very large valves and all the other aids to high speed revolution. Otherwise the main features of the four-cylinder chassis are but little altered.

The six adopts the new, small Continental motor, which is also a high-speed type, and a very clean, rigid engine. This motor has a bore of 3 1-4 in. and stroke 4 1-2 in., which is a difference from the 3 by 5-in. six which was originally scheduled for this model. The chassis is remarkably clean in outline as the storage battery is the only attachment to the

frame excepting the four springs and the unit powerplant. To the four either touring or roadster bodies are fitted, but the six is at present listed with a five-passenger touring body only.

Fiat Has New Bodies

With their four- and six-cylinder chassis the Fiat company has made practically no changes, the only two alterations being to the universal and the steering ball joint, of which both have had slight improvement directed toward increasing their durability. The Fiat design is strongly similar to that of the Italian cars of the same name, and is thus largely different from conventional practice in America. The main object is to provide high efficiency and great durability, these features being obtained with a very graceful chassis.

Though largely sold with custom-built bodies there are some standard Fiat body equipments and these have been considerably changed. One new model in particular, known as the Riviera, is a molded design with a small central cowl, and has the hood shape continued rearwards till it merges imperceptibly into the more square tonneau.

An extensive use of very high tensile chromium steels is a characteristic of the Fiat chassis and many steel parts are hardened which are not so treated in conventional practice.

Herff Brooks Six With Single Cylinders

Making a four- and also a six-cylinder motor the Herff Brooks company are still protagonists of the singly cast system for their engines. The six-cylinder motor has seven crankshaft bearings and develops its maxium power at 1500 r.p.m. while the four has five main bearings and is rated to give maximum output at the same speed.

Splitdorf magneto ignition is employed and Apelco two-unit electrical apparatus for starting and lighting. Both chassis have unit powerplants with cone clutch and three speeds. For the rear axles a special design, manufactured by the company, is used, this having straight bevel gears and double internal brakes. Listed with either touring or roadster bodies the two cars sell for very moderate prices.

Jackson Has Wide Range

A four and no less than *two* eights is the Jackson line for 1916. Both eights use the Northway powerplant the larger being a motor which has been greatly favored during the year and the smaller a new type which is strongly similar in design. These engines are unique in that the cylinder blocks and the right and left halves of the crankcase are integrally cast, the division being vertical. The motors have detachable cylinder heads which are a great convenience for valve grinding or cleaning out carbon.

Another Jackson feature is the use of full elliptic springs both front and rear and these are very rigidly attached to the frames. Rather more clearance than usual is allowed so that the springs have an extra wide amplitude, making for easy riding on rough roads. Also the steering lock is extra wide for convenience in narrow roads and on mountains.

The Jackson company pay rather special attention to the bodies of their cars, which include some roomy roadsters having large rear boots which will contain a sufficiency of baggage for quite long distance touring. They also make a special trans-continental type which has a device whereby the back of the front seat lets down and, with the cushions, makes a comfortable bed.

Jeffery Has New Four

The Jeffery Chesterfield six has been so successful that it is hardly altered for 1916, but the four-cylinder car has been remodelled almost throughout, to meet the demand for a lower price and still more power. The new car has a slightly larger motor than the old model, and a striking change is the adoption of a unit powerplant in place of the amidships gearbox which has previously been a Jeffery feature. This gearset has three speeds instead of four, and the change over to unit powerplant is also accompanied by the adoption of a new clutch which is a dry disk pattern.

The rear axle too, is novel, being a semi-floating type with a cast differential case and large, conical steel sleeves, drive is on the Hotchkiss principle with long, three-quarter elliptic springs. Back of the gearset there is a powerful transmission brake, operated from the emergency lever, this being a contracting brake, as are the brakes on the rear wheels.

It is instantly noticeable on looking at the chassis that the frame sides are straight from end to end, but the body is laid out so as to have ample width. The body sides behind the cowl are quite straight on the seven-passenger car, and the front seats are divided. These seats have high backs which are curved like an arm chair but there are no high sides. A wide choice of bodies is given including five- and seven-passenger sedans, for which the chassis has plenty of power. Although so new in general aspect, the proved features of the motor have been little changed, barring a new camshaft which is a factor in the increased power output.

Lubrication is combined force feed and splash, a plunger pump feeding the main bearings and also supplying dip troughs. An addition to the lubrication scheme is the provision of a lead from the pump to the bearing of the idler gear in the timing case, in order to make sure of the durability of this journal.

In equipment a new one-man top is supplied and a Carter fuel feed tank to raise gasoline from the cylindrical gas tank at the end of the chassis. The windshield is a new model, and the cowl board bears a new oil gage. In front of the dashboard there is a terminal block containing the fuses, and the electrical equipment is now two unit Bijur.

Kissel "All Year" Car

The Kissel company have a strong feature in their "all year" body which is either open as a touring car, or closed as a limousine, the upper structure being readily disposed of, leaving a fully open car. When closed either coupé or sedan effects are produced. Other types are available, but the Kissel company very rightly pride themselves upon their all year design with which they have been doing exceedingly well.

The four-cylinder chassis was a new introduction quite recently, and the six is a development from the 1915 car. The motor is Kissel built and a high speed type having block cylinders with integral intake manifold. Special care is taken to eliminate vibration, first by using a strong crankshaft and a rigid crankcase, and secondly by balancing up the set of pistons and rods for each motor, so that there shall be no preventable tendency to vibrate. Very large valves are used, these being more than half the cylinder bore in diameter, and have nickel steel heads on carbon steel stems.

The rear axle, which is also specially designed has two points of interest. The most obvious is that the brakes are double, side by side, but are external to the drums and not the expanding type, while the other feature of note is the remarkable length of the bevel pinion shaft, giving great rigidity to this important detail of the chassis.

Returning to the all year bodies, the tops of these have frames of heavy white ash and elm, with sashes of mahogany. The frames are covered with sheet steel and aluminum and the roofs are three ply whitewood covered with canvas. It is claimed that the materials used for the roof and its construction are such that warping is impossible.

Inside, the fittings are luxurious. Leather trimmings are employed, there are dome lights, and the other attachments are of an artistic nature. Best plate glass is used for the windows and the paintwork is of a high order of merit. On the two chassis twelve different body styles are available; three on the four and nine on the six.

Lenox Has Fast Roadster

There are not many firms who make a [illegible] car, but this is done with the Lenox sp[illegible]

large four, 4¼ by 5½ in. and is claimed to be able to do 65 m.p.h. in stock form. Although a speedster it is a thoroughly equipped car, having a top with curtains and a windshield, etc. There is also a starting system and Westinghouse battery ignition. The car commands a fairly high price.

The other Lenox is a six which is a five-passenger car, also intended for fairly rapid travel. Both cars are geared moderately high, the four 3.25 and the six 3.75 to 1.

Lexington Has Two Sixes and Four

The Lexington company do not designate their cars by years, believing that the annual change idea is outgrown. The four was a fresh introduction last year when the motor was changed for a Teetor high speed T-head powerplant, and this same engine is still being used. The six was also new about a year ago and, like the four is being continued with but little change in specification.

Of the sixes, one is a continuation from last year, practically unchanged, while the other is a new chassis with a 3¼ by 4½ in. motor and 116-in. wheelbase, selling for a most moderate price.

The Lexington cars have a particularly interesting detail in the Moore multiple exhaust manifold, which is fitted to both models. This exhaust branch is so cast that the gases escaping from each cylinder are provided with individual passages and cannot interfere one with another, the idea being to relieve back pressure as much as possible. It is considered by many that this manifold even allows one cylinder's exhaust to exercise some extractor effect upon the next.

Three and six-passenger bodies are provided for the six, and a five-passenger body for the four-cylinder chassis.

Loziers Unchanged

Neither the six- nor the four-cylinder Lozier is a new car, the makers adhering to their policy of making very sound chassis selling for a good price. The four is offered with touring and roadster bodies and the six with touring body only.

Special pains are taken with the equipment and the four is supplied with an extra tire as well as the demountable rim. A feature of the four is the use of a four-speed gearset with direct on third, but this is deemed unnecessary for the six, which has but three speeds. The axles are also different, the four having a pressed steel case and the six a built-up pattern, both being full-floating. Magneto ignition is used for both cars with a Gray & Davis starting and lighting equipment. Both cars have multiple disk clutches running in oil and pressure lubrication, the four being full pressure without any splash and the six being provided with dip troughs as well as the pump feed to the bearings.

Mitchells Are New Eight and Six

The 1916 Mitchell chassis both for the eight and the six is very much the same as last year, but the two engines are quite new. The Mitchell chassis is assembled on the two-unit system, that is to say the motor has a three-point attachment to the frame but does not carry the gearset, this being a portion of the transmission unit. It is not a rear axle gearset however, as the gearbox is located at the front end of the torque tube which incloses the driveshaft, everything centering upon the single universal, which is situated between the clutch and the gearset.

Cantilever rear springs are now used for both cars and the wheelbase is the same, 125 in.

An interesting point about these cars is that both eight and six sell for the same price; the purchaser of a 1916 Mitchell can choose his car first and then make up his mind which type of motor he prefers to have. There is a wide choice of body styles and a full equipment, while larger tires are inclusive in the price of the limousine.

In design, the eight cylinder motor is distinctive and uses the intake pipe as the water outlet also, the manifold being of duplex form. Cylinders are L-head blocks bolted to an aluminum crankcase, and the connecting-rods of the forked pattern. Very large valves and quick lift cams give the motor a high speed ability. In general respects the engine is simple and an instance of this simplicity is found in the timing gears of which there are but three. The crankshaft pinion meshes directly with the camshaft gear, and above the latter is another pinion that drives the generator and the fan. These gears are fed with oil direct from the pump, which assists to keep them quiet, and special pains are taken in the factory to select the gears for quietness, many changes being made if the test run shows the original set to be the least below standard.

A big Mitchell feature is the remarkable accessibility of everything. Firstly all accessories are arranged with accessibility strongly in mind, and then care is taken that no part of the body interferes.. For instance, the floor boards are readily removable, so as to give access to the clutch and universal, which being so far forward is in an ideal position for greasing. Also, not content with this, removal of the seat cushions discloses a sort of lattice work which is a removable frame thus the whole chassis can be laid bare in a few moments. Yet again, another point of exceptional convenience, the tool box is a steel case, fixed between the frame side and the motor.

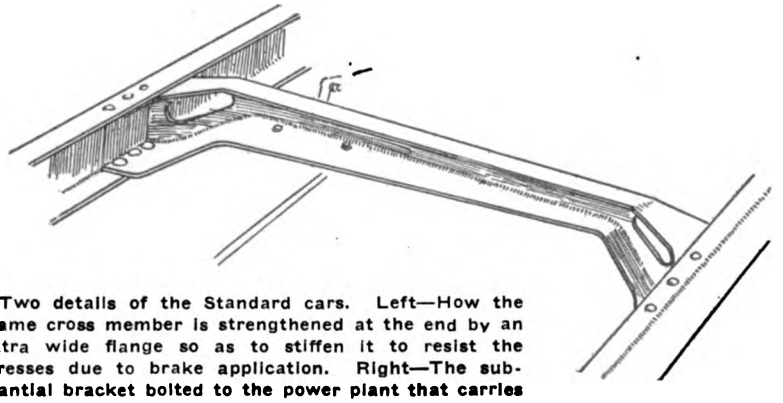
Monitor Has Low Priced Six

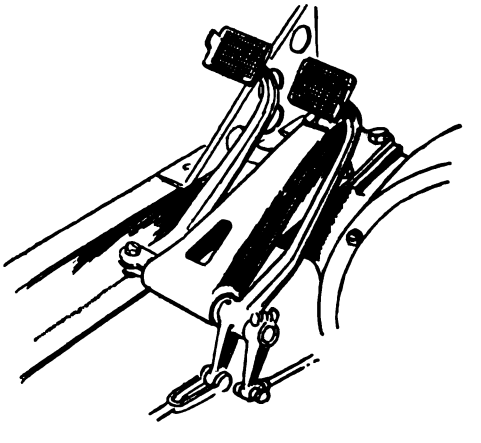
A distinctive design for both six- and four-cylinder chassis combined with low prices is the Monitor program. The engines have valves arranged F fashion, half in the head and half in the lower position and the camshafts are driven by silent chains. Both are unit powerplants with disk clutches running in oil.

To both cars five-passenger touring bodies are fitted, and on the four a roadster is supplied as an alternative at the same price.

National Twelve Is Unique

Making two sixes and a twelve, the latter is in the National case, intermediate in size, measuring by engine displacement.





Two details of the Standard cars. Left—How the frame cross member is strengthened at the end by an extra wide flange so as to stiffen it to resist the stresses due to brake application. Right—The substantial bracket bolted to the power plant that carries the clutch and brake pedals

The overall size of the twelve and the smaller six is the same, the big six having an extra 6 in. of wheelbase. New bodies of particularly handsome streamline form are being made for the big six, which is not a new chassis, and the bodies for the small six and for the twelve are modeled very much on the lines of the big six.

The twelve is the only V motor that so far has appeared with the valves arranged outside, the L-head cylinders being the reverse way round to the conventional, this making greatly for tappet accessibility and allowing the V to be used for mounting accessories. The special Splitdorf magneto is driven by silent chain and occupies the front end of the V, while the rear end is taken up by the starting motor. Only the generator and pump are outside the V these being set low down on the right side where they are accessible and yet do not interfere with the valves.

Of course, there are two camshafts these being gear driven, and the magneto and fan are driven by silent chain from one of the camshafts, this making only a short drive. Lubrication is very well worked out almost every part having a supply direct from the pump. Pistons are aluminum alloy and the speed capacity of the motor is very high indeed, 3000 r.p.m. being reached before touching the peak of the power curve. The carbureter is set in the V, using an intake manifold of the type usually associated with V motors, and internal passages then lead the gas across the cylinders to the valves.

The small six and twelve have unit powerplants, but the big six has the gearbox located amidships, and all have cone clutches. Large and extra powerful brakes are a feature of all three cars. Mention has already been made of the handsome lines of the bodies, but in addition to this, it may be remembered that the National company were among the first to adopt divided front seats. Working with this style of touring body they have produced a very convenient and comfortable design. On all the three cars cantilever springs are employed and the riding quality is noticeably above the average.

Oakland Stars Light Six

Oakland is represented this year by three models, a four, a six and an eight. The four is practically an improved continuation of the previous four, the eight and the six being entirely new. The six is a machine of the lighter type built to sell at a low price.

Whereas the four and the eight preserve the V-shaped German silver radiator and are built with very much the same shape of bodies that the cars of a year ago had, the six is an extremely light chassis with flat radiator. It is the first Oakland to use an overhead valve engine. The eight-cylinder motor is of the type in which each block of cylinders is cast integrally with half the crankcase, the latter being split vertically with the left half carrying the crankshaft. It is a standard Northway design, the six and the four also being built by that well-known motor maker.

The six-cylinder engine has dimensions of 2 13-16 by 4¾ in., and the valves are assembled on the head, which is detachable. The upper part of the crankcase is in one with the cylinders, this making a compact and substantial arrangement. To illustrate an assembly feature that is also conducive to simplicity of design, the combination of the water pump impeller, fan and fan bearings is conspicuous. The fan and water pump are really one unit, and the pump case is part in the casting of the cylinder block and part in the mounting of the fan. Thus the belt that drives the fan also works the pump, doing away with a special pump shaft and its driving mechanism.

This combination of units illustrates the pains that has been taken in all three chassis to reduce them to the utmost point of simplicity. The Hotchkiss type of drive is used on all, having been featured in Oakland design for several years now. The rear springs are made strong enough to take the drive and the torque, and the utter plainness of the chassis indicates that the engineers have accomplished what they set out to do. In the six, for instance, a plate is done away with as a mounting of the upper end of the three-quarter elliptic rear springs by slipping them into the ends of the frame channels and bolting them in place.

Oldsmobile Has Light Eight

Chassis standardization has been followed wherever possible in the 1916 Oldsmobiles, with the result that the four and the eight are very similar in construction throughout, the eight however, being stronger wherever necessary to be consistent with the greater power of the multi-cylinder engine. The former six-cylinder model has been dropped entirely.

In the four, the characteristic overhead valve engine is still used, this being of the type in which the push rods are entirely inclosed—an unusual feature where they run up the side of the cylinders. The eight is an L-head 2⅞ by 4¾, and like the four, the cylinder heads are detachable, with the crankcase split vertically into two sections, with one part integral with each block of cylinders.

The present Oldsmobile chassis is 8 in. longer than that used on the four of 1915, it now being 120 in. in length. The inclosure of the drive shaft has also been abandoned and, in keeping with the latest developments in chassis engineering, the Hotchkiss type of drive has been adopted. Naturally this makes a much lighter chassis when compared with former Oldsmobile practice, and to further lighten it, one cross member has been dispensed with without impairing the strength in any way. Due to the use of a pressed steel housing, the present axle is 48 lb. lighter than that used last year, the old form of case being malleable iron.

Thus, although the cars are more powerful than the previous types, they are much lighter, and consequently have a liveliness that is appreciated. The accelerative ability of the eight is excellent. To promote ease of riding, the rear springs have been made long and flat, they being almost horizontal when the car is in normal position. When deflected they bow to the other side of the horizontal making for more even action on the leaves.

Overland Adds Small Four

The introduction of a smaller four late in the fall has increased the Overland models to three, the others being the large four and the six.

All Overlands have the same characteristic appearance, and wherever possible they conform to one standard, although the difference in size of the cars makes necessary differences in the size and construction of parts. Up to this year, Overland motors had cylinders cast separately, but at the present time all three cars have block-cast engines. The six always did have this construction. This block casting of the cylinders of the large four car has not altered in any way the general design of the engine, simply changing the manifolding somewhat and introducing the added feature of a detachable head. In all the models the gearset is still one with the rear axle, although in the new four the design is entirely new to Overland practice. All three are equipped with magneto ignition, and have Auto-Lite starting and lighting.

It is in the new four, however, that most of the departures from former Overland practice are to be found. The design has been worked out to give a big value for the money and the underlying principles are to get as good an assembly layout as possible without sacrificing efficiency. One feature that will illustrate this is the casting of the cylinders and crankcase in one piece, and the abolition of external manifolds by coring passages within the casting leading to the valves. The cylinder head is detachable, and a more or less complicated part is done away with by the substitution of

rockers between the valve stems and cams in place of the conventional tappets. This makes a simple valve adjustment, at the same time eliminating any side thrust, and it also makes a quick assembly construction. An unusual feature is the drive of the camshaft and magneto by roller chain.

Compactness is also evident in the gearset, and to aid production and at the same time promote rigidity and consequently eliminate gear noise, the three countershaft gears are forged in one piece, it having a hollow center so as to operate on two roller bearings.

In the axle design, both front and rear, there are features heretofore unknown to Overland cars. The front axle is of the inverted Lemoine type, the wheel spindles being supported above the vertical spindle by a single arm, instead of the more conventional yoke mounting of the spindle. The rear axle is provided with a pressed steel housing, with external strengthening ribs. Springs are cantilevers in the rear of the new four, also a feature that is new to cars of this make.

Partin Palmer Makes Three Cars

Two fours and an eight make the Partin Palmer line for 1916, all three cars being very inexpensive. The eight is supplied with a neat six-passenger body, the larger four with a five passenger and the small four with a roadster.

The small four is not new, but both the others are recent additions. They have unit powerplant construction and thermo-syphon cooling, while the rear axles are fitted with double internal brakes. The eight is one of the highest geared cars now on the market having a top ratio of 3.5 to 1 with 33 by 4 in. tires.

Pathfinder Overhead Valve Twelve

Two distinct chassis, one with an overhead valve twelve and the other with a large six-cylinder motor, forms the Pathfinder output for next year. Both are entirely new cars of substantial construction and the six which is a very neat design ought not to be overlooked on account of the originality of the twelve.

The twelve has a Weidely motor with valves in the head, the single camshaft being in the usual position in the V, operating the valves by push rods and rockers. The cylinder heads are detachable, and the valves seat direct therein. The motor has a remarkably neat aspect, with the valves totally inclosed by cover plates and other covers over the push rods. Its accessibility is almost perfect, all the rocker mechanism being so put together that it is detachable by detail and with very facile adjustment for the valves.

For the six a large Continental powerplant is used, and the chassis differ in other respects also, the twelve having three-quarter rear springs and the six being fitted with cantilevers. Touring bodies and roadsters are made, including a clover leaf three passenger body which makes an ideal roadster equipment for the twelve.

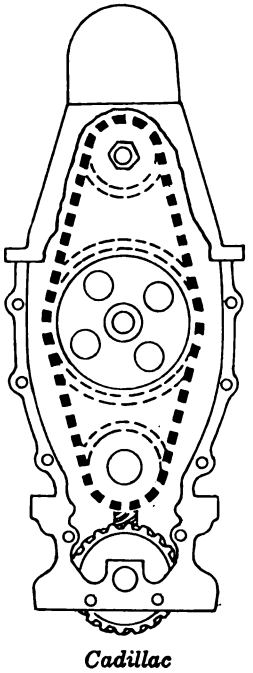
Pilot Has Three Sixes and an Eight

At the last shows the Pilot chassis was noticed particularly for its general robust proportions and for the flat cantilever springs employed, these being almost exactly the same as those used on the British Rolls-Royce. The motors were T-head with large valves, and the car eminently suited for hard work in rough country as well as smooth. For 1916 the two 1915 models will be carried on unaltered, but additionally there will be a lighter six of different layout.

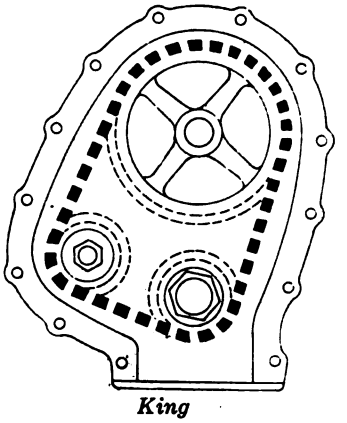
The new car has a 3 by 5-in. L-head motor and is a unit power plant design, the dry disk clutch and the gearset being in unit with the motor. It has not got the cantilever springs of the larger chassis but has semi-elliptic springs.

The Pilot eight uses the 3-in. by 5½-in. Buda motor and in other general respects resembles the larger sixes, having the cantilever rear springs. It is a 126-in. wheelbase chassis accommodating a seven-passenger body.

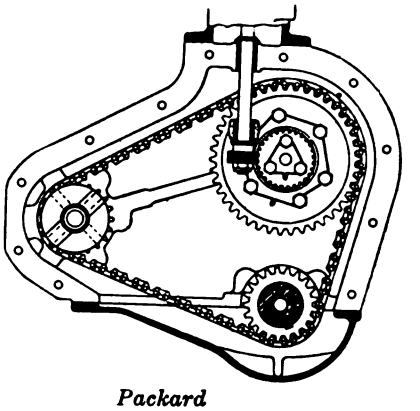
In body design the new Pilots are exponents of the double



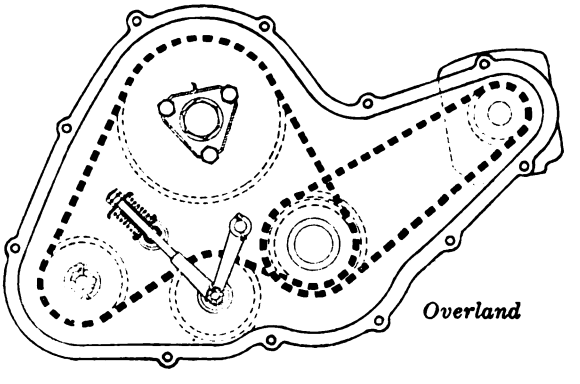
Cadillac



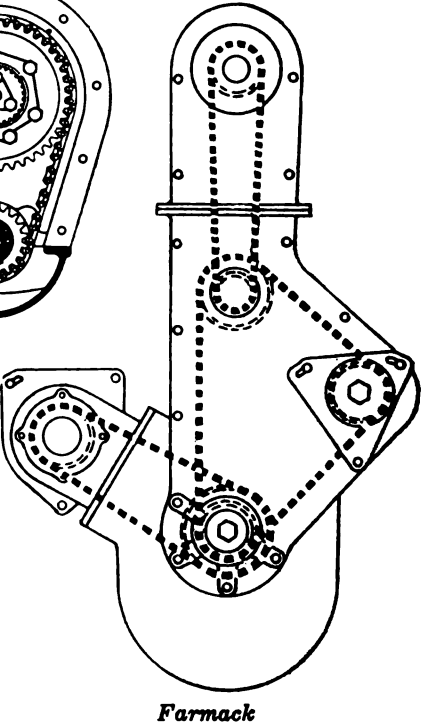
King



Packard



Overland



Farmack

Chain driving for camshafts has become much more largely used in the automobiles of 1916; the increase being 100 per cent over a year ago. Above are shown five typical layouts embodying most principles of design. The Cadillac is the simplest and is not adjustable, the Packard has an adjusting pinion on the generator shaft, this consisting of a slotted "Oldham" coupling so that turning an eccentric bushing adjusts the sprocket without affecting the generator center. The King has an idler gear on an eccentric bush, and from this idler a second chain goes to the generator shaft, which is not shown. Farmack has an elaborate layout for reaching the overhead camshaft, adjustment being provided on the triangular chain. In the Overland roller chain is used and is kept in tension by a spring loaded idler.

cowl idea, the five-passenger body having the center cowl type of streamline effect. This is obtained by bringing back the lines of the slightly oval radiator to the dash cowl, then extending the same lines, slightly broadened, to the center cowl, and so to the still more greatly widened back.

On the light six both four- and five-passenger touring bodies are obtainable, and the larger chassis have equipment for six or seven passengers if desired.

Pullman Makes Six and Four

The Pullman six is not much changed, but the four is a new model with high speed motor, disk clutch running in oil and cantilever rear springs. It is to be supplied with touring five-passenger body, with a coupé three-seated equipment or with either of two roadsters, these being for three and for two passengers.

A distinctive feature is the fitting of non-skid tires on all four wheels, the size being 31 by 4 in. Thermo-syphon cooling is employed and combined splash-pressure lubrication.

Regal Makes Eight and Two Fours

The big four Regal is a slightly altered continuation of the 1915 car, but the small four, an extremely neat little chassis, is new as is the eight. The eight motor has a unique camshaft arrangement as there is but one cam for each opposite valve pair, yet no rockers are employed.

This is done by raising the camshaft till the angle between the valves is 135 deg., and besides being simple this makes very greatly for tappet accessibility, while it is also of benefit in reducing the combustion head volume. The detachable cylinder heads are also a great advantage when removing carbon deposit or grinding the valves.

The large four and the eight both have rear axle transmissions, but the little four is a unit powerplant construction. All three cars have cantilever rear springs, and each has a Dyneto single unit lighting and starting equipment, this being accessibly disposed on the crankcase side. An alternative of five-passenger touring or of roadster bodies at the same price is given on each chassis.

Reo Improves Bodies

The four- and the six-cylinder Reo chassis have not been altered much for 1916, but have various detail refinements, notably a change in the starter drive which is simplified considerably.

In body work, however, much has been done, and the Reo six especially can be written down as one of the handsomest cars in its class. It is a molded streamline, combining the center cowl effect with the convenience of divided front seats. The top, when folded, lies perfectly horizontal and so continues the lines of the body, and the folding seats are large, with strong and rigid supports when in use.

The starting motor on Reo cars is located in a unique position, since it is operated on the front end of the main shaft of the gearbox, which is amidships. Last year the motor stood crosswise and a rather elaborate worm gear arrangement was used for the drive. This has been simplified by turning the motor round, and substituting a chain for the worm gear. It is lighter and equally effective.

For the engines the Reo company adhere to the F-head construction which they have used so long. The intake valves are in cages screwed into the head of the cylinder, and operated by push rods and rockers, while the exhaust valves lie beneath as in an L-head motor. This motor is specially interesting because of the successful way in which the overhead valve mechanism has been made quiet without inclosing the rockers. Firstly the tappets have mushroomed heads, and the washers at the foot of the valves and push rods are also provided with a large foot piece. Between the tappet and valve there is then interposed a cushion of soft material large enough in diameter to be very durable. Another point is the use of oil-absorbing felt to retain lubricant for the supply of the rocker fulcrums.

For oil supply to the principal parts of the engine there is a plunger pump which has the unique feature of being adjustable for output without a great deal of trouble.

On the six a peculiar cantilever rear spring is used, this layout having the front ends of the springs close against the frame while the rear ends on the axle are wider apart. This spreading of the springs is said to eradicate roll while leaving sufficient softness to give exceptionally good riding.

Saxon Considerably Improved

The new series Saxons cost just as much as they did before but they have a number of improvements and refinements which really make the cars strikingly good value. The little roadster is now fitted with a three-speed gearset instead of two speeds, and there is a change in the front of the cowl to bring the body up flush with the windshield and dispense with the former cloth filler skirt.

Body sides of the six, which enters its second year with very little mechanical change, are somewhat higher, this being principally due to the addition of a strip of molding around the top edge. A roadster type has also been fitted to the six chassis, and it is a graceful model, with well shaped rear deck.

In the six the chief mechanical change is the replacement of the single-unit starting and lighting system by a two-unit type, it still being made by the Detroit Starter Co. Saxon axle equipment, now made by Timken, is practically the same in design as it used to be, but a notable feature is the provision of the modern spiral-bevel axle gears as a noise-eliminating factor. The six-cylinder motor is a block type with detachable head and is quite conventional throughout; the four-cylinder engine is somewhat similar in design to the six.

On the six a nice feature is the adjustment for the chain drive of the generator, which is hung off the left rear supporting arm of the engine. A plate on the top of the generator fits into a trunnion pin attached to the supporting arm, and the generator can be rocked closer to, or away from, the engine to give the required adjustment of the sprocket centers.

In the familiar roadster, a starter and lighting unit is supplied for $50 extra, but the standard lighting has been changed by removing the acetylene lights from the sides and placing them in front, and then adding oil sidelamps. Another four refinement is the fitting of adjustable clutch and brake pedals, and added braking power has been provided by increasing the drum width from 1½ to 2 in., the diameter being 8 in.

A Saxon characteristic is the suspension of both four and six chassis on cantilevers, front and rear. The frames are also tapered to give good body support throughout the length.

Scripps-Booth Adds an Eight

About a year ago the Scripps-Booth company struck out on a new course in automobile designing and produced what it chose to term a luxurious light car. The success the concern has had during the past year has demonstrated that there is a field for such a type of car, and now it is bringing out a revised edition of this original four-cylinder model with an eight-cylinder powerplant as well as a four of similar appearance and general construction.

The new eight, with 2⅝-in. bore and 3¾-in. stroke, is said to develop over 35 hp. at 3000 r.p.m. and, while this power will perhaps not be an absolute necessity in a vehicle of this size, it is pointed out that it is designed primarily for the man who wants something out of the ordinary. The Scripps-Booth concern states that this new eight is being produced of a completeness and extreme equipment which takes it out of the price class of the four-cylinder model.

To the ordinary eye, no changes will be noted between this eight and the four, the only differences being in the strength-

ening of parts to withstand the extra power of the engine. But the four-cylinder engine is also a larger size and different in design from that heretofore used. Instead of 2⅞ by 4 cylinders, they are now 3 by 4¼, increasing the horsepower output to 21 at 1800 r.p.m., it is stated.

The general body lines that have been the subject of much favorable comment during the past year are to be continued in both the four and eight, the wheelbase of both cars remaining 110 in. Only the standard tread of 56 in. is to be supplied. Other specifications that are common to either model are the cantilever rear springs, dry-plate clutch, superseding the cone type, Bijur starting and lighting, Zenith carbureter, and three-speed gearset. The eight is to have a different design of axle from the four, and to promote silence spiral-bevel gears are fitted to it.

While both motors are cooled by thermo-syphon and battery ignition is employed, there is one radical difference, and that is in the oiling. The four uses a circulating splash system, but the eight naturally is provided with pressure feed. The crankshaft is drilled and the lubricant gets to the bearings under pressure. Aluminum is generously used in the construction of both motors.

Simplex Has New Six

The four-cylinder Simplex and the largest six are listed for next year without change, but there has been added a smaller six, though this is only small by comparison with very large cars indeed having a wheelbase of 143½ in., and a motor with 459 cu. in. displacement. All Simplex chassis are built of the highest class of materials to a conservative, but very thorough design, and are constructed with a complete disregard for cost. They are supplied for custom built bodies only and are almost custom built chassis, having a small output exclusively for a special class of customer.

In this respect the Simplex is in an almost unique position and holds a corresponding reputation for the special branch of automobile engineering which it represents.

The chassis is remarkable for its workmanship and for the quality of steel used and weight is a secondary consideration to strength, although the fine materials allow light parts to be made for many portions. The new six is a higher speed motor than the older cars, being scheduled to produce its maximum power at 2000 r.p.m.

Standard Eight and Six

Of these two cars the six is the more expensive and is a little longer in wheelbase, though much the same body equipment is fitted. The six and eight being listed with seven-passenger touring and three-passenger roadster bodies. On the six a limousine is included, but not upon the eight.

Both chassis have unit powerplants, but the six has three-quarter rear springs and a torsion tube, while the eight has semi-elliptics and Hotchkiss drive, both using dry disk clutches. Being moderately high priced cars the equipment is a special feature, and the makers are experienced in the art of body building, so the bodies are distinctly good in quality.

The main idea in laying out the chassis has been to adopt proved features and to concentrate upon the detail, thus there is nothing in the control or such small matters that has not been well worked out. The convenience of the user and of the driver has been studied so that the car can be kept in the best condition with a minimum of trouble.

Stearns Are Six, Eight or Four

Of these three cars it is only the eight that is wholly new. The light four made its appearance just a year ago, and has not been altered except by a rearrangement of the electric units, which makes for convenience. Likewise the six is to all intents the same car as last year's model. Both, of course, have Knight motors.

The eight is the first Knight-engined chassis to have a V motor, and the detail has been worked out with the greatest ingenuity. For example, there are two shafts for driving the eccentrics which operate the sleeves, as to accommodate sixteen throws on one shaft would be almost impossible. These two shafts are close together in the foot of the V just like the camshaft of a poppet valve motor, and there is a single silent chain front end. This chain drives only one of the eccentric shafts, and the second is connected to the first by a pair of spur gears. These gears are inclosed in a special chamber which is part of the crankcase and are used for the oil pump.

Battery ignition is used, this being supplied by a Remy distributer, and the cooling is by thermo-syphon circulation; the Knight motor is always easy to cool, and a V Knight especially so. The lubrication is all forced without any splash.

The gearset is in unit with the motor, inclosing a dry disk clutch and the service brake is a powerful contracting pattern located on the gearbox. An open type driveshaft is fitted and there is a torque arm, though drive passes through the cantilever rear springs. The motor has ability to revolve at a very high speed and is geared low, this giving a great high gear ability.

Standard body equipment consists of a seven-passenger touring type, of graceful outline; a modified molded form.

Studebaker Refines Design

In preparing the 1916 models for the market, the Studebaker engineers went over the chassis with two main ideas in view, one to effect standardization of the four- and six-cylinder models wherever possible so as to reduce manufacturing cost, and the other to eliminate any factors which might be conducive to noise. The bodies are practically alike on the four and the six, and most of the difference in wheelbase is taken up by the greater length of the six-cylinder engine. The wheelbases are 112 and 122 in., respectively. In fact, aside from this necessary wheelbase difference, the two chassis are practically alike except for the rear axle gear ratio and larger rear springs on the six.

One of the main changes in the cars as compared with the previous Studebakers is the redesigning of the engine for greater accessibility and quietness along with more power. Practically the same in general design, the four and the six engines both have their bore increased from 3½ to 3⅞ in., with the stroke remaining at 5 in. The cross shaft at the front which was a feature of the 1915 engine for driving pump and ignition distributer, has been entirely done away with, and the pump is now driven from the camshaft gear on the left, and the distributer is vertical and operated through bevel gear connection with the front of the camshaft. The other unit affected by the change is the generator, which now sets on end with its armature shaft vertical, and has spiral gear drive from the front gears. The starting motor is now located on the right front side of the engine, driving the crankshaft through roller chain connection.

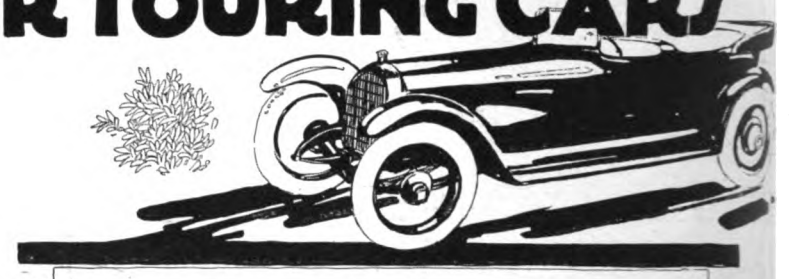
The former bronze clutch collar has been replaced by a ball-bearing throwout, this being quieter and more durable. Whipping of the driveshaft is guarded against by enlarging the diameter from 1⅛ to 1 5-16 in., and while no changes have been made in the rear axle gearset, the axle housing is increased in size. The entire spring suspension has been gone over, and on all cars three-quarter elliptic rear springs are now used. Lower hanging of the machine is also accomplished by lowering the rear springs and dropping the front axle at the spring seats.

The bodies are very comfortable and have leather upholstery, the general finish and lines being better than in the previous year. The bonnet slopes to the cowl without a ridge between, and in the control the placing of the instruments is more convenient. A notable point here is the location of the starter pedal at the gearshift gate within easy reach.

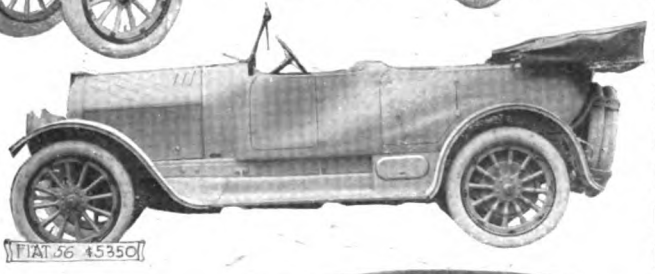
1916 CARS IN REVIEW

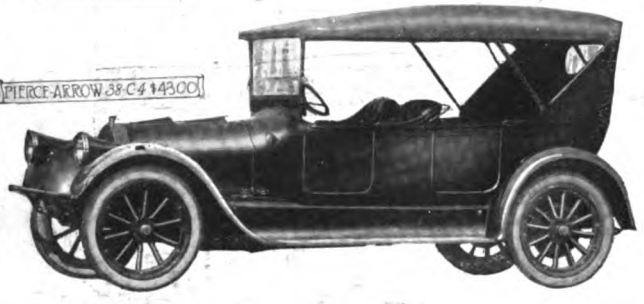
IN *the pages following are illustrated the cars of* 1916, *including every typical sort of bodywork and some peculiar specimens. It will be observed that the trends so obvious a year ago have persisted, and that the smooth exterior with curves that flow unbroken from front to rear is almost universal. This is the case with closed bodies as well as open types, with roadsters as with touring cars. The* 1916 *car review displays the handsomest collection of vehicles ever gathered together.*

FIVE PASSENGER TOURING CARS



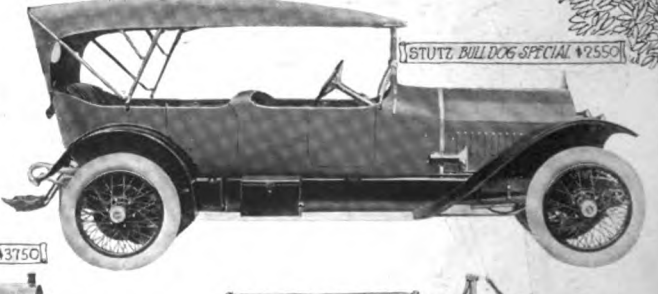
$5,000



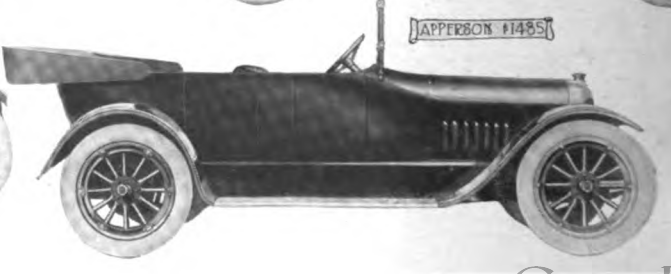


$4000

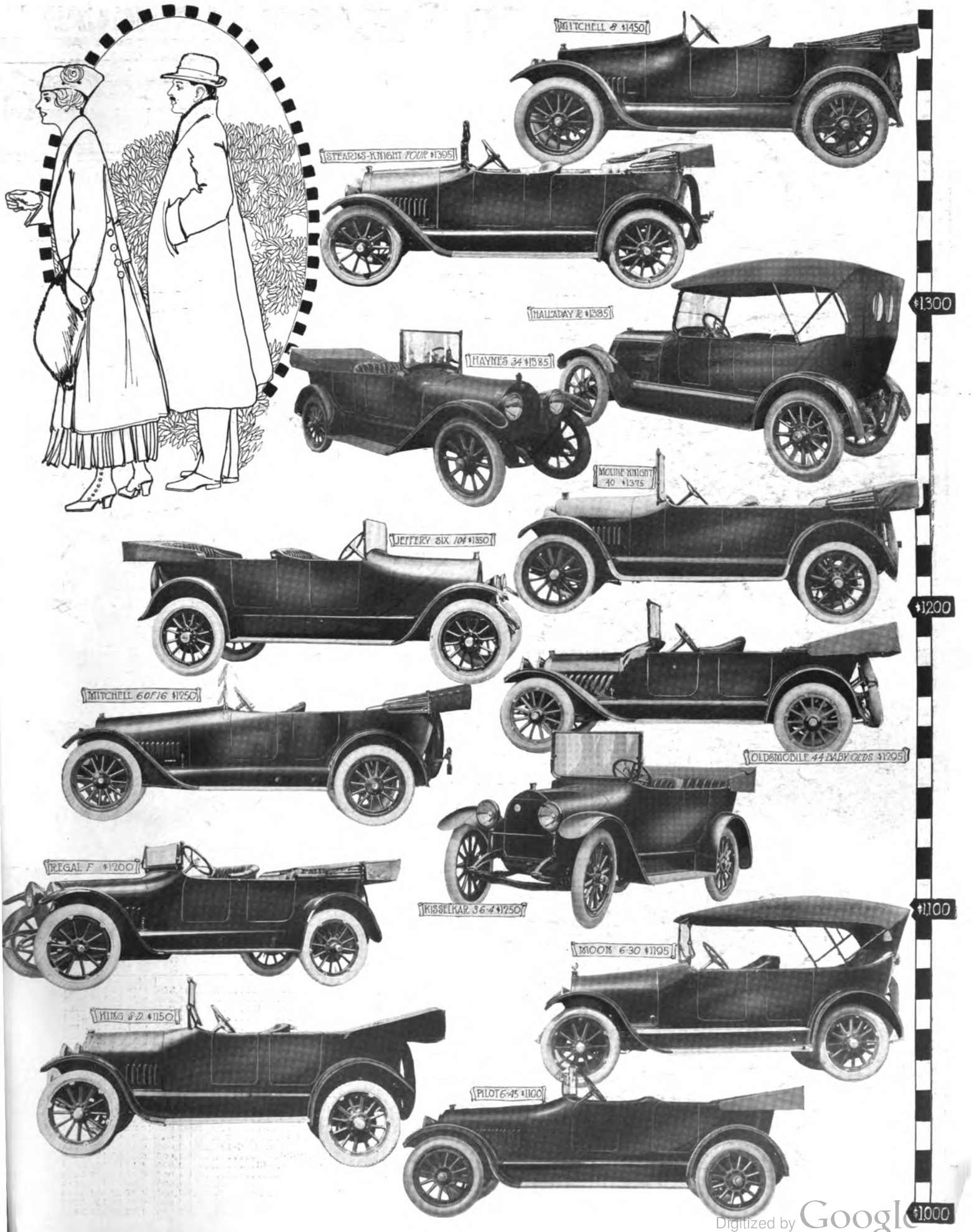
$3000



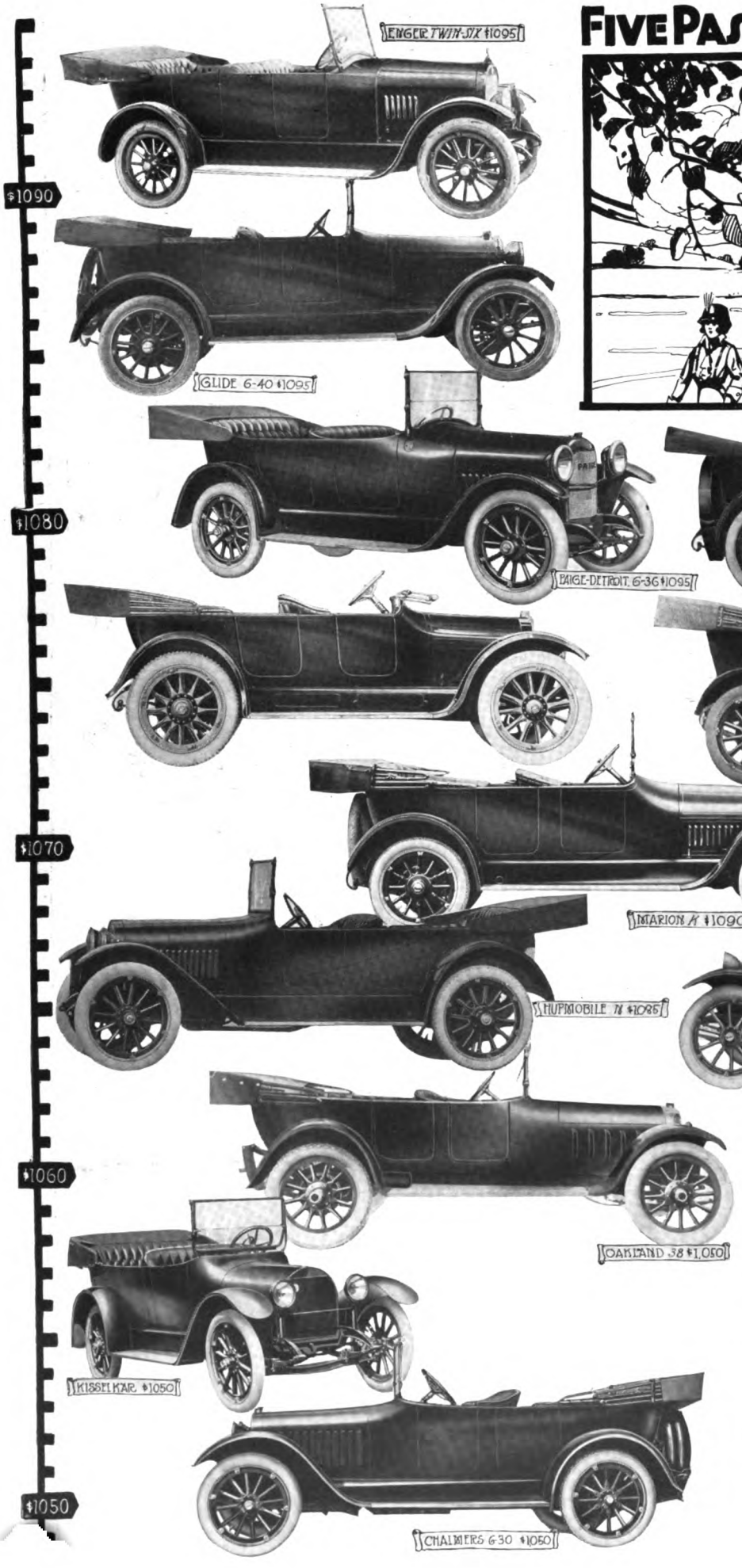
$2000



NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 6	$5,000	6	60.00	147½	37x5*
Chadwick	5,500				
Fiat, 56	5,550	6	46.60	135	36x4½*
Pierce-Arrow, 48	4,900	6	48.60	142	37x5
Fiat, 55	4,850	4	42.03	128	36x4½*
Pierce-Arrow, 38-C-4	4,300	6	38.40	134	36x4½
Cunningham, S	3,750				
Morse, D	3,600	4	34.23	127	35x5
Packard, Twin-Six 1-35	3,150	12	43.20	135	36x4½*
Franklin	2,850	6	31.54	120	34x4½
Marmon, 34	2,700	6	33.75	136	34x4½
Packard, Twin-Six 1-25	2,750	12	43.20	125	36x4½*
White, G A H	2,700	4	22.50	115	32x4
McFarlan, T	2,680	6	38.40	132	36x4½
Stutz, Bulldog Special	2,550	4	36.10	130	34x4½
Moline-Knight	2,500	4	25.60	128	36x4½
National, Newport	2,375	6	33.75	134	36x4½
Daniels, A	2,350	8	33.80	127	34x4½
Chalmers	2,175	6	38.40	132	36x4½
Standard, 6	2,100	6	38.40	126	36x4½
Cadillac, 53	2,080	8	21.25	122	36x4½
Kissel	2,000	6	31.54	126	34x4
Lenox, O	1,985	6	29.40	128	34x4½
Franklin	1,950	6	31.54	120	34x4½
Biddle	1,800	4	22.50	120	32x4
Pathfinder	1,695	6	29.40	122	35x4½
Kissel, 6-42	1,650	6	31.54	126	34x4
Apperson, 6-16	1,485	6	29.40	122	34x4
Mitchell, 8	1,450	8	28.80	125	34x4
Kissel, 6-42	1,485	6	31.54	126	34x4
Velie, 15	1,400	6	29.40	124	34x4
Stearns	1,395	4	22.50	119	34x4
Westcott, 41	1,395	6	25.35	120	34x4
Halladay	1,385	6	21.60	122	34x4
Haynes, 34	1,385	6	29.40	121	34x4
Lexington, 4-Ka	1,375	4	24.03	115	34x4
Moline-Knight, MK-40	1,375	4	22.50	118	34x4
Jeffery, Chesterfield	1,350	6	21.60	122	34x4



FIVE PASSENGER TOURING CARS



NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
King, E	$1,350	8	28.80	120	34x4
Ross, A	1,350	8	28.80	115	34x4
Oldsmobile, 44	1,295	8	26.45	120	33x4
Davis	1,250	6	16.90	120	34x4
Kissel, 6-42	1,250	6	31.54	126	34x4
Mitchell, 6 of 16	1,250	6	29.40	125	34x4
Mitchell, 8	1,250	8	28.80	125	34x4
Spaulding, H	1,250	4	32.40	120	36x4
Dispatch	1,210	4	22.50	120	36x3½
Regal, F	1,200	8	28.80	115	33x4
Jackson, 3-48	1,195	8	26.45	112	32x4
Moon, 6-30	1,195	6	25.35	118	33x4
King, D	1,150	8	26.45	113	33x4
Pilot, 6-45	1,100	6	21.60	119	32x4
Empire, 60	1,095	6	25.35	120	34x4
Enger, Twin-Six	1,095	12	33.06	115	32x4
Glide, 6-40	1,095	6	21.60	119	34x4
Herff-Brooks, H-6-40	1,095	6	38.40	120	34x4
Kline, 6-36	1,095	6	25.35	120	34x4
Oldsmobile, 43	1,095	4	19.60	120	33x4
Paige	1,095	6	21.60	112	32x4
Wayne	1,095	6	38.40	120	34x4
Willys Knight, 84	1,095	4	27.23	114	34x4
Marion, K	1,090	6	21.60	120	32x4
Hupmobile, N	1,085	4	22.50	119	34x4

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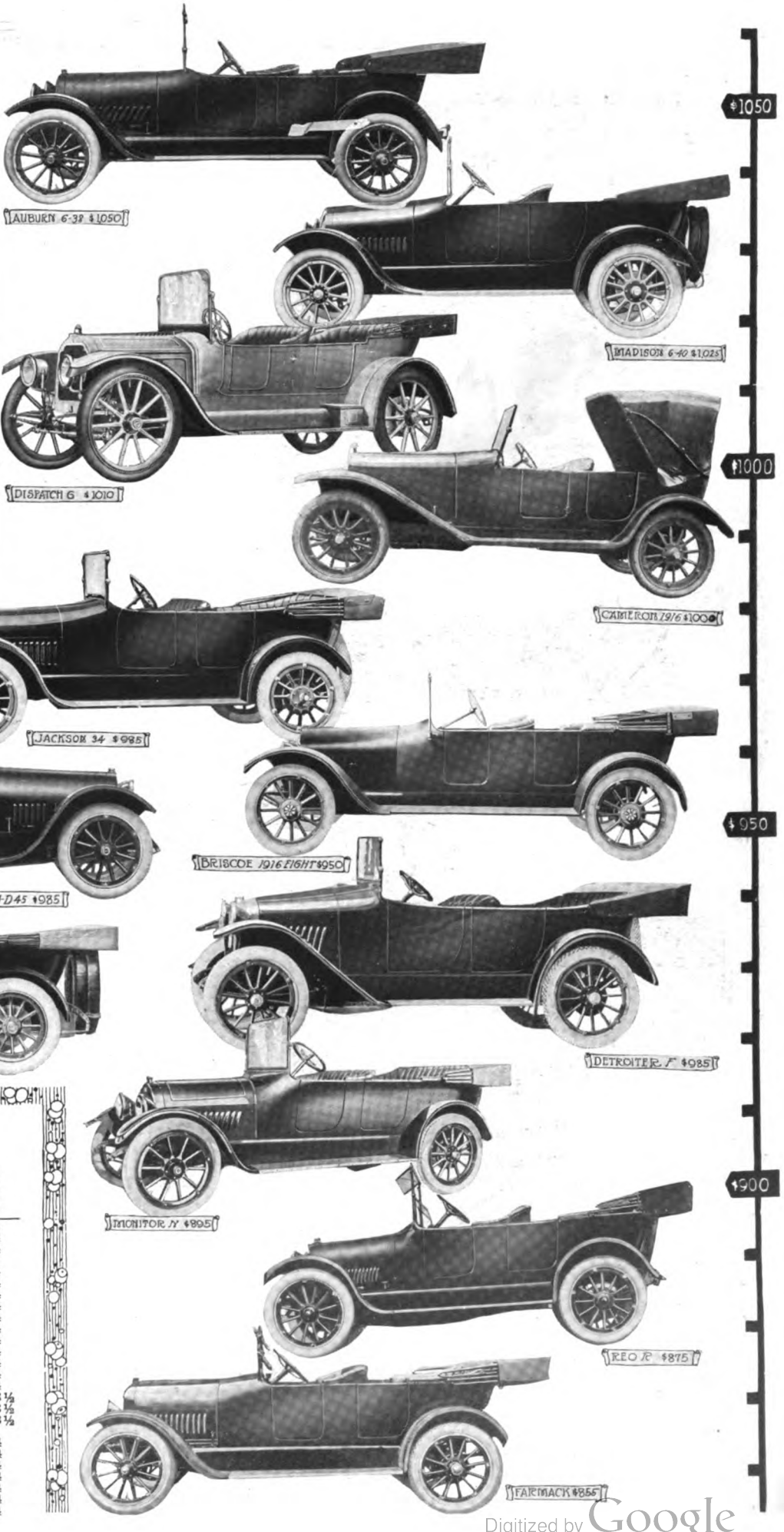
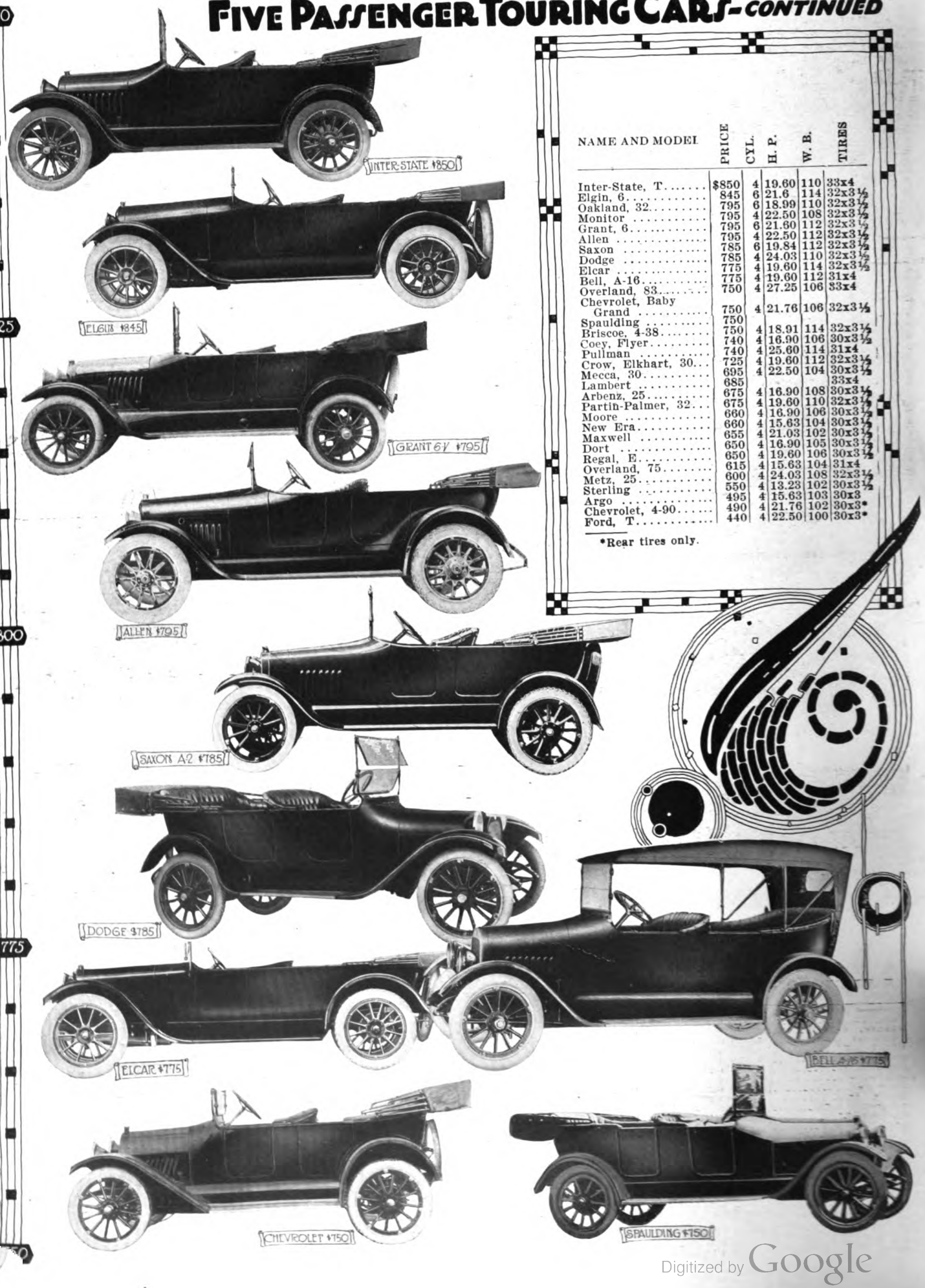


NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Madison, 6-40-T	$1,085	6	21.60	120	34x4
Velie, 22	1,065	6	23.35	115	32x4
Auburn, 6-38	1,050	6	21.60	120	34x4
Chalmers, 6-30	1,050	6	25.35	115	....
Kissel, 4-32	1,050	4	24.03	115	33x4
Oakland, 38	1,050	4	19.60	112	33x4
Dispatch, G	1,000	6	21.60	122	32x4
Jeffery, 4	1,000	4	22.50	116	34x4
Cameron	1,000	6	21.60	122	32x4
Regal, D	985	4	22.50	115	33x4
Paterson, 6-42	985	6	25.35	117	32x4
Jackson, 34	985	4	19.60	112	32x4
Detroiter, F	985	4	22.50	112	33x4
Buick, D-44-45	985	6	25.35	115	32x4
Auburn, 4-38	985	4	24.03	114	34x4
Hollier, 8	985	8	28.80	112	32x3½
Dodge	950	4	24.03	110	32x3½
Briscoe, 8	950	8	28.80	114	32x3½
Sun		6	21.60	116	
Empire, 45	935	4	24.03	116	33x4
Monitor, N	895	6	23.44	115	33x4
Herff-Brooks, 4-35	885	4	25.60	110	33x4
Richmond	885	4	25.60	110	33x4
Wayne	885	4	25.60	110	33x4
Reo, R	875	4	27.23	115	34x4
Farmack	855	4	19.60	112	33x4

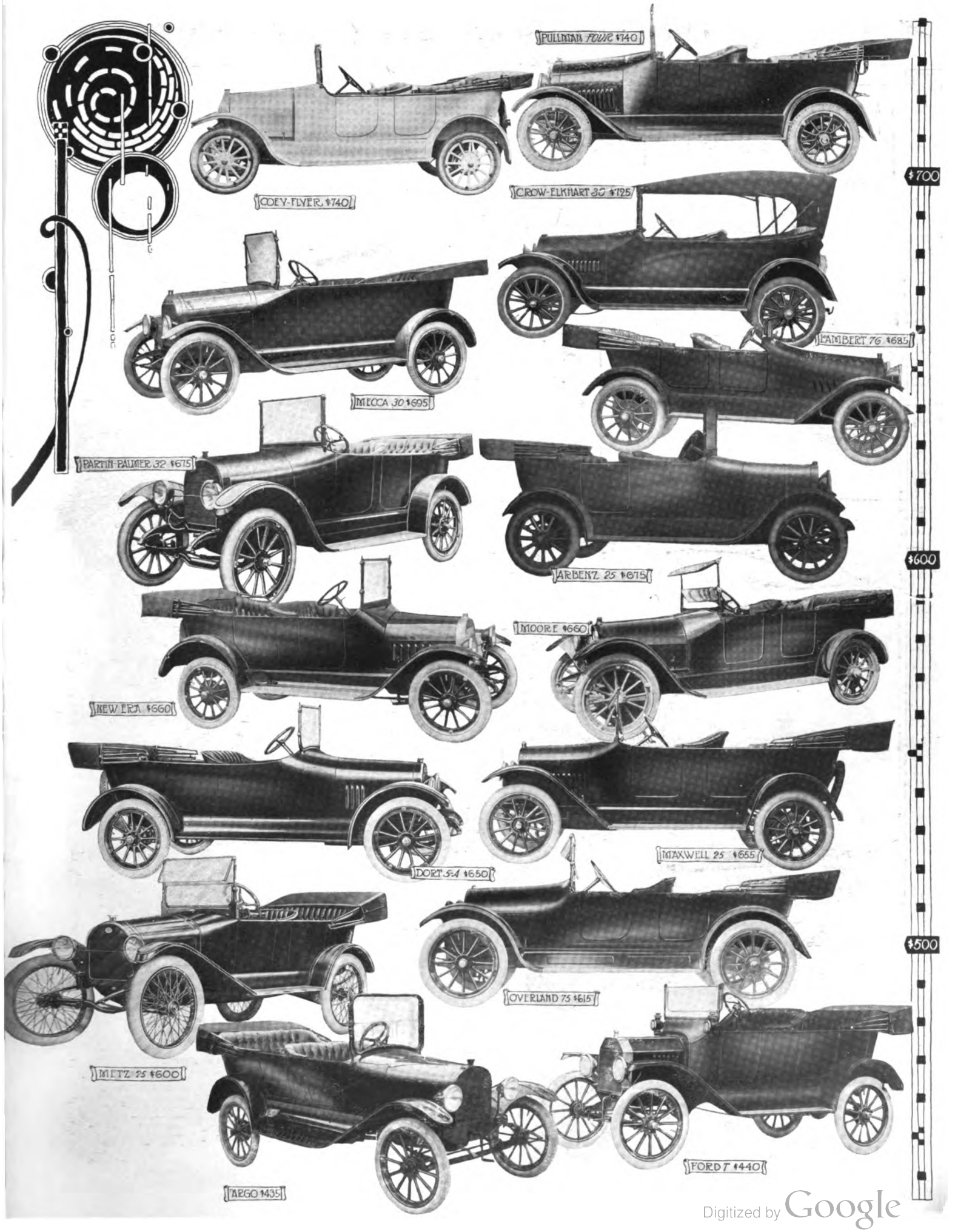
FIVE PASSENGER TOURING CARS—CONTINUED

$850
$825
$800
$775

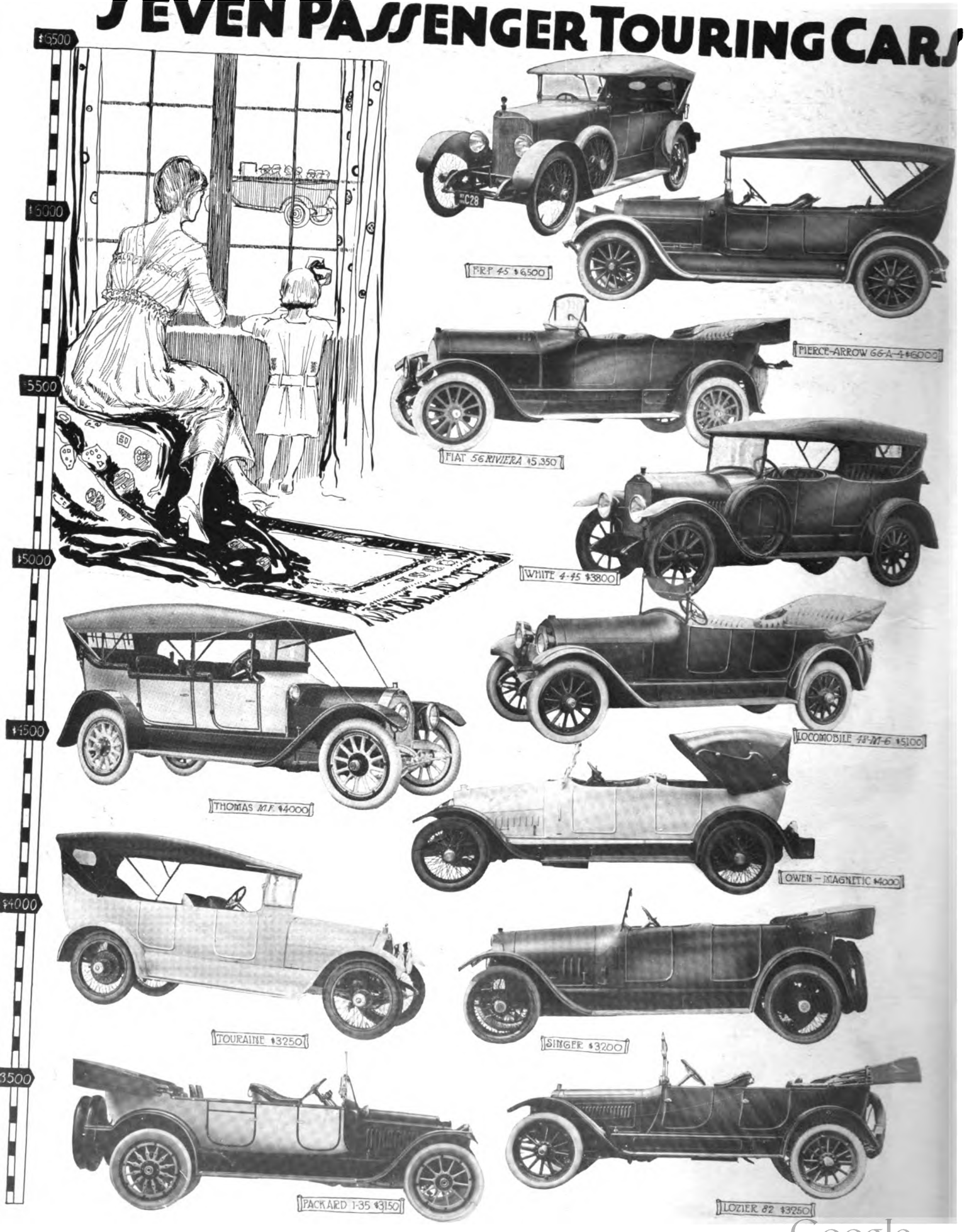


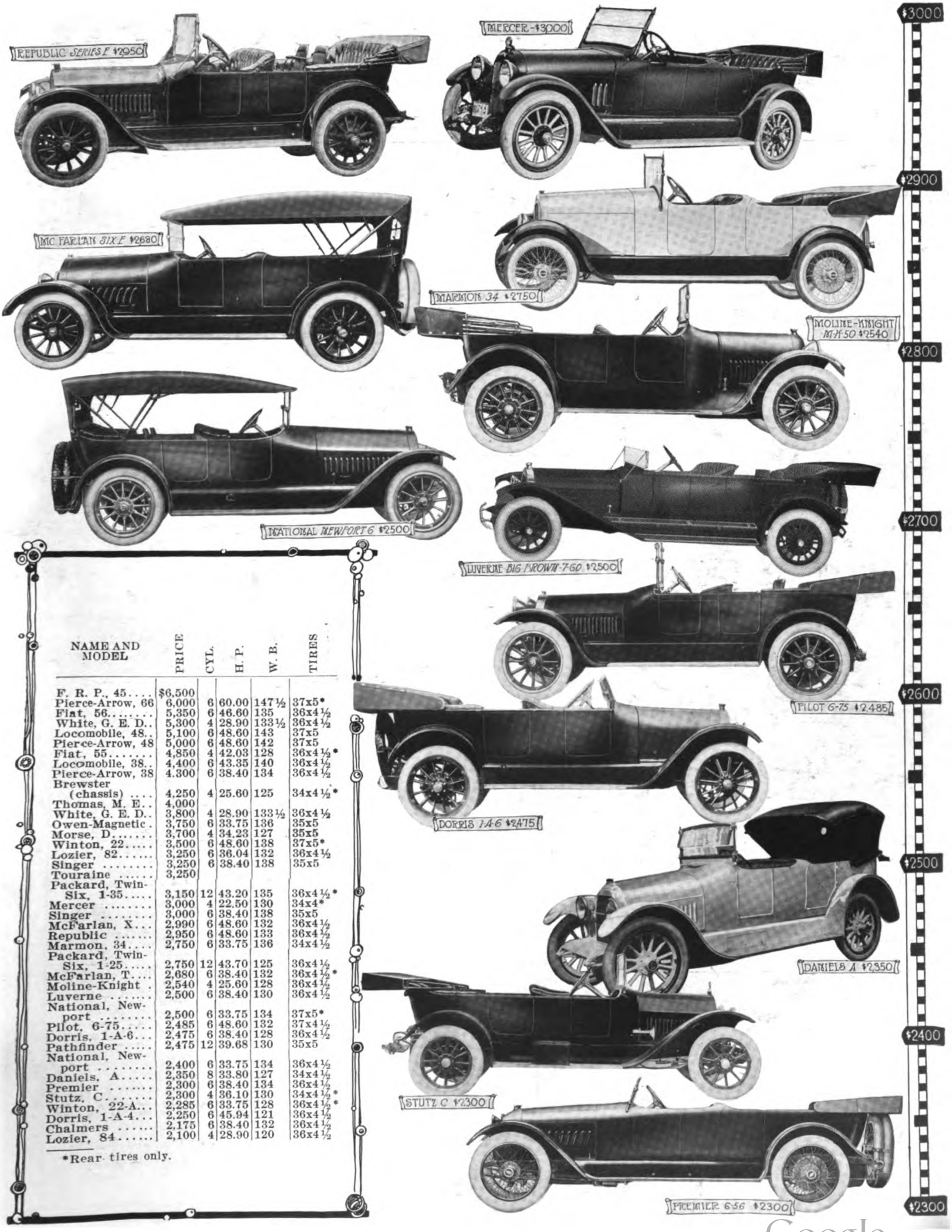
NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Inter-State, T.	$850	4	19.60	110	33x4
Elgin, 6	845	6	21.6	114	32x3½
Oakland, 32	795	6	18.99	110	32x3½
Monitor	795	4	22.50	108	32x3½
Grant, 6	795	6	21.60	112	32x3½
Allen	795	4	22.50	112	32x3½
Saxon	785	6	19.84	112	32x3½
Dodge	785	4	24.03	110	32x3½
Elcar	775	4	19.60	114	32x3½
Bell, A-16	775	4	19.60	112	31x4
Overland, 83	750	4	27.25	106	33x4
Chevrolet, Baby Grand	750	4	21.76	106	32x3½
Spaulding	750				
Briscoe, 4-38	750	4	18.91	114	32x3½
Coey, Flyer	740	4	16.90	106	30x3½
Pullman	740	4	25.60	114	31x4
Crow, Elkhart, 30	725	4	19.60	112	32x3½
Mecca, 30	695	4	22.50	104	30x3½
Lambert	685				33x4
Arbenz, 25	675	4	16.90	108	30x3½
Partin-Palmer, 32	675	4	19.60	110	32x3½
Moore	660	4	16.90	106	30x3½
New Era	660	4	15.63	104	30x3½
Maxwell	655	4	21.03	102	30x3½
Dort	650	4	16.90	105	30x3½
Regal, E	650	4	19.60	106	30x3½
Overland, 75	615	4	15.63	104	31x4
Metz, 25	600	4	24.03	108	32x3½
Sterling	550	4	13.23	102	30x3½
Argo	495	4	15.63	103	30x3
Chevrolet, 4-90	490	4	21.76	102	30x3*
Ford, T	440	4	22.50	100	30x3*

*Rear tires only.



SEVEN PASSENGER TOURING CARS

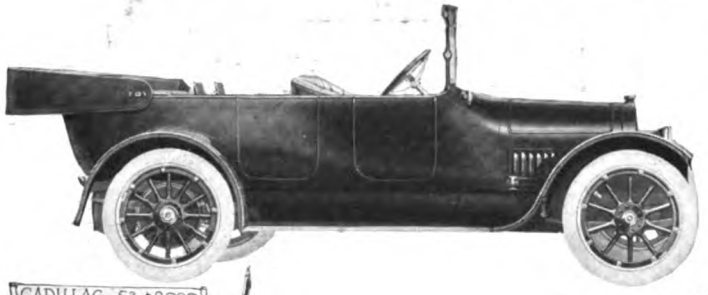




NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
F. R. P., 45	$6,500				
Pierce-Arrow, 66	6,000	6	60.00	147½	37x5*
Fiat, 56	5,350	6	46.60	135	36x4½
White, G. E. D.	5,300	4	28.90	133½	36x4½
Locomobile, 48	5,100	6	48.60	143	37x5
Pierce-Arrow, 48	5,000	6	48.60	142	37x5
Fiat, 55	4,850	4	42.03	128	36x4½*
Locomobile, 38	4,400	6	43.35	140	36x4½
Pierce-Arrow, 38	4.300	6	38.40	134	36x4½
Brewster (chassis)	4,250	4	25.60	125	34x4½*
Thomas, M. E.	4,000				
White, G. E. D.	3,800	4	28.90	133½	36x4½
Owen-Magnetic	3,750	6	33.75	136	35x5
Morse, D.	3,700	4	34.23	127	35x5
Winton, 22	3,500	6	48.60	138	37x5*
Lozier, 82	3,250	6	36.04	132	36x4½
Singer	3,250	6	38.40	138	35x5
Touraine	3,250				
Packard, Twin-Six, 1-35	3,150	12	43.20	135	36x4½*
Mercer	3,000	4	22.50	130	34x4*
Singer	3,000	6	38.40	138	35x5
McFarlan, X	2,990	6	48.60	132	36x4½
Republic	2,950	6	48.60	133	36x4½
Marmon, 34	2,750	6	33.75	136	34x4½
Packard, Twin-Six, 1-25	2,750	12	43.70	125	36x4½
McFarlan, T.	2,680	6	38.40	132	36x4½*
Moline-Knight	2,540	4	25.60	128	36x4½
Luverne	2,500	6	38.40	130	36x4½
National, Newport	2,500	6	33.75	134	37x5*
Pilot, 6-75	2,485	6	48.60	132	37x4½
Dorris, 1-A-6	2,475	6	38.40	128	36x4½
Pathfinder	2,475	12	39.68	130	35x5
National, Newport	2,400	6	33.75	134	36x4½
Daniels, A	2,350	8	33.80	127	34x4½
Premier	2,300	6	38.40	134	36x4½
Stutz, C	2,300	4	36.10	130	34x4½*
Winton, 22-A	2,285	6	33.75	128	36x4½*
Dorris, 1-A-4	2,250	6	45.94	121	36x4½
Chalmers	2,175	6	38.40	132	36x4½
Lozier, 84	2,100	4	28.90	120	36x4½

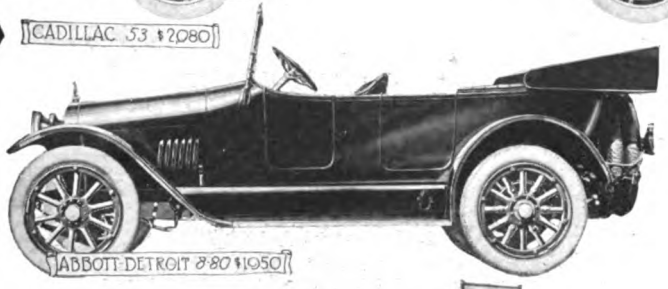
*Rear tires only.

SEVEN PASSENGER TOURING CARS—CONTINUED



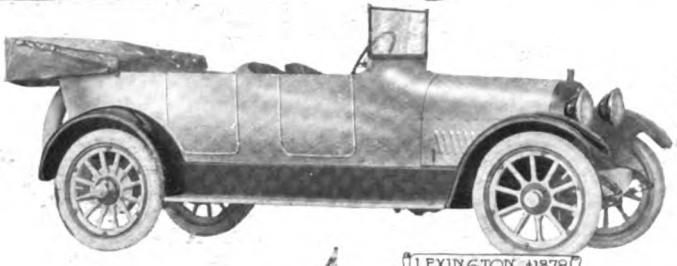
CADILLAC 53 $2080

CHALMERS MASTER SIX $2175



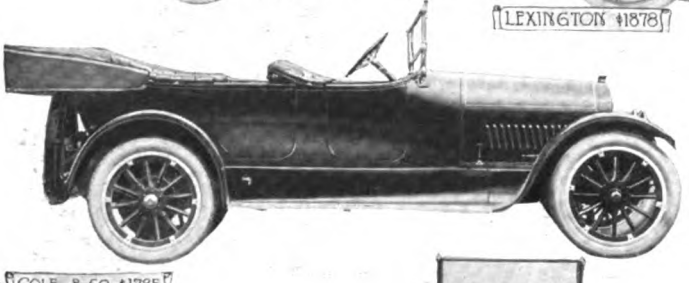
ABBOTT-DETROIT 8-80 $1950

STEARNS-KNIGHT 8 $2050

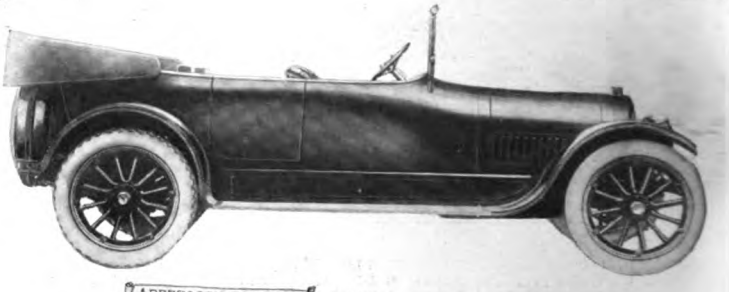


LEXINGTON $1878

PEERLESS 8-56 $1890

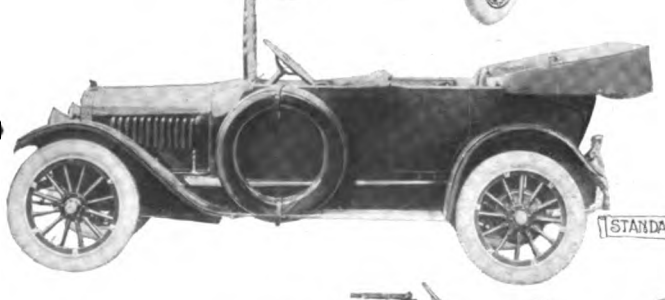


COLE 8-50 $1785

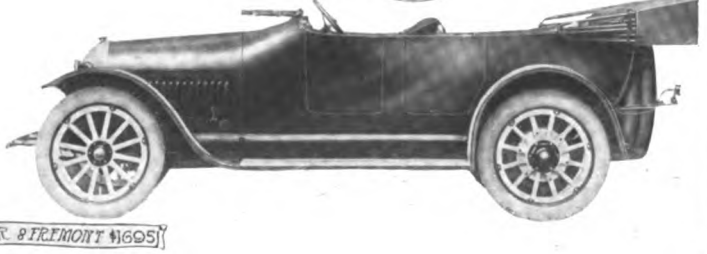


APPERSON 8-16 $1850

KISSEL 6-42 $1750



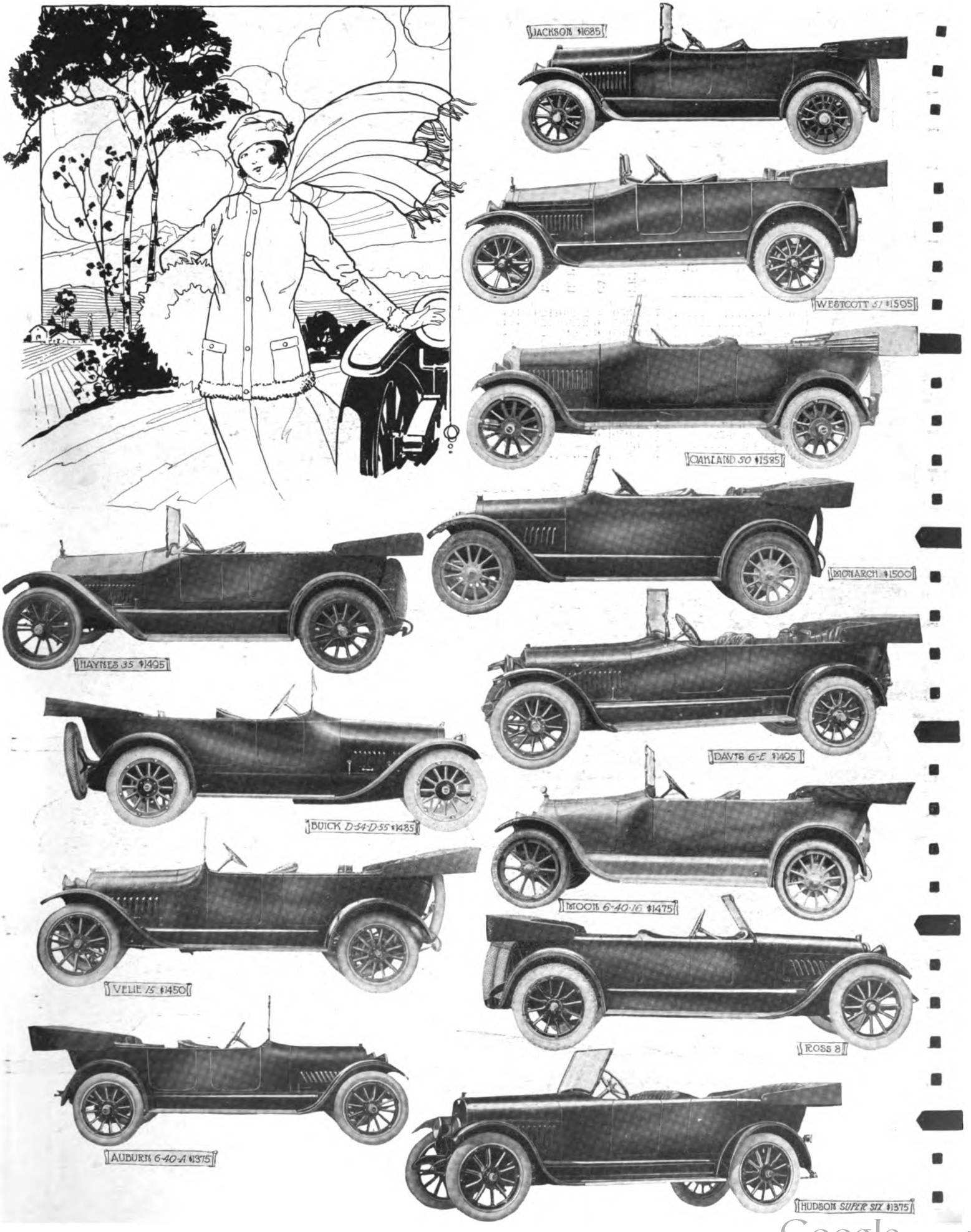
STANDARD 8 $1735



PATHFINDER 8 FREMONT $1695

NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Cadillac, 53	2,080	8	31.35	122	36x4½
Stearns-Knight,	2,050	8	33.85	123	35x4½
National	2,020	12	36.30	128	36x4½*
Stewart, T	1,950	6	29.40	127	34x4½
Abbott	1,950	8	33.80	121	35x4½
Peerless, 56	1,890	8	33.80	125	35x4½
Lexington, 6-La.	1,875	6	29.40	128	34x4*
Apperson	1,850	8	31.25	128	35x4½
Cole, 8-50	1,785	8	39.20	126	35x4½
Kissel, 6-42	1,750	6	31.54	126	35x4½
Standard, 8	1,735	8	28.80	121	35x4
National, Six	1,720	6	29.40	128	34x4½*
Pathfinder	1,695	6	29.40	122	35x4½
Jackson, 68	1,685	8	39.20	124	34x4½
Westcott, 51	1,595	6	29.40	126	35x4½
Kissel, 6-42	1,585	6	31.54	126	35x4½
Oakland, 50	1,585	8	39.20	127	34x4½
Chalmers, 6-48	1,550	6	29.40	126	34x4½
Apperson, 6-16	1,550	6	29.40	128	34x4
Monarch	1,500	8	28.80		33x4½
Davis, E	1,495	6	29.40	124	34x4½
Haynes, 35	1,495	6	29.40	127	35x4½
Buick	1,485	6	33.75	130	36x4½
Moon, 6-40	1,475	6	29.40	124	34x4
Velie, 15	1,450	6	29.40	124	34x4*
Auburn	1,375	6	29.40	127	34x4
Hudson, Super-Six	1,375	6	29.40	125½	35x4½
Chalmers, 6-40	1,350	6	23.44	124	34x4
Ross, A	1,350	8	28.80	115	34x4

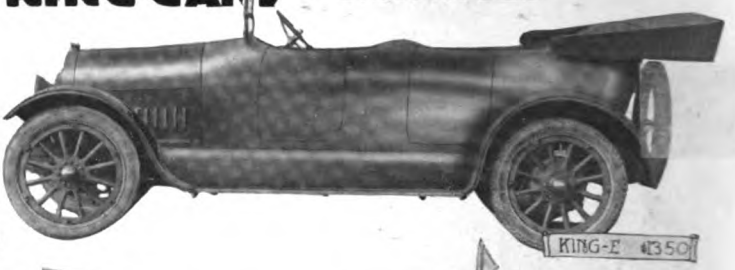
*Rear tires only.

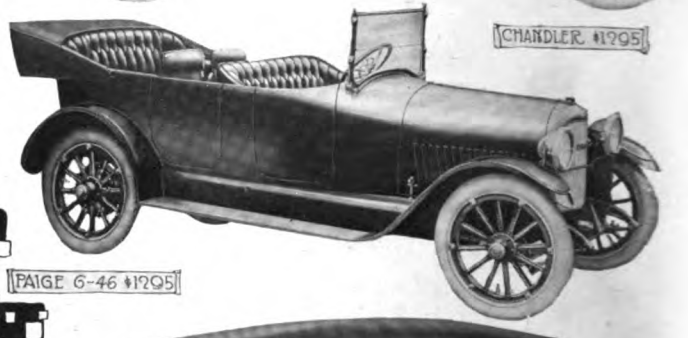


SEVEN PASSENGER TOURING CARS — CONTINUED

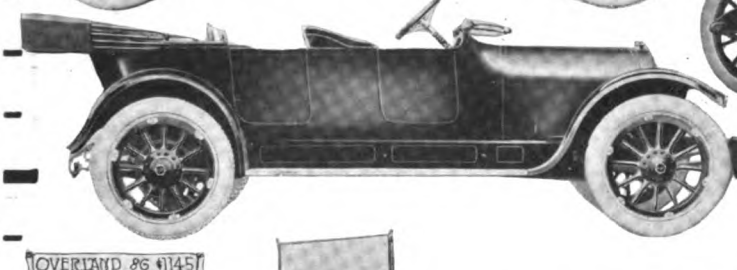
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
King, E	7	$1.350	8	28.80	120	34x4
Chandler	7	1,295	6	27.34	123	34x4
Paige, 6-46	7	1,295	6	29.40	123	34x4
Mitchell, 8	7	1,285	8	28.80	125	34x4
Reo, M	7	1,250	6		126	34x4½
Hupmobile, N. N	6	1,225	4	22.50	134	35x4½
Partin-Palmer, 8-45	6	1,195	8	31.25	115	33x4
Abbott, 6-44	7	1,195	6	25.35	122	32x4
Overland, 86	7	1,145	6	29.40	125	35x4½
Case, T	7	1,090	4	21.03	120	34x4
Madison, 6-40-T	7	1,085	6	21.60	120	34x4
Paterson, 6-42	7	1,060	6	25.35	117	32x4
Studebaker, 6-50	7	1,050	6	36.04	122	34x4
Jeffery, 4-62	7	1,035	4	22.50	116	34x4
Studebaker, 4-40	7	885	4	24.03	112	34x4

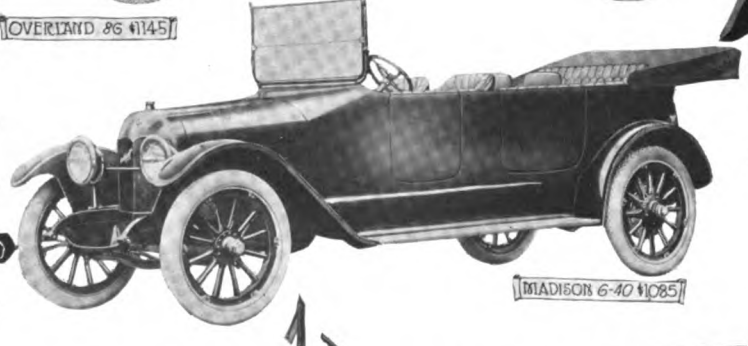
$1300





$1200





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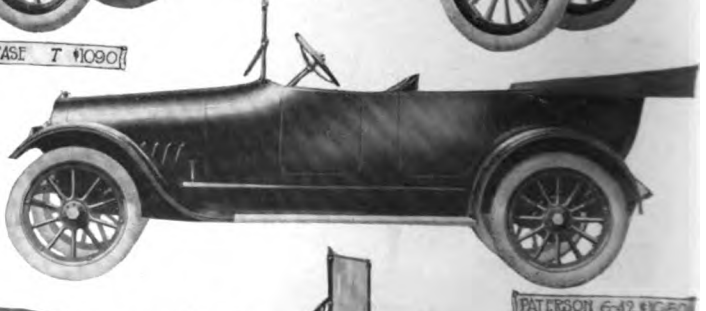
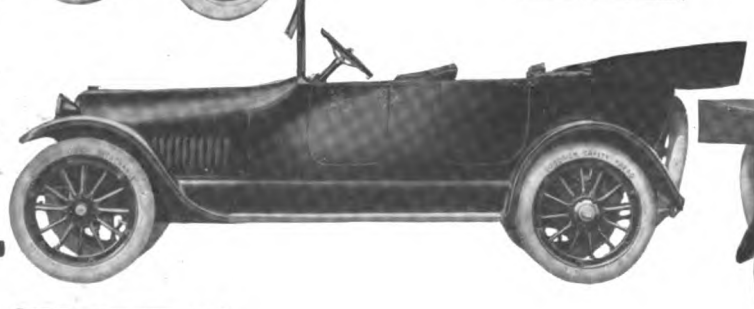
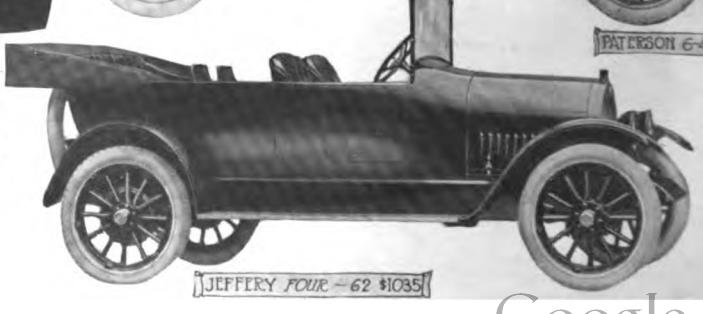
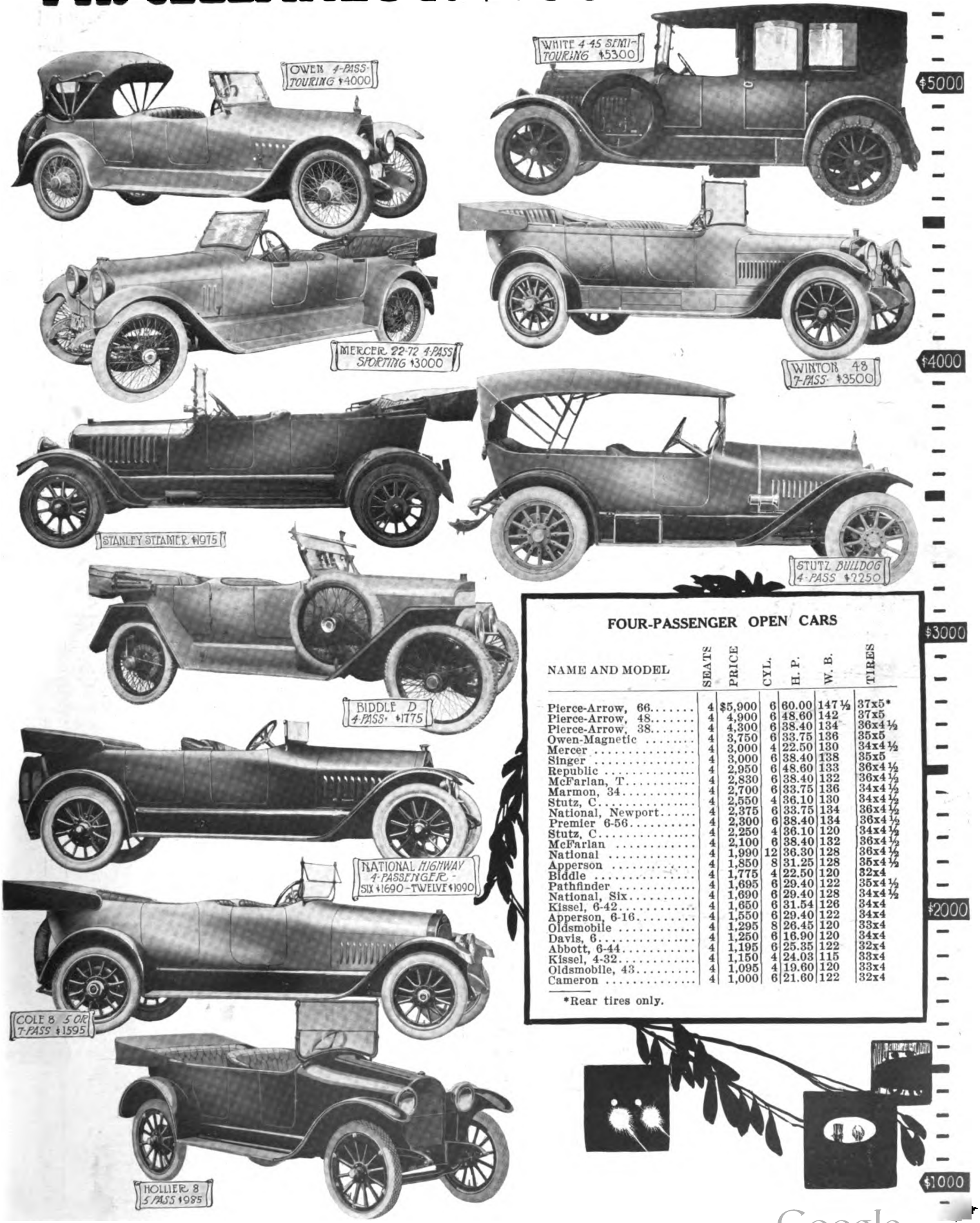






MISCELLANEOUS TOURING TYPES

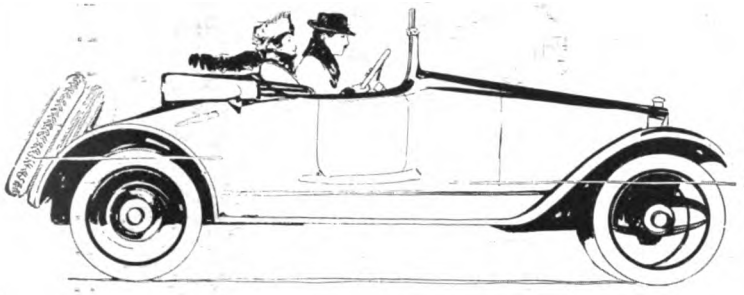


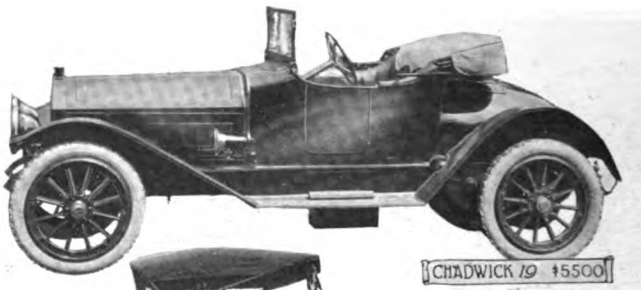
FOUR-PASSENGER OPEN CARS

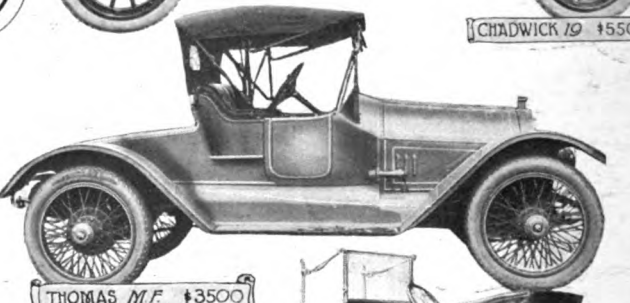
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 66	4	$5,900	6	60.00	147½	37x5*
Pierce-Arrow, 48	4	4,900	6	48.60	142	37x5
Pierce-Arrow, 38	4	4,300	6	38.40	134	36x4½
Owen-Magnetic	4	3,750	6	33.75	136	35x5
Mercer	4	3,000	4	22.50	130	34x4½
Singer	4	3,000	6	38.40	138	35x5
Republic	4	2,950	6	48.60	133	36x4½
McFarlan, T	4	2,830	6	38.40	132	36x4½
Marmon, 34	4	2,700	6	33.75	136	34x4½
Stutz, C	4	2,550	4	36.10	130	34x4½
National, Newport	4	2,375	6	33.75	134	36x4½
Premier 6-56	4	2,300	6	38.40	134	36x4½
Stutz, C	4	2,250	4	36.10	120	34x4½
McFarlan	4	2,100	6	38.40	132	36x4½
National	4	1,990	12	36.30	128	36x4½
Apperson	4	1,850	8	31.25	128	35x4½
Biddle	4	1,775	4	22.50	120	32x4
Pathfinder	4	1,695	6	29.40	122	35x4½
National, Six	4	1,690	6	29.40	128	34x4½
Kissel, 6-42	4	1,650	6	31.54	126	34x4
Apperson, 6-16	4	1,550	6	29.40	122	34x4
Oldsmobile	4	1,295	8	26.45	120	33x4
Davis, 6	4	1,250	6	16.90	120	34x4
Abbott, 6-44	4	1,195	6	25.35	122	32x4
Kissel, 4-32	4	1,150	4	24.03	115	33x4
Oldsmobile, 43	4	1,095	4	19.60	120	33x4
Cameron	4	1,000	6	21.60	122	32x4

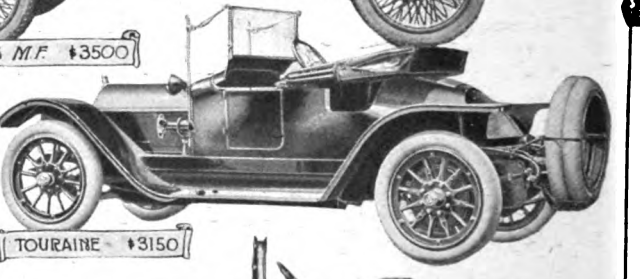
*Rear tires only.

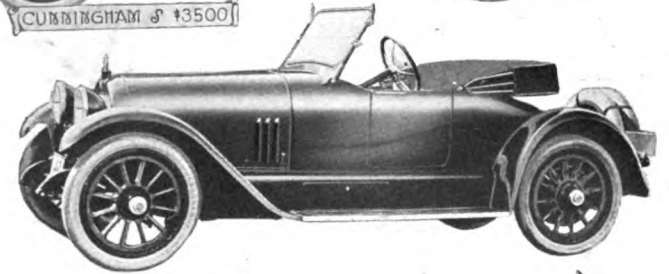
ROADSTERS and RUNABOUTS

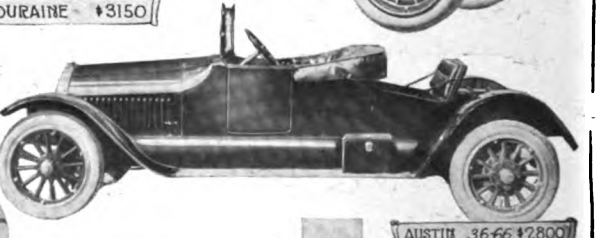


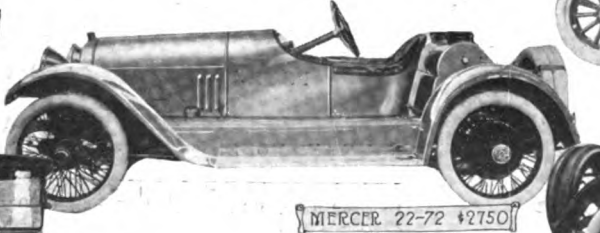


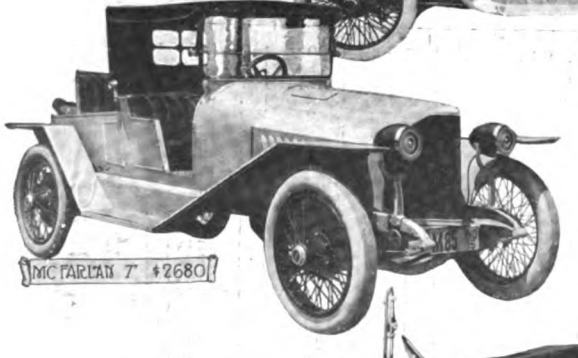


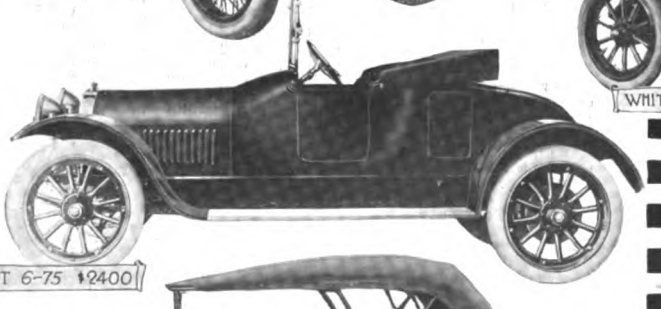






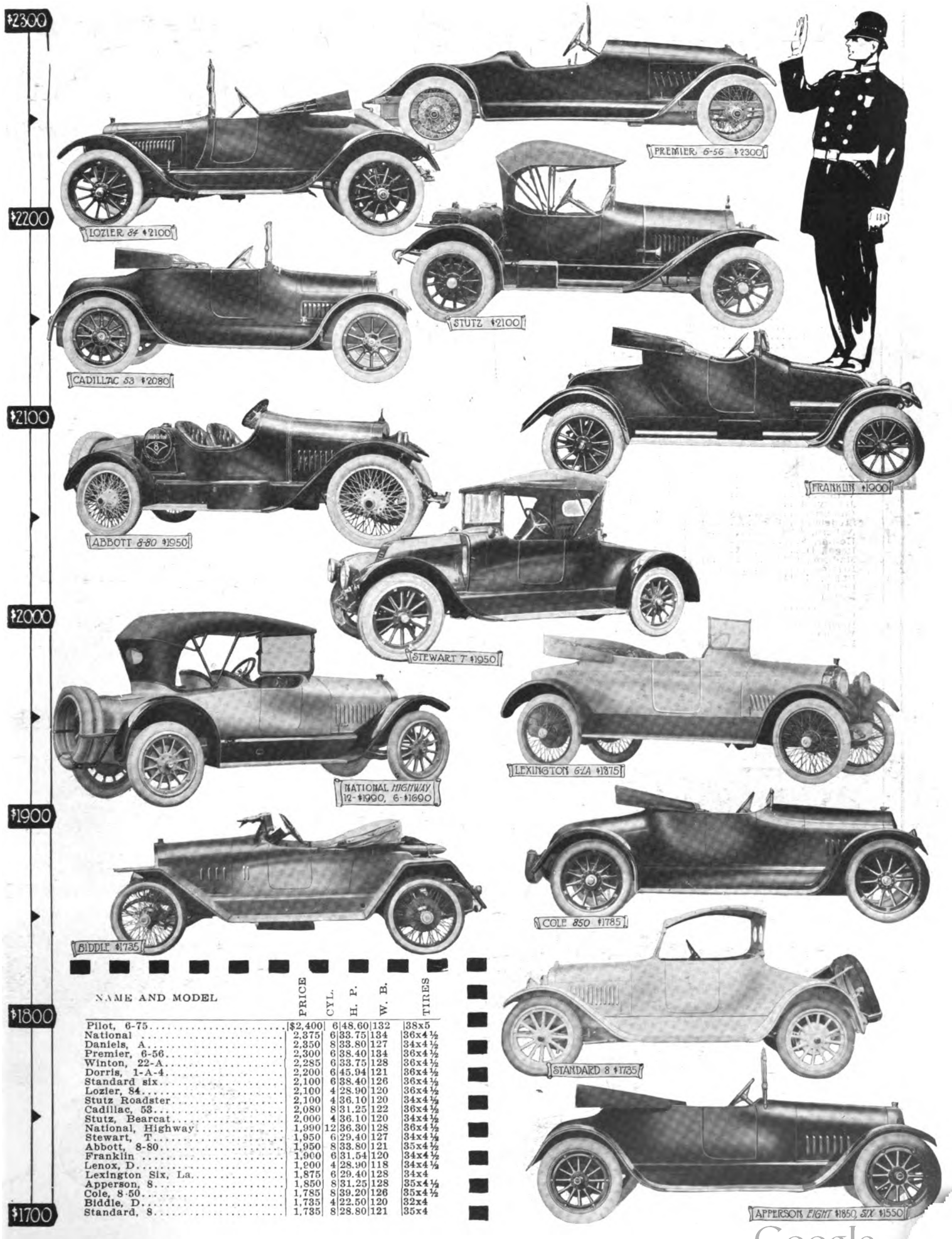






NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 66	$6,175	6	60.00	147 ½	37x5*
Chadwick, 19	5,500				
Fiat, 56	5,350	6	46.40	135	36x4 ½*
Pierce-Arrow, 48	4,900	6	48.60	142	37x5
Pierce-Arrow, 38	4,300	6	38.40	134	36x4 ½
White, G. E. D.	3,750	4	28.90	133 ½	36x4 ½
Cunningham, S.	3,500				
Thomas, M. F.	3,500				
Winton, 22	3,500	6	48.60	138	37x5
Touraine	3,150				
Singer	3,000	6	38.40	138	
Mercer, 22-72	2,900	4	22.50	115	32x4
Austin, 36-66	2,800				
Packard Twin six, 1-25	2,750	12	43.20	125	36x4 ½*
Mercer, 22-72	2,750	4	22.50	115	32x4
Marmon, 34	2,700	6	33.75	136	34x4 ½
McFarlan, T	2,680	6	38.40	132	36x4 ½
White, G. A. H.	2,650	4	22.50	115	32x4
Moline-Knight	2,500	4	25.60	128	36x4 ½
Dorris, 1-A-6	2,475	6	38.40	128	33x4 ½
Pathfinder	2,475	12	39.68	130	35x5

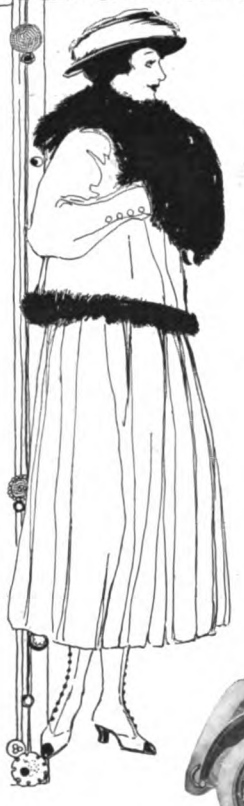
* Rear tires only.

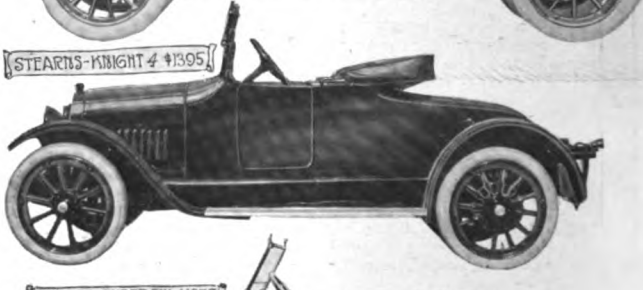


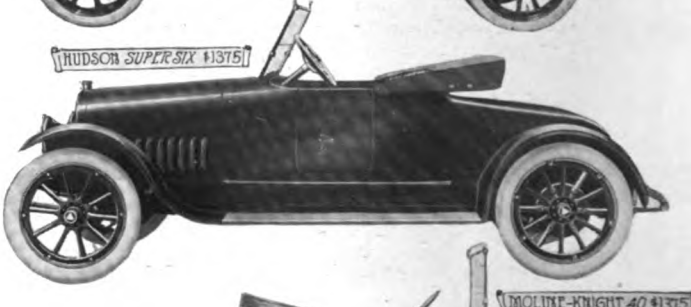
NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pilot, 6-75	$2,400	6	48.60	132	38x5
National	2,375	6	33.75	134	36x4½
Daniels, A	2,350	8	33.80	127	34x4½
Premier, 6-56	2,300	6	38.40	134	36x4½
Winton, 22-A	2,285	6	33.75	128	36x4½
Dorris, 1-A-4	2,200	6	45.94	121	36x4½
Standard six	2,100	6	38.40	126	36x4½
Lozier, 84	2,100	4	28.90	120	36x4½
Stutz Roadster	2,100	4	36.10	120	34x4½
Cadillac, 53	2,080	8	31.25	122	36x4½
Stutz, Bearcat	2,000	4	36.10	120	34x4½
National, Highway	1,990	12	36.30	128	36x4½
Stewart, T	1,950	6	29.40	127	34x4½
Abbott, 8-80	1,950	8	33.80	121	35x4½
Franklin	1,900	6	31.54	120	34x4½
Lenox, D	1,900	4	28.90	118	34x4½
Lexington Six, La	1,875	6	29.40	128	34x4
Apperson, 8	1,850	8	31.25	128	35x4½
Cole, 8-50	1,785	8	39.20	126	35x4½
Biddle, D	1,735	4	22.50	120	32x4
Standard, 8	1,735	8	28.80	121	35x4

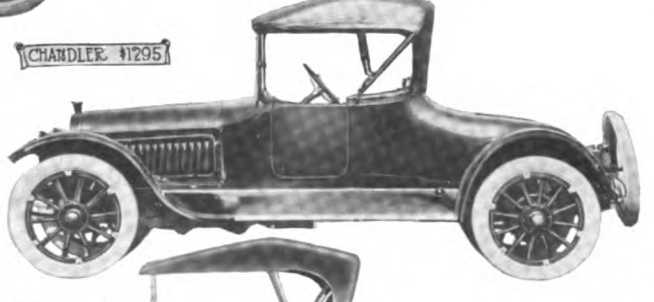
ROADSTERS and RUNABOUTS—CONTINUED

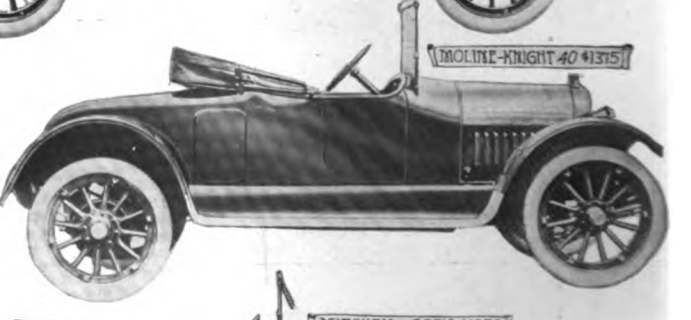
NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pathfinder, 8-6	$1,695	6	29.40	122	35x4½
National, Highway	1,690	6	29.40	128	34x4½
Kisselkar, 42	1,650	6	31.54	126	34x4*
Westcott, 51	1,595	6	29.40	126	35x4½
Haynes, 34	1,485	6	29.40	121	34x4
Moon	1,475	6	29.40	124	34x4
Buick, D-54	1,450	6	33.75	130	36x4½
Stearns-Knight	1,395	8	33.80	123	35x4½
Westcott, 41	1,395	6	25.35	120	34x4
Halladay	1,385	6	21.60	122	34x4
Auburn, 6-40	1,375	6	29.40	127	34x4
Moline-Knight	1,375	4	22.50	118	34x4
Hudson, super-six	1,375	6	29.40	125	35x4½
Chalmers	1,350	6	23.44	124	34x4
Chandler	1,295	6	27.34	123	34x4
Mitchell, 6 of 16	1,250	6	29.40	125	34x4
Mitchell, 8	1,250	8	28.80	125	34x4
Spaulding, H	1,250	4	32.40	120	36x4
Regal, F	1,200	8	28.80	115	33x4
Moon	1,195	6	25.35	118	33x4
Abbott	1,195	6	25.35	122	32x4
King, D	1,150	8	26.45	113	33x4
Dispatch, D	1,135	4	22.50	120	36x3½
Scripps-Booth, S-D		8	22.05	110	32x3½
Pilot, 6-45	1,100	6	21.60	119	32x4
Kline, 6-36	1,095	6	25.35	120	34x4
Herff-Brooks, H-6-50	1,095	6	38.40	120	34x4
Oldsmobile, 43	1,095	4	19.60	120	34x4
Wayne	1,095	6	38.40	120	34x4
Marion, K	1,090	6	21.60	120	32x4
Case, T	1,090	4	21.03	120	34x4
Hupmobile, N	1,085	4	22.50	119	34x4
Willys-Knight, 84	1,065	4	27.23	114	34x4
Auburn, 6-38	1,050	6	21.60	120	34x4
Oakland, 38	1,050	4	19.60	112	33x4
Velie	1,040	6	23.35	115	32x4
Jeffery, 4	1,000	4	22.50	116	34x4
Cameron	1,000	6	21.60	122	32x4
Studebaker, 6-50	1,000	6	36.04	122	34x4
Auburn, 4-38	985	4	24.03	114	34x4
Hollier, 8	985	8	28.80	112	32x3½
Regal, D	985	4	22.50	115	33x4
Madison, 6-40	985	6	21.60	112	34x4
Briscoe	950	8	28.80	114	32x3½
Buick, D-44	950	6	25.35	115	32x4
Empire, 45	935	4	24.03	116	33x4
Dispatch, D	935	4	22.50	120	36x3½
Sun		6	21.60	116	
Reo, R	875	4	27.23	115	34x4
Herff-Brooks	885	4	25.60	110	33x4
Wayne	885	4	25.60	110	33x4
Farmack	885	4	19.60	112	33x4

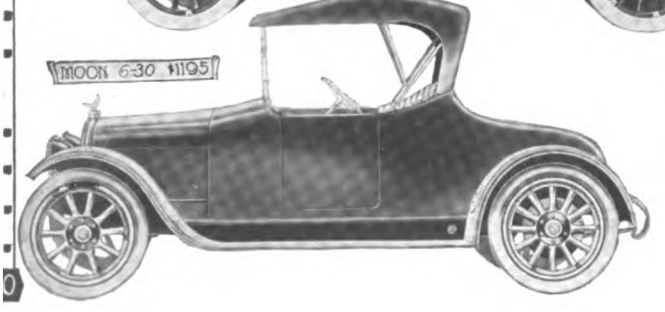


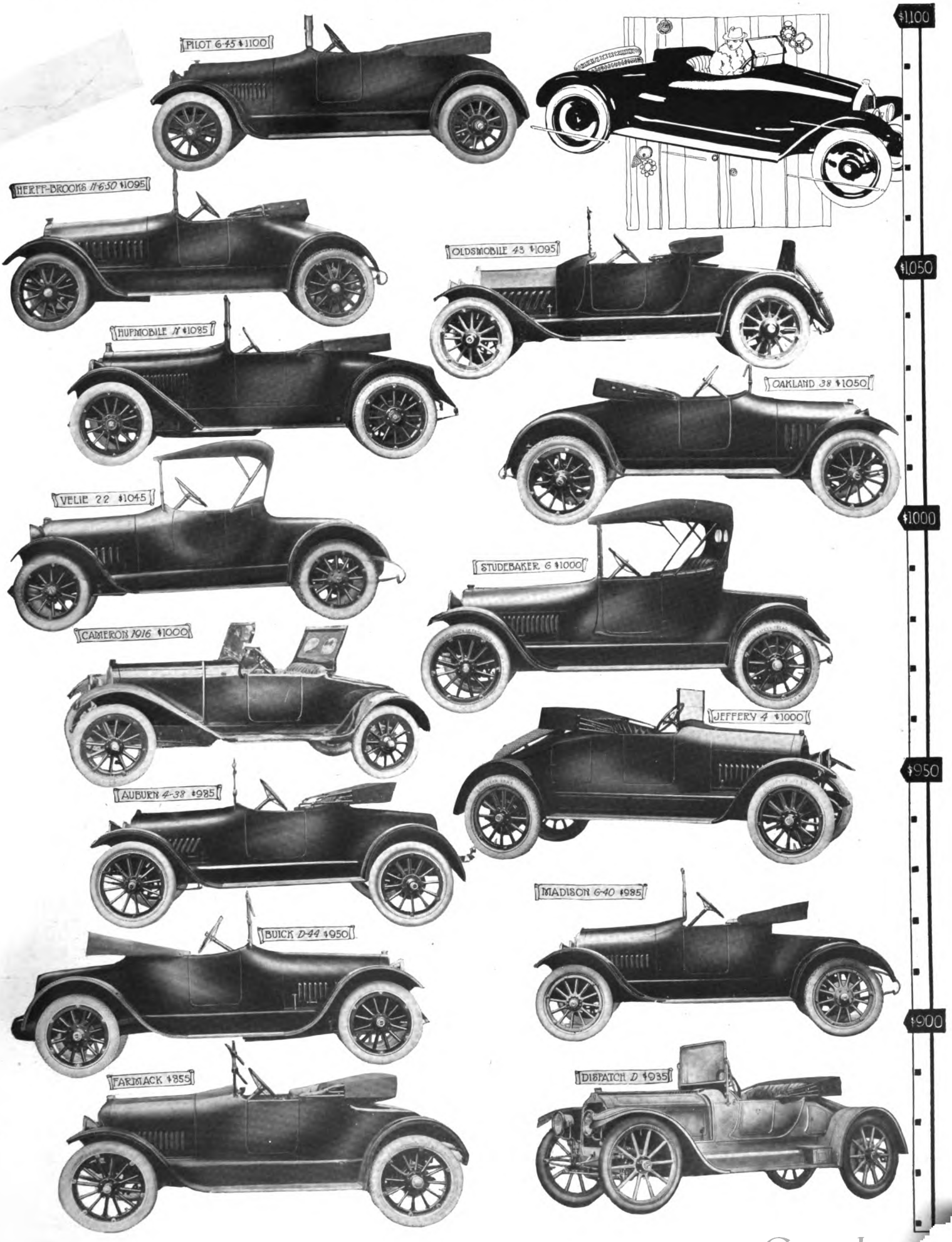




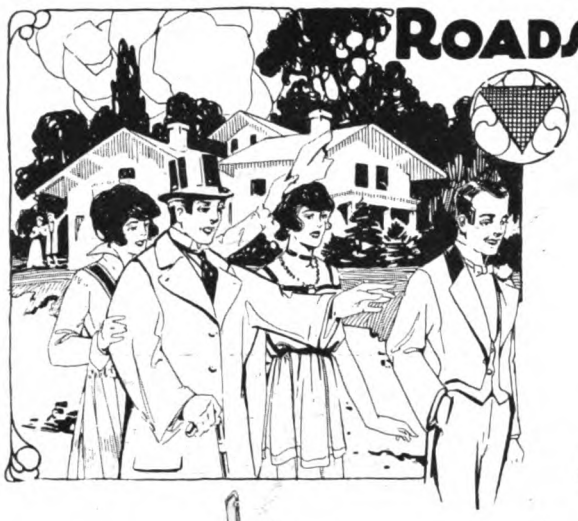


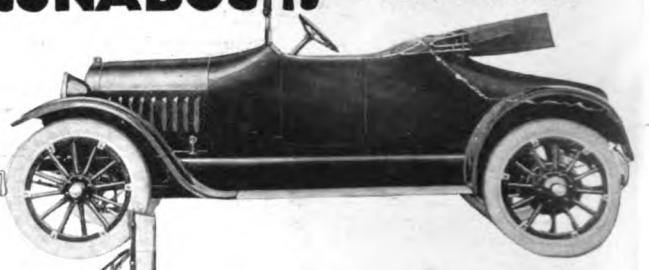


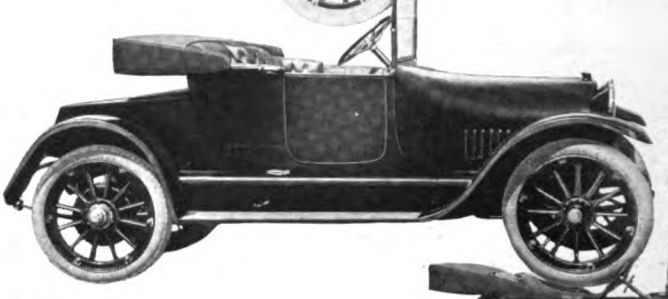


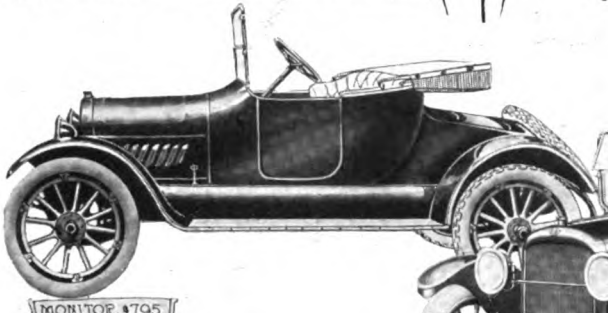


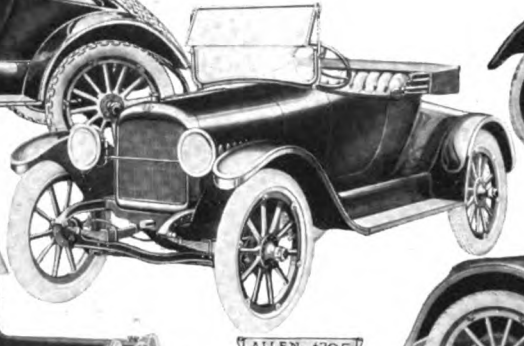
ROADSTERS and RUNABOUTS—CONTINUED

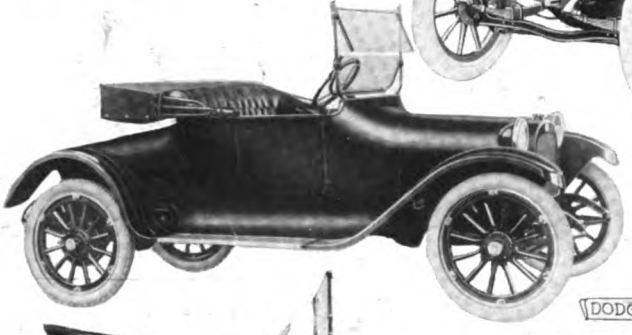


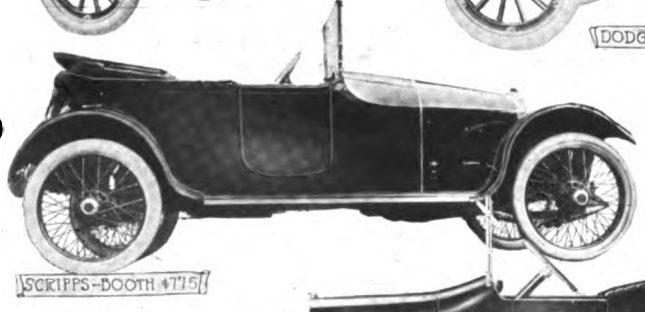


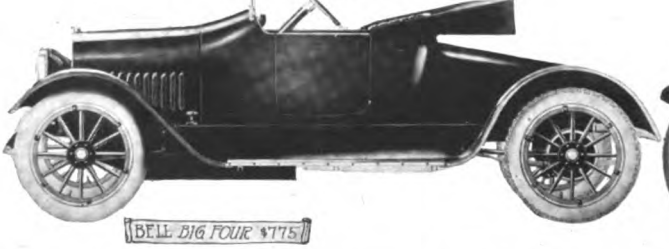






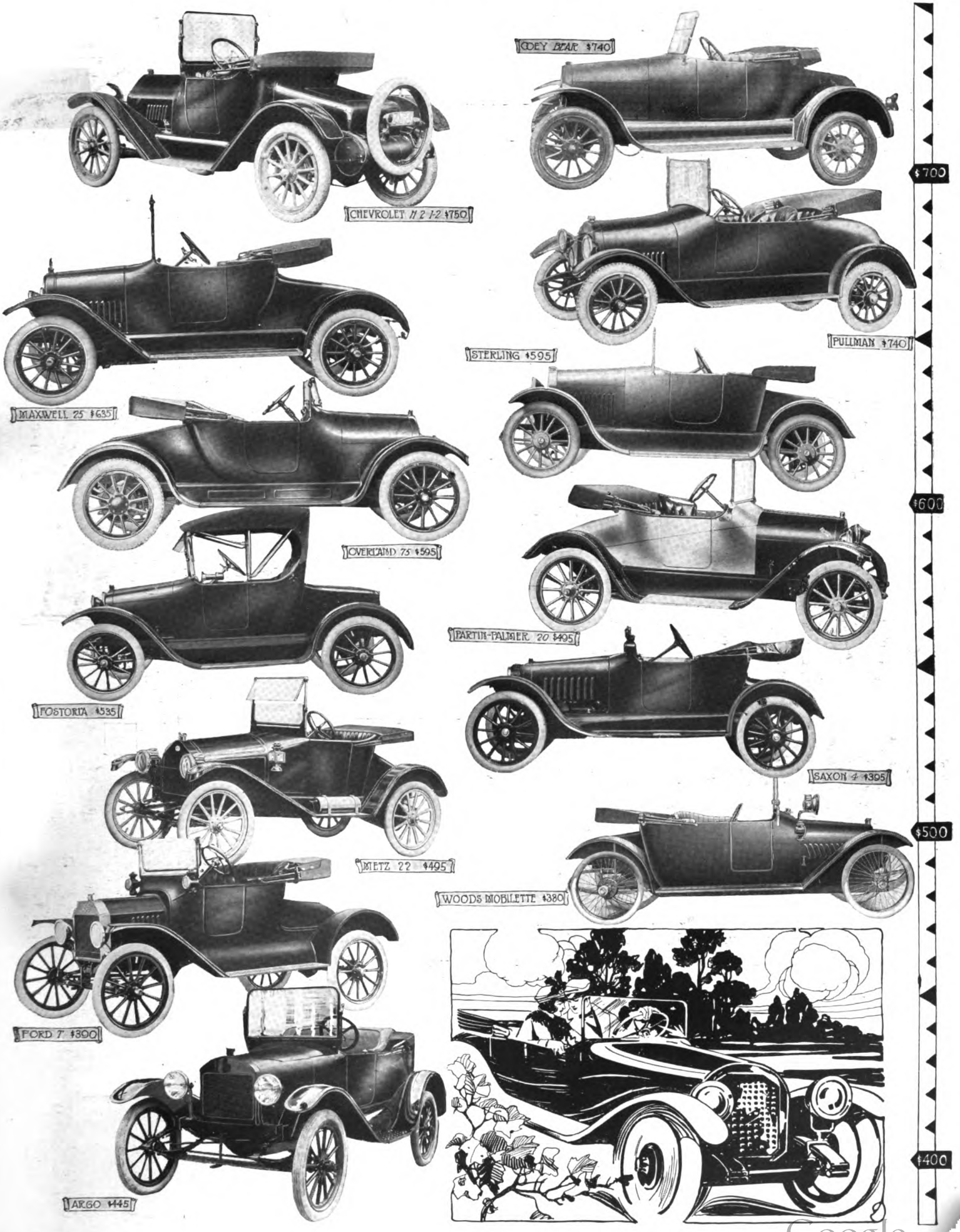






NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Interstate, T	2	$850	4	19.60	110	33x4
Studebaker, 4-40	3	850	4	24.03	112	34x4
Allen	2	795	4	22.50	112	32x3½
Grant, 6	3	795	6	21.60	112	32x3½
Monitor	2	795	4	22.50	108	32x3½
Oakland, 32	2	795	6	18.99	110	32x3½
Saxon	3	785	6	19 84	112	32x3½
Dodge	2	785	4	24.03	110	32x3½
Bell	2	775	4	19.60	112	31x4
Elcar	3	775	4	19.60	114	32x3½
Scripps-Booth, C	3	775	4	14.40	110	30x3½
Briscoe, 4	3	750	4	18.91	114	32x3½
Chevrolet, Royal Mail	2	750	4	21.76	106	32x3½
Harvard	2	750	4	14.40	100	28x3
Coey, Bear	2	740	4	19.60	106	30x3½
Pullman	2	740	4	25.60	114	31x4

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Overland, 83	2	$725	4	27.25	106	33x4
Mecca, 30	2	695	4	22.50	104	30x3½
Regal, E	2	650	4	19.60	106	30x3½
Maxwell, 25	2	635	4	21.03	102	30x3½
Metz, 25	2	600	4	24.03	108	32x3½
Overland, 75	2	595	4	15.63	104	31x4
Monroe	2	495	4	15.01	96	30x3
Metz, 22	2	495	4	24.03	108	32x3½
Partin-Palmer, 20	2	495	4	19.60	96	29x3½
Sterling	2	595	4	13.23	102	30x3½
Argo	2	445	4	15.63	96	30x3
Saxon, 4	2	395	4	12.10	96	28x3
Trumbull	2	395	4	13.23	80	28x3
Vixen, 3-P	3	395	4	12.10	106	28x3
Ford, T	2	390	4	22.50	100	30x3
Woods Mobilette	2	380	4	11.03	104	28x3



ROADSTERS and RUNABOUTS — CONTINUED

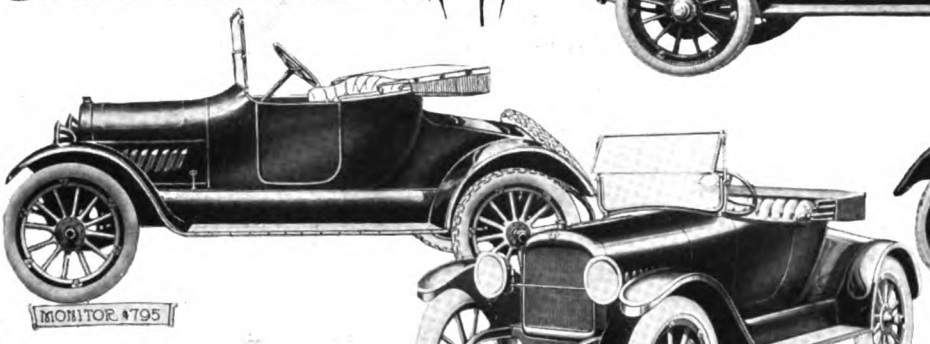
$850

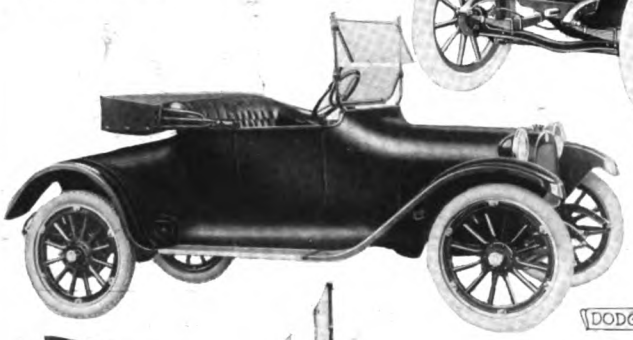
$825

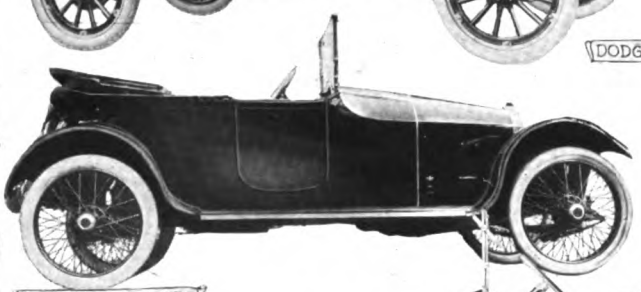
$800

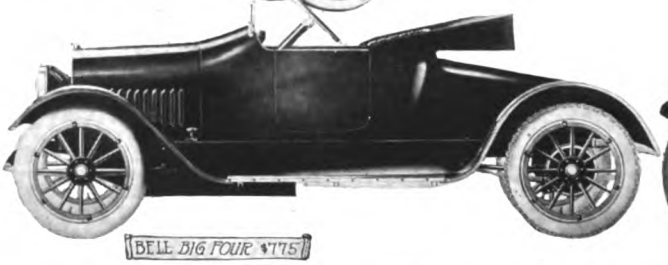
$775

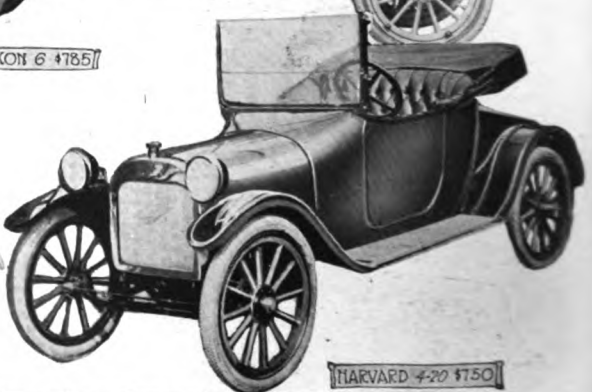
$750







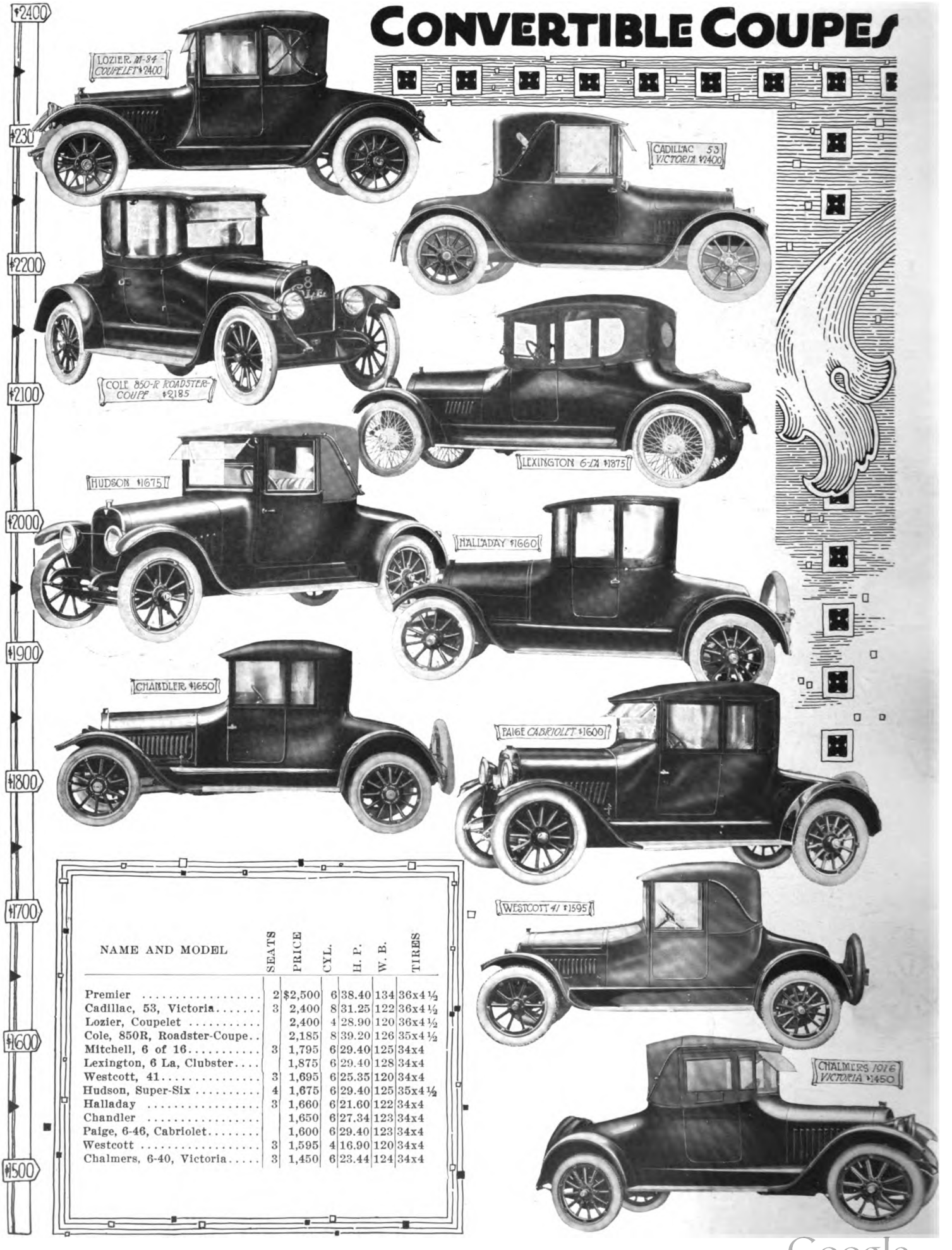




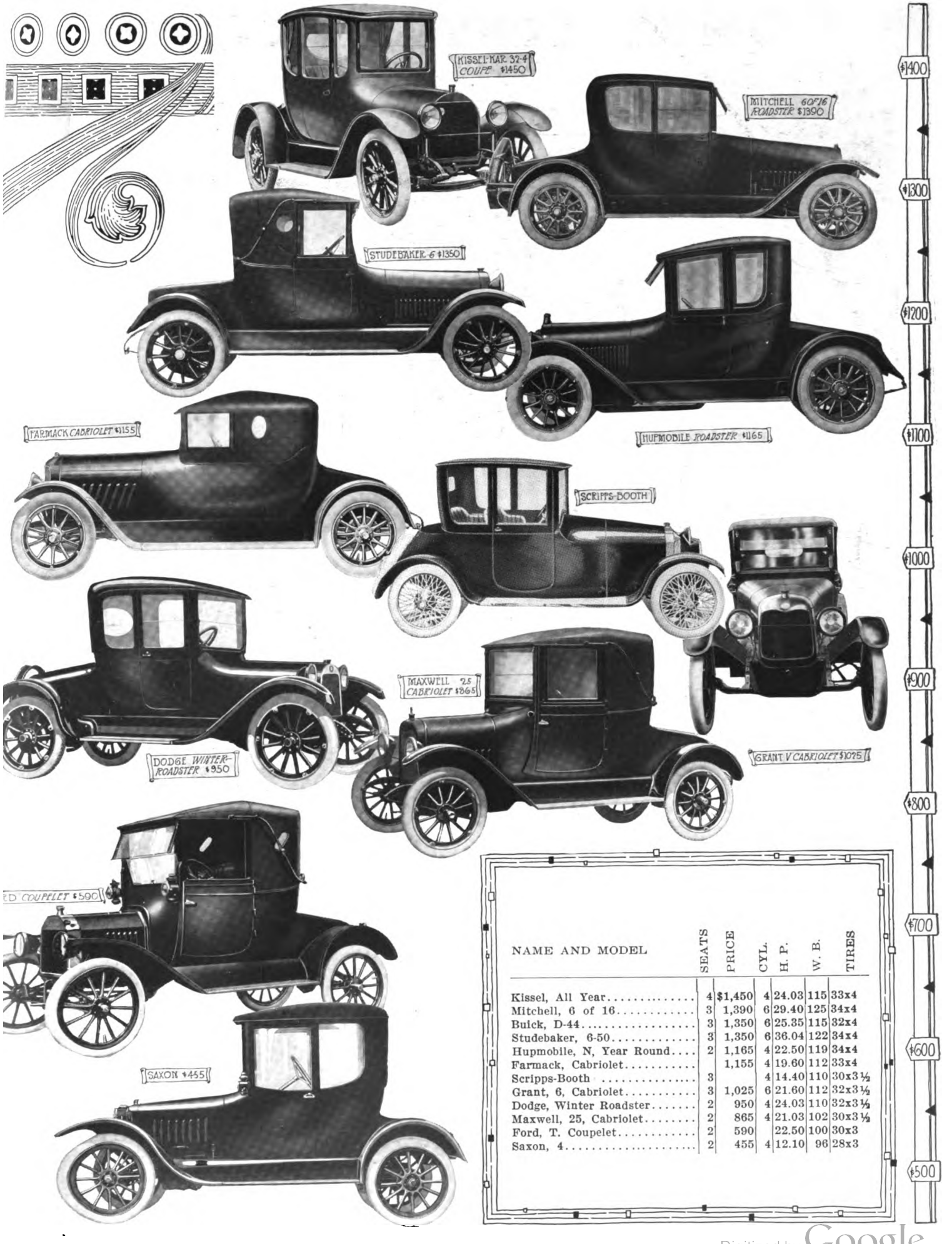
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Interstate, T	2	$850	4	19.60	110	33x4
Studebaker, 4-40	3	850	4	24.03	112	34x4
Allen	2	795	4	22.50	112	32x3½
Grant, 6	3	795	6	21.60	112	32x3½
Monitor	2	795	4	22.50	108	32x3½
Oakland, 32	2	795	6	18.99	110	32x3½
Saxon	3	785	6	19 84	112	32x3½
Dodge	2	785	4	24.03	110	32x3½
Bell	2	775	4	19.60	112	31x4
Elcar	3	775	4	19.60	114	32x3½
Scripps-Booth, C	3	775	4	14.40	110	30x3½
Briscoe, 4	3	750	4	18.91	114	32x3½
Chevrolet, Royal Mail	2	750	4	21.76	106	32x3½
Harvard	2	750	4	14.40	100	28x3
Coey, Bear	2	740	4	19.60	106	30x3½
Pullman	2	740	4	25.60	114	31x4

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Overland, 83	2	$725	4	27.25	106	33x4
Mecca, 30	2	695	4	22.50	104	30x3½
Regal, E	2	650	4	19.60	106	30x3½
Maxwell, 25	2	635	4	21.03	102	30x3½
Metz, 25	2	600	4	24.03	108	32x3½
Overland, 75	2	595	4	15.63	104	31x4
Monroe	2	495	4	15.01	96	30x3
Metz, 22	2	495	4	24.03	108	32x3½
Partin-Palmer, 20	2	495	4	19.60	96	29x3½
Sterling	2	595	4	13.23	102	30x3½
Argo	2	445	4	15.63	96	30x3
Saxon, 4	2	395	4	12.10	96	28x3
Trumbull	2	395	4	13.23	80	28x3
Vixen, 3-P	3	395	4	12.10	106	28x3
Ford, T	2	390	4	22.50	100	30x3
Woods Mobilette	2	380	4	11.03	104	28x3

CONVERTIBLE COUPES



NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Premier	2	$2,500	6	38.40	134	36x4½
Cadillac, 53, Victoria	3	2,400	8	31.25	122	36x4½
Lozier, Coupelet		2,400	4	28.90	120	36x4½
Cole, 850R, Roadster-Coupe		2,185	8	39.20	126	35x4½
Mitchell, 6 of 16	3	1,795	6	29.40	125	34x4
Lexington, 6 La, Clubster		1,875	6	29.40	128	34x4
Westcott, 41	3	1,695	6	25.35	120	34x4
Hudson, Super-Six	4	1,675	6	29.40	125	35x4½
Halladay	3	1,660	6	21.60	122	34x4
Chandler		1,650	6	27.34	123	34x4
Paige, 6-46, Cabriolet		1,600	6	29.40	123	34x4
Westcott	3	1,595	4	16.90	120	34x4
Chalmers, 6-40, Victoria	3	1,450	6	23.44	124	34x4



NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Kissel, All Year	4	$1,450	4	24.03	115	33x4
Mitchell, 6 of 16	3	1,390	6	29.40	125	34x4
Buick, D-44	3	1,350	6	25.35	115	32x4
Studebaker, 6-50	3	1,350	6	36.04	122	34x4
Hupmobile, N, Year Round	2	1,165	4	22.50	119	34x4
Farmack, Cabriolet		1,155	4	19.60	112	33x4
Scripps-Booth	3		4	14.40	110	30x3½
Grant, 6, Cabriolet	3	1,025	6	21.60	112	32x3½
Dodge, Winter Roadster	2	950	4	24.03	110	32x3½
Maxwell, 25, Cabriolet	2	865	4	21.03	102	30x3½
Ford, T. Coupelet	2	590		22.50	100	30x3
Saxon, 4	2	455	4	12.10	96	28x3

CONVERTIBLE SEDANS

$2250

HUDSON SUPER SIX SEDAN $1900

COLE 8 - SEDAN $2285

$2000

CHANDLER $1795

MITCHELL 6 OF 16 SEDAN $1450

$1750

GLIDE 6-40 $1295

$1500

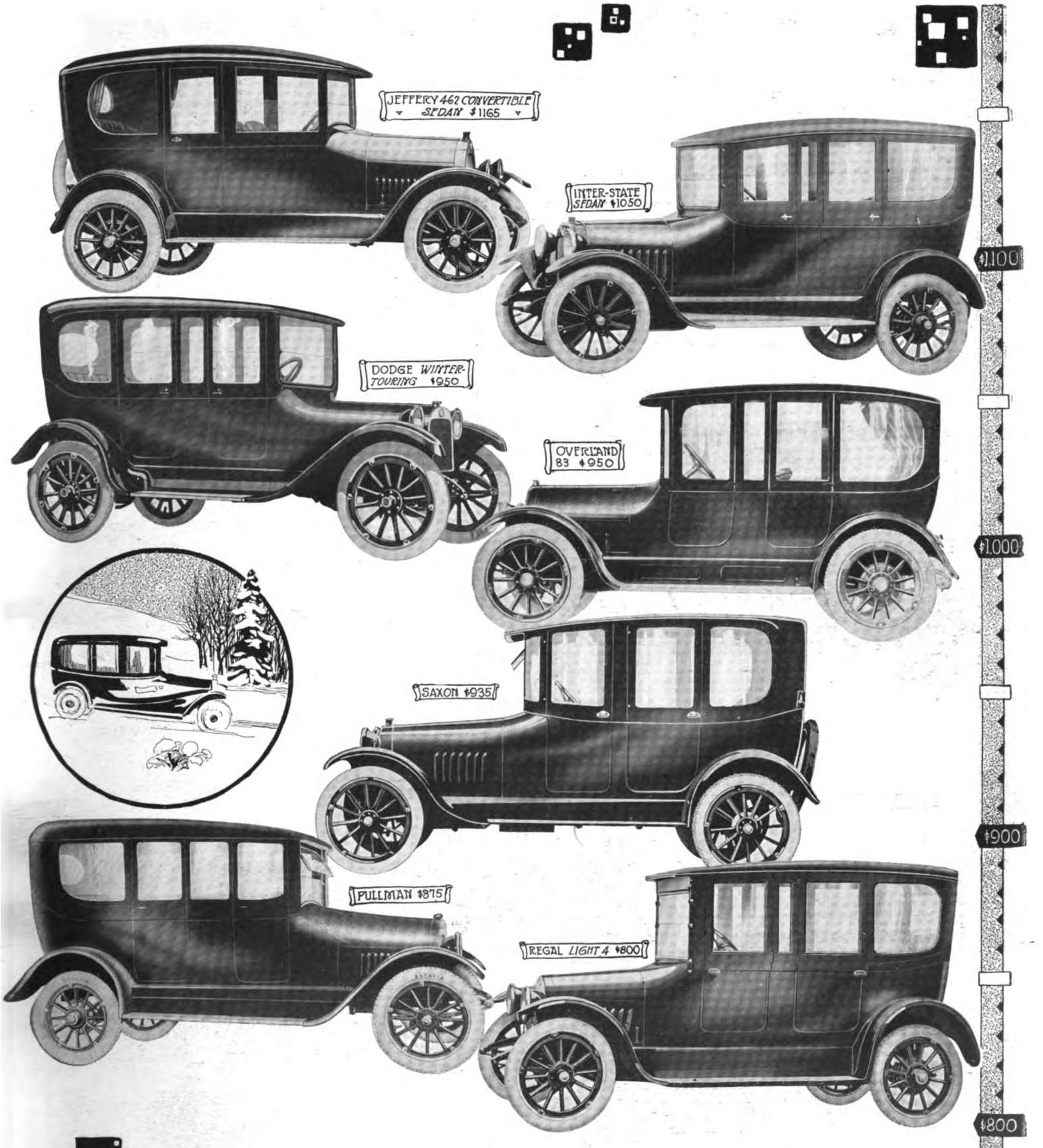
JACKSON 348 $1105

KISSELKAR 42-6 ALL YEAR $2000

$1250

HUPMOBILE $1185

$1000



NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
White, Semi-touring	7	$5,300	4	28.90	133 ½	36x4 ½
Cole, 8-50, Dem. Sedan	7	2,285	8	39.20	126	35x4 ½
Kissel, 42-6, All-Year	4	1,950	6	31.54	126	34x4
Hudson, Super Six, Sedan		1,900		29.40	125 ½	35x4 ½
Chandler, 6		1,795		27.34	123	34x4
Kissel, 32-4, All-Year	4	1,450	4	24.03	115	33x4
Mitchell, 6 of 16	7	1,450	6	29.40	125	34x4
Mitchell, 6 of 16	5	1,415	6	29.50	125	34x4
Glide, Six-40	5	1,295	6	21.60	119	34x4

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Jackson, 8, 3-48	5	$1,195	8	26.45	112	32x4
Hupmobile	5	1,185	4	22.50	112	33x4
Jeffery, 4 Sedan	5	1,165	4	22.50	116	34x4
Inter-State, Sedan	5	1,050	4	19.60	110	33x4
Overland, 83		950	5	27.23	106	33x4
Dodge, Winter touring	5	950	4	24.03	110	32x3 ½
Saxon, 6	5	935	6	19.84	112	32x3 ½
Pullman		875		22.50	114	31x4
Regal, Light Four	5	800	4	22.50	115	33x4

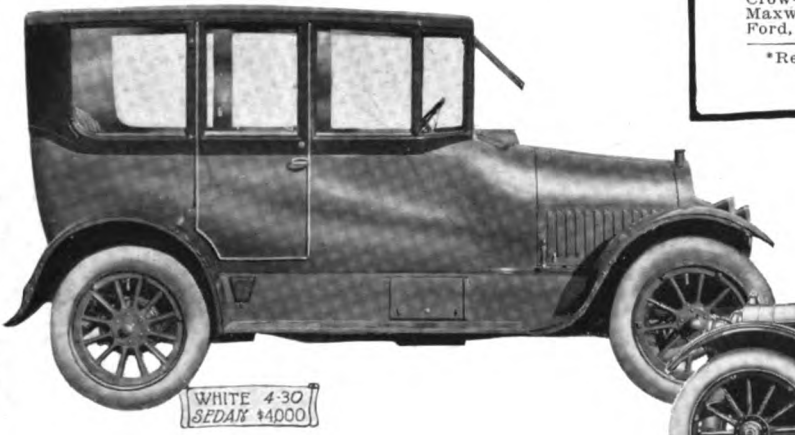
SEDANS

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 38		$5,200	6	38.40	134	36x4½
Winton, 22	7	4,600	6	48.60	138	37x5
McFarlan, X	6	4,000	6	48.60	132	36x4½
White, G. A. H.	5	4,000	4	22.50	115	32x4
Stutz, C	6	3,675	4	36.10	130	34x4½
Winton, 22A	7	3,500	6	33.75	128	36x4½
National, Newport	5	3,400	6	33.75	134	36x4½
Owen-Magnetic			6	33.75	136	35x5
Daniels, A.		3,250	8	33.80	127	34x4½
Moline-Knight	5	3,250	4	25.60	128	36x4½
National, Highway	5	3,200	12	36.30	128	36x4½
Lozier, M-6	5	3,000	6	36.04	132	36x4½
National	5	2,900	6	29.40	128	34x4½
Franklin	5	2,850	6	21.03	120	34x4½
Cole, Eight	7	2,285	8	39.20	126	35x4½
Chandler		2,250	6	27.34	123	34x4
Kissel	7	2,100	6	31.54	126	35x4½
Westcott, 51	7	1,945	6	29.40	126	35x4½
Hudson, Super-Six	7	1,900	6	29.40	125½	35x4½
Paige, 6-46		1,900		29.40	123	34x4
Buick, D-44	5	1,875	6	25.35	115	32x4
Chalmers, 6-40	7	1,700	6	23.44	124	34x4
Westcott, 41	5	1,695	6	25.35	120	34x4
King, Eight	5		8	28.80	120	34x4
Halladay	5		6	21.60	122	34x4
Abbott	5		6	25.35	122	32x4
Hupmobile, N	5	1,365	4	22.50	119	34x4
Crow-Eckhart	5	1,095	4	19.60	112	32x3½
Maxwell	5	935	4	21.03	102	30x3½
Ford, T	5	740	4	22.50	100	30x3*

*Rear tires only.

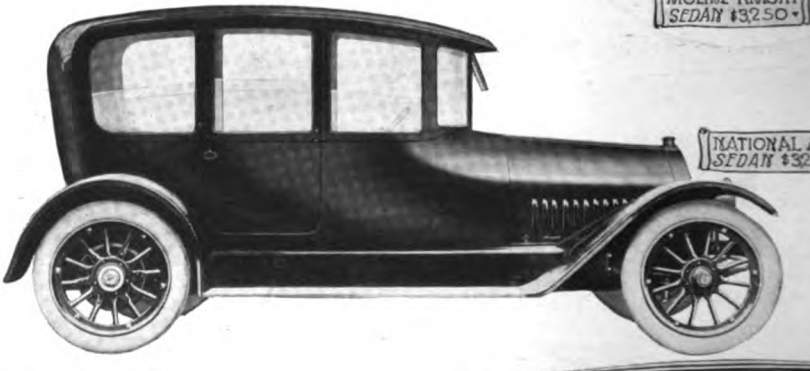
$5,000

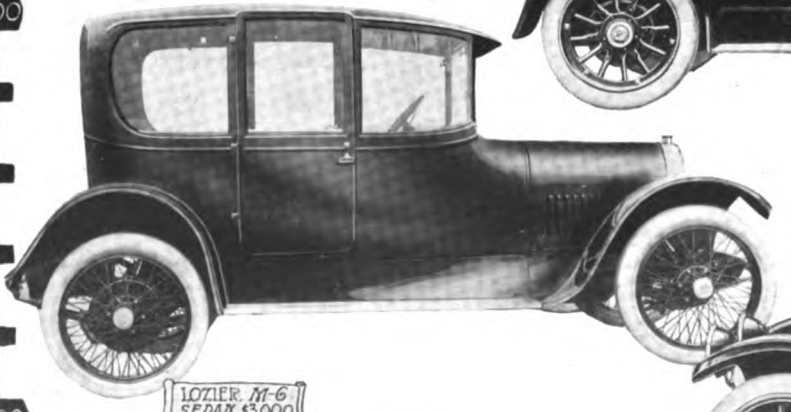
$4,500



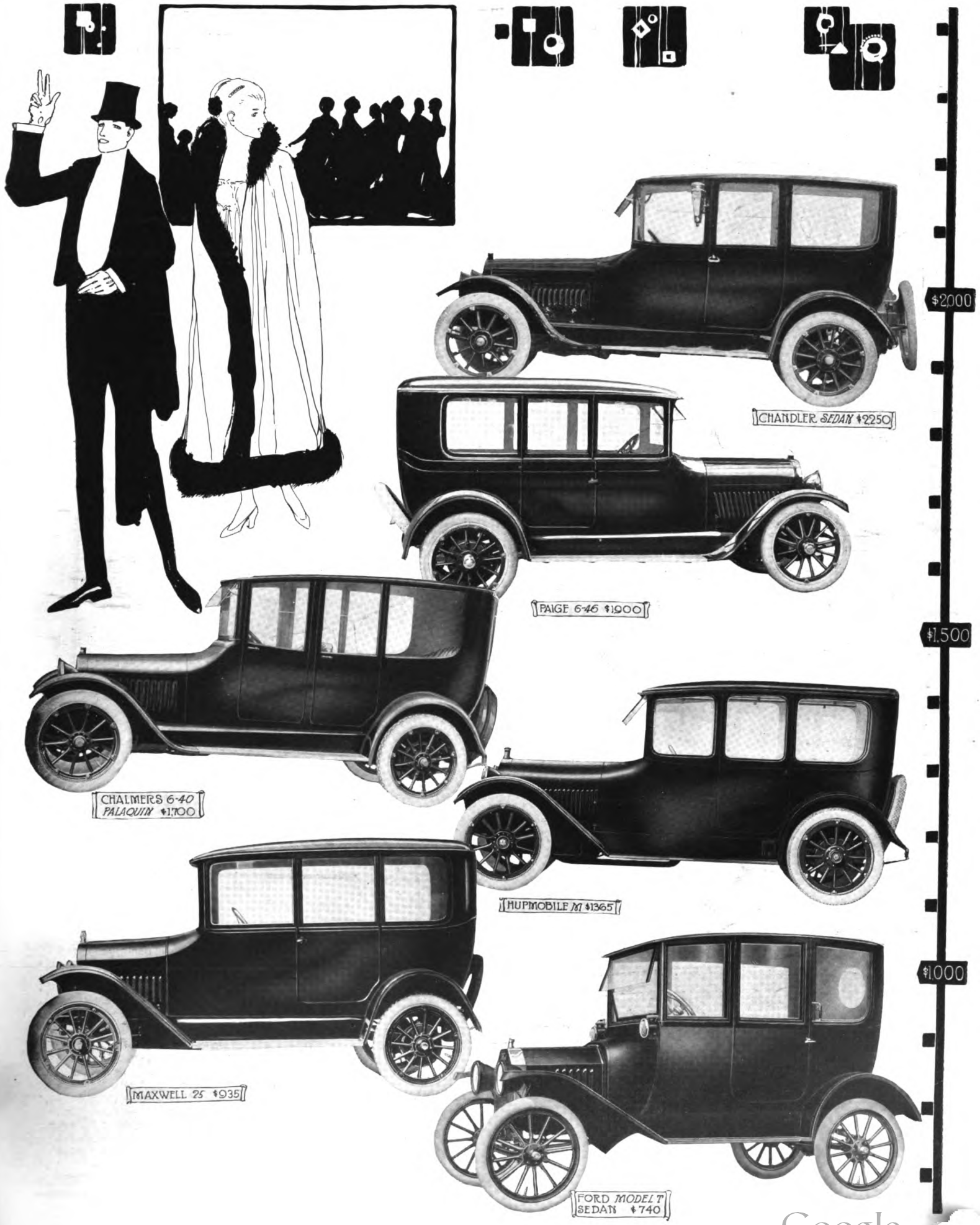
$4,000

$3,500

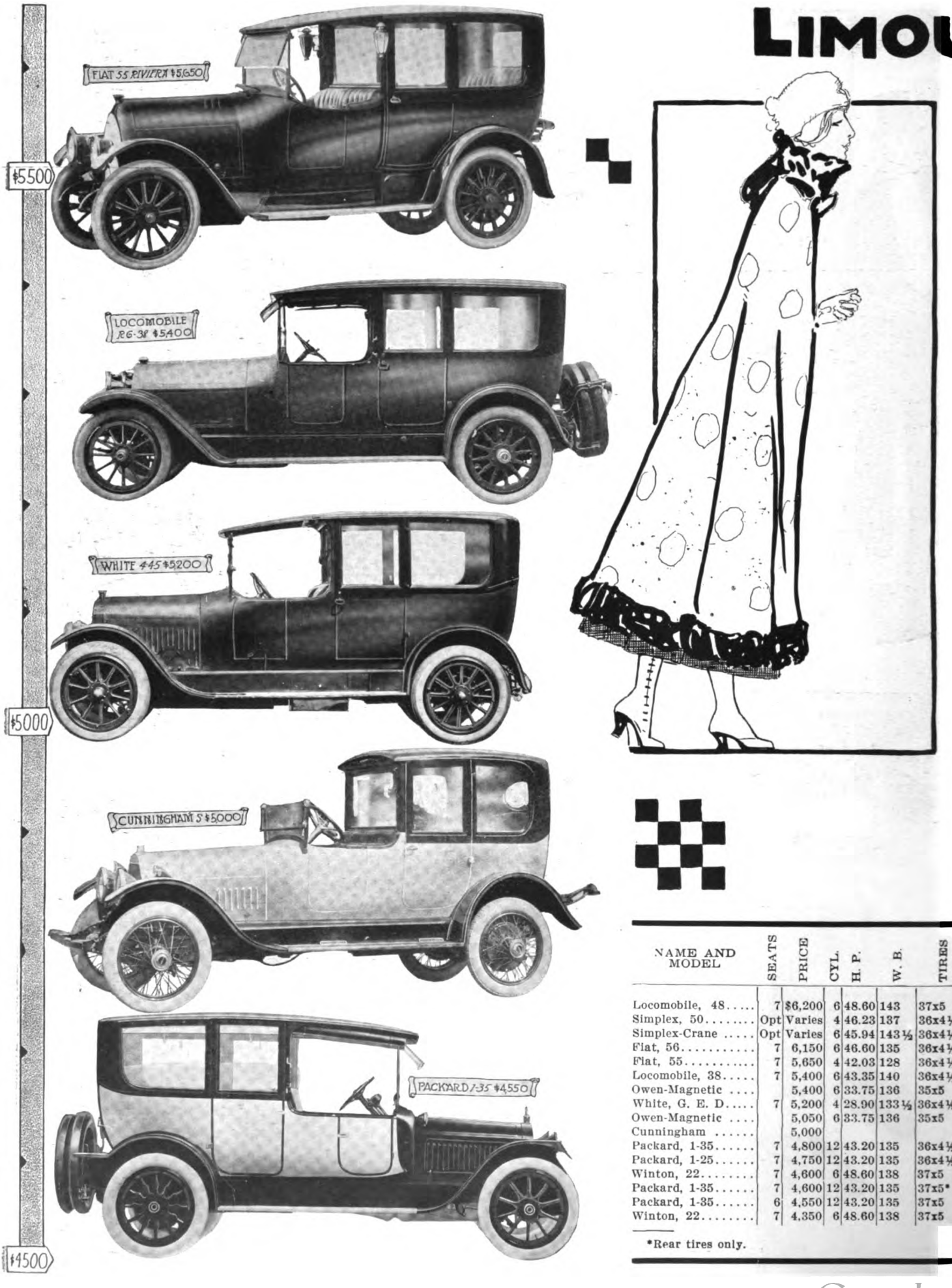




$3,000



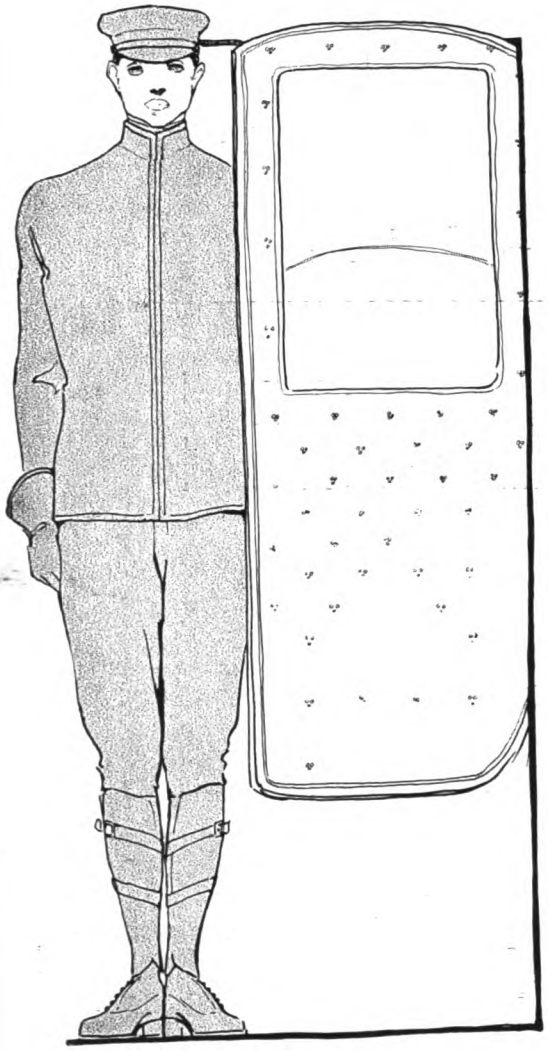
LIMOU

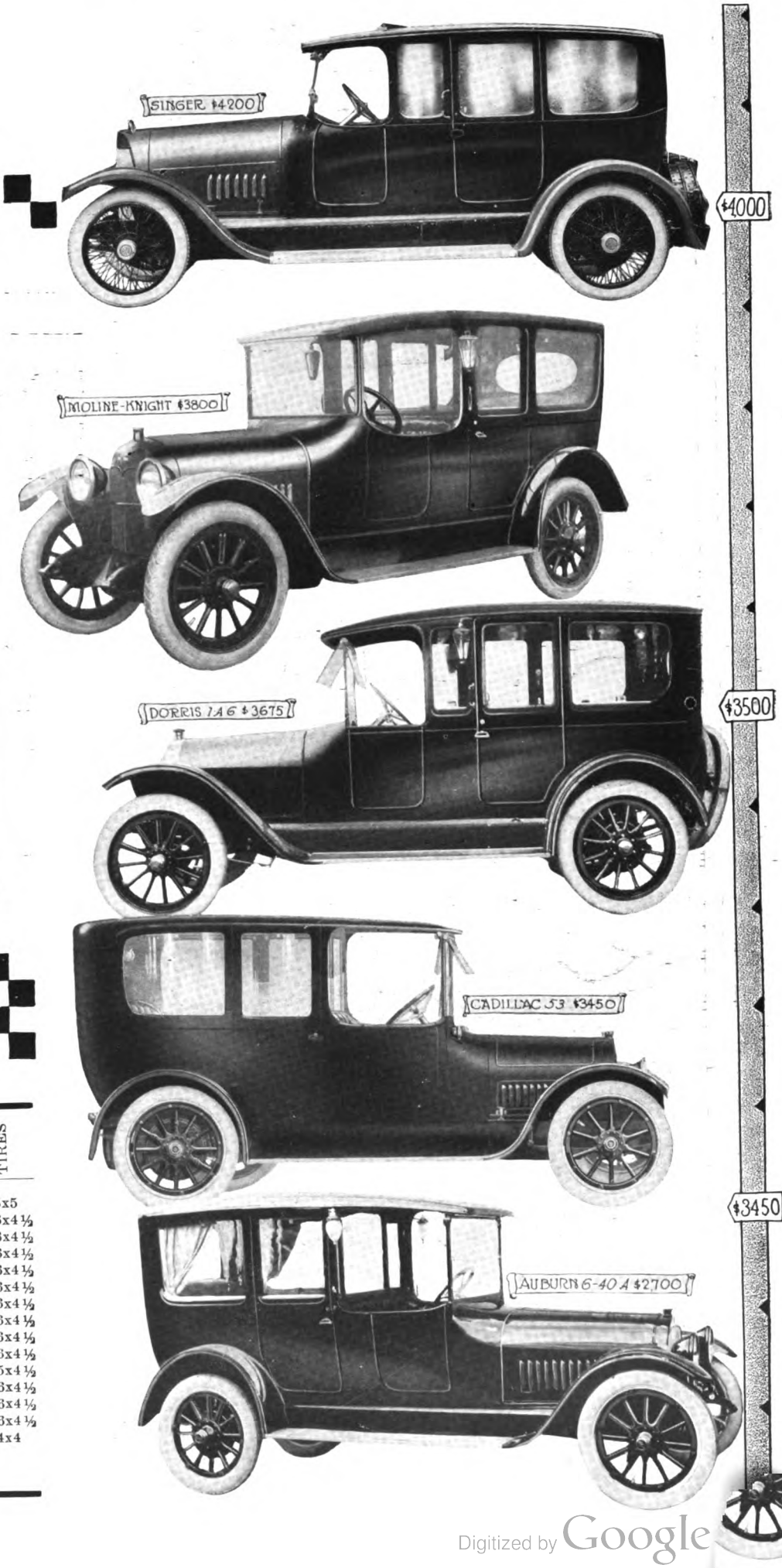


NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Locomobile, 48.....	7	$6,200	6	48.60	143	37x5
Simplex, 50.....	Opt	Varies	4	46.23	137	36x4½*
Simplex-Crane	Opt	Varies	6	45.94	143½	36x4½*
Fiat, 56.....	7	6,150	6	46.60	135	36x4½*
Fiat, 55.....	7	5,650	4	42.03	128	36x4½*
Locomobile, 38.....	7	5,400	6	43.35	140	36x4½*
Owen-Magnetic		5,400	6	33.75	136	35x5
White, G. E. D.....	7	5,200	4	28.90	133½	36x4¼
Owen-Magnetic		5,050	6	33.75	136	35x5
Cunningham		5,000				
Packard, 1-35.....	7	4,800	12	43.20	135	36x4½*
Packard, 1-25.....	7	4,750	12	43.20	135	36x4½*
Winton, 22.....	7	4,600	6	48.60	138	37x5
Packard, 1-35.....	7	4,600	12	43.20	135	37x5*
Packard, 1-35.....	6	4,550	12	43.20	135	37x5
Winton, 22.....	7	4,350	6	48.60	138	37x5

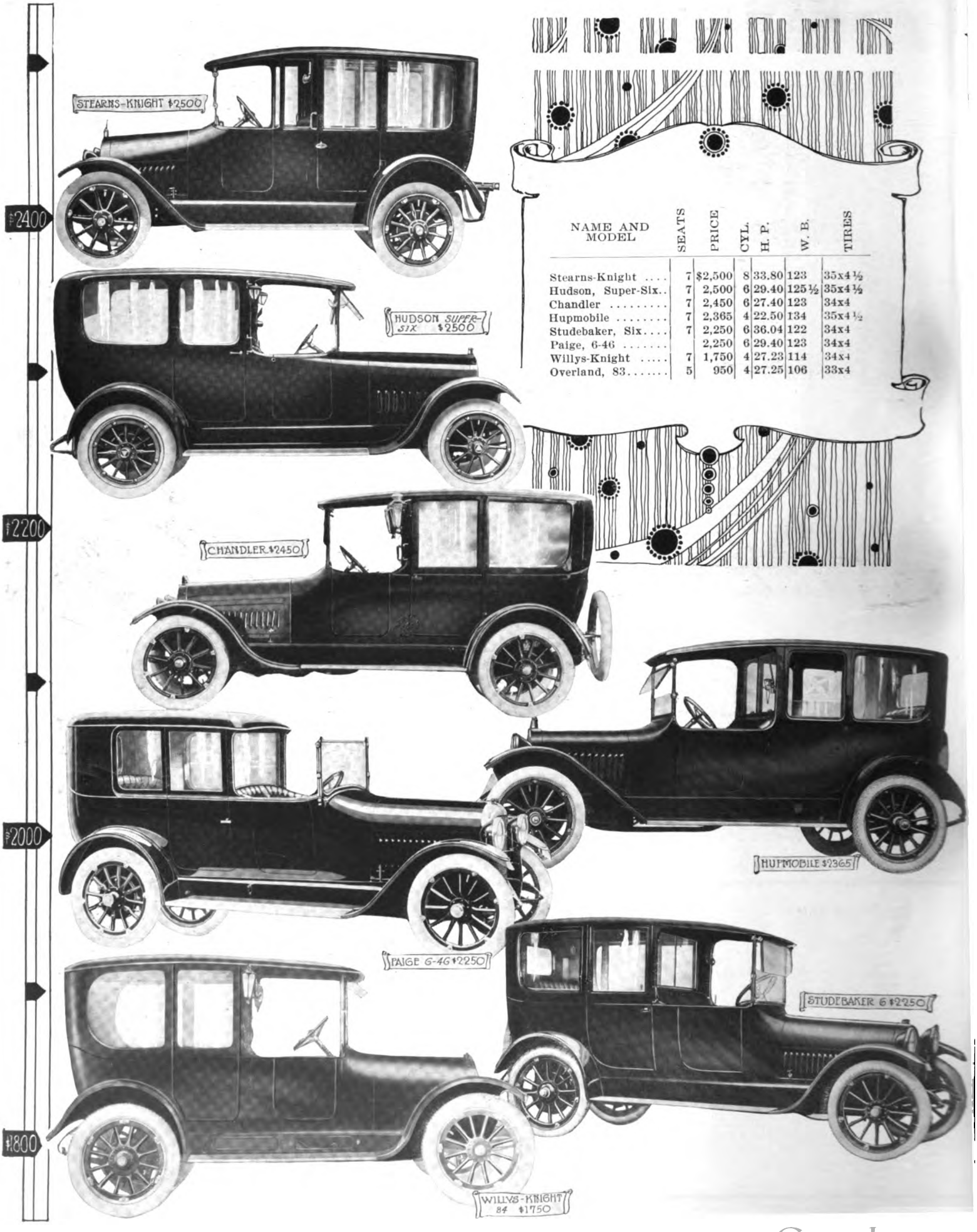
*Rear tires only.

SINES



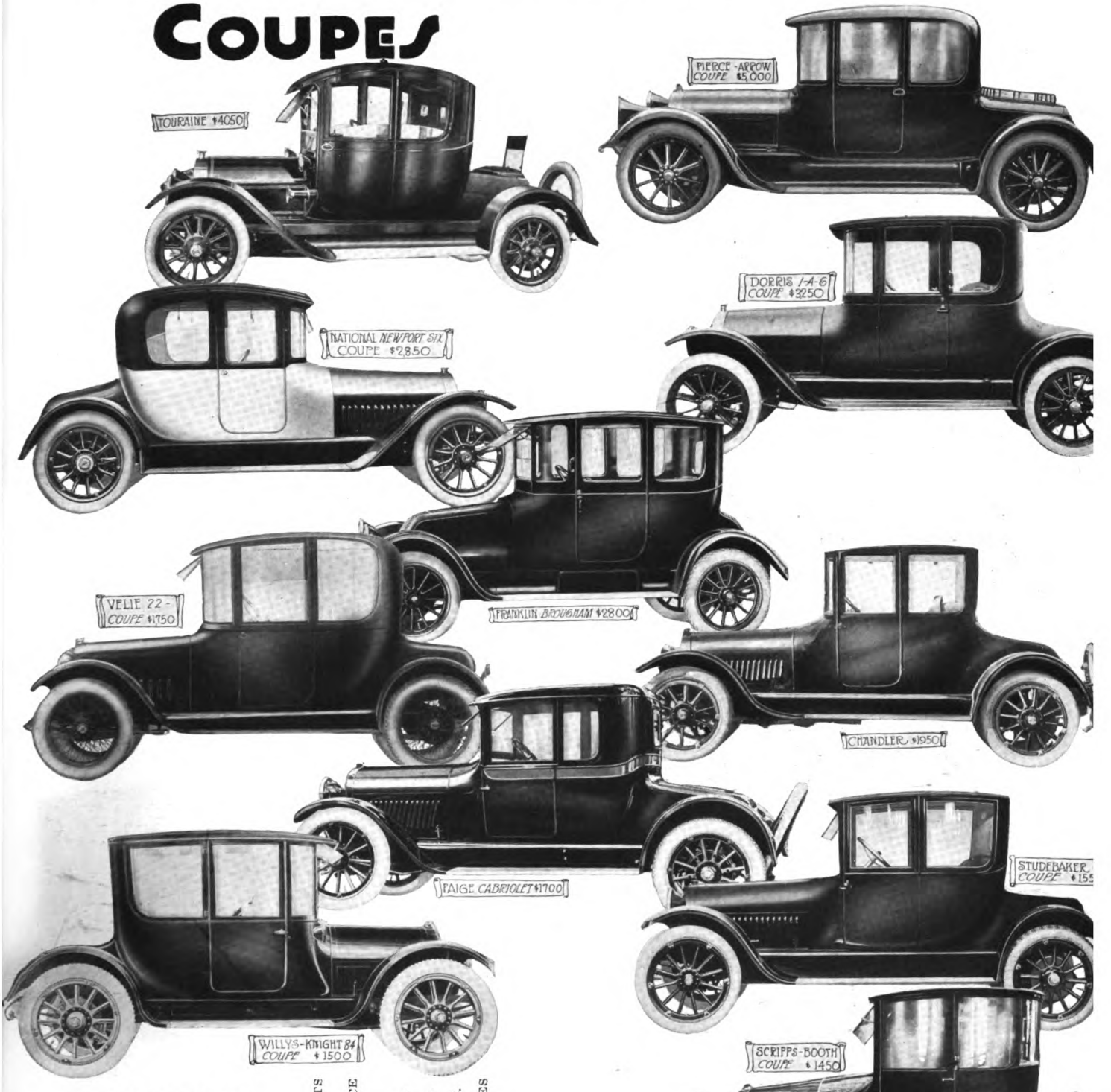


NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Singer	7	$4,200	6	38.40	138	35x5
McFarlan, X	7	4,200	6	48.60	132	36x4½
McFarlan, X	6	4,000	6	48.60	132	36x4½
Moline-Knight	7	3,800	4	25.60	128	36x4½
Dorris, I. A. C	7	3,675	6	38.40	128	36x4½
Standard	7	3,600	6	38.40	126	36x4½
Winton, 22-A	7	3,500	6	33.75	128	36x4½
Cadillac	7	3,450	8	31.25	122	36x4½
Dorris	7	3,425	6	45.94	121	36x4½
Chalmers	7	3,350	6	38.40	132	36x4½
Cole	8	3,250	8	39.20	126	35x4½
Winton, 22-A	7	3,250	6	33.75	128	36x4½
Packard	7	2,750	12	43.20	125	36x4½
Packard	6	2,750	12	43.20	125	36x4½
Auburn, 6-40	7	2,700	6	29.40	127	34x4



NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Stearns-Knight	7	$2,500	8	33.80	123	35x4½
Hudson, Super-Six..	7	2,500	6	29.40	125½	35x4½
Chandler	7	2,450	6	27.40	123	34x4
Hupmobile	7	2,365	4	22.50	134	35x4½
Studebaker, Six....	7	2,250	6	36.04	122	34x4
Paige, 6-46		2,250	6	29.40	123	34x4
Willys-Knight	7	1,750	4	27.23	114	34x4
Overland, 83.....	5	950	4	27.25	106	33x4

COUPES

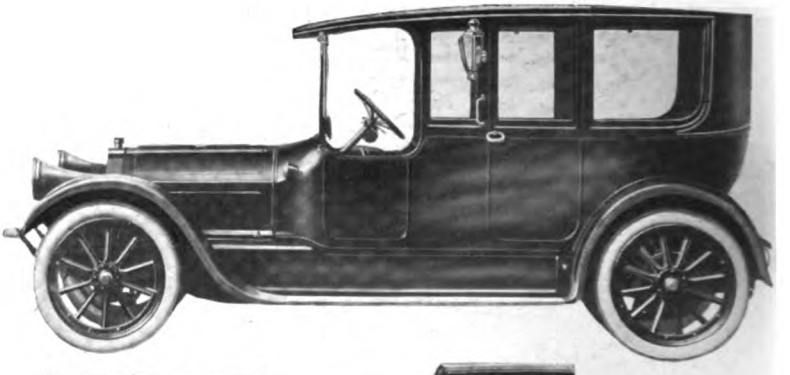


NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 48		$5,700	6	48.60	142	37x5
Pierce-Arrow, 38		5,000	6	38.40	134	36x4½
Touraine		4,050				
Packard	3	3,700	12	43.20	125	36x4½*
Dorris, 1-A-6	4	3,250	6	38.40	128	36x4½
Dorris, A-4	4	3,000	6	45.94	121	36x4½
National, Newport	4	2,850	6	33.75	134	36x4½
Franklin		2,800	6	31.54	120	34x4½
National, Highway 12	4	2,650	12	36.30	128	36x4½
Franklin	3	2,600	6	31.54	120	34x4½
National, Highway	4	2,350	6	29.40	128	34x4½
Cole, 8	4	2,185	8	39.20	126	35x4½
Chandler		1,950	6	27.34	123	34x4
Kissel, 6-42	4	1,950	6	31.54	126	34x4
Moon, 6-40	3	1,800	6	29.40	124	34x4
Mitchell, 6	3	1,795	6	29.40	125	34x4
Velie, 22	4	1,750	6	23.35	115	32x4
Paige, 6-46		1,750	6	29.40	123	34x4
Studebaker	4	1,550	6	36.04	122	34x4
Willys-Knight	4	1,500	4	27.23	114	34x4
Kissel, 4-32	4	1,450	4	24.03	115	33x4
Scripps-Booth	3	1,450	4	14.40	110	30x3½
Dispatch, H	3	1,200	4	22.50	120	36x3½
Crow, 30	3	995	4	19.60	112	32x3½
Pullman	3	990	4	22.50	114	31x4
Overland, 83	2	875	4	27.25	106	33x4
Harvard	3	850	4	14.40	100	28x3
Trumbull	2	600	4	13.23	80	28x3
Saxon	2	455	4	12.10	96	28x3

*Rear tires only.

$5500
$5000
$4500
$4000
$3500
$3000
$2500
$2000
$1500
$1000
$500

LANDAULETS

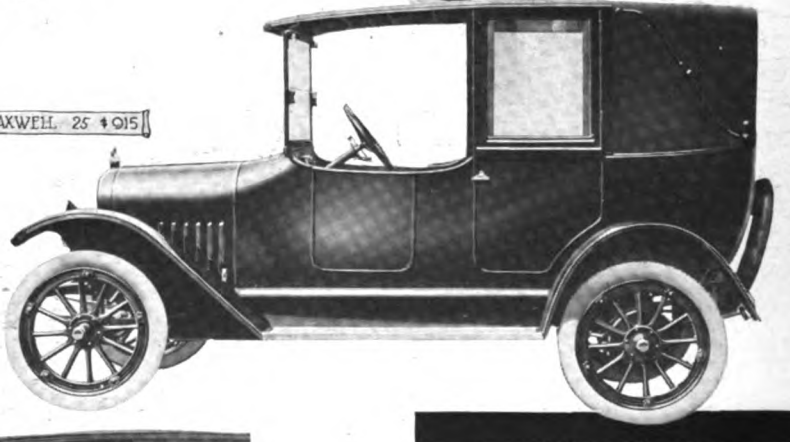


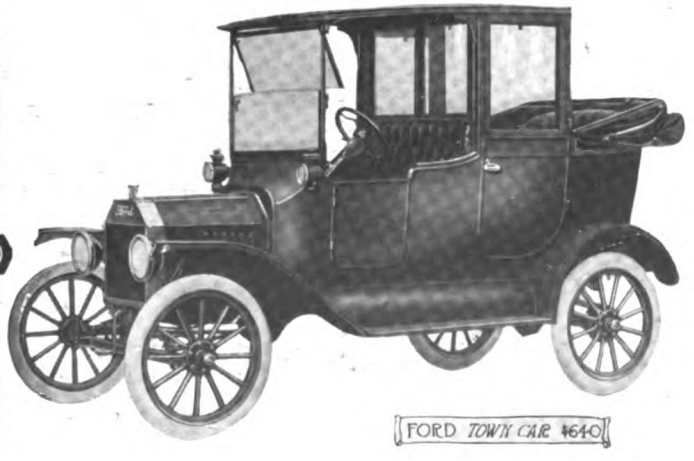
PIERCE-ARROW 38 C-4 LANDAULET $5,200.

WHITE 4-45 LANDAU-LIMOUSINE $5200

PACKARD 1-35 – LANDAULET $4650

MAXWELL 25 $915



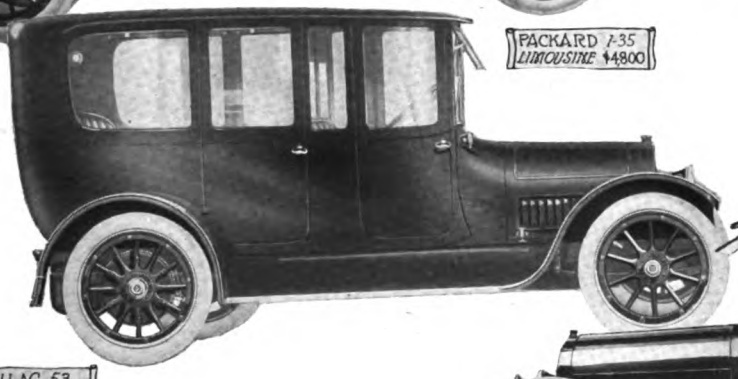


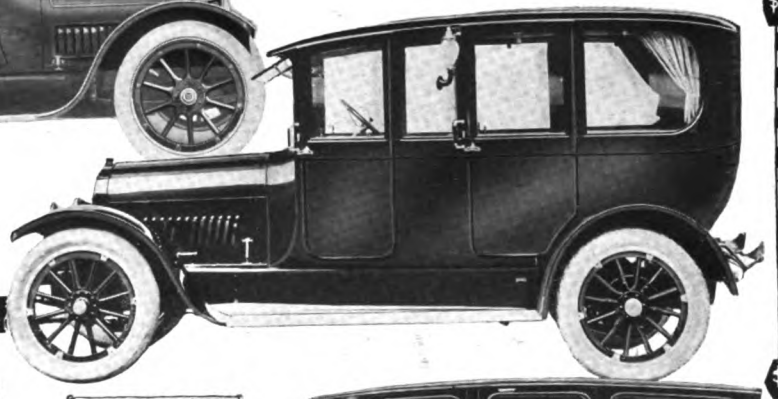
FORD TOWN CAR $640

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 66		$7,200	6	60.00	147 ½	37x5*
Locomobile, 48	7	6,300	6	48.60	143	37x5
Fiat, 56	7	6,250	6	46.60	135	36x4 ½ *
Pierce-Arrow, 48		6,200	6	48.60	142	37x5
Pierce-Arrow, 48, Brougham		5,800	6	48.60	142	37x5
Fiat, 55	7	5,750	4	42.03	128	36x4 ½ *
Locomobile, 38	7	5,500	6	43.35	140	36x4 ½ *
Pierce-Arrow, 38		5,200	6	38.40	134	36x4 ½
White, G. E. D.	7	5,200	4	28.90	133 ½	36x4 ½
Owen Magnetic			6	33.75	136	35x5
Winton	7	4,600	6	48.60	138	37x5
Packard, 1-35	6	4,650	12	43.20	135	36x4 ½ *
Singer	7	4,350	6	38.40	138	35x5
Packard	6	4,150	12	43.20	125	36x4 ½ *
Daniels		3,500	8	33.80	127	34x4 ½
Winton, 22A	7	3,500	6	33.75	128	26x4 ½
Packard	6	2,750	12	43.20	125	36x4 ½
Packard	7	2,750	12	43.20	125	36x4 ½
Maxwell, 25	6	915	4	21.03	102	30x3 ½
Ford, T	6	640	4	22.50	100	30x3*

*Rear tires only.

BERLINES





$8000 $7500 $7000 $6500 6000 $5500 $5000 $4500 $4000 $3500 $3000

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Simplex Crane		$7,800				
Pierce-Arrow, 66, Brougham		6,950	6	60.00	147½	37x5*
Pierce-Arrow, 66		6,800	6	60.00	147½	37x5*
Locomobile, 48	7	6,500	6	48.60	143	37x5
Fiat, 56	7	6,400	6	46.60	135	36x4½*
Pierce-Arrow, 48, Brougham		5,950	6	48.60	142	37x5
Fiat, 55	7	5,900	4	42.03	128	36x4½*
Locomobile, 38	7	5,700	6	43.35	140	36x4½*
Packard, 1-35	7	4,800	12	43.20	135	36x4½
Packard, 1-35	4	4,600	12	43.20	135	36x4½*
McFarlan, X	7	4,300	6	48.60	132	36x4½
Packard, 1-25, Brougham	4	4,200	12	43.20	125	36x4½*
Cadillac, 53	7	3,600	8	31.25	122	36x4½
Cole, 8-50-B		3,250	8	39.20	126	35x4½
Franklin	7	3,100	6	31.54	120	34x4½
Cadillac, 53, Brougham	5	2,950	8	31.25	122	36x4½

*Rear tires only.

$5500
$5000
$4500
$4000
$3500
$3000
$2500
$2000
$1500
$1000
$500

LANDAULETS

PIERCE-ARROW 38 C-4 LANDAULET $5,200.

WHITE 4-45 LANDAU-LIMOUSINE $5200

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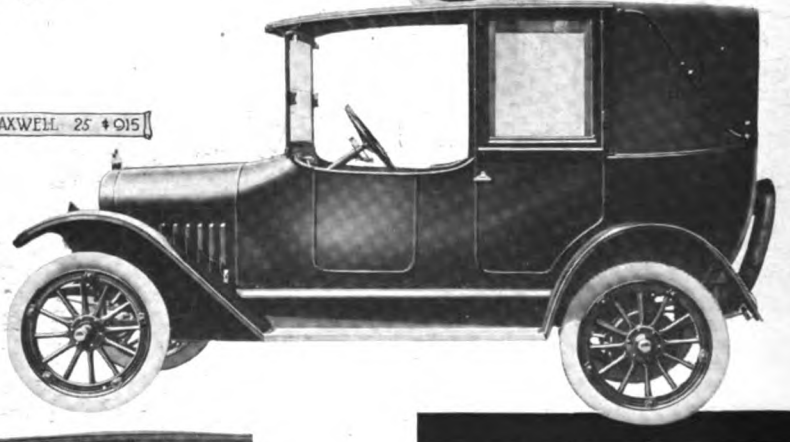
MAXWELL 25 $915

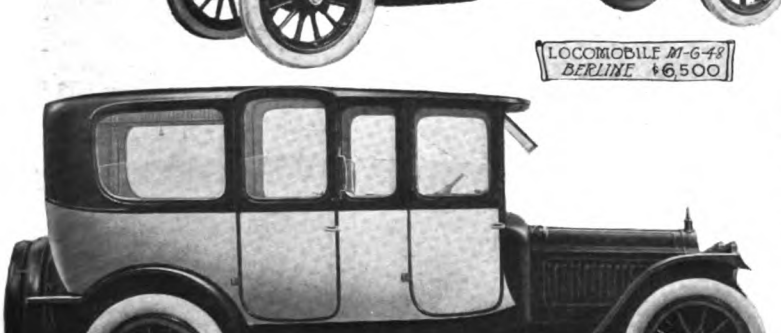


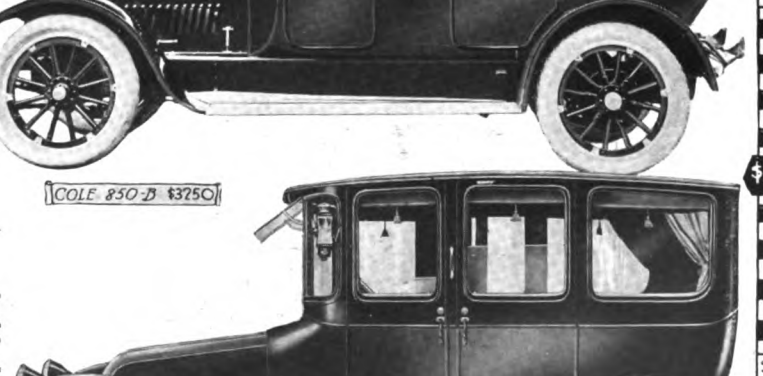
FORD TOWN CAR $640

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 66		$7,200	6	60.00	147 ½	37x5*
Locomobile, 48	7	6,300	6	48.60	143	37x5
Fiat, 56	7	6,250	6	46.60	135	36x4 ½*
Pierce-Arrow, 48		6,200	6	48.60	142	37x5
Pierce-Arrow, 48, Brougham		5,800	6	48.60	142	37x5
Fiat, 55	7	5,750	4	42.03	128	36x4 ½*
Locomobile, 38	7	5,500	6	43.35	140	36x4 ½*
Pierce-Arrow, 38		5,200	6	38.40	134	36x4 ½
White, G. E. D.	7	5,200	4	28.90	133 ½	36x4 ½
Owen Magnetic			6	33.75	136	35x5
Winton	7	4,600	6	48.60	138	37x5
Packard, 1-35	6	4,650	12	43.20	135	36x4 ½*
Singer	7	4,350	6	38.40	138	35x5
Packard	6	4,150	12	43.20	125	36x4 ½*
Daniels		3,500	8	33.80	127	34x4 ½
Winton, 22A	7	3,500	6	33.75	128	26x4 ½
Packard	6	2,750	12	43.20	125	36x4 ½
Packard	7	2,750	12	43.20	125	36x4 ½
Maxwell, 25	6	915	4	21.03	102	30x3 ½
Ford, T	6	640	4	22.50	100	30x3*

*Rear tires only.

BERLINES





$8000 $7500 $7000 $6500 $6000 $5500 $5000 $4500 $4000 $3500 $3000

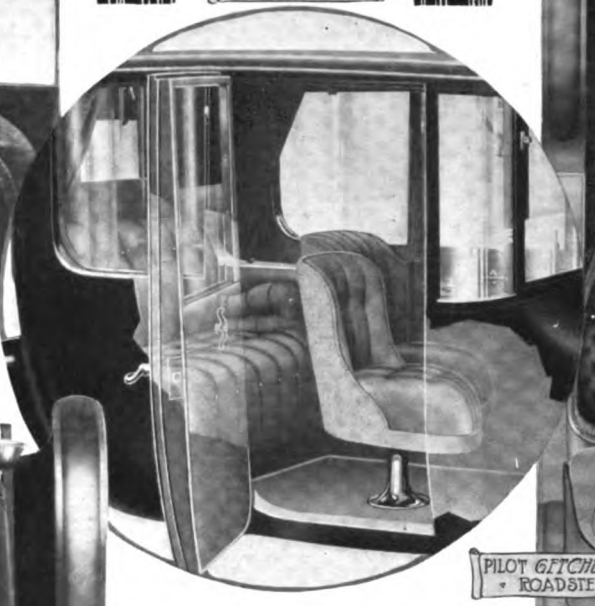
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Simplex Crane		$7,800				
Pierce-Arrow, 66, Brougham		6,950	6	60.00	147½	37x5*
Pierce-Arrow, 66		6,800	6	60.00	147½	37x5*
Locomobile, 48	7	6,500	6	48.60	143	37x5
Fiat, 56	7	6,400	6	46.60	135	36x4½*
Pierce-Arrow, 48, Brougham		5,950	6	48.60	142	37x5
Fiat, 55	7	5,900	4	42.03	128	36x4½*
Locomobile, 38	7	5,700	6	43.35	140	36x4½*
Packard, 1-35	7	4,800	12	43.20	135	36x4½
Packard, 1-35	4	4,600	12	43.20	135	36x4½*
McFarlan, X	7	4,300	6	48.60	132	36x4½
Packard, 1-25, Brougham	4	4,200	12	43.20	125	36x4½*
Cadillac, 53	7	3,600	8	31.25	122	36x4½
Cole, 8-50-B		3,250	8	39.20	126	35x4½
Franklin	7	3,100	6	31.54	120	34x4½
Cadillac, 53, Brougham	5	2,950	8	31.25	122	36x4½

*Rear tires only.

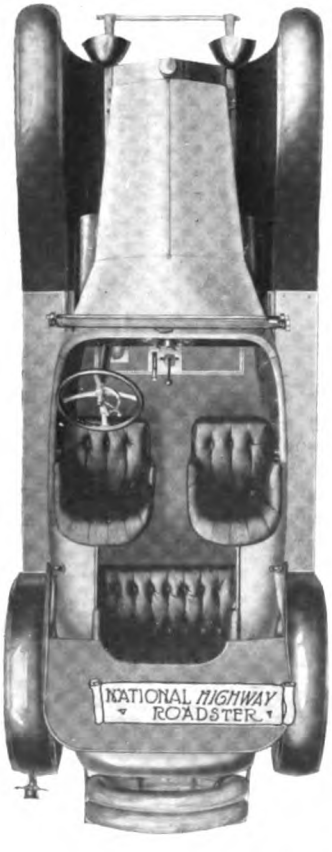
SEATING THE PASSENGERS

CHANDLER VESTIBULED SEATING

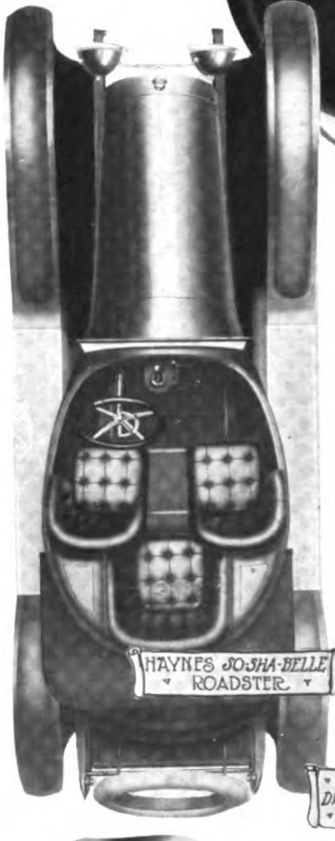
STEARNS-KNIGHT CHAIRS



PILOT GETCHUMMY ROADSTER



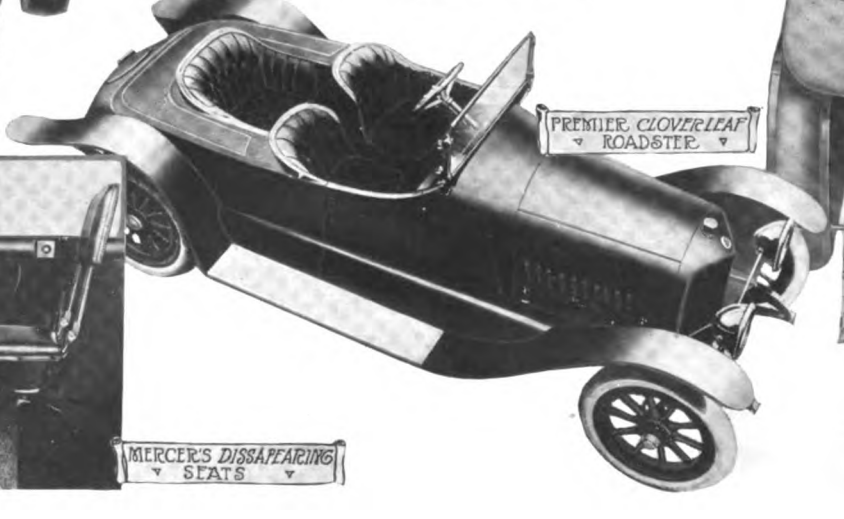
NATIONAL HIGHWAY ROADSTER



HAYNES JO-SHA-BELLE ROADSTER

COLE'S-THREE DISSAPEARING SEATS IN BERLINE

MITCHELL THREE SEATER



PREMIER CLOVERLEAF ROADSTER

MERCER'S DISSAPEARING SEATS

Four New Cars Announced

Paige, Briscoe, Haynes and Studebaker*

THE Paige Co. announces a new light six of the five-passenger form to sell at $1,050 and known as the Fleetwood Six-38 model, it replacing the Hollywood model that sold at $1,095. It is offered as a better car with greater value, despite the reduction in price. It has a larger and roomier body of more beauty of line, and is propelled by a larger, more powerful and smoother running engine than the model it supersedes, and besides these differences, it has higher quality upholstery, paint and finish.

Five inches have been added to the wheelbase, bringing it to 117 in., and the increased power is mainly attained by adding ⅛ in. to the cylinder bore, making it 3⅛ in. The stroke remains 5 in. This increased diameter boosts the N. A. C. C. rating from 21.6 to 23.5 hp., and the displacement from 212 cu. in. to 230 cu. in. The advertised horsepower is now 38, and much attention has been paid to engine balance, this also having to do with the greater power. As a step in this direction the crankshaft has been enlarged ¼ in., and it now operates on three 2-in. bearings of 2 11/16, 2¾ and 3⅛ in. length, front to rear. Much the same general design of the power plant is found, with the cylinder head detachable from the main cylinder block and the gearset in unit.

Other features of the chassis are a multiple-disk clutch, propeller shaft inclosed within a torsion tube, 44-in. cantilever rear springs, and 32 by 4 tires. In other respects, as in the general motor design, practically the same construction is used as for the previous model.

In addition to those motor changes that are conducive to more power, there are a number of smaller refinements that are worthy of attention. The forcing of oil to the main bearings and the timing gears is made more positive by a plunger pump operated by an eccentric on the camshaft, this taking the place of the formerly-used vane pump on the end of the camshaft. The main bearing caps are now held by four bolts instead of two, which makes a more substantial construction, and a point that should assist in maintaining compression is the fitting of three rings to the pistons instead of two. To aid in silencing the helical timing gears, a silk intermediate gear replaces the former iron one, so that neither gear with which it is in contact works against a metallic surface.

New Briscoe Four at $585

Following closely upon the increased facilities of the Briscoe Motor Co. as announced last week, comes the new Briscoe 24, which is the first product of the enlarged $6,000,000 corporation.

The new Briscoe has a reduction in price over the previous four, the new model selling at $585, whereas its predecessor listed at $750. The motor is 3⅛ by 5⅛ in. and the cylinders are block cast, cooling being obtained by the thermo-syphon system in connection with a honeycomb radiator. Lubrication is accomplished by the constant-level splash system. The rear axle is a floating design with gearless differential.

A two-unit system of starting and lighting is used. Regular equipment consists of a one-man waterproof top, rain-vision, clear-vision windshield, electric horn and tools. Tires are 30 by 3½ with demountable rims.

The car will be made in five-passenger touring car and two-passenger roadster models. This addition giving the Briscoe a triple line, the 4-38 at $750, and the 8-38 at $950 being continued. Production plans of the 24 call for 15,000 for 1916, while 10,000 of the other Briscoe models is the production figure set for the new year.

Haynes Adds Two Twelves

The Haynes Co. has developed a twelve-cylinder engine which will be supplied as alternative to the six-cylinder motor of the Haynes models 34 or 35. The additional cost will be about $400 and the new models will be precisely like the respective sixes in everything except the engine. The dimensions of this new motor are 2¾ by 5 in., so the stroke to bore ratio is much greater than the average.

Aluminum pistons are fitted and the lubrication system is of the full pressure variety, the motor externally being typical of Haynes design with two blocks of cylinders on an aluminum crankcase. The motor is attached to the frame at three points, which assists its interchangeability with the six-cylinder model.

The cars are very fully equipped and have wire wheels with cord tires as standard.

Studebaker Alters Prices

Changes in the nature of refinements are in evidence in the Studebakers just brought out as series 17. Although mechanically the four- and six-cylinder chassis are practically the same as they were, there is one noticeable difference in the adoption of the Stewart vacuum gasoline feed and the removal of the gasoline tank from the cowl to the rear of the chassis. Most of the refinements have come in the bodies, some of them as a result of this tank removal.

There have been some revisions of prices, too. The fours are all cheaper, the seven-passenger four-cylinder touring car being now offered at $845 instead of $885; the roadster is $25 less at $825 and the landau-roadster is $1,145 instead of $1,185. But where prices have been changed in the sixes, they have been slightly upward. The seven-passenger touring car stays at $1,050, but the six roadster is boosted from $1,000 to $1,025. The landau-roadster is the same as it was at $1,350, but the six coupe is $1,600 instead of $1,550; and the limousine has been raised $250 to $2,500. On the six chassis, a new body type has also appeared in the form of a seven-passenger sedan that sells at $1,675.

Perhaps the most attractive change in the bodies of the new touring cars in the division of the front seats into the individual type with a curved back for each passenger. Due to the shifting of the tank to the rear, the front seats have been moved forward 2¼ in., and they are provided with means of moving them forward or back 1¼ in., to meet the convenience of the occupant. The pedals have also been lengthened, providing a greater leverage. Along with these front compartment changes, the depth of the rear seating space has been increased 2 in., to give a roomier tonneau.

A little refinement that will be appreciated is the overlapping of the upper windshield glass over the lower by ⅜ in. so as to exclude wind and storm. Also due to the removal of the gasoline tank, the cowl board has been altered in design and the instruments rearranged neatly. The board is moved upward and forward to give more leg room, and as an added feature of convenience, the carbureter air control bracket is now located on the cowl board instead of the steering post.

*NOTE—The details of these cars were received too late for inclusion in our classified descriptions or in the specification tables.

1916 Passenger Automobiles Listed

Listing 108 Makes of Cars and 176 Chassis Models—Full Details of Power Plant Seventy-Eight Sixes, Twenty-

FOLLOWING its annual custom, THE AUTOMOBILE publishes herewith its table of specications to serve as a reference for the 1916 models. The information from which these tables are derived is authentic data furnished by the manufacturers themselves upon specification sheets especially adapted for the purpose. These sheets are filled out and signed by a member of the concern making the car, thereby rendering the information supplied accurate and as complete as possible. There are a few makers whose names do not appear in the list and where this occurs it is because the 1916 models have not as yet been announced and will not be until after the opening of the New York Show. In other instances models are announced in these tabulations for the first time.

Include 108 Makes

In addition to the information given in the tabulations a review of the field is given in the descriptions published on pages 1185 to 1212 of this issue, and for those to whom the price is of particular importance a buyer's guide will be found with cars listed under price classifications on pages 1213 to 1244. This other information, together with the complete data furnished in the specification tables herewith, offers an excellent opportunity to not only observe the trends of the industry and its individual design, but also for the intended purchaser offers a far better opportunity for investigation than would be secured in a week's visit along the showrooms of the automobile row of a large city.

Tabulations on this and succeeding pages include the names of 108 different manufacturers and a total of 176 different chassis models. These are listed alphabetically, and in every case are the models that the manufacturers named are placing on the market for the 1916 season. The use to which these tables are put depends entirely upon the purpose of the reader. For the purchaser, the better way would be to first turn to the price classification and select the name of the manufacturer making models at the price desired. After the names and models have been noted, the specification tables should be turned to and here, at a glance, the intending purchaser can make whatever comparisons he desires and see which car is most closely adapted to his needs.

In going over the mechanical specifications of a car the nature of the work that the car is intended to do must be taken into careful consideration. Naturally, for a hilly, arduous country, the intending purchaser looks for a car with plenty of reserve power and a gear ratio which will enable him to meet the difficulties of the country. On the other hand, a car which is intended to be used over the level surfaces of the city streets may not require the weight and power of the car intended for the rougher countries, but on the other hand should show the factors of economy and comfort.

The arrangement of the tables follow through the chassis in logical order. The power plant is first considered, and under this broad head the number of cylinders, the bore and stroke dimensions, horsepower, displacement, cylinder shape, make of motor, details of the valve location, camshaft drive, cooling, lubrication, ignition, carburetion and electrical equipment are furnished.

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement, Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC SYSTEM Starter Make	ELECTRIC SYSTEM Lighting Make
A																				
Abbott, 8-44	8	3.250x5.000	33.80	331.8	V	4		Inside	Hel'l	P	Pressure	Piston	Single	Remy	Hand	Zenith	Vacuum	Yes	Auto-l	Auto-l
Abbott, 6-44	6	3.250x4.500	25.85	224.0	L	6		Left	Hel'l	P	Splash-Pres	Piston	Single	Remy	Hand	Zenith	Vacuum	Yes	Remy	Remy
Allen	4	3.750x5.000	22.50	220.9	L	4	Own	Right	Hel'l	T	Splash	Piston	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Westhse	Westhse
Apperson, 8-16	8	3.125x5.000	31.25	306.8	V	4	Own	Inside	Hel'l	T	Pressure	Gear	Dual	Remy	Hand		Vacuum	Yes	Bijur	Bijur
Apperson, 6-16	6	3.500x5.125	29.40	295.9	L	6	Own	Right	Hel'l	P	Pressure	Gear	Dual	Remy	Hand		Vacuum	Yes	Bijur	Bijur
Arbenz, 25	4	3.250x5.000	16.90	165.9	L	4	Lycoming	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Carter	Gravity	Yes	Aplco	Aplco
Argo	4	3.125x4.000	15.63	122.7	L	4		Left	Hel'l	T	Splash		Single	Conn	Hand	Mayer	Gravity	No	Disco	Disco
Argo Roadster	4	3.125x4.000	15.63	122.7	L	4		Left	Hel'l	T	Splash		Single	Conn	Hand	Mayer	Gravity	No	Disco	Disco
Auburn, 6-38	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash	Vane	Single	Remy	H & A	Rayfield	Vacuum	Yes	Remy	Remy
Auburn, 6-40A	6	3.500x5.000	29.40	288.6	L	6	Continental	Right	Hel'l	P	Splash	Piston	Single	Delco	H & A	Rayfield	Vacuum	Yes	Delco	Delco
Auburn, 4-38	4	3.875x5.000	24.03	235.8	T	4	Teetor	Opp	Hel'l	P	Splash	Piston	Single	Remy	H & A	Rayfield	Vacuum	Yes	Remy	Remy

ABBREVIATIONS:—**Cylinder Shape:** L-Head, L; T-Head, T. **Make of Motor:** Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut.&Beav.; Golden, Belknap & Swarts, G.B.&S. **Valve Location:** Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. **Camshaft Drive:** Helical, Hel'l; Spur Gears, Spur. **Cooling Circulation:** Thermo Syphon, T; Pump, P. **Lubrication System:** Splash Pressure, Splash-Pres. **Ignition Make:** Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. **Ignition Control:** Hand and Automatic, H&A; Automatic, Atmtc. **Make of Carbureter:** Stromberg, Strombrg.

with Their Technical Specifications

Transmission System and Running Gear of Seventy-Three Models of Fours, Three Eights and Four Twelves

In giving the bore and stroke of the motor the fractions of an inch are supplied in decimals carried accurately to three places. Since practically all the manufacturers in this country have motors with dimensions which do not run to smaller fractions than eighths of an inch, this decimal system gives the measurements with absolute accuracy.

Supply Formula Horsepower

Under the head, Society of Automobile Engineers Horsepower, denoted in the table as S. A. E. H. P., the formula horsepower is supplied. This is the figure arrived at by the use of the formula which has become generally accepted by insurance rating concerns and by state and municipal authorities. The formula is the bore squared times the number of cylinders divided by 2.5. Thus, a six-cylinder motor with 3 by 5 cylinders would have its horsepower calculated by formula by carrying out the operation of multiplying 3 by 3 by 6 and dividing by 2.5, giving a rating of 21.60 horsepower. This figure must be regarded as separate and distinct from the brake horsepower, which depends altogether upon the individual characteristics of the motor and which, therefore, cannot be estimated but must be determined by actual tests. Since test figures are not available, no attempt has been made to publish brake horsepower.

In order to complete the information given by the formula horsepower, which in the modern design is practically certain to be below the maximum output, the piston displacement also is furnished. This gives an accurate clue to the capacity of the motors and, in fact, is probably more of a guide to expected output than the formula.

Supplemental Late Information

Information arriving too late to be put in the alphabetical tabulation below is given herewith. Other new cars, of which detailed specifications are not available, are described on page 1245.

Chalmers Light Six

Chalmers Light Six, No. of Cylinders, 6; Bore and Stroke, 3.250 by 4.500; S. A. E. H.P., 25.4; Piston Displacement, 224; Shape, I; Cast, 6; Valve Location, Head; Camshaft Drive, Hel'l; Lubricating System, Splash-Pressure; Ignition, Single; Remy; Carbureter, Stromberg; Electric Lighting and Starting, Westinghouse; Clutch, Disk; Gearset, Three-speed; Selective, Unit M; Axle, Timken Semi-floating; Gear Ratio, 4.75 to 1; Wheelbase, 115 In.; Tires, 32 by 4; Rear Springs, Semi-elliptic; Steeling Wheel, Left; Control, Center; Crankshaft Bearing, Plain, 3; Anti-friction Bearings, Gearset Bearings, Roller; Rear Axle Bearings, Roller; Front Wheel Bearings, Roller.

Pilot 8-55

Pilot 8-55; No. of Cylinders, 8; Bore and Stroke, 3.000 by 5.125; S. A. E. H.P., 28.80; Piston Displacement, 289.8; Cylinder Shape, V; Cast, 4; Valve Location, Inside; Camshaft Drive, Hel'l; Cooling, Thermo; Lubrication, Pressure; Oil Pump, Gear; Ignition, Single, Westinghouse; Hand and Automatic Control, Starting and Lighting, Westinghouse; Clutch, Disk; Gearset, Selective, Unit M; Three-Speeds; Spiral Bevel Drive; Drive Through Springs; Axle, Floating, Hess; Gear Ratio, 4 to 1; Wheelbase, 126; Tires, 34 by 4; Spring Cantilever; Left Drive, Center Control; Crankshaft Bearing; Plain 3; Gearset Bearings, Ball; Rear Axle Bearings, Ball; Front Wheel Bearings, Roller.

Hollier Eight

Hollier Eight, No. of Cylinders, 8; Bore and Stroke, 3 by 4¼; S. A. E. H.P., 28.80; Piston Displacement, 240.3; Shape, V; Cast, 4's; Valve Location, inside; Camshaft Drive, Hel'l; Lubricating System, Pressure; Oil Pump, Gear; Ignition, Single, At. Kent, Atmtc. Control; Carbureter, Stewart; Electric Starting and Lighting, Apelco; Clutch, Cone; Gearset, Selective, Amidships, Three-Speed; Final Drive, Bevel; Gear Ratio, 4 to 1; Wheelbase, 112; Tires, 32 x 3½; Wheels, Wood; Rear Springs, Cantilever; Steering Wheel, Left; Control, Center; Crankshaft Bearings, Plain, 3; Anti-Friction Bearing, Gearset, Ball; Rear Axle, B. & R.

Lexington 6-0

Lexington 6-0, No. of Cylinders, 6; Bore and Stroke, 3.250 by 4.500; S. A. E. H.P., 25.35; Piston Displacement, 224.0; How Cast, 6; Cooling Circulation, Pump; Lubrication, Splash Pressure; Ignition, Single; Electric Starting and Lighting, Westinghouse; Fuel Feed, Vacuum; Clutch, Disk; Gearset Type, Selective; Location, Unit M; Number of Speeds, Three; Drive, Spiral Bevel; Drive Through, Springs; Rear Axle, Floating; Make, Hess; Wheelbase, 116; Tires, 32 by 4; Steering Location, Left; Levers, Center.

H A L Twelve

H A L Twelve, Motor, Twelve-Cylinder; Bore and Stroke, 2.875 by 5.000; S. A. E. H.P., 39.68; Piston Displacement, 389.5; Wheel base, 135 in.; Tires, 34 by 4½.

TRANSMISSION							RUNNING GEAR					CONTROL				ANTI-FRICTION BEARINGS			
GEARSET								TIRES											
Location	Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R Axle	Total Gear Ratio on Direct	Wheelbase	Front	Rear	Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Make of Speedometer	Crankshaft Bearings, Type and No.	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
Unit M.	3	Sp.B.	Rad.Rd	Float...	Jacobson..	4.60–1	121	35x4½	35x4½	Wood.	¾ Ell..	Left...	Center.	.....	Plain 3.	Roll...	Roll..	Roll.	A
Unit M..	3	Sp.B..	Spring	Float...	Hess.....	4.58–1	122	32x4	32x4	Wood.	S-E....	Left...	Center.	.....	Plain 3.	Roll...	Roll.	Ball	Abbott, 8–44
Unit M..	3	Bevel.	Spring..	Float....	Own.....	4.00–1	112	32x3½	32x3½	Wood.	S-E....	Left...	Center.	Corbin.....	Plain 2.	Ball ..	Ball ..	Ball..	Abbott, 6–44
Amid...	3	Sp.B..	Spring..	Semi-F..	Own.....	4.25–1	128	35x4½	35x4½	Wood.	¾ Ell..	Left..	Center.	.....	Plain 3.	Roll...	Roll..	Ball ..	Allen
Amid...	3	Sp.B..	Spring..	Semi-F..	Own.....	3.92–1	128	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	.....	Plain 4.	Roll...	Roll..	Ball ..	Apperson, 8–16
Unit M.	3	Bevel.	Spring..	Float...	Gemco....	4.25–1	108	30x3½	30x3½	Wood.	Cant..	Left..	Center.	Carter.....	Plain 2.	Ball...	Roll..	Ball ..	Apperson, 6–16
Unit X..	3	Bevel.	Spring..	Semi-F..	Own.....	4.25–1	103	30x3	30x3	Wood.	Ell....	Left...	Center.	None.....	Plain 2.	Ball ..	Ball ..	Ball ..	Arbenz, 25
Amid...	2	Bevel.	Rad.Rd	Semi-F..	Own.....	4.25–1	96	30x3	30x3	Wood.	Ell....	Left...	Center.	None.....	Plain 2.	Ball ..	Ball ..	Ball ..	Argo
Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.42–1	120	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart-W....	Plain...	Ball ..	Ball ..	B&R.	Argo Roadster
Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.00–1	127	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart-W....	Plain...	Ball ..	B&R.	Ball ..	Auburn, 6–38
Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.00–1	114	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart-W....	Plain...	Ball ..	B&R.	Ball ..	Auburn, 6–40–A
																			Auburn, 4–38

ONS:—Starter Make: Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; use, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, Unit with Axle, Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle:** Floating, i-Floating, Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weiss, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter Ell; Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R.

1916 Passenger Automobiles Listed with

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement, Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC SYSTEM Starter Make	ELECTRIC SYSTEM Lighting Make
B																				
Bell, A-16	4	3.500x5.000	19.60	192.4	L	4	Lycoming	Right	Hel'l	T	Splash	Piston	Single	At Kent	Hand	Carter	Gravity	No	Disco	Disco
Biddle, D	4	3.750x5.125	22.50	226.4	L	4	Own	Right	Hel'l	T	Splash-Pres	Gear	Single	Westhse	H & A	Special	Vacuum	No	Westhse	Westhse
Brewster	4	4.000x5.500	25.60	276.5	...	4	Own	Kni	Chain	P	Pressure	Gear	Single	Bosch	Hand	Zenith	Vacuum	Yes	U.S.L.	U.S.L.
Briscoe, 8	8	3.000x3.500	28.80	197.9	I	4	Ferro	Head	Hel'l	T	Pressure	.....	Single	Remy	Hand	Zenith	Gravity	Yes	Aplco	Aplco
Briscoe, 4-38	4	3.437x5.125	18.91	190.4	L	4	Model	Left	Hel'l	T	Splash	Piston	Single	Remy	Hand	Mayer	Gravity	Yes	Aplco	Aplco
Buick, D-54, D-55	6	3.750x5.000	33.75	331.4	I	2	Own	Head	Hel'l	P	Splash	Gear	Single	Delco	H & A	Marvel	Vacuum	No	Delco	Delco
Buick, D-44, D-45	6	3.250x4.500	25.35	224.0	I	6	Own	Head	Hel'l	P	Splash	Gear	Single	Delco	H & A	Marvel	Vacuum	No	Delco	Delco
C																				
Cadillac, 53	8	3.125x5.125	31.25	314.4	V	4	Own	Inside	Chain	P	Pressure	Gear	Single	Delco	H & A	Own	Pressure	No	Delco	Delco
Cameron	6	3.000x5.000	21.60	212.0	L	6	Own	Left	Spur	P	Splash-Pres	Piston	Single	At Kent	H & A	Zephyr	Gravity	Yes	Aplco	Aplco
Case, T	4	3.625x6.000	21.03	247.7	L	4	Own	Right	Chain	T	Splash-Pres	Piston	Dual	Westhse	Hand	Own	Gravity	Yes	Westhse	Westhse
Chalmers, Master 6	6	4.000x5.500	38.40	414.7	T	3	Own	Opp	Hel'l	P	Splash-Pres	Gear	Single	Bosch	Hand	Rayfield	Pres-grav	Yes	Entz	Entz
Chalmers, 48	6	3.500x5.500	29.40	317.5	T	6	Own	Opp	Hel'l	T	Splash-Pres	Gear	Single	At Kent	H & A	Rayfield	Gravity	Yes	Entz	Entz
Chalmers, 40	6	3.125x5.000	23.44	230.1	I	6	Own	Head	Worm	T	Splash-Pres	Gear	Single	At Kent	H & A	Rayfield	Gravity	Yes	G & D	G & D
Chandler, 16	6	3.375x5.000	27.34	268.4	L	3	Own	Right	Chain	P	Splash	Piston	Single	Bosch	Hand	Rayfield	Vacuum	Yes	G & D	G & D
Chevrolet, Royal Mail H-2½	4	3.687x4.000	21.76	170.9	I	4	Own	Head	Hel'l	T	Splash	Gear	Single	Conn	Hand	Zenith	Pressure	Yes	Auto-l	Auto-l
Chevrolet, Baby Grand H-4	4	3.687x4.000	21.76	170.9	I	4	Own	Head	Hel'l	T	Splash	Gear	Single	Conn	Hand	Zenith	Pressure	Yes	Auto-l	Auto-l
Chevrolet, Royal Mail H-2	4	3.687x4.000	21.76	170.9	I	4	Own	Head	Hel'l	T	Splash	Gear	Single	Conn	Hand	Zenith	Gravity	Yes	Auto-l	Auto-l
Chevrolet, 4-90	4	3.687x4.000	21.76	170.9	I	4	Own	Head	Hel'l	T	Splash	Piston	Single	Simms	Hand	Zenith	Gravity	Yes	Auto-l	Auto-l
Cole 8-50	8	3.500x4.500	39.20	346.3	V	4	Northway	Inside	Hel'l	P	Splash-Pres	Gear	Dual	Delco	H & A	Strombrg	Vacuum	Yes	Delco	Delco
Crow-Elkhart, 30	4	3.500x5.000	19.60	192.4	L	4	Lycoming	Right	Hel'l	T	Splash	Piston	Single	Conn	Hand	Zenith	Gravity	Yes	Disco	Disco
D																				
Daniels, A	8	3.250x5.000	33.80	331.8	V	4	Hersch-Spill	Inside	Hel'l	P	Pressure	Gear	Single	Westhse	Hand	Zenith	Vacuum	Yes	Westhse	Westhse
Davis, 6-F	6	3.250x4.500	25.35	224.0	L	6	Own	Right	Hel'l	P	Splash	Piston	Single	Delco	H & A	Strombrg	Vacuum	Yes	Delco	Delco
Davis, 6-E	6	3.500x5.250	29.40	303.1	L	6	Own	Right	Hel'l	P	Splash	Piston	Single	Delco	H & A	Strombrg	Vacuum	Yes	Delco	Delco
Detroiter, F	4	3.750x4.250	22.50	187.7	L	4	.....	Left	Chain	T	Splash	Piston	Single	Splitdorf	Hand	Schebler	Gravity	Yes	Dyneto	Dyneto
Dispatch, G	4	3.750x5.000	22.50	220.9	L	4	Wisconsin	Left	Hel'l	T	Pressure	Gear	Single	Bosch	Hand	Rayfield	Gravity	Yes	U.S.L.	U.S.L.
Dodge	4	3.875x4.500	24.03	212.3	L	4	Own	Right	Hel'l	P	Splash	Vane	Single	Eisemann	Hand	Stewart	Pressure	Yes	N.E.	N.E.
Dorris, 1-A-4	6	4.375x5.000	45.94	451.0	I	2	Own	Head	Hel'l	P	Splash	Gear	Single	Westhse	Hand	Strombrg	Vacuum	No	Westhse	Westhse
Dorris, 1-A-6	6	4.000x5.000	38.40	377.0	I	3	Own	Head	Hel'l	P	Splash	Gear	Single	Bosch	Hand	Strombrg	Vacuum	No	Westhse	Westhse
Dort, 5-A	4	3.250x5.000	16.90	165.9	L	4	Own	Right	Hel'l	T	Splash	Piston	Single	Conn	Hand	Carter	Gravity	Yes	Westhse	Westhse
E																				
Elkhart	4	3.500x5.000	19.60	192.4	L	4	Lycoming	R&Hd	Hel'l	T	Splash	Piston	Single	Delco	Atmtc	Carter	Vacuum	Yes	Aplco	Aplco
Empire, 60	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Conn	Hand	Schebler	Vacuum	Yes	Auto-l	Auto-l
Empire, 45	4	3.875x5.000	24.03	235.8	T	4	Teetor	Opp	Hel'l	T	Splash	None	Single	Conn	Hand	Schebler	Vacuum	Yes	Auto-l	Auto-l
Enger, Twin-Six	12	2.625x3.500	33.08	227.3	I	6	Own	Head	Chain	T	Splash-Pres	Gear	Single	Remy	Hand	Zenith	Gravity	No	Westhse	Westhse
F																				
Farmack	4	3.500x5.000	19.60	192.4	I	4	Own	Head	Chain	T	Splash	Piston	Single	Splitdorf	Hand	Strombrg	Gravity	No	Bijur	Bijur
Fiat, 56	6	4.400x6.000	46.60	364.0	L	6	Own	Left	Hel'l	P	Pressure	Gear	Dual	Bosch	Hand	Own	Pressure	No	Own	Own
Fiat, 55	4	5.125x6.750	42.03	557.0	L	4	Own	Left	Hel'l	P	Pressure	Gear	Dual	Bosch	Hand	Own	Pressure	No	Own	Own
Ford, T	4	3.750x4.000	22.50	176.7	L	4	Own	Right	Spur	T	Splash-Grav	Fly-W	Single	Own	Hand	Hol.-K'g*	Gravity	Yes	None	Ford
Franklin, 8	6	3.625x4.000	31.54	247.4	I	1	Own	Head	Hel'l	Air	Pressure	Gear	Single	Eisemann	Atmte	Own	Gravity	Yes	Dyneto	Dyneto
F.R.P.	4	4.600x6.750	33.85	442.1	I	4	Own	Kin	Worm	P	Splash-Pres	Piston	2-Pt	Bosch	Hand	Zenith	Pressure	Yes	Bosch	Bosch
G																				
Glide, 6-40	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash	Gear	Single	Westhse	Hand	Rayfield	Vacuum	Yes	Westhse	Westhse
Grant, V	6	3.000x4.250	21.60	180.2	I	6	Own	Head	Hel'l	T	Splash	Piston	Single	At Kent	H & A	Rayfield	Gravity	Yes	Allis-Ch	Allis-Ch
H																				
Halladay, R-2	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Left	Hel'l	P	Splash	Gear	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Westhse	Westhse
Harvard, 4-20	4	3.000x4.250	14.40	120.2	I	4	Sterling	L&Hd	Hel'l	T	Splash-Pres	Piston	Single	Bosch	Hand	Zenith	Gravity	No	Dyneto	Dyneto
Haynes, 34	6	3.500x5.000	29.40	288.6	L	6	Own	Right	Spur	P	Splash	Piston	Dual	Remy	Hand	Rayfield	Vacuum	.....	Leece-N	Leece-N
Haynes, 35	6	3.500x5.000	29.40	288.6	L	6	Own	Right	Spur	P	Splash	Piston	Dual	Remy	Hand	Rayfield	Vacuum	.....	Leece-N	Leece-N
Herff-Brooks, 4-35	4	4.000x4.500	25.60	226.2	L	1	Own	Left	Hel'l	T	Splash	Piston	Single	Splitdorf	Hand	Strombrg	Gravity	Yes	Aplco	Aplco
Herff-Brooks, H-6-50	6	4.000x4.500	38.40	339.3	L	1	Own	Left	Hel'l	P	Splash	Piston	Single	Splitdorf	Hand	Strombrg	Gravity	Yes	Aplco	Aplco
Hudson, Super-Six	6	3.500x5.000	29.40	288.6	L	6	Own	L&Hd	Hel'l	P	Splash	Piston	Single	Delco	H & A	Own	Vacuum	Yes	Delco	Delco
Hupmobile, N U and N L	4	3.750x5.500	22.50	242.9	L	4	Own	Left	Chain	T	Splash-Pres	Fly-W	Single	At Kent	H & A	Zenith	Gravity	Yes	Bijur	Bijur
Hupmobile N	4	3.750x5.500	22.50	242.9	L	4	Own	Left	Chain	T	Splash-Pres	Fly-W	Single	At Kent	H & A	Zenith	Gravity	Yes	Bijur	Bijur
I																				
Inter-State T and TR	4	3.500x5.000	19.60	192.4	L	4	Rut.&Beav*	L&Hd	Hel'l	T	Splash	Gear	Single	Remy	Hand	Schebler	Gravity	....	Remy	Remy

ABBREVIATIONS:—**Cylinder Shape:** L-Head, L; T-Head, T. **Make of Motor:** Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut.&Beav.*; Golden, Belknap & Swarts, G.B.&S. **Valve Location:** Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. **Camshaft Drive:** Helical, Hel'l; Spur Gears, Spur. **Cooling Circulation:** Thermo Syphon, T; Pump, P. **Lubrication System:** Splash Pressure, Splash-Pres. **Ignition Make:** Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. **Ignition Control:** Hand and Automatic, H&A; Automatic, Atmtc. **Make of Carbureter:** Stromberg, Strombrg.
Holley and Kingston.

Their Technical Specifications—Continued

MAKE AND MODEL	Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R Axle	Total Gear Ratio on Direct	Wheelbase	TIRES Front	TIRES Rear	Wheels	Rear Springs	CONTROL Location Steering Wheel	CONTROL Gearshift Location	Make of Speedometer	Crankshaft Bearings, Type and No.	ANTI-FRICTION BEARINGS Gearset	ANTI-FRICTION BEARINGS Rear Axle	ANTI-FRICTION BEARINGS Front Wheel
B																					
Bell, A-16	Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Hess.....	4.00–1	112	31x4	31x4	Wood.	¾ Ell..	Left...	Center.	Stewart-W....	Plain...	Ball...	Roller.	Ball...
Biddle, D	Plate..	Sel...	Unit M..	4	Sp.B..	Spring..	¾ Float..	.....	4.00–1	120	32x4	32x4	Wire..	¾ Ell..	Left...	Center.	Hoffecker....	Plain 3.	Ball...	B&R..	Ball...
Brewster	Cone..	Sel...	Amid...	3	Sp.B..	Tor.T..	Float....	Own.....	3.92–1	125	34x4½	34x4½	Wood.	Cant..	Left..	Center.	Warner	Plain...	Ball...	.....	Roll...
Briscoe, 8	Cone..	Sel...	Amid...	3	Bevel.	Spring..	Float...	Salisby....	4.41–1	114	32x3½	32x3½	Wood.	Cant..	Opt...	Center.	Stewart.....	Plain...	Plain..	B&R..	Ball...
Briscoe, 4-38	Cone..	Sel...	Unit X..	3	Bevel.	Spring..	Float...	Salisby....	4.08–1	114	32x3½	32x3½	Wood.	Cant..	Opt...	Center.	Stewart.....	Plain 3.	Plain..	B&R..	Ball...
Buick D-54, D-55	Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	Float...	West.M...	3.77–1	130	36x4½	36x4½	Wood.	Cant..	Left..	Center.	Stewart.....	Plain 4.	Ball...	Ball...	Ball...
Buick D-44, D-45	Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	Float...	West.M...	3.78–1	115	32x4	32x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 4.	Ball...	Ball...	Ball...
C																					
Cadillac, 53	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Timken...	4.50–1	122	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Warner.....	Plain 3.	Ball...	Roller.	Ball...
Cameron	Cone..	Sel...	Unit X..	3	Bevel.	Tor.T..	Semi-F..	Own.....	3.75–1	122	32x4	32x4	Wood.	Cant..	Left...	Center.	Corbin.....	Plain 3.	Ball...	Ball...	Ball...
Case, T	Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	¾ Float..	West.M...	4.25–1	120	34x4	34x4	Opt...	Cant..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...
Chalmers, Master 6	Disk..	Sel...	Unit M..	4	Sp.B..	Spring..	Float...	Timken...	3.75–1	132	36x4½	36x4½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...
Chalmers, 48	Disk..	Sel...	Unit X..	3	Sp.B..	Tor.T..	Float...	Timken...	4.00–1	126	34x4½	34x4½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...
Chalmers, 40	Plate..	Sel...	Unit X..	3	Sp.B..	Tor.T..	¾ Float..	Timken...	4.50–1	124	34x4	34x4	Wood.	S-E...	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...
Chandler, 16	Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Own.....	4.40–1	123	34x4	34x4	Wood.	S-E...	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Roll...
Chevrolet, Royal Mail, H-2½	Cone..	Sel...	Amid...	3	Bevel.	Spring..	Semi-F..	Walker-W.	4.00–1	106	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...
Chevrolet, Baby Grand, H-4	Cone..	Sel...	Amid...	3	Bevel.	Spring..	Semi-F..	Walker-W.	4.00–1	106	32x3½	82x3½	Wood.	Ell...	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...
Chevrolet, Royal Mail, H-2	Cone..	Sel...	Amid...	3	Bevel.	Spring..	Semi-F..	Walker-W.	4.00–1	106	32x3½	32x3½	Wood.	Ell...	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...
Chevrolet, 4-90	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	Own.....	3.67–1	102	30x3	30x3½	Wood.	¼ Ell..	Left...	Center.	None.....	Plain 3.	Ball...	Roll...	Ball...
Cole, 8-50	Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Semi-F..	Timken...	4.47–1	126	35x4½	35x4½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	B&R..	Roll...	Roll...
Crow-Elkhart, 30	Disk..	Sel...	Unit X..	3	Bevel.	Tor.T..	Float...	Salis.....	4.25–1	112	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain...	Roll...	Roll...	Ball...
D																					
Daniels, A	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Columbia..	4.50–1	127	34x4½	34x4½	Wood.	S-E...	Left...	Center.	Warner.....	Plain 3.	Ball...	Roll...	Roll...
Davis, 6-F	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	West-M...	4.42–1	120	34x4	34x4	Wood.	Plat...	Left...	Center.	None.....	Plain 3.	Ball...	Roll...	Ball...
Davis, 6-E	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	West-M...	4.00–1	124	34x4½	34x4½	Wood.	Plat...	Left...	Center.	None.....	Plain 3.	Ball...	Roll...	Ball...
Detroiter, F	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Hess.....	4.00–1	112	33x4	33x4	Wood.	Plat...	Left...	Center.	Stewart-W....	Plain 3.	Ball...	Ball...	Ball...
Dispatch, G	.....	.....	Amid...	4	Chain.	Rad.Rd	Dead...	Own.....	3.12–1	120	36x3½	36x3½	Wood.	Ell....	Right.	Right..	Corbin.....	Plain 3.	Ball...	Ball...	Ball...
Dodge	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Own.....	3.61–1	110	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Johns-Man...	Plain 3.	Ball...	Roll...	Roll...
Dorris, 1-A-4	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Timken...	4.08–1	121	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...
Dorris, 1-A-6	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Timken...	4.08–1	128	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Stewart.....	Plain 7.	Roll...	Roll...	Roll...
Dort, 5-A	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	Walk-W...	4.10–1	105	30x3½	30x3½	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 2.	Ball...	B&R..	Ball...
E																					
Elkhart	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Gemco....	4.25–1	114	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Jones.....	Plain...	Ball...	Roll...	Ball...
Empire, 60	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	West-M...	4.00–1	120	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	B&R..	Ball...
Empire, 45	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	West-M...	4.00–1	116	33x4	33x4	Wood.	S-E...	Left...	Center.	Stewart.....	Plain 3.	Ball...	B&R..	Ball...
Enger, Twin-Six	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Hess.....	4.75–1	115	32x4	32x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	Ball...	B&R..	Ball...
F																					
Farmack	Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Peru.....	4.25–1	112	33x4	33x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 2.	Ball...	Roll...	Ball...
Fiat, 56	Disk..	Sel...	Amid...	4	Bevel.	Tor.T..	Semi-F..	Own.....	3.06–1	135	36x4½	37x5	Wood.	¾ Ell..	Right.	Right..	Warner.....	Plain 4.	Ball...	Ball...	Ball...
Fiat, 55	Disk..	Sel...	Amid...	4	Bevel.	Tor.T..	Semi-F..	Own.....	2.70–1	128	36x4½	37x5	Wood.	¾ Ell..	Right.	Right..	Warner.....	Plain 3.	Ball...	Ball...	Ball...
Ford, T	Disk..	Plan.	Unit M..	2	Bevel.	Tor.T..	Semi-F..	Own.....	3.63–1	100	30x3	30x3½	Wood.	Cross..	Left...	Left....	Extra.....	Plain 3.	Plain..	Roll...	Ball...
Franklin, 8	Disk..	Sel...	Amid...	3	Sp.B..	Spring..	Semi-F..	Own.....	4.00–1	120	34x4½	34x4½	Wood.	Ell....	Left...	Center.	Warner.....	Plain 7.	Ball...	Roll...	Roll...
F.R.P.	Cone..	Sel...	Amid...	4	Bevel.	Spring..	Float...	Own.....	2.6 –1	140	36x4	36x5	Wire..	S-E...	Right.	Right..	.....	Plain ..	Ball ..	Ball ..	Ball ..
G																					
Glide, 6-40	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Amer.....	4.64–1	119	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Ball...
Grant, V	Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	Float...	Peru.....	4.50–1	112	32x3½	32x3½	Wood.	Cant..	Left...	Center.	Stewart.....	Plain...	Ball...	B&R..	Ball...
H																					
Halladay, R-2	Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Hess.....	4.62–1	122	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain...	Ball...	.....	Ball...
Harvard, 4-20	Disk..	Sel...	Unit M..	3	Bevel.	Spring..	Semi-F..	Detroit....	4.00–1	100	28x3	28x3	Opt...	½ Ell..	Opt...	Center.	Corbin.....	Plain...	Ball...	Ball...	Roll...
Haynes, 34	Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.07–1	121	34x4	34x4	Wood.	S-E...	Left...	Center.	Warner.....	Plain 3.	Ball...	B&R..	Ball...
Haynes, 35	Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.07–1	127	35x4½	35x4½	Wood.	S-E...	Left...	Center.	Warner.....	Plain 3.	Ball...	B&R..	Ball...
Herff-Brooks, 4-35	Cone..	Sel...	Unit M..	3	Bevel.	Tor.T..	Semi-F..	Own.....	4.00–1	110	33x4	33x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 5.	Ball...	Ball...	Roll...
Herff-Brooks, H-6-50	Cone..	Sel...	Unit M..	3	Bevel.	Tor.T..	Semi-F..	Own.....	4.00–1	120	34x4	34x4	Wood.	¼ Ell..	Left...	Center.	Stewart.....	Plain 7.	Ball...	Ball...	Roll...
Hudson, Super-Six	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Semi-F..	.....	4.45–1	125½	35x4½	35x4½	Opt...	S-E...	Left...	Center.	Stewart.....	Plain 4.	Roll...	Roll...	Roll...
Hupmobile, N U and N L	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	American..	4.00–1	134	35x4½	35x4½	Wood.	S-E...	Left...	Center.	Van Sicklen...	Plain 3.	B&R..	Ball ..	Roll...
Hupmobile, N	Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	American..	4.00–1	119	34x4	34x4	Wood.	S-E...	Left...	Center.	Van Sicklen...	Plain 3.	B&R..	Ball...	Roll...
I																					
Inter-State, T and TR	Cone..	Sel...	Unit X..	3	Bevel.	Tor.T..	¾ Float..	Peru.....	4.00–1	110	33x4	33x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	.....	.....	Ball...

ABBREVIATIONS:—Starter Make: Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, Unit M; Unit with Axle, Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle:** Floating, Float; Semi-Floating, Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weiss, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter Elliptic, ¾ Ell; Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R.

1916 Passenger Automobiles Listed with

MAKE AND MODEL	No. of Cylinders	Bore and Stroke Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carburetor	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC SYSTEM Starter Make	ELECTRIC SYSTEM Lighting Make
J																				
Jackson, 6S	8	3.500x4.500	39.20	346.3	V	4	Northway	Inside	Spur	P	Pressure	Gear	Single	Conn	Hand		Vacuum		Auto-l	Auto-l
Jackson, 3-48	8	2.875x4.750	26.45	246.7	V	4	Northway	Inside	Spur	P	Splash	Gear	Single	Conn	Hand		Vacuum		Auto-l	Auto-l
Jackson, 34	4	3.500x5.000	19.60	192.4	L	4	Northway	L&Hd	Hel'l	P	Splash	Piston	Single	Conn	Hand	Schebler	Vacuum	Yes	Auto-l	Auto-l
Jeffery, Chesterfield	6	3.000x5.000	21.60	212.0	L	6	Buda	Right	Hel'l	P	Splash-Pres	Vane	Single	Bosch	Hand	Strombrg	Vacuum	Yes	Bijur	Bijur
Jeffery, Four	4	3.750x5.250	22.50	231.9	L	4	Own	Right	Hel'l	P	Splash-Pres	Piston	Single	Bosch	Hand	Strombrg	Vacuum	Yes	Bijur	Bijur
K																				
King, Eight D	8	2.875x5.000	26.45	259.7	V	4	Own	Inside	Chain	T	Pressure	Gear	Single	At Kent	H&A	Zenith	Vacuum	Yes	Ward L	Ward
King, Eight E	8	3.000x5.000	28.80	282.7	V	4	Own	Inside	Chain	T	Pressure	Gear	Single	At Kent	H&A	Ball	Vacuum	Yes	Ward L	Ward
Kissel, 6-42	6	3.625x5.500	31.54	340.3	L	6		Right	Hel'l	P	Splash	Gear	Single	Eisemann	Hand	Strombrg	Vacuum	Yes	Own	Westhse
Kissel, 4-32	4	3.875x5.500	24.03	259.4	L	4		Right	Hel'l	P	Splash	Gear	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Own	Westhse
Kline, 6-36	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Westhse	Hand	Own	Vacuum	Yes	Westhse	Westhse
L																				
Lenox, D	4	4.250x5.500	28.90	312.0	L	4	Buda	Right	Hel'l	P	Splash-Pres	Gear	Single	Westhse	H&A	Own	Gravity	No	Westhse	Westhse
Lenox, O	6	3.500x5.125	29.40	295.9	L	6	Buda	Left	Hel'l	P	Splash-Pres	Gear	Single	Westhse	H&A	Zenith	Vacuum	Yes	Westhse	Westhse
Lexington, 6-L A	6	3.500x5.000	29.40	288.6	L	6	Continental	Right	Hel'l	P	Splash	Piston	Single	Westhse	H&A	Schebler	Vacuum	Yes	Westhse	Westhse
Lexington, 4-K A	4	3.875x5.375	24.03	252.5	T	4	Teetor	Opp	Hel'l	P	Splash		Single	Westhse	Atmtc	Schebler	Vacuum	Yes	Westhse	Westhse
Locomobile, 48-M 6	6	4.500x5.500	48.60	524.8	T	2	Own	Opp	Hel'l	P	Splash	Gear	Dual	Bosch	Hand	Own	Pressure	Yes	Westhse	Westhse
Locomobile, 38-R 6	6	4.250x5.000	43.35	425.6	T	2	Own	Opp	Hel'l	P	Splash	Gear	Dual	Bosch	Hand	Own	Pressure	Yes	Westhse	Westhse
Lozier, 84	4	4.250x6.500	28.90	368.8	L	4	Own	Right	Chain	P	Pressure	Gear	Dup	Bosch	Hand	Stewart	Pressure	Yes	G&D	G&D
Lozier, 82	6	3.875x6.000	36.04	424.5	L	3	Own	Rt&H	Hel'l	P	Splash-Pres	Gear	Single	Eisemann	Hand	Rayfield	Vacuum	Yes	G&D	G&D
Luverne, 7-60	6	4.000x5.000	38.40	377.0	L	2	Beaver	Left	Hel'l	T	Splash	Gear	Dual	Bosch	Hand	Schebler	Vacuum	Yes	Apleo	Apleo
M																				
Madison, T	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash	Vane	Single	Remy	Hand	Rayfield	Vacuum	Yes	Remy	Remy
Marion, K	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash-Pres	Vane	Single	Westhse	Hand	Zenith	Vacuum	Yes	Westhse	Westhse
Marmon, 34	6	3.750x5.125	33.75	339.7	I	6	Own	Head	Hel'l	P	Pressure	Gear	Single	Bosch	Hand	Strombrg	Pres-Gr	Yes	Bosch	Bosch
Maxwell	4	3.625x4.500	21.03	185.8	L	4	Own	Right	Hel'l	T	Splash	Piston	Single	Simms	Hand	K-D	Gravity	Yes	Simms-H	Simms-H
McFarlan, 6-T	6	4.000x6.000	38.40	452.4	T	6	Teetor	Opp	Hel'l	P	Splash-Pres	Gear	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Westhse	Westhse
McFarlan, X	6	4.500x6.000	48.60	572.5	T	6	Teetor	Opp	Hel'l	P	Splash-Pres	Gear	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Westhse	Westhse
Mecca, 30	4	3.750x4.250	22.50	187.7	L	4	G.B.&S	Right	Chain	T	Pressure	Piston	Single	Splitdorf	Hand	Schebler	Vacuum	Yes	Disco	Disco
Mercer, 22-72 Tour	4	3.750x6.750	22.50	298.2	L	4	Own	Right	Chain	P	Pressure	Gear	Single	Bosch	Hand	Zenith	Vacuum		U.S.L	U.S.L
Mercer, 22-72 Run	4	3.750x6.750	22.50	298.2	L	4	Own	Right	Chain	P	Pressure	Gear	Single	Bosch	Hand	Zenith	Vacuum		U.S.L	U.S.L
Metz, 25	4	3.875x4.000	24.03	188.7	L	4	Own	Right	Spur	T	Splash	Gear	Single		Fixed	A.W.T	Gravity	No	G&D	G&D
Mitchell	8	3.000x5.125	28.80	289.8	V	4	Own	Inside	Hel'l	T	Splash	Gear	Single	Conn	Hand	Zenith	Vacuum	Yes	Westhse	Westhse
Mitchell Six	6	3.500x5.000	29.40	212.0	L	6	Own	Left	Hel'l	P	Splash-Pres	Piston	Single	Conn	Hand	Rayfield	Vacuum	Yes	Apleo	Apleo
Moline-Knight, M K-50	4	4.000x6.000	25.60	301.6		4	Own	Kni	Chain	T	Pressure	Gear	Dual	Bosch	Hand	Schebler	Pressure	Yes	Wagner	Wagner
Moline Knight, 40	4	3.750x5.000	22.50	220.9		4	Own	Kni	Chain	T	Pressure	Gear	Single	Conn	Hand	Schebler	Vacuum	Yes	Auto-l	Wagner
Moniter, C and R	4	3.750x4.250	22.50	187.7	L	4		L Hd	Chain	T	Splash-Pres		Single	Splitdorf	Hand	Schebler	Vacuum		Disco	Disco
Moniter, N	6	3.125x5.000	23.44	230.1	L	6		R Hd	Chain	T	Splash-Pres		Single	Splitdorf	Hand	Schebler	Vacuum	Yes	Disco	Disco
Monroe, M-2	4	3.062x3.750	15.01	110.5	I	4		Head	Hel'l	T	Splash	Piston	Single	Conn	Hand	Zenith	Gravity	Yes	Auto-l	Auto-l
Moon, 6-40	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash	Gear	Single	Delco	Hand	Rayfield	Vacuum	Yes	Delco	Delco
Moon, 6-30	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash	Gear	Single	Delco	Hand	Strombrg	Vacuum	Yes	Delco	Delco
Morse, D	4	4.625x5.000	34.23	336.0	I	1		Head	Spur	P	Splash	Gear	Dual	Eisemann	Hand	Strombrg	Gravity	Yes	G&D	G&D
N																				
National, Highway 12	12	2.750x4.750	36.30	338.6	V	6	Own	Outsi	Hel'l	P	Pressure	Gear	Single	Splitdorf	Hand	Rayfield	Vacuum	Yes	Westhse	Westhse
National, Highway 6	6	3.500x5.250	29.40	303.1	L	6	Buda	Right	Hel'l	P	Splash-Pres	Gear	Single	Splitdorf	Hand	Rayfield	Vacuum	Yes	Westhse	Westhse
National, Newport 6	6	3.750x5.500	33.75	364.5	L	6	Buda	Right	Hel'l	P	Splash-Pres	Gear	Single	Eisemann	Hand	Rayfield	Pressure	Yes	Westhse	Westhse
O																				
Oakland, 50	8	3.500x4.500	39.20	346.5	V	4	Northway	Inside	Hel'l	P	Splash-Pres	Gear	Dual	Delco	H&A	Strombrg	Vacuum	Yes	Delco	Delco
Oakland, 32	6	2.812x4.750	18.99	177.0	I	6	Northway	Head	Hel'l	P	Splash-Pres	Piston	Dual	Remy	Hand	Marvel	Vacuum	Yes	Remy	Remy
Oakland, 38	4	3.500x5.000	19.60	192.4	L	4	Northway	Left	Hel'l	P	Splash	Piston	Dual	Delco	H&A	Marvel	Vacuum	Yes	Delco	Delco
Oldsmobile, 44	8	2.875x4.750	26.45	246.7	V	4	Northway	Inside	Hel'l	P	Pressure	Gear	Single	Delco	H&A	Johnson	Vacuum	No	Delco	Delco
Oldsmobile, 43	4	3.500x5.000	19.60	192.4	I	4	Northway	Head	Hel'l	P	Splash	Piston	Single	Delco	H&A	Marvel	Vacuum	Yes	Delco	Delco
Overland, 86	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Splitdorf	Hand	Varies	Vacuum	Yes	Auto-l	Auto-l
Overland, 83	4	4.125x4.500	27.23	240.5	L	1	Own	Left	Hel'l	T	Splash		Single	Splitdorf	Hand	Strombrg*	Gravity	Yes	Auto-l	Auto-l
Overland, 75	4	3.125x5.000	15.63	153.4	L	4	Own	Right	Chain	T	Splash	Piston	Single		Hand		Gravity	Yes	Auto-l	Auto-l
Owen-Magnetic	6	3.750x5.500	33.75	364.5	L	6	Buda	Right	Hel'l	P	Splash		Single	Bosch	Hand	Master	Vacuum	Yes	Own	Own
P																				
Packard, Twin-Six	12	3.000x5.000	43.20	424.1	V	6	Own	Inside	Chain	P	Pressure	Gear	Single	Delco	H&A	Own	Pressure	Yes	Bijur	Bijur
Paige, 6-36	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash	Vane	Single	Remy	Hand	Strombrg	Gravity	Yes	G&D	G&D
Paige, 6-46	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Remy	Hand	Rayfield	Gravity	Yes	G&D	G&D
Partin Palmer, 20	4	3.125x4.500	15.63	138.1	L	4	Leroi	Right	Hel'l	T	Splash	Piston	Single	Conn	Hand	Schebler	Gravity	Yes	Allis-Ch	Allis-Ch
Partin Palmer, 8-45	8	3.125x4.000	31.25	245.4	L	4	Perkins	Right	Hel'l	T	Splash	Piston	Single	Conn	Hand	Rayfield	Gravity	Yes	Remy	Remy

ABBREVIATIONS:—**Cylinder Shape:** L-Head, L; T-Head, T. **Make of Meter:** Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut. & Beav.; Golden, Belknap & Swarts, G.B.&S. **Valve Location:** Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. **Camshaft Drive:** Helical, Hel'l; Spur Gears, Spur. **Cooling Circulation:** Thermo Syphon, T; Pump, P. **Lubrication System:** Splash Pressure, Splash-Pres. **Ignition Make:** Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. **Ignition Control:** Hand and Automatic, H&A; Automatic, Atmtc. **Make of Carburetor:** Stromberg, Strombrg.

*Tillotson also furnished.

Their Technical Specifications—Continued

TRANSMISSION									RUNNING GEAR					CONTROL				ANTI-FRICTION BEARINGS			
	GEARSET									TIRES											
Clutch Type	Type	Location	Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R. Axle	Total Gear Ratio on Direct	Wheelbase	Front	Rear	Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Make of Speedometer	Crankshaft Bearings, Type and No.	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
Cone..	Sel...	Unit M..	3	Sp.B..	Rad.Rd	Float...	Salisby....	4.10–1	124	34x4½	34x4½	Wood.	Ell....	Left...	Center.	Van Sicklen...	Plain 3.	Ball...	B&R..	Roll...	Jackson, 6S
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Salisby....	4.41–1	112	32x4	32x4	Wood.	Ell....	Left...	Center.	Van Sicklen...	Plain...	Ball...	B&R..	Ball...	Jackson, 3–4S
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Salisby....	4.41–1	112	32x4	32x4	Wood.	Ell....	Left...	Center.	Van Sicklen...	Plain 3.	Ball...	B&R..	Ball...	Jackson, 34
Plate..	Sel...	Amid...	4	Worm.	Spring..	Float...	Own.....	4.83–1	122	34x4	34x4	Wood.	Cant..	Left...	Center.	Van Sicklen...	Plain 3.	Ball...	Ball...	Roll...	Jeffery, Chesterfield
Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	Semi-F..	Own.....	4.10–1	116	34x4	34x4	Wood.	½ Ell..	Left...	Center.	Van Sicklen...	Plain 3.	Roll...	Roll...	Roll...	Jeffery, Four
																					K
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	American..	4.64–1	113	33x4	33x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Ball...	Ball...	King, Eight
Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	American..	4.64–1	120	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Ball...	Ball...	King, Eight E
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Own.....	3.92–1	126	34x4	34x4	Wood.	½ Ell..	Left...	Center.	.....	Plain 3.	Ball...	Roll...	Roll...	Kissel, 6–42
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.25–1	115	33x4	33x4	Wood.	½ Ell..	Left...	Center	.....	Plain 3.	Ball...	Roll...	Roll...	Kissel, 4–32
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	½ Float..	Hess.....	4.50–1	120	34x4	34x4	Wood.	½ Ell..	Left...	Center.	Stewart	Plain 3.	Ball...	Roll...	Ball...	Kline, 6–36
																					L
Cone..	Prog.	Unit X..	3	Bevel.	Tor.T..	½ Float..	Salisby....	3.25–1	118	34x4½	34x4½	Opt...	S-E....	Left...	Center.	Hoffecker	Plain 3.	Ball...	Ball...	Ball...	Lenox, D
Disk..	Sel...	Unit M..	3	Bevel.	Spring..	½ Float..	Salisby....	3.75–1	128	34x4½	34x4½	Opt...	S-E....	Left...	Center.	Hoffecker	Plain 4.	Ball...	Ball...	Ball...	Lenox, O
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	½ Float..	Hess.....	4.07–1	128	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Ball...	Lexington, 6–L A
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	½ Float..	Hess.....	4.00–1	115	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain...	Ball...	Ball...	Ball...	Lexington, 4–K A
Disk..	Sel...	Amid...	4	Sp.B..	Rad.Rd	Float...	Own.....	3.85–1	143	37x5	37x5	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 7.	Ball...	Ball...	Roll...	Locomobile, 48–M 6
Disk..	Sel...	Amid...	4	Sp.B..	Rad.Rd	Float...	Own.....	3.85–1	140	36x4½	37x5	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 7.	Ball...	Ball...	Roll...	Locomobile, 38–R 6
Disk..	Sel...	Unit M..	4	Bevel.	Sp&T..	Float...	Timken...	3.93–1	120	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Jones.....	Plain 3.	Roll...	Roll...	Roll...	Lexier, 84
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	American..	3.93–1	132	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Warner.....	Plain 3.	Ball...	Ball...	Ball...	Lexier, 82
Disk..	Sel...	Unit M..	3	Sp.B..	Rad.Rd	Float...	West-M....	3.75–1	130	36x4½	36x4½	Wood.	Ell....	Left...	Center.	Stewart.....	Plain 4.	Ball...	.....	Roll...	Luverne, 7–60
																					M
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	American..	4.64–1	120	34x4	34x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Ball...	Madison, T
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	½ Float..	Salisby....	4.33–1	120	32x4	32x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...	Marion, K
Cone..	Sel...	Unit X..	3	Sp.B..	Tor.T..	½ Float..	Own.....	3.69–1	136	34x4½	34x4½	Wire..	Trans.	Left...	Center.	Van Sicklen...	Plain 4.	B&R..	B&R..	Roll...	Marmon, 34
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	½ Float..	Own.....	3.58–1	102	30x3½	30x3½	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 2.	Roll...	Roll...	Roll...	Maxwel
Cone..	Sel...	Amid...	3	Sp.B..	Tor.T..	Float...	West. M....	3.07–1	132	36x4½	36x4½	Opt...	Cant..	Left...	Center.	Warner.....	Plain 4.	Ball...	.....	Ball...	McFarlan, 6–T
Cone..	Sel...	Amid...	3	Sp.B..	Tor.T..	Float...	West. M....	3.07–1	132	36x4½	36x4½	Opt...	Cant..	Left...	Center.	Warner.....	Plain 4.	Ball...	Ball...	Ball...	McFarlan, X
Disk..	Sel...	Unit M..	3	Bevel.	Spring..	Semi-F..	Detroit....	.....	104	30x3½	30x3½	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain..	Ball...	Roll..	Roll...	Mecca, 30
Disk..	Sel...	Amid...	4	Sp.B..	Spring..	Float...	Own.....	.....	130	34x4½	34x4½	Opt...	S-E....	Left...	Center.	Van Sicklen...	Plain 3.	Ball...	B&R..	Ball...	Mercer, 22–72 Tour
Disk..	Sel...	Amid...	4	Sp.B..	Spring..	Float...	Own.....	.....	115	32x4	32x4	Opt...	S-E....	Left...	Center.	Van Sicklen...	Plain 3.	Ball...	B&R..	Ball...	Mercer, 22–72 Run
.....	Fric..	.....	7	Chain.	Frame..	Spec....	Own.....	.....	108	32x3½	32x3½	Opt...	Ell....	Left...	Center.	Stewart.....	Plain 3.	None..	None..	Ball...	Metz, 25
Cone..	Sel...	Amid...	3	Bevel.	Spring..	Float...	Own.....	4.41–1	125	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	B&R..	Roll...	Roll...	Mitchell
Cone..	Sel...	Amid...	3	Sp.B..	Tor.T..	Float...	Own.....	4.12–1	125	34x4	34x4	Wood.	Cant..	Left...	Center.	Own.....	Plain 3.	Ball...	Roll...	Roll...	Mitchell Six
Cone..	Sel...	Amid...	4	Sp.B..	Tor.T..	Float...	West. M....	4.25–1	128	36x4½	36x4½	Wood.	S-E....	Left...	Center.	Warner.....	Plain 3.	Ball...	B&R..	Ball...	Meline–Knight, M K–50
Cone..	Prog.	Amid...	3	Sp.B..	Tor.T..	½ Float..	West. M....	4.40–1	118	34x4	34x4	Wood.	2-Cr..	Left...	Center.	Warner.....	Plain 3.	Ball...	B&R..	Ball...	Meline–Knight, 40
Disk..	Sel...	Unit M..	3	Bevel.	Spring..	Semi-F..	Russel....	4.00–1	108	32x3½	32x3½	Wood.	½ Ell..	Left...	Center.	.....	Plain 3.	Ball...	Roll...	Ball...	Meniter, C and R
Disk..	Sel...	Unit M..	3	Bevel.	Tor.T..	½ Float..	Russel....	4.00–1	115	33x4	33x4	Wood.	½ Ell..	Left...	Center.	.....	Plain 3.	Ball...	Roll...	Ball...	Meniter, N
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	½ Float..	West.M....	.....	96	30x3	30x3	Wood.	½ Ell..	Left...	Center.	.....	Plain 2.	Ball...	B&R..	Ball...	Monroe, M–2
Plate.	Sel...	Unit M..	3	Sp. B.	Spring..	Float...	Hess.....	4.00–1	124	34x4	34x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Ball...	Moon, 6–40
Plate.	Sel...	Unit M..	3	Sp. B.	.....	Float...	Hess.....	4.60–1	118	33x4	33x4	Wood.	S-E....	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Ball...	Moon, 6–30
Disk..	Sel...	Amid...	4	Bevel.	Tor.T..	Semi-F..	Easton....	3.33–1	127	35x5	35x5	Wood.	Ell....	Right.	Right..	.....	Plain 5.	Ball...	Ball...	Ball...	Morse, D
																					N
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Columbia..	4.58–1	128	36x4½	36x4½	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Roll...	National, Highway, 12
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Columbia..	4.42–1	128	34x4½	34x4½	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 4.	Ball...	Roll...	Roll...	National, Highway, 6
Cone..	Sel...	Amid...	3	Sp.B..	Spring..	Float...	Timken...	4.08–1	134	36x4½	36x4½	Wood.	Cant..	Left...	Center.	Warner.....	Plain 4.	Ball...	Roll...	Roll...	National, Newport, 6
																					O
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	West. M....	4.08–1	127	34x4½	34x4½	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...	Oakland, 50
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	West. M....	4.25–1	110	32x3½	32x3½	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 3.	B&R..	Roll...	Ball...	Oakland, 32
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	West. M....	4.42–1	112	33x4	33x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 3.	B&R..	Roll...	Ball...	Oakland, 38
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	½ Float..	West. M....	4.42–1	120	33x4	33x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain...	B&R..	Ball...	Roll...	Oldsmobile, 44
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	½ Float..	West. M....	4.42–1	120	33x4	33x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain...	B&R..	Roll...	Roll...	Oldsmobile, 43
Cone..	Sel...	Unit X..	3	Bevel.	Tor.T..	Float...	Own.....	4.01–1	125	35x4½	35x4½	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain...	Ball...	Roll...	Roll...	Overland, 86
Cone..	Sel...	Unit X..	3	Bevel.	Tor.T..	Float...	Own.....	3.70–1	106	33x4	33x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain...	Ball...	Roll...	Roll...	Overland, 83
Cone..	Sel...	Unit X..	3	Bevel.	Tor.T..	Float...	Own.....	.....	104	31x4	31x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 2.	Ball...	Ball...	.....	Overland, 75
Elec..	None	Infin....	Ra..	Sp.B..	Spring..	Float...	American..	3.50–1	136	35x5	35x5	Opt...	S-E....	Left...	.....	Jones.....	Plain 4.	.....	.....	Roll...	Owen–Magnetic
																					P
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Semi-F..	Own.....	4.35–1	125*	36x4½	37x5	Wood.	Plat...	Left...	Left....	Warner	Plain 3.	Ball...	Ball...	Roll...	Packard, Twin–Six
Disk..	Sel...	Unit X..	3	Sp.B..	Tor.T..	½ Float..	Salisby....	4.41–1	112	32x4	32x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	B&R..	Roll...	Ball...	Paige, 6–36
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	½ Float..	Salisby....	4.35–1	123	34x4	34x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	B&R..	Roll...	Ball...	Paige, 6–46
Disk..	Sel...	Unit X..	3	Bevel.	Rad.Rd	Float...	Lefever....	4.00–1	96	29x3½	29x3½	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain 2.	Ball...	Ball...	Ball...	Partin Palmer, 29
Disk..	Sel...	Unit M..	3	Bevel.	Rad.Rd	½ Float..	Salisby....	3.50–1	115	33x4	33x4	Wood.	½ Ell..	Left...	Center.	Stewart.....	Plain...	Roll...	Roll...	Ball...	Partin Palmer, 8–45

ABBREVIATIONS:—**Starter Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, Unit M; Unit with Axle, Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle:** Floating, Float; Semi-Floating, Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weiss, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter Elliptic, ¾ Ell; Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R. *Also 135.

1916 Passenger Automobiles Listed wit

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement, Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC ST Starter Make	
Partin Palmer, 32	4	3.500x5.000	19.60	192.4	L	4	Lycoming	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Schebler	Gravity		Federal	
Paterson, 6-42	6	3.250x4.500	25.35	224.0	L	6		Right	Hel'l	P	Splash	Piston	Dual	Delco	Hand	Strombrg.	Vacuum	Yes	Delco	
Pathfinder, La Salle	12	2.875x5.000	39.68	389.5	I	3	Own	Head	Spur	P	Pressure	Piston	Single	Delco	Hand	Strombrg.	Vacuum	Yes	Delco	
Pathfinder, 8-A B and C	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash	Piston	Single	Westhse	Hand	Strombrg.	Gravity		Westhse	
Peerless, 56	8	3.250x5.000	33.80	331.8	V	4	Own	Inside	Hel'l	P	Pressure	Gear	Dual	At Kent	H&A		Vacuum	Yes	G&D	
Pierce-Arrow, 66-A-4	6	5.000x7.000	60.00	824.7	T	2	Own	Opp	Spur	P	Pressure	Gear	Doub	Bosch	Hand	Own	Pressure		Westhse	
Pierce-Arrow, 48-B-4	6	4.500x5.500	48.60	524.8	T	2	Own	Opp	Hel'l	P	Pressure	Gear	Doub	Bosch	Hand	Own	Pressure		Westhse	
Pierce-Arrow, 38-C-4	6	4.000x5.500	38.40	414.7	T	2	Own	Opp	Hel'l	P	Pressure	Gear	Doub	Bosch	Hand	Own	Pressure		Westhse	
Pilot, 6-75	6	4.500x6.000	48.60	572.5	T	6	Teetor	Opp	Hel'l	P	Splash	None	Single	Westhse	H&A	Strombrg.	Vacuum	Yes	Westhse	
Pilot, 6-55	6	3.875x5.250	36.04	371.4	T	6	Teetor	Opp	Hel'l	P	Splash-Pres	Piston	Single	Westhse	H&A	Strombrg.	Vacuum	Yes	Westhse	
Pilot, 6-45	6	3.000x5.000	21.60	212.0	L	6	Teetor	Right	Hel'l	P	Splash-Pres	Piston	Single	Delco	H&A	Rayfield	Vacuum	Yes	Delco	
Premier, 6-56	6	4.000x5.500	38.40	414.7	T	3	Own	Opp	Hel'l	P	Splash	Gear	Single	Delco*	Hand	Rayfield	Vacuum	Yes	Delco*	
Pullman, 6-48	6	3.750x5.250	33.75	347.9	L	3		Left	Hel'l	P	Splash-Pres	Gear	Dual	Simms	Hand	Strombrg.	Gravity	Yes	Westhse	
Pullman, 4	4	3.750x4.250	22.59	187.7	L	4		Left	Chain	T	Splash-Pres	Piston	Dual	Splitdorf	Hand	Strombrg.	Gravity	Yes	Apleo	
R																				
Regal, E	4	3.500x4.000	19.60	153.9	L	4	Port Huron	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Stewart	Gravity	Yes	Dyneto	
Regal, D	4	3.750x5.000	22.50	220.9	L	4	Own	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Stewart	Vacuum	Yes	Dyneto	
Regal, F	8	3.000x4.500	28.80	254.4	V	4	Port Huron	Inside	Hel'l	T	Splash-Pres	Gear	Single	Conn	Hand	Stewart	Vacuum	Yes	Dyneto	
Ree, R	4	4.125x4.500	27.23	240.5	L	2	Own	R&H	Hel'l	P	Splash	Piston	Single	Remy	Hand	Johnson	Gravity	Yes	Remy	
Ree, M	6	3.562x5.125	30.46	306.6	L	3	Own	R&H	Hel'l	P	Splash	Piston	Single	Remy	Hand	Johnson	Vacuum	Yes	Remy	
Republic, E	6	4.250x5.000	43.35	425.6	T	2	Wisconsin	Opp	Hel'l	P	Pressure	Gear	Dual	Delco	Hand	Rayfield	Vacuum	Yes	Delco	
Ross, Eight C	8	3.250x5.000	33.80	331.8	V	4		Inside	Chain	P	Pressure	Piston	Dual		H&A	Zenith	Vacuum	Yes		
Ross, Eight A	8	3.000x4.500	28.80	254.4	L	4		Right	Chain	T	Pressure	Piston	Single	At Kent	H&A	Zenith	Vacuum	Yes	Detroit	
S																				
Saxon, 17	6	2.875x4.500	19.84	175.3	L	6	Continental	Right	Hel'l	T	Splash	Piston	Single	At Kent	H&A	Rayfield	Gravity	Yes	Detroit	
Saxon, S-2	6	2.875x4.500	19.84	175.3	L	6	Continental	Right	Hel'l	T	Splash	Piston	Single	At Kent	H&A	Rayfield	Gravity	Yes	Detroit	
Saxon, 14-15	4	2.750x4.000	12.10	97.2	L	4	Continental	Right	Hel'l	T	Splash	Piston	Single	At Kent	Atmtc	Mayer	Gravity	Yes		
Scripps-Booth, C	4	3.000x4.250	14.40	120.2	L	4	Sterling	L&Hd	Hel'l	T	Splash	Gear	Single	At Kent	Atmtc	Zenith	Vacuum*	Yes	Bijur	
Scripps-Booth, D	8	2.625x3.750	22.05	162.3	I	4	Sterling	Head	Hel'l	T	Pressure	Gear	Single	At Kent	Atmtc	Zenith	Vacuum	Yes	Bijur	
Simplex, 50	4	5.375x6.500	46.23	590.0	T	2	Own	Opp		P	Splash	Gear	Dual	Bosch	Hand	Newcomb	Pressure	No	Rushmore	
Simplex, 46	6	4.375x6.250	45.94	563.7	L	3	Own	Left	Chain	P	Pressure	Gear	Dual	Bosch	Hand	Newcomb	Pressure	No	Rushmore	
Simplex, 50	4	5.375x6.500	46.23	590.0	T	2	Own	Opp	Hel'l	P	Splash	Gear	Dual	Bosch	Hand	Newcomb	Pressure	No	Rushmore	
Singer	6	4.000x5.500	38.40	414.7	T	3	Hersch-Spill	Opp	Hel'l	P	Splash	Gear	Single	Bosch	Hand	C.R.G	Vacuum		Westhse	
Spaulding, H	4	4.250x5.500	28.90	312.0	L	4	Buda	Right	Hel'l	P	Splash	Piston	Dual	Simms	Hand	Rayfield	Vacuum	Yes	Ents	
Standard, 8	8	3.000x5.000	28.80	282.7	V	4	Hersch-Spill	Inside	Hel'l	P	Pressure	Gear	Single	Westhse	Hand	Zenith	Vacuum	Yes	Westhse	
Standard, 6	6	4.000x5.500	38.40	414.7	T	3	Hersch-Spill	Opp	Hel'l	P	Splash	Gear	Dual	Splitdorf	Hand	Rayfield	Pressure	No	Westhse	
Stearns Knight, 4	4	3.750x5.625	22.50	248.5		4	Own	Kni	Chain	P	Pressure	Gear	Single	Remy	Hand	Schebler	Gravity	Yes	Westhse	
Stearns-Knight, 6	6	4.250x5.750	43.35	489.4		2	Own	Kni	Chain	P	Splash-Pres	Gear	Dual	Bosch	Hand	Strombrg.	Pressure	Yes	G&D	
Stearns-Knight, 8	8	3.250x5.000	33.80	331.8		4	Own	Kni	Chain	T	Pressure	Gear	Single	Remy	Hand	Rayfield	Vacuum	Yes	Westhse	
Sterling	4	2.875x4.000	13.23	103.7	L	4		L&Hd	Spur	T	Splash-Pres	Piston	Single	Opt	Atmtc	Opt	Gravity	Yes	Optional	
Stewart, T	6	3.500x5.000	29.40	288.6	L	6		Right	Hel'l	P	Splash	Piston	Single	Westhse	Atmtc	Rayfield	Vacuum	Yes	Westhse	
Studebaker 4-40	4	3.875x5.000	24.03	235.8	L	4	Own	Left	Hel'l	P	Splash	Gear	Single	Remy	Hand	Schebler	Gravity	Yes	Wagner	
Studebaker, 6-50	6	3.875x5.000	36.04	353.8	L	6	Own	Left	Hel'l	P	Splash	Gear	Single	Remy	Hand	Schebler	Gravity	Yes	Wagner	
Stutz, C	4	4.750x5.500	36.10	389.9	T	2	Wisconsin	Opp	Spur	P	Splash-Pres	Gear	2-Pt	Bosch	Hand	Strombrg.	Pres.-Gra.	Yes	Remy	
Stutz, C, Readster	4	4.750x5.500	36.10	389.9	T	2	Wisconsin	Opp	Spur	P	Splash-Pres	Gear	2-Pt	Bosch	Hand	Strombrg.	Pres.-Gra.	Yes	Remy	
Sun	6	3.000x5.000	21.60	212.0	L	6		Right	Hel'l	T	Splash	Piston	Dual	Remy	Hand		Vacuum	Yes	Remy	
T																				
Trumbull, 16-B	4	2.875x4.000	13.23	103.7	L	4	Milwaukee	Right	Hel'l	T	Splash	Piston	Single	Splitdorf	Hand	Zephyr	Gravity	Yes	R&M*	
V																				
Velie, Biltwel, 15	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Dual	At Kent	Atmtc	Strombrg.	Vacuum	Yes	G&D	
Velie, New Biltwel, 22	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Remy	Atmtc	Strombrg.	Vacuum	Yes	Remy	
Vixen, 3-P	4	2.750x4.000	12.10	95.0	L	4		Right	Spur	T	Splash	Ring	Single	At Kent	Hand	Zephyr	Gravity	Yes	None	
W																				
Wayne, Richmond	6	4.000x4.500	38.40	339.3	L	1	Own	Right	Hel'l	P	Splash	Gear	Single	Splitdorf	Hand	Strombrg.	Gravity	Yes	Apleo	
Wayne, Richmond 4	4	4.000x4.500	25.60	226.2	L	1	Own	Right	Hel'l	T	Splash	Piston	Single	Splitdorf	Hand	Strombrg.	Gravity	Yes	Apleo	
Westcott, 51	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Dual	Delco	H&A	Rayfield	Vacuum		Delco	
Westcott, 41	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Dual	Delco	H&A	Rayfield	Vacuum		Delco	
White, G.A.H	4	3.750x5.125	22.50	226.4	L	4	Own	Right	Hel'l	P	Splash-Pres	Piston	Single	Bosch	Hand	Own	Vacuum		Own	
White, G.E.D	4	4.250x6.375	28.90	361.7	L	4	Own	Right	Hel'l	P	Splash-Pres	Piston	Single	Bosch	Hand	Own	Vacuum		Own	
Willys-Knight, 84	4	4.125x4.500	27.23	240.5		4		Kni	Chain	T	Pressure	Gear	Single	Splitdorf	Hand	Tillotsn	Vacuum	Yes	Auto-l	
Winton, 22	6	4.500x5.500	48.60	524.8	L	2	Own	Right	Chain	P	Pressure	Gear	Dupl	Bosch	Hand	Rayfield	Vacuum	Yes	Bijur	
Winton, 22-A	6	3.750x5.250	33.75	347.9	L	2	Own	Right	Chain	P	Pressure	Gear	Dupl	Bosch	Hand	Rayfield	Vacuum	Yes	Bijur	
Woods Mobilette	4	2.625x4.000	11.03	87.0	L	4	Own	Right	Hel'l	T	Splash	Piston	Single	Bosch	Hand	Carter	Gravity	Yes	None	

ABBREVIATIONS:—Cylinder Shape: L-Head, L; T-Head, T. Make of Motor: Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut.&Beav.; Golden, Belknap & Swartz, G.B.&S. Valve Location: Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. Camshaft Drive: Helical, Hel'l; Spur Gears, Spur. Cooling Circulation: Thermo Syphon, T; Pump, P. Lubrication System: Splash Pressure, Splash-Pres. Ignition Make: Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. Ignition Control: Hand and Automatic, H&A; Automatic, Atmtc. Make of Carbureter: Stromberg, Strombrg.
Remy also supplied.

Their Technical Specifications—Continued

TRANSMISSION									RUNNING GEAR					CONTROL				ANTI-FRICTION BEARINGS			
	GEARSET									TIRES											
Clutch Type	Type	Location	Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R Axle	Total Gear Ratio on Direct	Wheelbase	Front	Rear	Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Make of Speedometer	Crankshaft, Bearings, Type and No.	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
Disk	Sel	Unit M.	3	Bevel	Spring	Float	Gar.Eq.Co.	4.00–1	110	32x3½	32x3½	Wood	¾ Ell.	Left	Center	Stewart	Plain 2	Ball	Ball	Ball	Partin Palmer, 32
Cone	Sel	Unit M.	3	Bevel	Spring	Float	West. M.	4.00–1	117	32x4	32x4	Wood	¾ Ell.	Left	Center		Plain 3	Ball	Roll	Ball	Paterson, 6–42
Disk	Sel	Unit M.	3	Sp.B.	Spring	Float	American	4.30–1	130	35x5	35x5	Wire	¾ Ell.	Left	Center	Stewart	Plain	Roll	Roll	Roll	Pathfinder, La Salle
Disk	Sel	Unit M.	3	Sp.B.	Spring	Float	Salisby	4.00–1	122	35x4½	35x4½	Wood	Cant.	Left	Center	Stewart	Plain	Ball	B&R	Roll	Pathfinder, 8–A, B and C
Disk	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Timken	4.42–1	125	35x4½	35x4½	Wood	Plat	Left	Center		Plain 3	Ball	Roll	Roll	Peerless, 56
Cone	Sel	Amid	4	Sp.B.	Spring	Semi-F	Own	Option	147.5	37x5	38x5½	Wood	¾ Ell.	Right	Right	Stewart	Plain 7	Ball	B&R	Roll	Pierce-Arrow, 66–A–4
Cone	Sel	Amid	4	Sp.B.	Spring	Semi-F	Own	Option	142	37x5	37x5	Wood	¾ Ell.	Right	Right	Stewart	Plain 7	Ball	B&R	Roll	Pierce–Arrow, 48–B–4
Cone	Sel	Amid	4	Sp.B.	Spring	Semi-F	Own	Option	134	36x4½	36x4½	Wood	¾ Ell.	Right	Right	Stewart	Plain 7	Ball	B&R	Roll	Pierce–Arrow, 38–C–4
Cone	Sel	Amid	3	Bevel	Spring	Float	Timken	3.66–1	132	37x4½	37x4½	Wood	S-E	Left	Center	Stewart	Plain	Ball	Roll	Roll	Pilot, 6–75
Cone	Sel	Unit M.	3	Sp.B.	Spring	Float	Hess	4.00–1	126	34x4	34x4	Wood	Cant.	Left	Center	Stewart	Plain	Ball	Ball	Roll	Pilot, 6–55
Plate	Sel	Unit M.	3	Sp.B.	Spring	Float	Hess	4.50–1	119	32x4	32x4	Wire	Cant.	Left	Center	Stewart	Plain	Ball	Roll	Ball	Pilot, 6–45
Disk	Sel	Unit M.	3	Sp.B.	Tor.A	Float	Timken	4.08–1	134	36x4½	36x4½	Wire*	S-E	Left	Center	Warner	Plain 3	Roll	Roll	Roll	Premier, 6–56
Disk	Sel	Unit M.	4	Bevel	Spring	Float	Timken		134	36x4½	36x4½	Wire	¾ Ell.	Left	Center		Plain	Ball			Pullman, 6–48
Disk	Sel	Unit M.	3	Bevel	Spring	Float	Timken	4.25–1	114	31x4	31x4	Wood	Cant.	Left	Center		Plain	Ball			Pullman, 4
Cone	Sel	Unit M.	3	Bevel	Tor.T	Float	Peru	4.25–1	106	30x3½	30x3½	Wood	Cant.	Left	Center	Stewart	Plain 2	Roll	Roll	Ball	R Regal, E
Cone	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Peru	4.00–1	115	33x4	33x4	Wood	Cant.	Left	Center	Stewart	Plain 3	Roll	Roll	Ball	Regal, D
Cone	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Peru	4.00–1	115	33x4	33x4	Wood	Cant.	Left	Center	Stewart	Plain 2	Roll	Roll	Ball	Regal, F
Disk	Sel	Amid	3	Bevel	Spring	Semi-F	Own	4.00–1	115	34x4	34x4	Wood	¾ Ell.	Left	Center	Stewart	Plain 3	Roll	Roll	Roll	Reo, R
Disk	Sel	Amid	3	Sp.B.	Spring	Float	Own	4.00–1	126	34x4½	34x4½	Wood	Cant.	Left	Center	Stewart	Plain 3	Roll	Roll	Roll	Reo, M
Cone	Sel	Amid	4	Bevel	Rad.Rd	Float	American	4.00–1	133	36x4½	36x4½	Wood	¾ Ell.	Left	Center	Warner	Plain 3	Ball	Ball	Ball	Republic, E
Plate	Sel	Unit M.	3	Sp.B.	Spring	Float			130	34x4	34x4	Wood	S-E	Left	Center		Plain	Ball	Ball	Ball	Ross, Eight C
Disk	Sel	Unit M.	3	Sp.B.	Spring	¾ Float	Timken	4.45–1	115	34x4	34x4	Wood	¾ Ell.	Left	Center		Plain 3	B&R	Roll	Roll	Ross, Eight A
Plate	Sel	Unit X	3	Sp.B.	Tor.T	¾ Float	Timken	4.75–1	112	32x3½	32x3½	Wood	Cant.	Left	Center	Stewart	Plain 3	Plain	Roll	Roll	S Saxon, 17
Plate	Sel	Unit X	3	Sp.B.	Tor.T	¾ Float	Timken	4.75–1	112	32x3½	32x3½	Wood	Cant.	Left	Center	Stewart	Plain 3	Plain	Roll	Roll	Saxon, S–2
Cone	Sel	Unit X	3	Bevel	Tor.T	Semi-F	Timken	4.75–1	96	28x3	28x3	Wood	Cant.	Opt	Center	None	Plain 2	Plain	Roll	Ball	Saxon, 14–15
Disk	Sel	Unit M.	3	Bevel	Spring	¾ Float	Own	4.70–1	110	30x3½	30x3½	Wire	Cant.	Left	Center		Plain 2	Ball	Ball	Ball	Scripps–Booth, C
Cone	Sel	Unit M.	3	Sp.B.	Spring	¾ Float	Russel	4.70–1	110	32x3½	32x3½	Wire	Cant.	Left	Center		Plain 2	Ball	Ball	Ball	Scripps–Booth, D
Cone	Sel	Amid	4	Sp.B.	Rad.Rd	¾ Float	Own	2.13–1	137	36x4½	37x5	Opt	S-E	Right	Right	Warner	Plain 3	Ball	Ball	Ball	Simplex, 50
Cone	Sel	Unit M.	4	Sp.B	Spring	Float	Own	3.00–1	143½	36x4½	37x5	Opt	S-E	Left	Center	Warner	Plain 3	Ball	Ball	Roll	Simplex, 46
Cone	Sel	Amid	4	Sp.B.	Tor.T	¾ Float	Own	2.75–1	137	36x4½	37x5	Opt	S-E	Right	Right	Warner	Plain 3	Ball	Ball	Ball	Simplex, 50
Plate	Sel	Unit M.	4	Sp.B.	Spring	Float	Timken	3.50–1	138	35x5	35x5	Opt	Cant.	Left	Center	Warner	Plain	Roll	Roll	Roll	Singer
Disk	Sel	Amid	3	Bevel	Spring	Float	Met. Prod	3.75–1	120	36x4	36x4	Wood	¾ Ell.	Left	Center	Warner	Plain	B&R	Roll	Roll	Spaulding, H
Plate	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Timken	4.45–1	121	35x4	35x4	Wood	S-E	Left	Center	Stewart	Plain	Roll	Roll	Roll	Standard, 8
Disk	Sel	Unit M.	3	Bevel	Tor.T	Float	West. M.	4.00–1	126	36x4½	36x4½	Wood	¾ Ell.	Left	Center	Stewart	Plain	B&R	Ball	Ball	Standard, 6
Disk	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Own	4.50–1	119	34x4	34x4	Opt	Cant.	Left	Center	Johns-Man	Plain 3	B&R	B&R	Ball	Stearns–Knight, 4
Disk	Sel	Unit M.	4	Sp.B.	Spring	Float	Own	3.40–1	134*	37x5	37x5	Opt	¾ Ell.	Left	Center	Johns-Man	Plain 7	Ball		Roll	Stearns–Knight, 6
Disk	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Own	4.75–1	123	35x4½	35x4½	Opt	Cant.	Left	Center	Johns-Man	Plain 3	B&R	B&R	Ball	Stearns–Knight, 8
Plate	Sel	Unit M.	3	Bevel	Spring	¾ Float	American	3.80–1	102	30x3½	30x3½	Wood	Cant.	Left	Center						Sterling
Disk	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Timken	4.75–1	127	34x4½	34x4½	Wood	Cant.	Left	Center		Plain	B&R	Roll	Roll	Stewart, T
Disk	Sel	Unit X	3	Bevel	Rad.Rd	Float	Own	4.00–1	112	34x4	34x4	Wood	¾ Ell.	Left	Center	Stewart	Plain 3	Roll	Roll	Roll	Studebaker, 4–40
Disk	Sel	Unit X	3	Bevel	Rad.Rd	Float	Own	3.70–1	122	34x4	34x4	Wood	¾ Ell.	Left	Center	Stewart	Plain 4	Roll	Roll	Roll	Studebaker, 6–50
Disk	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Stutz	3.50–1	130	34x4½	34x4½	Opt	S-E	Right	Right	Warner	Plain 3	Ball	Ball	Roll	Stutz, C
Disk	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Stutz	3.06–1	120	34x4½	34x4½	Wood	S-E	Right	Right	Warner	Plain 3	Ball	B&R	B&R	Stutz, C, Roadster
Disk	Sel	Unit M.	3	Sp.B.	Spring	Float	Hess		116			Wood	S-E	Left	Center		Plain	Ball	B&R	Ball	Sun
Disk	Sel	Unit X	3	Bevel	Tor.T	Semi-F	Warner	3.60–1	80	28x3	28x3	Wire	Cant	Opt	Center	Corbin	Plain 2	Ball	B&R	Ball	T Trumbull, 16–B
Cone	Sel	Unit M.	4	Sp.B.	Spring	Semi-F	Timken	4.08–1	124	34x4	34x4	Wood	¾ Ell.	Left	Center	Stewart	Plain 3	Ball	Roll	Roll	V Velie, Biltwel, 15
Cone	Sel	Unit M.	3	Sp.B.	Spring	¾ Float	West.M.	4.25–1	115	32x4	32x4	Opt	¾ Ell.	Left	Center	Stewart	Plain 3	Ball	B&R	Ball	Velie, New Biltwel, 22
Friction	Rear			Chain	Arms		Davis		106	28x3	28x3	Wire	Coil	Center	Right		Plain 2	Ball		Ball	Vixen, 3–P
Disk	Sel	Unit M.	3	Bevel	Tor.T	Semi-F	Own	4.00–1	120	34x4	34x4	Wood	¾ Ell.	Left	Center	Stewart	Plain 7	Ball	Ball	Roll	W Wayne, Richmond
Disk	Sel	Unit M.	3	Bevel	Tor.T	Semi-F	Own	4.00–1	110	33x4	33x4	Wood	¾ Ell.	Left	Center	Stewart	Plain 5	Ball	Ball	Roll	Wayne, Richmond 4
Plate	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Timken	4.45–1	126	35x4½	35x4½	Wood	Cant.	Left	Center	Stewart	Plain 3	Ball	Roll	Roll	Westcott, 51
Plate	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Timken	4.45–1	120	34x4	34x4	Wood	Cant.	Left	Center	Stewart	Plain 3	Ball	Roll	Roll	Westcott, 41
Cone	Sel	Amid	4	Bevel	Rad.Rd	Semi-F	Own		115	32x4	32x4	Wood	¾ Ell.	Left	Center	Warner	Ball 2	Ball	Ball	Ball	White, G.A.H.
Cone	Sel	Amid	4	Bevel	Rad.Rd	Semi-F	Own		133.5	36x4½	36x4½	Wood	¾ Ell.	Left	Center	Warner	Ball 2	Ball	Ball	Ball	White, G.E.D.
Disk	Sel	Unit X	3	Bevel	Tor.T	Float	Own	4.00–1	114	34x4	34x4	Wood	¾ Ell.	Left	Center		Plain	Ball	Roll	Roll	Willys–Knight, 84
Plate	Sel	Unit M.	4	Sp.B.	Spring	Float	Timken	4.08–1	138	37x5	37x5	Opt	¾ Ell.	Left	Center	Warner	Plain	B&R	Roll	Roll	Winton, 22
Plate	Sel	Unit M.	4	Sp.B.	Spring	Float	Timken	4.45–1	128	36x4½	36x4½	Opt	¾ Ell.	Left	Center	Warner	Plain 4	B&R	Roll	Roll	Winton, 22–A
Disk	Sel	Unit X	2	Bevel	Tor.T	Float	Own	4.00–1	104	28x3	28x3	Wire	¾ Ell.	Left	Center	Extra	Plain 2	Ball	B&R	Ball	Woods Mobilette

ATIONS:—Starter Make: Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; **ughouse, Westhse;** Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, **t; Unit with Axle,** Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle: Floating, Semi-Floating,** Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weiss, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter **;, ¾ Ell;** Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R. *Also 140.

The FORVM

THE ENGINEERING SIGNIFICANCE OF AMERICAN RACING SUCCESSES; THE FRENCH AND THE AMERICAN VIEWPOINTS—BALANCE OF EIGHTS—ROTARY ENGINES

Old European vs. New American Racing Cars

By Louis Delage,
L. Delage & Cie, Courbevoie, France

EDITOR THE AUTOMOBILE:—In your issue of Oct. 14 you publish an article entitled America's Engineering Triumph, with a sub-title reading Europe's Finest Cars Completely Vanquished by the Product of American Engineering Skill.

Will you allow me, sir, as the builder of one of these cars, to make a few reflections? Can you in all truthfulness say that you have defeated the finest European cars? Do you think it is really just to compare cars designed and built during the present year with racing cars constructed two and a half years ago? Since that time, it must be admitted, you in America have worked hard at the problems of efficiency of motors and automobile mechanism, while we have been able to do nothing? English, French and German automobile manufacturers, against whom your own manufacturers have just competed, have, unfortunately, had another and more important task on hand.

Europe Originated Ideas

Again, you state that this rout of European cars has been brought about by the genius of American ideas. Here again, sir, I must ask you if you can honestly uphold such a claim? This letter has not been written with any idea of belittling the winning American cars. But accompanying this article are two mechanical drawings of the winning motor. These drawings show that this wonderful motor possesses the Peugeot crankshaft built up in two parts according to the Delage method. The lubrication system is that of the Delage cars. The camshaft drive is Peugeot type. The combustion chamber, the valves, and the camshaft are Mercedes. The connecting-rods and pistons and their method of attachment are Peugeot and Sunbeam. The general characteristics of the motor, the bore and stroke, are Sunbeam, Peugeot and Delage, these same characteristics having also been adopted by Mercedes in the last French grand prix. In view of this, can you in all honesty make very serious claims in favor of American mechanical skill?

Admires Stutz Performance

I must again repeat that I do not wish by this letter to deny the incontestable value of the Stutz cars, nor do I wish to belittle the splendid results obtained by Stutz in this race. But I do believe that you Americans are better sportsmen than to seek to compare your new cars with our old ones, and to give to your new cars more merit than they really possess.

Some day circumstances will allow us to line up by the side of American cars with racing machines designed and built at the same time as your own; we shall compete with our own drivers and our own mechanicians; we shall have our own workshops established by the side of the track, with everything that our men may need to put their cars into the best possible racing condition. If you win then, but not until then, you can claim to have completely vanquished Europe's finest cars.

I hope that day may come soon. It will give me the greatest personal pleasure to compete against your national champions, as we did so successfully at Indianapolis two years ago.

Engineering Is Evolution—Not Revolution

By Harry Stutz,
President Stutz Motor Car Co.

EDITOR THE AUTOMOBILE:—There has been a tendency in some quarters to contend that much of the engineering in the Stutz is of foreign origin. Especially is this tendency shown since the American car showed its heels to the fastest cars racing in 300 cu. in. class Europe has ever produced. The demonstration took place on the lightning-fast Sheepshead bay course and it was the most pronounced demonstration of superior quality that any car ever made in a competitive test—the Stutz winning both first and second. European automobile trade journals and a very few American publications have tried to show that the Stutz cars were very similar to the foreign cars. But for that matter, so are all very fast cars, because the principles of engineering which are employed in making fast cars are universal and almost standard. To deny the fundamentals of fast construction would be suicidal on the part of any maker who seriously contemplates making a showing against the world's fastest cars.

American Stamina Won

At the same time it must be remembered that one of the things which won for Stutz was stamina. Speed was present but it was American stamina which tipped the scales the right way and brought an American car home the winner.

It would be ridiculous for an American writer to violate the precepts of good composition set down by Milton, Macaulay and Shakespeare. No American painter would violate the laws of drawing evolved by the world's great masters. American writers and painters may some day do for art what the Stutz did for racing, namely, bring the championship to our side of the Atlantic, but if they do they will not accomplish this end by working along new and revolutionary lines. Engineering, as well as art, is an evolution, not a revolution. That which is good is clung to—that which proves wrong is eliminated by time. If America had failed to recognize this fact a European car would at this moment be the world's champion instead of an American.

Europe has not hesitated to adopt everything American that has looked good to it. They have adopted our submarines, our telephones, our aeroplanes, our smokeless pow-

der and a thousand and one other things that we have done better than they. If we in turn find something that they have contributed to the world's sum total of knowledge why should we deny ourselves the benefit of it? The trick comes in adapting European ideals to our conditions. And don't forget that there were as many Americanisms in the two Stutz cars that captured first and second place in the big Sheepshead Bay Race as there were Europeanisms. And the most important Americanism was stamina.

V Motors and Vibration

By Arthur A. Bull

Assistant Chief Engineer Cole Motor Car Co.

EDITOR THE AUTOMOBILE:—In the issue of THE AUTOMOBILE for Nov. 11, Allen Loomis calls attention to what he considers an obvious error in the computation of unit inertia pressure and takes exception to the figures given in the paper. The figures given are, however, substantially correct, as the following comments will tend to show.

First, Mr. Loomis states that "the total inertia forces acting upon each crankpin of the Cole motor are due to the inertia of the reciprocating masses of two cylinders," presumably by reason of opposite cylinders having their pistons attached to a common bearing.

Fundamentally this statement is correct; however, the net resultant of the forces of both piston masses is not by any means the addition of the forces of both piston masses as the statement would infer.

On the contrary, the maximum resultant force on the crankpin is substantially the same as the maximum inertia of *one* piston mass only.

Twin Bearings Advantageous

Unconsciously, therefore, Mr. Loomis, in his assertion, substantiates one of the virtues of the twin bearing as used in the Cole eight, because, while the bearing is double that which would be used with side by side rods, the resultant inertia force is practically no more than that due to one piston mass.

The maximum condition exists when one piston is at the top of its stroke.

The inertia will be at a maximum in this cylinder.

The opposite piston is attached to the same crankpin and will be just past mid position, having a small accelerating force acting on the crankpin in the line of the connecting-rod.

Plotting the magnitude and direction of these two component forces graphically, the resultant force and its direction are found, it being about 5 lb. above the larger component.

In the same paragraph Mr. Loomis says, "The *inertia* forces will be plus the revolving weight of the connecting-rod big ends."

The bearing loads set up by the revolving masses of the connecting-rod big ends is usually considered as being due to the "centrifugal force" of the masses rather than inertia, and was for this reason not included. Since this was evidently included in the twin six figure for inertia pressures, to make the comparison fair, the following correction is added: Unit pressure due to inertia of reciprocating parts and centrifugal force of big ends in Cole eight—452 lb.

Referring to the criticism regarding the calculation of the horizontal vibratory force:

Let it first be emphasized that the diagrams, Figs. 4 and 5, referred to by Mr. Loomis and which he claims to have modified, represented the "unbalanced forces of the piston masses in each block," and were referred to as such in the paper, page 14, while the title added to the diagrams themselves indicated this also.

Since the resultant curve in Figs. 4 and 5 was that of two masses, the total resultant would be twice that magnitude; hence Mr. Crawford's correction.

However, these diagrams and those indicated at Figs. 9 and 10 were primarily intended to picture graphically the inertia forces at the distinctive speeds of rotation, to show the actual piston inertia of each piston and its load on the crankpin at different angularities and also to show how the inertia forces cancelled out with a crankshaft with the pins set at 90 deg.

Illustration, Fig. 8, was also added to show how a "balanced system" was possible in the "V-type eight" eliminating the vibratory force alluded to, correcting the statement that the V eight must of necessity be an unbalanced system.

In the light of the arguments, founded by research, given in Mr. Crawford's paper, and the possibilities of developments, the one (apparent) disadvantage argued against the eight V principle, that is, the vibratory tendency, seems to have a weak foundation, ignoring the successful performance of the eight to date.

Unbalanced Force Unimportant

To one who has read the paper thoroughly, it will be observed that the point which was intended to be brought out prominently was that "the theoretically unbalanced forces did not offer such objectional vibrations as do the vibrations arising from other sources, such as elastic yielding of the parts, and unevenness in cylinder work to which the twin six would be more prone than the "V eight" of equal capacity.

So far as the actual magnitude of the horizontal vibratory force, this is admittedly 1.43 times that of the force in the block, or 1.43 times greater than the unbalanced forces of a four-cylinder engine of one-half the capacity of the eight.

If, however, it is considered in another way, the vibratory force of the eight would only be 7/10 that of a four of equal capacity.

Referring to the remark wherein Mr. Loomis says, "The vibratory effect cannot be ignored either when one considers theoretically but properly that this force *acts upon only one end of only the unsprung weight of the car.*"

This is not quite clear—is it assumed that the vibratory effect will be more pronounced in the tonneau by reason of the application of the force at the end of the chassis remote therefrom?

The contrary would appear the more logical!

Would it not be reasonable to assume that the vibratory force, which is in nature similar to an externally applied force, has an effect similar to the smaller vibrations imparted to the car by road shocks?

Revolving Motor Is Suggested Term

By Fred C. Booth

EDITOR THE AUTOMOBILE:—Anent Edward V. Hartford's timely discussion of gnome and rotary motors, I suggest use of the word Revolving as applicable to motors of the French gnome and American gyro types only.

These motors revolve in every part but the crankshaft, the pistons having a simultaneous reciprocal and revolving motion. All others, however, revolve the crankshaft only. Hence, types of aviation motors may be accurately divided into three classes, gnome or revolving type, star type, having a radial arrangement of the cylinders, but with cylinders and crankcase fixed, and car type, of four, six, eight or twelve cylinders, vertical or V arrangement.

Incidentally, the true rotary engine is a thing of the future. I expect to see it replace even our present smooth eights and twelves, just as surely as the steam rotary engine or turbine is replacing the reciprocating type.

The Rostrum

Compression Varies Widely in Stock Cars

EDITOR THE AUTOMOBILE:—What is the average cold air compression in automobile engines? I have heard much about high-compression engines of late and I would like to find out just what is meant. The other day I received a booklet describing a popular eight in which a Northway motor is used, the compression being given as 60 lb. per sq. in. and it was spoken of as being rather high. Four or five years ago when big, slow-speed, low compression motors were the rule, I understood that 60 lb. was considered as about the average. By 60 lb. compression I mean gage, not absolute.

Or, to put it a little more specifically, what compression is used in the following motors, or as many of them as you can give without too much trouble: Mercer 22-72; Packard twin-six, Cadillac eight, Studebaker, Pierce and Stearns? Also how high does the compression (cold air), run in some of the racers that fared forth at Sheepshead Bay in the Astor Cup Race?

Worcester, Mass. F. B. F.

—Compression varies all the way from 40 to 80 lb. per sq. in. absolute, all depending on the ideas of the engineer to design the motor and the purposes for which it is intended.

To give you definite figures as you ask is not possible in all cases as some manufacturers object to the publication of this information. The compression in the Packard Twin-Six is approximately 75 lb. with the throttle wide open and at a motor speed of 110 to 120 r.p.m. This pressure while somewhat higher than the average is made possible by the small bore of the motor which is only 3 in. On the Packard 4½-in. motor, the compression has been 60 lb. and the 5-in. bore motors, 55 lb.

The Pierce-Arrow compression space varies from 26.6 to 29 per cent of the cylinder displacement in the 38, 48 and 66 cars. The highest compression is used in the 38.

On the Stearns the compression space is one-fifth of the total cylinder volume. The compression in the Cadillac eight is 86 lb. at 1000 r.p.m., with a wide open throttle. The Studebaker has a compression of from 60 to 65 lb. gage at about 100 r.p.m. This amounts to about 70 lb. per sq. in.

In racing cars the compression reaches 100 lb. per sq. in.

Forty Cu. In. Tank Is Necessary

Editor THE AUTOMOBILE:—How small a tank could be used that could be made to hold sufficient carbide gas to last one ¼-ft. burner 15 hr. If a circular tank was used what could be its smallest possible dimensions? How much carbide could be used?

If all the gas in the carbide was stored in the tank without loss, would the outlay for a small plant to charge tanks of this kind be great? Could it be done at all? What in your opinion would the cost of manufacturing such tanks be?

Indiana, Pa. J. W.

—The tube for containing the quantity of gas desired in this instance must have 40 cu. in. water capacity. The diameter and length can be made as desired to give this capacity. The interior of the cylinder must be constructed along the lines laid down in the regulations of the Inter-State Commerce Commission, Shipping Container Specifications No. 8 in that they must be completely filled with a porous substance saturated with acitone or other approved solvents and must not be filled to exceed a pressure of 250 lb. to the square inch.

Regarding the second paragraph of your letter, high pressure generators used for generating and of their own pressure charging these cylinders, are not only unsafe but positively dangerous. Within the past several years a great many of very disastrous accidents have happened, therefore, the gas should be generated in low-pressure generators and pumped into the cylinders using compressors of at least two stages.

The cost of such a plant will be considerable and the cost of manufacturing the special size cylinders, unless they are used in very large quantities, would make the expense of the operation out of all proportions to the benefit to be derived from the use of such a container.

The Prest-O-Lite company now markets a container 4 in. in diameter by 10 in. in overall length which contains 10 cu. ft. of gas and would carry a ¼-ft. burner for 40 hr. This however, is the smallest cylinder that this concern believes it possible to produce and handle commercially, having spent considerable time and money experimenting with smaller sized cylinders for special portable purposes.

Rebuilding Hupmobile 20 of 1909

Editor THE AUTOMOBILE:—I have a 1909 model 20 Hupmobile which I am contemplating cutting down for a raceabout. Can I lower the steering wheel?

2—Please give me the timing on this car to give the best results. Any other suggestions would be greatly appreciated.

Athens, Tenn. C. C. H.

—Any good mechanic should be able to do this work for you, although THE AUTOMOBILE has no record of it having been done. The steering gear on this car is a rack and pinion design and would not seem to present any particular difficulty.

2—The timing on this car is given in the diagram on the next page.

Steering Connections of Cadillac 1915

Editor THE AUTOMOBILE:—Will you kindly let me know if this would be right for the firing order of an eight-cylinder motors: 1, 8, 3, 6, 4, 5, 2, 7?

2—Under or connected at the end of the steering rod housing is some attachment which operates when the spark or gas lever is operated—meaning spark and gas lever at driving wheel sector. Will you kindly explain its duties? Cadillac 1915 late model.

3—How would you test for a grounded interrupter point?

4—How should one test for switch trouble? Not a starting switch.

5—Will you kindly explain the reason for light on a Ford getting dim when the car takes a hill?

6—Explain the timing of a Bijur motor generator distributer.

7—Kindly explain the type of push rods used on a Cadillac eight 1915 model? How are they adjusted?

Jersey City, N. J. E. W. C.

—The cylinders may be made to fire in that order although it is more customary to have them firing across the block.

2—The steering shaft on the type 51 Cadillac is hollow and a tube and rod run through the center. The spark lever above the steering wheel is connected to the upper end of the rod. The throttle lever above the steering wheel is connected to the upper end of the tube. Small segments of bevel gears are attached to the lower ends of the tube and rod. Other segments of bevel gears mesh with the segments attached to the spark rods and throttle tube. Rods running from these segments operate the spark advance and the throttle in the carbureter.

3—A flow of current through the primary when the breaker points are separated, should give a clue to this. This can be detected by an ammeter on the ignition line when the points are separated.

4—Disconnect the wires from the switch and close the circuits by touching the wires together. If the circuit operates correctly at that time, but incorrectly by the switch, it will indicate that something is wrong with the latter.

5—The current output of the Ford magneto generator rises in proportion to the speed of motor. Consequently when the motor slows down on a hill the generator output becomes less and the lights grow dim.

6—The Bijur Motor Lighting Co., does not make any motor generators with distributers.

7—The valve tappets on the eight-cylinder Cadillac are operated by rocker arms. The upper end of each valve tappet is drilled and tapped and an adjustment screw fitted with a lock nut. The adjustment is made by loosening the lock nut and screwing the adjustment screw in or out as required. After this, it is locked with the adjustment nut.

Effect of Metering Pin Shape

Editor THE AUTOMOBILE:—Will you describe the effects of the following conditions through the Rostrum Dept.? Having the needle valve jet point in say any carbureter ground at a very acute angle and also having it ground at a more obtuse angle what will be the effect of such seats, at both low and high engine speeds in each case; considering its adjustment to be common for all speeds, such as used in the Kingston carbureter. The case I have in mind is a Kingston and seems to load when the engine is pulling extremely hard; hence, low speed. Would a change in the jet point L effect this? Also, explain the effect of different levels low and high, not above jet, of float in connection with this?

Pratt, Kans. R. P.

—The difference in the grinding of the needle valve will not have any effect on the carbureter in which the position of the needle valve remains constant, because if the area of the opening is correct, that is all that is necessary. If on the other hand, the needle valve acts as a metering pin, and is raised and lowered to give compensation for different speeds, the angle will have a very material difference, since it will effect the area of the opening differently for each angle.

The effect of different levels is simply that a higher level will give a richer mixture at the jet and a lower level will give the leaner mixture for the same needle valve opening.

R.P.M. of 1910 Elmore

Editor THE AUTOMOBILE:—I would like to know at what revolutions per minute or piston speed the 1910 Elmore engine developed its maximum power. This engine is of the three-port two-cycle type with ordinary crankcase compression. The mixture is transferred from the crankcase to cylinder through the ordinary form of by-pass and not by means of distributing valves. The later models used the distributing valves.

This motor has four cylinders, and a bore of 4½ and stroke of 4-in.

Ithaca, N. Y. H. C. D., JR.

—The revolutions per minute of the Elmore 1910 engine are 800 to 1300.

It is of course understood that the r.p.m. of a motor will vary with each change in its condition as regards carbonization, etc.

Equipment of Model 17 Buick

Editor THE AUTOMOBILE:—I have a 1910 Buick model 17 and would like to know what the original equipment was, as to ignition, carburetion and water systems. I also would like to know the bore, stroke and rating of this engine and will greatly appreciate your advice in the matter.

N. Y. City. W. J. R.

—Model 17 Buick was a four-cylinder motor with a 4½ bore and 5-in. stroke. These motors have been able to develop up to 50 hp. at 1200 r.p.m. on the block. They were equipped with Schebler carbureter, Remy magnetos and pump circulating cooling system with gear pumps and tubular radiators.

Franklin Uses Less Oil than Record

Editor THE AUTOMOBILE:—I read with much interest the article in THE AUTOMOBILE entitled, Franklin Travels 1046 miles on 1 gal. of Oil. As I have been driving a Franklin 6-30 roadster for the past seventeen months and the oil consumption has been much less than that record during the whole period, provided you do not consider the oil needed to refill the reservoir after drawing out and cleaning the crankcase. I have driven the car over 10,000 miles and it has never required more than 1 qt. of oil to maintain the level in the reservoir for 800 miles.

It takes 6½ qt. to refill the reservoir, and I clean out and renew the supply every 1500 miles, and during the run of 1500 miles it is unnecessary to add more than 3 pt. to 2 qt. to maintain the level. I am using Quaker State oil, the same as the car used in the above mentioned test, but I have always used Oildag mixed with it. I might add the facts that the engine has never had a bearing adjusted or a valve ground yet and runs as smoothly as when new.

Brattleboro, Vt. C. A. S.

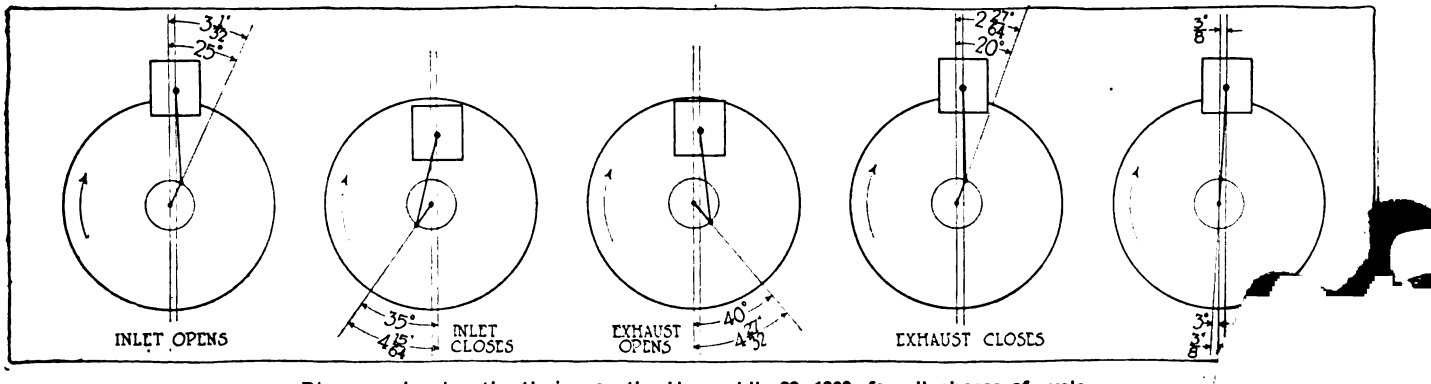


Diagram showing the timing on the Hupmobile 20, 1909, for all phases of cycle

The Automobile

PUBLISHED WEEKLY

Vol. XXXIII Thursday, December 30, 1915 No. 27

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
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231-241 West 39th Street, New York City

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Consolidation Vs. Speculation

BIG combines and great mergers may spell prosperity or ruin, according to whether they commercially are reasonable or not. Combinations between companies which are brought about by the desire for better trading in the future and the consequent better profits that may be expected to accrue are usually good. Combinations that are made with the idea of immediate profits on the deal in stocks are usually bad. To make a human analogy a man builds a better house if he means to live in it than he will erect as a speculation in the hope of a quick sale. The man who builds his house and makes his home in it is the more useful citizen of the country. The business chief who makes his business and lives in it is the better citizen of his industry.

Countries and industries alike depend for their reputation, and for the well being of those who are identified with them in humble capacity, upon the integrity and common sense of their government. Industries rank with each other much as nations, and the industry that loses the respect and trust of its world is in as bad a case as a nation that is placed similarly.

In an incredibly short space of time the automobile industry has built itself a great place in the commercial divisions of the world's business. It is now the task of all in that industry to see the reputation so easily gained is maintained no less ably.

Meeting the Price

EMPHATICALLY the most remarkable thing about the 1916 automobile is its price; its unexpected cheapness. No living man can say whether we are enjoying a false drop which will prove in the future to have been ill conceived, or whether we are but half way down on the fall. Whether the average price of the 1917 automobile is to show a continued drop, or whether it will show a rise, is a matter purely of speculation. Yet, whatever the future has in store the fact remains that the automobile of 1916 is the best and cheapest the world has ever seen.

There are better cars to be had for $1,000 to-day than were purchasable two years ago for double the money. This means that the buyer is going to get much more than double the amount of return for the money expended, he is gaining 50 per cent on the price and gaining an indefinite amount in addition because of the better engineering in his car.

Fours Preponderate

DESPITE all averages deduced from listed models of cars, it must not be forgotten that there have been made vastly more four-cylinder automobiles than all other types added together. Next year the *majority* of the cars built will have four cylinders, some say 75 per cent of the 1916 cars produced in America will have this number of cylinders. The reason can be only that four-cylinder construction is the cheapest that will give reasonable satisfaction.

As cheaper models of sixes and eights are placed on the market, and as the manufacturers thereof increase their production, the proportional preponderance of fours may be decreasing, but the very great increases of output are to be sought rather among the four-cylinder specialists than in other fields.

Noise the Quarry

TRACING the development of the automobile it is easy to observe waves of activity in definite directions and in successive periods, and making such an examination reveals the suggestion that the noisiest part of the chassis has generally been the first to obtain the concentrated attention of engineers.

After the first struggles had resulted in the production of a machine that had some modicum of reliability, the first feature of it to be altered was the chain drive. The chain drive was reliable and fairly efficient and it gave very little trouble, but it did certainly create considerable noise as the chains became worn, hence, the big change of the next year or two, was from chain transmission to the live axle and bevel drive.

Another noisy part of the chassis was the gearbox, and this was attacked at a slightly later, but slightly overlapping period, with the result that the direct drive on high gear was evolved.

Having thus more or less disposed of the trans-

mission, the noise of the motor became paramount, and we saw inclosed valves, sleeve valves, chain front ends, smaller cylinders and more of them; and so forth. Two years ago the motor had been silenced to a point where the transmission became noisy again by comparison and thence sprang the worm drive activity, which culminated in the discovery of easy means for making the spiral bevel.

To-day noise is conquered, or almost so; motor, gearset and smaller parts operate almost noiselessly and engineers have had time for other things, such as high gear ability. Signs are not wanting that this, too, is almost subdued to the will of the engineer, leaving the way open for the next achievement, which seems likely to be that of weight reduction.

Body Development

FEW things are more remarkable in the progress of the past 2 years than the development of bodies. The car bodies of 1916 are much more handsome in appearance and much more comfortable internally than were those of 1914, and they are costing less to make. It is largely another instance of the efficiency of simplicity.

Emphatically 1915 has been a year of large bodies, big seven-passenger equipment being put on quite low-priced chassis, and in looking down the list of body options given by the leading makers it is easy to see the reaction, in the shape of many three-seated roadsters, clover leaf four-passenger cars and the variants thereof.

The close-coupled tonneau body is coming back in a new form, and apparently is finding much favor with motorists. Seeing that it was practically a new thing a year ago, the number of the clover leaf style of body now in use is a striking tribute to the qualities of this design and everything points to a much greater output of this equipment during 1916.

Cantilevers Spreading

AS the arguments for and against cantilever springs have died away, with very little conclusion reached on academic points, it is noteworthy that the use of the cantilever spring has increased considerably. There is no hidden mystery within the cantilever form of suspension, it can give good or bad results just as can any other type, but in practice the spring designers have been most successful in choosing cantilever proportions.

The cantilever spring has proved itself a worthy part of a chassis. Stripped of any glamor it remains an excellent form of spring, specially suitable for certain applications and less desirable for others. It provides the automobile engineer with an additional form of great adaptability as an alternative to other types, and its convenience is likely to lead to a still greater extension of its field. In body development another thing of probable importance is the spreading popularity of the detachable top which enables a touring body to be converted into a fully closed type. This style is at present in an early stage of development and is full of promise for the future, the manufacturers who have adopted it finding a growing demand and great appreciation of the convenience. Some expect this to lead to a wider use of closed bodies, and others fancy the body with a permanent roof and removable windows, but meanwhile the upper structure which is detachable as a unit is being turned out in thousands.

Simplification

READING through the analysis of trends of design as shown by the 1916 chassis it is very noticeable that almost every development of the past year has been towards simplification of some part or other. The only thing in which complexity has apparently been increased is the motor, but this is not really the case either. The V engine, eight or twelve-cylinder, has more simple parts like pistons and cylinders, but it has usually fewer intricate small pieces than the average six of a year or two ago. Sixes have many fewer parts than used to be deemed necessary, and even fours exhibit a small trend in the same direction, though we have had some extremely simple fours for several years.

The greatest change, perhaps, is to be seen in the reduced number of attachments to the frame as engineers of assembling companies have made a very close study of this. The total number of hours work that go to the complete assembly of a 1916 chassis is smaller than would have been deemed possible a few years ago. It suggests the speculation as to how much further it will be possible to go.

Future Prosperity

THAT the phenomenal prosperity of the automobile trade in 1915 will be continued is the view meeting with general acceptance, and it is a reasonable view, for there seems every reason why the prosperity of trade in America should continue long after the war is over. The American automobile industry has this year been taxed to the utmost to meet the domestic demands, and has fallen far short of meeting the orders that have poured in from all over the world. Everywhere that Europe used to send automobiles, in the British colonies and dependencies, in Russia, in South America, there is more or less of an automobile famine. For one year the shortage of supply has not been serious to these countries, but next year it will begin to be, and in 1917 the markets will be starving for cars. It will be 1918 at the earliest before the European factories are able to ship automobiles in any quantity to count and meanwhile there is, on a rough but conservative computation, $100,000,000 of export business to be done by the American industry.

If the domestic demand continues, it seems improbable that the increased outputs planned will be able to take care of this foreign trade which means that it stands as a reserve market and an insurance against any unexpected drop in home demands. Never has any industry been in a happier position.

The History of the American Automobile Industry—10

Gurney and Hancock, Two Great Pioneers in the Development of the Steam Road Vehicle—Steam Stage Lines—32 M.P.H. Made by Two-Cylinder Three-Wheeler in 1831

By David Beecroft

¶ Review—Last week took up the development of the modern regime in steam vehicle construction dating from 1898 up to 1906, during which time over fifty American manufacturers were building steam automobiles in quantities and the steam vehicle was far ahead of the internal combustion engine driven machine. Several quaint and novel plans for vehicle propulsion were described, including the Gordon Squirrel steam car in which the engine was mounted inside of a large, wide wheel and tended to climb the wheel as the squirrel climbs its revolving cage, the weight of the engine thereby becoming the propelling power, the wheel being attached behind the vehicle and pushing the latter forward as it rolled. Griffiths, the first to develop a comfortable vehicle, was also mentioned and the semi-elliptic springs he used described.

This week some of the later developments in the steam car field are traced, showing the increasing practical application of steam for vehicle propulsion.

BETTER results followed the efforts of Sir Goldsworth Gurney, England, 1793-1875, who was educated as a doctor, practised as a surgeon, lectured on chemistry and other scientific matters, and was the inventor of the oxy-hydrogen blowpipe, the calcium light using an oxy-hydrogen flame on incandescent lime, and the steam jet for ventilating purposes.

Gurney began his experiments in 1823, when there was considerable public interest, and no doubt brought to his assistance the experience of the earlier workers. Of his first automobile but little is known, but it seems that he propelled it by legs or pushers like Gordon's. He next tried propelling wheels, this being about 1825 or 1826. In 1827 his new improved steam coach was brought out and seems to have been the most successful vehicle thus far. It carried twenty-one passengers, six inside the coach and fifteen on the outside or top seats. It was a six-wheeler, the main four wheels being practically such as would be employed upon a horse-drawn vehicle, but the pole instead of having horses was supported by two steering wheels, guided by a tiller in the hands of the operator, who sat very low in front with the throttle and brake levers close at hand.

Three reaches connected the axles and supported the two cylinders between them. One rear wheel only was driven, the other being loose to permit turning, but a clutch was provided that could be used to fix it to the axle when additional traction was required. In addition he fitted pushing legs that could be dropped and brought into use for hill climbing or any similar unusual service, but these were later removed. Brake shoes rubbing on the tires controlled the speed down hill and for stopping, and the engine could be reversed.

The boiler was tubular and fitted with fusible plugs. Four chimneys or smoke flues were used, but there was no smoke because coke and charcoal were burned. As in recent years, there must have been much apprehension lest these inventions of the Evil One should blow up, because *The Mirror*, London, of Dec. 15, 1827, explains that the boiler was "perfectly safe and could not burst or cause injury because of its new plan and philosophical principles." It made a run of 6 miles in 35 minutes, going up hill at 5 m.p.h., and attaining a speed of 14 to 15 m.p.h. in other parts, although the roads were heavy.

In 1828 this vehicle, or a successor, was sold to an iron master, Crawshay, and fitted for use as a tramway locomotive. Two years later Crawshay wrote that it could get up steam in less than 5 minutes, do 3 miles in 39 minutes and could draw 20 tons after it on an iron way, although it weighed but 3000 lb.

Two years later he again reported very favorably on its performance, and stated that it had needed but trifling repairs. In 1829, July 28, Gurney and a party started from London to Bath, three riding on the tractor and five in the carriage which it hauled. Others accompanied in horse carriages, and the speed averaged 12 m.p.h. At Melksham a crowd collected at a fair and was so dense it was impossible to move through except slowly. They were principally farm laborers and factory workmen, and considered the carriage injurious to their interests. With a cry "Down with machinery" they attacked the party, disabled Gurney and knocked the principal engineer senseless.

Carried 2600 Passengers

In the early part of 1831 Gurney's drags were used by Sir Charles Dance in a steam carriage service between Cheltenham and Gloucester. Three round trips daily, amounting to nearly 4000 miles, and carrying more than 2600 passengers, were made. The receipts were more than $10,000, and the fuel expense but one-third of this.

Public feeling, however, was strongly antago-

nistic. Various obstacles were placed in the way. Heaps of stone and in some instances loose stone barriers 18 in. high were placed across the roads, compelling the steam vehicles to turn into the fields to get around them. An axle having broken because of these obstructions, a general overhauling was given and no perceptible wear was found except in the crank bearings. Dance claimed that during this period the vehicles caused no accident nor injury to anyone, and the engines were never out of order. He secured his passengers because of lower than coach fares, but just as the project was beginning to show a working profit, the Turnpike Trust secured from Parliament an act permitting them to considerably increase tolls on steam carriages. This being done in various parts of the country, Gurney gave up the problem and later applied to Parliament for compensation for his losses. He claimed $180,000 direct and a very much greater indirect loss. The committee appointed found Gurney to be the first successful user of steam carriages on common roads, and recommended a grant of $80,000, which was not made, however.

Gurney had a very high opinion of the value of mechanical propulsion and succeeded in interesting a number of people in his devices. He gave up this line of work in 1831, partly because of a serious boiler explosion in one of his carriages in Scotland. Dance, however, continued for some time afterward, and in 1833 fitted a new boiler mostly of his own design. With this factor and a large coach trailer he attained speed as high as 16 m.p.h.

Hancock's Début

Walter Hancock (1799-1852), a great steam pioneer, was the son of a timber merchant and cabinet-maker in England, but apprenticed as watchmaker and jeweler, although he practised as a mechanical engineer. His brother Thomas is credited as being the founder of the india-rubber trade in England, an art since of great importance, if not an absolute necessity to the automobile.

Hancock invented about 1824 a very light, small steam engine which used a rubber bag instead of a cylinder and piston. This worked quite well on a small scale, and seemed to him the proper thing for motor vehicles because of its light weight and extreme simplicity. A trial, however, proved its unfitness, but Hancock, having started on motor vehicles, continued. He placed his engines vertically to keep them out of the dirt and dust, invented a boiler of flat chambers which permitted a pressure of about 100 lb., very high for those days; used a centrifugal fan for blowing the fire and exhausted the steam into the grate so that it passed up the chimney, instead of out into the road where it might scare horses. During his 12 or 14 years' connection with the industry, he built nine or ten different vehicles, one of which, running between London and Stratford, was the first motor vehicle to regularly carry passengers for hire. How closely the motor vehicle movement followed the demands of the times will be seen if we remember that the first line of London omnibuses was inaugurated in 1829 by a coachmaker

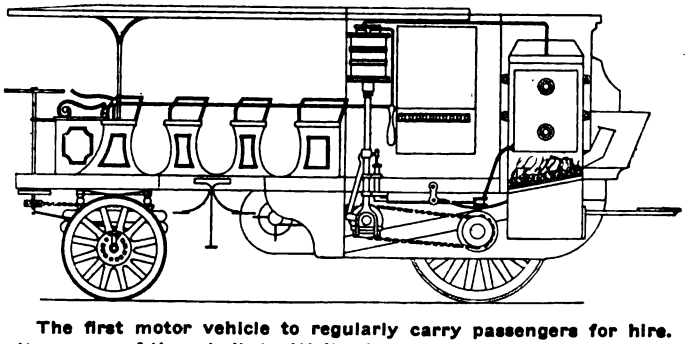
In August, 1834, Hancock started t
between London and Paddington.
plenty of passengers, the boilers ga
steam and every part worked with c
cess. When on one occasion one of the vehicles met with a mishap, Hancock sent to his shop for an extra which, having a two-speed gear, then considered a novelty, readily towed in the disabled car, although a hill had to be climbed. By the end of November, possibly owing to bad roads, the service was discontinued, about 4000 passengers having been carried.

10 m.p.h. in Ireland

In January, 1835, one of his vehicles was taken to Dublin and operated a short while by a steam coach company. It was brought back in August, and on a 75-mile and back journey showed an average of 10 m.p.h. The report of this run says it was well received everywhere and the bystanders were ready with assistance when required. Stops for water were necessary every hour or so. In the same year some experimental trips were made from London to Birmingham, and in 1836 three coaches and sometimes four ran on the Paddington Road, said to have been one of the least promising around London for such traffic. This venture between May and September carried nearly 13,000 passengers and ran every day except Sunday. In 1839, after 14 years' experience, he proposed a service from London to Birmingham, at 12 to 14 m.p.h., using a train having three trailing coaches, carrying eighty passengers, and 1.5 ton of goods; also a freight service of tractor with trailer van attached carrying 32 tons at 10 m.p.h.

32 m.p.h. in 1831

The fastest carriages of this earlier period seem to have been those of Summers & Ogle in 1831. Their first vehicle was a three-wheeler with a tubular boiler and two-cylinder engine, which is said to have attained a speed of 32 to 35 m.p.h., with a large number of passengers aboard. In view of the fact that their next vehicle with a three-cylinder engine and nineteen passengers made but 15 m.p.h., it is possible there is some error in the faster speed reported. The speeds were high for those days of poor roads.



The first motor vehicle to regularly carry passengers for hire. It was one of those built by Walter Hancock, a great steam vehicle pioneer. In August, 1834, Hancock started two steam carriages running between London and Paddington. This service was discontinued by the end of November, possibly owing to poor roads, about 4000 passengers having been carried

Chevrolet Capital $80,000,000

Increased from $20,000,000—Plan to Take Controlling Shares of G. M. C.

DOVER, DEL., Dec. 28—The Chevrolet Motor Co. of New York City has increased its capital from $20,000,000 to $80,000,000.

NEW YORK CITY, Dec. 24—The stockholders of the Chevrolet Motor Co., yesterday ratified the proposal of the directors of the company to increase the capitalization from $20,000,000 to $80,000,000, this step being taken in connection with a plan of that company to take over the controlling shares of the General Motors Co., by means of an exchange of stock. By this plan the General Motors stock, which has been obtained by a syndicate, is to be offered at a ratio of five shares of Chevrolet stock for one share of General Motors common. Under this proposal, between 110,000 and 120,000 shares of General Motors common will be offered.

The total number of shares represented at the meeting by proxy was 169,398 and in person 16,242, a total of 185,640. Somewhat over 100,000 shares of General Motors common will be affected by the proposed plan. The stock represents the holdings of W. C. Durant; Lamont Berlin, director of Aetna Explosives Co.; Pierre Du Pont; S. F. Prior of the Union Metallic Cartridge and Remington Arms Co. and J. A. Haskell, A. H. Wiggen, C. S. Sabin, and a few others, many representing Durant interests.

The acquisition of a controlling interest in General Motors by the Chevrolet company would make it the automobile company with the largest capital in the country.

A Step Toward Merger?

It is rumored that the increase of stock is a step toward the merger of the two companies. It is stated that Mr. Durant and his associates representing the Du Pont powder and Remington arms interests has secured enough General Motors stock to give them complete control of the company. It is estimated that including the holdings of his associates, Durant controls as much as 60 per cent or 70 per cent of General Motors stock.

Mr. Durant stated yesterday that the Chevrolet company on its present earning basis will show approximately 20 per cent on its present capitalization. Thus far the production had been at the rate of 185 cars daily, and it is estimated that by January this will be increased to 220 cars a day. By March it is planned to increase the output to 350 cars a day.

General Motors is unaffected by the plan and has nothing to do with it. Certain holders of General Motors stock entertain a proposal to exchange their shares for shares in another company. The remaining General Motors stock remains as at present, the only effect being that the floating supply is much reduced.

Sales of cars in General Motors are running in excess of 10,000 cars a month and its gross receipts in excess of $10,000,000 a month. It is estimated that the results for the current year will show a total of more than 120,000 cars made and sold, gross receipts in sales of $120,000,000 and net profits in excess of $24,000,000, or approximately 150 per cent on the outstanding $16,500,000 in common stock.

American Chain Co. to Take Over Weed Company

BRIDGEPORT, CONN., Dec. 28—After Jan. 1 the name Weed Chain Tire Grip Co. will begin to fade from the business world. Its place will be taken by the American Chain Co., and the company requests that all correspondence be addressed to the latter corporation. There is to be no change in personnel, management, policy or product.

The American Chain Co. was formed several years ago and is practically identical with the Weed company. It was created to establish a distinct manufacturing department to deal with production problems, but with the completion of a new factory the consolidation toward which the two companies have been working will be made effective.

Celfor Tool to Manufacture M. & S. Differential

DETROIT, MICH., Dec. 29—The Celfor Tool Co., Buchanan, Mich., has been licensed to manufacture the M. & S. differential and will use this differential as stock in all its axles as soon as facilities can be completed to manufacture them. The Celfor company is at present building a plant in South Bend, Ind., to be known as the South Bend Gear Co. which plant will manufacture solely the M. & S. differentials for the Celfor axles. A. E. Coom, will be manager of the factory the offices of which will be in the J. M. S. Building, South Bend. It is expected that the Celfor company will start deliveries in January. The M. & S. differential will be interchangeable with the other conventional types of differentials at present used in Celfor axles.

Fiat Gets Enger in East

NEW YORK CITY, Dec. 28—The Fiat Motor Sales Co., this city, has become distributor of the Enger for practically the whole of the Eastern territory. The company still represents the Fiat.

To Probe Gasoline Prices

Federal Trade Commission to Investigate Alleged Oil Shortage

WASHINGTON, D. C., Dec. 28—*Special Telegram*—The Federal Trade Commission is preparing to investigate the high cost of gasoline in two ways: First, by ascertaining the truthfulness of charges that in places where there is active competition between the large oil companies, prices are normal, while in sections where no competition exists the price is fixed upon the basis of all the "traffic can bear." Second, to ascertain whether there is an actual shortage of crude oil as alleged in some quarters as an excuse for hoisting the price. The Geological Survey keeps accurate oil production statistics which will facilitate the work. It is said that one prime object of the investigation will be to eliminate the middleman who receives an undue profit at the expense of producer and consumer.

It is practically certain that a congressional investigation of the subject will be proposed after the holidays. The Federal Trade Commission has all the power of any committee of Congress and also the benefit of expert technical assistance. Furthermore, it can inflict punishment for any violation of law and adopt remedial measures.

Two reasons given by the producers for the unprecedented series of advances in the price of gasoline in the past seven months are the decline of production and the tremendously increased demand due to the rapidly growing use of automobiles and motor trucks.

The following table of average prices in cents for the past five years up to Dec. 28 shows the marked upward trend:

Year	Opening	High	Low	Closing
1911	11	11	9	9
1912	9	16	9	16
1913	16	17	16	16
1914	16	16	13	16
1915	13	21	12	21

The increase in the price of fuel in cents in the past seven months is:

Month	Texas (Wholesale)	Standard (Wholesale)	To Consumer
May	12	11	11-15
June	12	12	12-15
August	14	14	14-17
August	15	15	15-19
September	16	16	18-22
October	17	17	18-23
November.	18	18	18-24
November.	19	19	19-25
December.	20	20	20-26
December.	21	21	21-27

Singer Builds Tire Stitcher

NEW YORK CITY, Dec. 29—The Singer Sewing Machine Co. has entered the automobile field with a machine for sewing treads on used tires of automobiles. The machine can be operated up to a speed of 250 stitches per minute and can be driven by a motor of ⅝ hp. or by foot.

Motor-Generator Patents Valid

Court of Appeals Declares Coleman Single-Unit Patents Valid and Infringed

NEW YORK CITY, Dec. 28—The Coleman patents, covering drive in motor-generator starting and lighting equipment, have been declared valid by the circuit court of appeals. These patents, which are owned by Conrad Hubert, who has licensed the Dayton Engineering Laboratories Co., maker of Delco apparatus, have been in the courts in an infringement suit brought against the Sidney B. Bowman Automobile Co., the New York dealer that sold a Marmon car fitted with a North East motor-generator starting and lighting system.

The court of appeals not only has declared these patents valid, but also that they are infringed by the North East device as fitted on the Marmon car cited in the case. The construction referred to in the patents applies to what is known as single-unit systems, namely those in which the electric starting motor and the electric generator are combined in one unit.

The Two Patents

The two patents involved were granted to C. J. Coleman under dates of Nov. 24, 1903 and Jan. 29, 1907. The earlier of these patents, No. 745,157, directly specifies a means for starting an automobile engine by the application of a motor-generator and for using the engine for the purpose of re-storing energy which would subsequently be used in making a start. This patent also described the means for the control of the vehicle's speed ratio. The system, as described, consists of a motor-generator connected through a train of gears to the crankshaft, the latter having a differential conection with the motor-generator so that the latter drives at one speed ratio and is driven at another. This differential connection is effected by having two sets of gearing which can be used alternately by means of a friction clutch.

The second patent, No. 842,827, deals with the means provided for automatically changing the motor-generator functions from those of a motor to those of a generator according to crankshaft speed and also for giving a maximum torque for starting. Special provision is made in this patent for controlling the speed of the engine so that it will drive the motor-generator as a dynamo at a constant speed.

The complaint is based on the following: On March 24, 1913, the Bowman company sold a four-cylinder Marmon car equipped with a single-unit electric starter made by the North East Electric Co., Rochester, N. Y., which device the Dayton Engineering Laboratories Co. claims to infringe the Coleman patents owned by Conrad Hubert and under which the Dayton company is the licensee. Suit was brought in July, 1913, and the Bowman interests cited numerous patents issued to inventors covering starters and analogous constructions to prove their contention that the patents were invalid and that there was no infringement. The district court decided that both patents were valid but that only No. 745,157 was infringed. Neither side being satisfied with this decision, cross appeals were made to the circuit court of appeals with the result that the validity of both patents was sustained but that No. 842,827 was also held to be infringed.

This decision of the circuit court of appeals brings the litigation to an end, the validity of the basic Coleman patents covering the single-unit type of electric starter being established.

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Weidely Motors Co. Now—Capital Increased to $350,000

INDIANAPOLIS, IND., Dec. 24—At a stockholders' meeting of the Weidely Motor Co., this city, held yesterday afternoon, the capital stock of the company was increased from $100,000 to $350,000 and the name of the corporation changed to Weidely Motors Co. The arrangement for additional capital was made necessary by the increasing demand for the Weidely twelve-cylinder, valve-in-head motors.

The officers of the company for the ensuing year are: President, W. E. Showers; vice-president and general manager, G. A. Weidely; secretary and treasurer, W. A. Umphrey, who with Edmund Rosenberg and L. A. Coleman, compose the board of directors.

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Mason Car to Resume

DES MOINES, IOWA, Dec. 24—George R. Mason, formerly manufacturer of the Mason car, has opened here the Mason Motor Service Co. in the old Mason factory and announces that he plans to resume the manufacture of Mason cars here as soon as practical.

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Dahlquist with Timken-David-Brown

BUFFALO, N. Y., Dec. 28—Charles S. Dahlquist, chief engineer of the Lippard-Stewart Motor Car Co., this city, has been appointed manager of the Timken-David-Brown Co., Detroit, Mich. Carl D. Peterson, assistant engineer with Mr. Dahlquist, becomes chief engineer of the Lippard-Stewart company.

Boston Blacking Enters Field

To Make and Market Complete Line of Cleaning and Polishing Preparations

EAST CAMBRIDGE, MASS., Dec. 27—The Boston Blacking Co. of this city, one of the largest manufacturers of polishes and cements for the shoe and leather trade, has entered the automobile accessory field with a very complete line of cleaning and polishing preparations for all parts of the car. This company, with factories in nine different countries and with branch offices and warerooms in all the larger cities of the United States, is taking up the question of manufacturing automobile polishes not as an experimental department but as a standard arm of its business. The various polishes will be marketed through the regular channels of automobile jobbers, dealers, etc., and the various merchandise will be put up in pints, quarts and larger quantities for convenient merchandising. The goods are marketed under the trade name of Be-Be-Co. which is carried by all goods of the company.

Among the various polishes specially intended for the automobile are: Mohair top dressing, leather top dressing, top lining dye, seat and slip cover cleaner, cushion dressing, metal and body polishes, giving gloss and dull finishes, brass polish, nickel polish, body polish, motor car soap, hand cleaners and red, white and gray tire paints.

The company has branch factories in Chelsea, Mass., Montreal, Que., England, Germany, France, Austria, Sweden, Italy and Australia, and branch offices and warerooms in all the large cities of the United States.

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Packard Buys Land for Aviation Tests Next Spring

DETROIT, MICH., Dec. 24—It was announced by Vice-president of Engineering J. C. Vincent, of the Packard Motor Car Co., that this company recently acquired a large tract of land on Lake St. Clair, near Mt. Clemens, to be used as an aviation field. As was stated very recently by President Henry B. Joy, of the Packard company, the company is becoming strongly interested in aviation matters. Tests with aeroplane motors have been going on for six months. Experiments and testing on the aviation ground will probably be started in the spring. The first experimental aeroplane has been ordered from a New Jersey concern. The Packard company does not expect to make complete aeroplanes at least for the time being, concentrating upon motors.

Hudson Stock Super-Six Makes 75.7 Miles in Hour in A. A. A. Test

New Model with Stock Equipment Accelerates from Standing Start to 60 M.P.H. in 23 Sec.—Official Trials Precede Announcement of Car

NEW YORK CITY, Dec. 27—On Nov. 18, 24, 25 and 29 the new Hudson Super-Six, which makes its first appearance this week, was put through a series of sanctioned tests on the Sheepshead Bay speedway. The tests, conducted by F. E. Edwards representing the contest board of the American Automobile Association, consisted of acceleration and speed trials in which the stock touring car with three passengers attained a speed of 60 m.p.h. in 23 sec. from a standing start, a speed of 50 m.p.h. from standing start in 16.2 sec. and starting from 5 m.p.h. in high gear accelerated to 30 m.p.h. in 10 sec. and to 50 m.p.h. in 19.4 sec. In addition to these trials the Hudson Super-Six, with two passengers, was run for one hour in which time it completed 75.689 miles and with five passengers and top and windshield up completed 70.742 miles. The final test consisted of a 100-mile trial, this distance being covered by the same car in 1:41:40, an average speed of 74.67 m.p.h. Obviously, to attain these average speeds it was necessary to run without interruption.

The car was under close observation from time of completion to arrival at factory after the test, F. E. Edwards checking it before, during and after trials.

The car is one of the new 1916 Hudson seven-passenger touring cars fitted with a six-cylinder block cast 3½ by 5 motor; wire wheels and Goodrich Silvertown cord tires 34 by 4. The weight of the car without passengers, but with all liquid compartments filled was 3164 lb. All the motor equipment usually supplied was left intact, so there is no doubt of the car coming under the stock classification as designated by the rules of the American Automobile Association. The gasoline used for all tests showed 58½ deg. Baumé at 40 deg. Fahr.

Acceleration Trials

The acceleration trials were conducted on Nov. 18. In the opening trial the car, with windshield up, was driven by C. H. Vincent, experimental engineer of the Hudson company, and beside him was F. E. Edwards of the A. A. A. and in the tonneau H. A. Tarantous, Edwards' assistant. Starting from 5 m.p.h. in high gear the driver was given a signal to accelerate and when the car had attained a speed of 30 m.p.h. the watches showed 10 sec. and at 50 m.p.h. 19.4 sec. These times were taken by two watches and these checked, exactly. In the next acceleration trial, held a few minutes after the first, the car with the same driver and passengers was made to accelerate to 60 m.p.h. from a standing start and going through the gears. The car was stopped, and at a given signal the driver started, shifting into first, second and high, after which a speed of 60 m.p.h. was attained, the time taken being 23 sec. A reading taken at 50 m.p.h. showed 16.2 sec. During these trials the windshield was up, as stated previously, and the top folded.

Owing to the severity of the weather the next test was run on Nov. 24, on which day the thermometer showed 42 deg. F. The trial was for one hour with the car containing five persons, and both top and windshield were up. The Hudson Super-Six, the same car which was used in the acceleration trials, made a flying start at 3.36 p. m. and in one hour completed 70.742 miles, and as in the other trials which followed consistent running was a most noticeable feature. The variation in lap time never exceeded 1.8 sec., the slowest lap recorded being 1.41.2 and the fastest 1.39.4. The driver, Ralph Mulford, drove well up on the highly banked turns, which means that the car traveled slightly more than two miles to the lap. The car with all passengers weighed 3986 lb.

Made 75.689 Miles in Hour

As the weather permitted it, the next trial was run on the following day, Nov. 25, and this test consisted of a one-hour run with two passengers, Ralph Mulford driving and C. Vincent in the seat beside him. The top was folded and the windshield halves were placed in a horizontal position. The driver guided the car around the speedway, for a few laps to warm up the engine and at a given signal from the mechanic timing was started. The official start was 11.03 p. m. and at the finish of the hour the car had traveled 75.689 miles. The fastest laps made during this one-hour run were the sixth and eighth, both of which were made in 1:33.80 an average of 76.75 m.p.h.

One of the most remarkable performances of the Hudson was made under adverse conditions in the 100-mile test which was conducted on Nov. 29. During this test there was a variation in temperature from 48 deg. Fahr. at the start to 43 deg. at the finish. The 100 miles were completed in 1:41:40 an average of 74.67 m.p.h. and for this whole period the motor was turning over at about 2600 r.p.m.

New Car in Rock Hill, S. C.

ROCK HILL, S. C., Dec. 31—Automobiles are now being manufactured in this city by the Anderson Motor Co., a concern which occupies the premises and is made up of the same officials as the Rock Hill Buggy Co. The car, which was designed by Joseph Anglada, consulting engineer, is a six and is equipped with a complete line of accessories, including electric searchlight on the windshield, tonneau heater and electric cigar lighter. The price of the car, which is known as the Anderson Six-40-Six, is $1,250.

The car is assembled and the specifications include the Continental six 3¼ by 4½-in. unit power plant with Covert transmission, Borg & Beck dry-disk clutch and Mott axles. The wheelbase is 120 in., and the tires 33 by 4.

Niblette Resigns from Goodrich Branch

BUFFALO, N. Y., Dec. 27—H. B. Niblette, general manager of the local branch of the B. F. Goodrich Co., has resigned, after being with the company for seventeen years. He will temporarily make his headquarters at the Knickerbocker Hotel, New York City, beginning Jan. 3.

Frontenac Motor Co. to Build Louis Chevrolet Racers

DETROIT, MICH., Dec. 23—A team of racing cars designed by Louis Chevrolet, is expected to take a prominent part in the speedway races in this country next year, according to the plans of the Frontenac Motor Co., which has been organized here and incorporated, to build and campaign them.

Louis Chevrolet is president of the Frontenac company and associated with him are Joseph Boyer, Jr., as secretary-treasurer and V. R. Heftler as vice-president. Mr. Heftler will be recognized as president of the Zenith Carbureter Co. and Mr. Boyer is interested in the Springfield Metal Body Co. Another of the incorporators is William Small, who is agent for the Chevrolet car in Indianapolis.

Maxwell Goes 12,405 Miles in 25 Days

LOS ANGELES, CAL., Dec. 28—A stock Maxwell touring car, under official observation by the American Automobile Assn., and as part of a motor non-stop run still in progress, has established the following road records: 5000 miles in ten days; 10,000 miles in twenty days, and 12,405 miles in twenty-five days.

Van Ness Resigns from Great Western

PERU, IND., Dec. 27—F. W. Van Ness has resigned as general manager of the Great Western Automobile Co., this city.

Daniels and Wood to Speak to S. A. E.

Sec. of Navy and Maj. Gen. of Army To Discuss Transport Problems

NEW YORK CITY, Dec. 28—As a climax to its winter meeting, the Society of Automobile Engineers will make the practical requirements for national preparedness the leading thought at the annual banquet at the Hotel Plaza, Thursday evening, Jan. 6, which will mark the conclusion of its New York mid-winter session. The Honorable Josephus Daniels, Secretary of the Navy, who originated the Naval Consulting Board, in which the S. A. E. is actively represented by two of its past-presidents, will address the members, while Major-General Leonard Wood, U. S. A., will discuss the army transport problems. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, will speak for the manufacturing end of the industry.

An attendance of more than 500 is expected at the banquet, which is to be one of the most elaborate affairs ever undertaken by the Society, and many special features have been planned. Among the guests, in addition to the principal speakers and their aides, will be the president and directors of the automobile Chamber of Commerce and the presidents of many of the other leading technical societies.

Prominent British Dealers Here

NEW YORK CITY, Dec. 28—On Christmas morning there landed from the Lapland the well-known London dealer and former racing driver Charles Jarrott who is on a mission here in connection with business on behalf of the Russian government. It is also his intention to look around the New York show, though he does not admit that he is seeking anything in particular for his regular business. He stated that he expected to spend about four weeks mostly in the East before returning to England.

On the same boat was J. B. Ferguson, designer of the ingenious Irish car which was described in THE AUTOMOBILE for Dec. 9. He has one of his chassis with him and will exhibit it at Grand Central Palace, on the third floor, the idea being to demonstrate the very latest development of British engineering. It will be remembered that the car has a complete self-lubricating system.

McIntyre Farm Tractor $750

COLUMBUS, OHIO, Dec. 24—The McIntyre Mfg. Co., this city, is arranging to put on the market about Feb. 1 a 12-hp. gasoline farm tractor which will retail at $750. The company, which has been making some automobile parts and special machinery, has been experimenting on the new tractor for some time.

The tractor will be designed both for hauling farm machinery and wagons and to furnish stationary power for farm work. It is mounted on three wheels with the two wheels in the rear. The company has placed contracts for materials and will be ready to make deliveries Feb. 1.

Eveready Starter for Fords

LONG ISLAND CITY, Dec. 24—A new electric lighting and starting system for Fords has been put out by the American Ever Ready Works, Long Island City. The starter is mounted in front of the radiator directly on the front of the crankshaft in order to eliminate side strains on the crankshaft. Since this position is on the center line of the crankshaft, the stresses are at a minimum. The starter runs at engine speed and it is claimed by the manufacturers that it acts as a vibration damper, due to the flywheel effect. The drive is through a flexible coupling without chains. The entire system is inclosed in a small black enamel case and the time required for attaching is about 1 hr.

Moline Plow Co. Names New Car the Stephens

FREEPORT, ILL., Dec. 24—The Stephens is the name chosen for the new car shortly to be constructed by the Freeport branch of the Moline Plow Co., the falling off in the demand for buggies and farm wagons forcing the company to engage in the construction of automobiles in order to keep the plant working on full time and with a full force. M. A. Steele, manager of the Freeport plant is in Detroit supervising the construction of the models. Two cars are being made and are due to reach Freeport Jan. 1. They will then be given a 5000-mile test run. The output for the first year will be approximately 600.

Master Spark Plug is Now Called Master Calorite

HARTFORD, CONN., Dec. 24—The Hartford Machine Screw Co., this city, maker of the Master spark plug has changed the name of its product to the Master Calorite spark plug.

The company has adopted a new insulating material known as calorite which is stated to be unaffected in an instant change in a temperature of 2300 deg., and also fracture proof. The new material, which is a special composition and made in this country, is somewhat similar in appearance to porcelain, although it is greyish in color and has not such a glossy appearance.

1,200,000 Cars and Trucks for 1916

892,618 Motor Vehicles Sold in 1915—842,249 Passenger Cars—50,369 Trucks

NEW YORK CITY, Dec. 28—According to statistics compiled by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, the production of motor vehicles in this country for 1916 will exceed 1,200,000. On the basis that anyone with an annual income of $1,200 can own a car, there is a market in the United States for 5,000,000 cars. Other statistics given are:

Motor vehicles sold during 1915	892,618
Retail value of these vehicles	$691,778,950
Passenger cars sold in 1915	842,249
Retail value of passenger cars	$565,856,450
Motor trucks sold in 1915	50,369
Retail value of motor trucks	$125,922,500
Carloads of automobiles shipped in 1915	200,000
Money spent on highways in 1915	$250,000,000
Proportion of motor vehicles to miles of road	1 to 1
Proportion to area of U. S. in sq. miles	1 to 1½
Proportion of cars to population of U. S.	1 to 48
Total manufacturers of cars and trucks	448
Commercial vehicle manufacturers	257

By way of contrast, the production in 1899 was 3700 motor vehicles valued at $4,750,000 and in 1903 it was 11,000, the value being $12,650,000.

Tire Prices to Be Raised 12½ to 20 Per Cent

NEW YORK CITY, Dec. 27—Tire prices are scheduled to advance 12½ to 20 per cent with the advent of the new year. For some time the increasing price of crude rubber as well as fabric and other materials used in tire construction has been the basis of a rumor to the effect that the leading tire manufacturers were about to announce new lists considerably in advance of those now in force.

Firestone Distributing Plant for K. C.

KANSAS CITY, MO., Dec. 27—The Firestone Tire & Rubber Co. has been granted building permits in Kansas City, Mo., for the erection of an eight-story reinforced concrete building to be used as a distributing plant at Twentieth Street and Grand Avenue. The cost is estimated at $180,000. The building will be completed by June 1.

New Acme ¾-Ton Truck

CADILLAC, MICH., Dec. 28—The Cadillac Auto Truck Co., this city, has announced a new ¾-ton truck to sell at a reasonable price.

Jack with Aeromarine Plane & Motor

TORONTO, ONT., Dec. 27—R. K. Jack, chief engineer of the Russell Motor Car Co., this city, has been appointed engineer and factory manager of the Aeromarine Plane & Motor Co., New Yor' City.

Baker-R & L 8½% Stock Dividend

Will Increase Outstanding Common from $1,382,000 to About $1,500,000

CLEVELAND, OHIO, Dec. 27—The Baker-R & L Co., with which the Owen Magnetic Co. was recently incorporated, has declared the quarterly dividend of 1¼ per cent on the preferred and common stocks, and a dividend of 8½ per cent payable in common stock to the holders of common stock. The outstanding common stock at the present time is $1,382,000 and the stock dividend will increase this to approximately $1,500,000.

A statement, as yet unconfirmed, has been made that the new interests in the company will acquire $1,000,000 of the new common stock, which will bring the issue up to about $2,500,000.

New Era Opens Bank Accounts for Employees

JOLIET, ILL., Dec. 24—The New Era Engineering Co., this city, has opened for each of its employees a savings account with the First National Bank, this city. Employees for three months and over are given credit for $5; and each employee who has been with the company for less than three months, $2.50. The company will pay, in addition to the 3 per cent given by the bank, 2 per cent on the employees' salaries deposited in this bank during the coming year.

Federal Truck Increases Wages 5 to 10 per Cent

DETROIT, MICH., Dec. 24—A bonus of from 5 to 10 per cent of their yearly salary was the Christmas present which the Federal Motor Truck Co. gave to its employees this year. The 10 per cent bonus went to those who had been on the company's payroll one year or longer; a bonus of 7½ per cent went to those who have been with the company from nine months to one year and the 5 per cent bonus to those with the company from six to nine months.

According to Vice-president M. L. Pulcher, this policy is giving excellent results, as it tends to reduce very materially the number of employees leaving the company during the year. During 1915, the number of employees who have been on the payroll for one year or more was increased 15 per cent over the previous year.

McLean Tire Buys Morgan & Marshall Co. Factory

CLEVELAND, OHIO, Dec. 27—The McLean Tire & Rubber Co., this city, has purchased the plant of the Morgan & Marshall Co., East Liverpool, Ohio, and will start operation in January.

With its present equipment the company will be able to turn out 500 casings and 500 tubes per day, together with an unlimited amount of accessories. A tire with a 4000-mile guarantee will be made.

J. C. McLean, president of the M. & M. Co. will also be president of the McLean Tire & Rubber Co., and W. B. Davis will be an officer, also.

$10 Accounts for Lewis Axle Employees

JACKSON, MICH., Dec. 24—Over 400 workers of the Lewis Spring & Axle Co., maker of the Hollier eight, received as a Christmas gift from the company a Union Bank pass book, with $10.

Timken Axle Employees Get Bonus

DETROIT, MICH., Dec. 27—Between $12,000 and $14,000 was distributed among the employees of the Timken-Detroit Axle Co., this year, as a Christmas bonus.

2½ per Cent Dividend on Lozier Claims

DETROIT, MICH., Dec. 27—A third dividend of 2½ per cent on approved claims against the Lozier Motor Co., which was adjudicated bankrupt a year ago, is being paid this week by the Detroit Trust Co., making a total distribution of 12½ per cent since the receivership. This distribution totals $80,000.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat	Mon.	Week's Ch'ge
Aluminum	.56	.53	.53	.53	.53	.53	—.03
Antimony	.38	.38	.38½	.38½	.38½	.38½	+.00½
Beams & Channels, 100 lb.	1.97	1.97	2.07	2.07	2.07	2.07	+.10
Bessemer Steel, ton	30.00	30.00	32.00	32.00	32.00	32.00	+2.00
Copper, Slec., lb.	.20¼	.20¼	.20¼	.20¼	.20¼	.21½	+.01¼
Copper, Lake, lb.	.20¼	.20¼	.20¼	.20¼	.20¼	.21½	+.01¼
Cottonseed Oil, bbl.	8.53	8.50	8.30	8.40	8.40	8.48	—.05
Cyanide Potash, lb.	.28	.28	.28	.28	.28	.28	...
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl.	.21	.21	.21	.21	.21	.21	...
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.40	5.40	5.40	5.40	5.40	5.40	...
Linseed Oil	.63	.63	.64	.64	.64	.64	+.01
Open-Hearth Steel, ton	31.00	31.00	33.00	33.00	33.00	33.00	+2.00
Petroleum, bbl., Kansas, crude	1.20	1.20	1.20	1.20	1.20	1.20	...
Petroleum, bbl., Pennsylvania, crude	2.15	2.15	2.15	2.15	2.15	2.15	...
Rapeseed Oil, refined	.90	.90	.90	.96	.96	.96	+.06
Rubber, Fine Up-River, Para	.77	.78	.78	.78	.78	.81	+.04
Silk, raw, Italian	...	...	5.25	...	...	5.25	...
Silk, raw, Japan	...	...	4.55	...	...	4.60	+.05
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.50	+50
Tin, 100 lb.	39.50	39.00	38.75	38.75	39.25	39.25	—.25
Tire Scrap	.05½	.05½	.05½	.05½	.05½	.05½	...

Steel Prices Are Higher

Rubber Rises to 81 Cents—Copper Quotes at 21½ Cents—Sulphuric Acid Up

NEW YORK CITY, Dec. 28—Prices in the automobile materials market have reached unprecedented marks. Bessemer and open-hearth steel, for instance, have nearly doubled the prices in effect last spring. Last week both grades of steel went up $2 per ton, Bessemer reaching $32 and open-hearth $33. Although copper advanced sharply last week, the prices in general are not as high proportionately as in some of the other metals. Both lake and electrolytic grades of copper went up yesterday to 21½ cents a pound, just 1¼ cents higher.

A few of the metal prices dropped. Aluminum closed yesterday at 53 cents, or 3 cents lower than last Tuesday's quotation. Tin dropped 25 cents per 100 lb., closing at $39.25.

Sulphuric acid went up 50 cents. Refined rapeseed oil closed yesterday at 96 cents, just 6 cents higher.

Fine up-river Para rubber prices last week saw a gradual increase from 77 cents on Tuesday to 81 cents yesterday. Ceylon first late crepe prices went up to 91 cents. The market for crude rubber shows an increased demand reported from the manufacturers.

H. A. Lozier Co. Elects

CLEVELAND, OHIO, Dec. 28—The H. A. Lozier Co. has been formally organized by the selection of the following officers: H. A. Lozier, president; E. W. Foote, vice-president; E. G. Tillotson, treasurer, and Frank H. Ginn, secretary. Mr. Tillotson is the head of the bond house of the Tillotson & Wolcott Co. and Frank H. Ginn is a prominent attorney.

To Build Taxis on Coast

SAN FRANCISCO, CAL., Dec. 24—Final arrangements have been made by R. P. Mathews and G. M. Anderson of the Gray Taxicab Co., this city, for the establishment of their taxicab factory. As the result of having secured a monopoly of the taxicab service from all of the stations of the Southern Pacific system, the Gray Taxicab Co. has purchased the Goldy Machine plant at Sunnyvale, 30 miles south of San Francisco.

The company plans to employ 125 men from the start and will turn out seven or eight cars a day until they have supplied the demand in all of the cities along the Southern Pacific system. The new company will be known as the Andermat Machine Co.

The property of the Goldy Machine Co.

includes 20 acres of land adjoining the main line of the Southern Pacific. The factory includes four main buildings and several smaller buildings. The two main buildings are 150 by 200 ft., the foundry is 100 by 200 ft., while the boiler room is 50 by 100 ft. The purchase price of the Goldy works is said to be $50,000 to $60,000.

White Motor Co. Incorporated

CLEVELAND, OHIO, Dec. 28—The White Motor Co., this city, has been incorporated to take over the business of the White Co. under plans recently announced. The initial capital stock was placed at $20,000, but Attorney M. B. Johnson of the firm representing the interests in the company, stated that an increase had already been made to $16,000,000.

New Louisville Co. to Make Cars in Kentucky Wagon Plant

LOUISVILLE, KY., Dec. 24—Announcement was made here to-day of the plan to organize a new concern to manufacture and assemble automobiles at the plant of the Kentucky Wagon Mfg. Co. The line will include a truck, five-passenger four-cylinder touring car and a roadster. The car will have a 112-in. wheelbase and will sell for $750.

Cassidy Takes Long Horn Sales

NEW YORK CITY, Dec. 24—The management of the sales department of the G. Piel Co., manufacturer of Long horns and G-P muffler cut-outs, on Jan. 1, 1916, will be turned over in its entirety to the newly formed selling corporation of the Edward A. Cassidy Co.

Security Prices Are Lower

General Motors Common Down 6 Points—Chevrolet Stock Lowered 9 Points

NEW YORK CITY, Dec. 28—Last week's automobile and accessory securities were subject to many small changes. A feature of the issues during the last two weeks has been the absence of any extraordinary gains such as General Motors and Paige-Detroit experienced. General Motors, incidentally, after a 37-point drop the previous week, dropped 6 more points last week. And Chevrolet, which is closely allied at the present time with General Motors, has again dropped, this time 9 points, making a total of 19 points in two weeks. Chalmers common, which has been showing little activity heretofore, dropped 20 points to 130. Willys-Overland common closed at 239, just 4 points lower.

Tire issues show considerable strength. Portage Rubber common went up to 70 with a net gain of 10 points; Miller Rubber preferred rose 2 points; Kelly-Springfield common rose 7 points; Goodrich common closed 2¼ points gain, and U. S. Rubber common rose 1 point.

Several of the automobile issues showed substantial gains. Packard common closed at 180 or 5 points higher; Reo Car went up 11 points; and the three Maxwell issues showed fractional gains. To-morrow Maxwell perferred will sell ex-dividend 14¼ per cent. Based from yesterday's price, this will mean a figure below 90 for the stock, or an income basis of about 8 per cent.

The Detroit issues were correspondingly lower. General Motors dropped to 425 the total drop amounting to 57½ points. Its preferred closed at 114 with a loss of 4½ points. Paige dropped 10 points. The new issue of stock of the Ford Motor Co. of Canada, Ltd., went down 15 points.

Maxwell Earns $1,469,809 in Quarter Ending Oct. 31

NEW YORK CITY, Dec. 24—The Maxwell Motor Co. reports for the three months ended Oct. 31, 1915, net earnings from operations, after deducting costs of manufacturing and expenses of advertising, selling, administration and taxes of $1,425,489; other income including cash discounts on goods purchased $60,949; sundry miscellaneous revenue, $10,370; giving a total of $1,469,809. The balance sheet shows profit and loss surplus $4,492,106 and total assets and liabilities of $44,081,631.

Mais Resigns From Burford

HARRISBURG, PA., Dec. 24—A. F. Mais has resigned as chief engineer of the H. G. Burford Co., Fremont, Ohio, to become chief engineer of the Morton Truck & Tractor Co., this city.

1000 Lee Tires a Day

NEW YORK CITY, Dec. 28—Production of the Lee Tire & Rubber Co. is now at the rate of 1000 tires a day. During the month of November the sales of the Lee company were 25 per cent greater than they were in November, 1914.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax Rubber Co., new	..	..	70	70½	+1
Aluminum Castings pfd	95	100	..	..	..
J. I. Case pfd	..	..	83	87	— ¼
Chalmers Motor Co. com	..	¶88	130	150	—20
Chalmers Motor Co. pfd	..	¶92½	101	103	+1
Chevrolet Motor Co	..	..	127	130	—9
Electric Storage Battery Co	..	..	65	67	+1
Firestone Tire & Rubber Co. com	348	352	690	705	..
Firestone Tire & Rubber Co. pfd	110	112	112	113	..
General Motors Co. com	76¼	77½	495	497	—6
General Motors Co. pfd	89	91	117	118	—3¼
B. F. Goodrich Co. com	23	25	74¾	76	+2¼
B. F. Goodrich Co. pfd	91	95	112	112½	—1½
Goodyear Tire & Rubber Co. com	190	192	335	338	—1
Goodyear Tire & Rubber Co. pfd	102	104	114	..	+1
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	..	..	26	30	—4
International Motor Co. pfd	..	..	47	53	—3
Kelly-Springfield Tire Co. com	65	68	*297 / † 74	298 / 75	+7 / +2
Kelly-Springfield Tire Co. 1st pfd	75	79	95	98	..
Kelly-Springfield Tire Co. 2d pfd	93	97	†72½	74	+ ½
Maxwell Motor Co. com	14	15	75½	77	+ ¼
Maxwell Motor Co. 1st pfd	41½	43	102	104	+ ½
Maxwell Motor Co. 2d pfd	16	17	56	57	+ ¼
Miller Rubber Co. com	..	..	235	243	..
Miller Rubber Co. pfd	..	..	112	114	+2
New Departure Mfg. Co. com	..	..	..	..	..
New Departure Mfg. Co. pfd	..	..	..	..	..
Packard Motor Car Co. com	..	100	180	195	+5
Packard Motor Car Co. pfd	90	..	102	105	+2
Paige-Detroit Motor Car	..	..	..	710	..
Peerless Motor & Truck Corp	..	..	35	36	—3½
Portage Rubber Co. com	25	30	70	75	+10
Portage Rubber Co. pfd	80	85	100	102	+1
Regal Motor Co. pfd	..	..	..	22	..
‡Reo Motor Truck Co	10½	11½	22½	23½	+1
‡Reo Motor Car Co	21½	23	65	66	+11
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	51	53	86	89	..
Stewart-Warner Speed. Corp. pfd	98	101	108	..	..
Studebaker Corporation com	30¾	32½	167½	168¼	— ½
Studebaker Corporation pfd	85	87	112½	113½	—1½
Swinehart Tire & Rubber Co	69	70	87	90	+2
Texas Company	..	..	231	233	+ ¼
U. S. Rubber Co. com	51	53	55	55½	+1
U. S. Rubber Co. 1st pfd	100	102	109	110	+1½
Vacuum Oil Co	..	..	233	236	—5
White Motor Co	..	..	53	53½	+1
Willys-Overland Co. com	84	85½	239	241	—4
Willys-Overland Co. pfd	92	94	112	113½	—2¾
ACTIVE STOCKS					
Chalmers Motor Co. com	..	88	..	156	—2
Chalmers Motor Co. pfd	..	92½	..	102½	..
Continental Motor Co. com	155	175	248	258	+1
Continental Motor Co. pfd	..	..	91	94	—1
Ford Motor Co. of Canada	445	480	400	410	—15
General Motors Co. com	..	83	425	460	—57½
General Motors Co. pfd	88	..	114	117	—4½
Maxwell Motor Co. com	14	15	73½	76	—1½
Maxwell Motor Co. 1st pfd	43	45	100	103	—1
Maxwell Motor Co. 2d pfd	17	19	53½	56½	—1
Packard Motor Car Co. com	..	100	..	195	+11
Packard Motor Car Co. pfd	90	..	103½	104½	+2
Paige-Detroit Motor Car Co	..	..	..	710	—10
‡Reo Motor Car Co	21½	22½	65	..	+7
‡Reo Motor Truck Co	10½	11½	22	..	—1½
Studebaker Corporation com	..	..	164½	167½	—3½
Studebaker Corporation pfd	..	..	112	115	— ¼
INACTIVE STOCKS					
‡Atlas Drop Forge Co	..	25	28½	31	..
Kelsey Wheel Co	185	..	270	..	+5
‡W. K. Prudden Co	..	20	25	28	+1
Regal Motor Co. pfd	..	25	..	22½	..

¶Ex-dividend. *Old. †New. ‡Par value $10.

Program of Show Week Activities

S. A. E. Program

Monday, Jan. 3, S. A. E. Office, 29 West 39th Street

Standards Committee Last Quarterly Meeting, 10 a. m.
Engine and Transmission Division.
Electric Vehicle Division.
Frame Sections Division.
Iron and Steel Division.

2 P. M.

Electrical Equipment Division.
Springs Division.
Research Division.
Truck Standards Dvision.

Tuesday, Jan. 4, S. A. E. Office, 29 West 39th Street

Standards Committee's Last Quarterly Meeting, 9 a. m.

Wednesday, Jan. 5, at Engineering Societies Building

Business Session, 9:30 a. m.
Treasurer's Report.
Appointment for Election of Officers for New Year.
Membership Committee Report.
Discussion on Reports of Divisions of Standards Committee.

STANDARDS COMMITTEE REPORTS

Report of Electrical Equipment Division, A. L. Riker.
Report of Engine and Transmission Division, Prof. W. T. Fishleigh.
Report of Electric Vehicle Division, A. J. Slade.
Report of Iron and Steel Division, K. W. Zimmerschied.
Report of Lock Washer Division, C. H. Loutrel.
Report of Miscellaneous Division, J. G. Utz.
Report of Research Division, D. L. Gallup.
Report of Springs Division, C. W. McKinley.
Report of Truck Standards Division, W. P. Kennedy.

Thursday, Jan. 6, at Engineering Societies Building. Professional Session, 9:30 A. M.

President's Address.
Address of President-Elect.
Dr. J. S. Unger on Effect of Sulphur Content in Steel.
Henry Schroeder on Electric Bulbs for Automobiles.

1:30 P. M.

Battery vs. Magneto Ignition.
Alexander Churchward.
Frank Conrad.
Dr. R. H. Cunningham.
Joseph Bijur.
F. R. Hoyt.

Sixteenth Annual National Automobile Show, Grand Central Palace, De. 31-Jan. 8

Beginning at 2 p. m., Friday, Dec. 31, at 10 a. m., daily thereafter. Closing hour is 10:30 p. m.

Social and Business

Dec. 30-31—Bosch Magneto Co.—Distributors' convention. Dec. 30—Evening banquet at Reisenweber's, Eighth Avenue and 58th Street. Dec. 30—Selling luncheon, noon, advertising offices.
Dec. 31—Cole—Dealers' meeting at Colt-Stratton Salesrooms, Broadway and 57th Street.
Jan. 3—A. A. A.—Dinner (evening) to Chairman Richard Kennerdell of the Contest Board of the A. A. A.; Biltmore.
Jan. 3—White—Meeting, Hotel Astor, after show.
Jan. 4—National Automobile Chamber of Commerce—Waldorf-Astoria; annual banquet, evening.
Jan. 4—Chalmers—Noon luncheon at Churchills, Broadway and 48th Street.
Jan. 4—Velie—Dealers' meeting, 9 a. m., Claridge Hotel.
Jan. 4—Leece-Neville Co.—Meeting, Haynes Automobile Co.'s salesrooms, 1715 Broadway.
Jan. 4—Saxon—Luncheon at Biltmore, 1 p. m.
Jan. 4 and 6—Franklin—Luncheon at Manhattan, 12-2 p. m.
Jan. 5—National Automobile Chamber of Commerce—Directors' Meeting at Headquarters, 7 East 42d Street, at 10 a. m.
Jan. 5—Mitchell—Dealers' Meeting at Biltmore, 12 a. m.
Jan. 5—Motor & Accessory Manufacturers Assn.—Waldorf-Astoria; 8th annual banquet; 7:30 p. m.
Jan. 5—Motor & Accessory Manufacturers Assn.—9.30 a. m., Executive Committee meeting, association offices; 10 a. m., Finance Committee, offices; 11 a. m., Board of Directors, offices; 3 p. m., 12th annual meeting, Waldorf-Astoria.
Jan. 6—Chandler—Breakfast at Biltmore, 9 a. m.
Jan. 6—Motor & Accessory Manufacturers Assn.—Board of Directors meeting, offices, 2:30 p. m.
Jan. 6—Society of Automobile Engineers—Plaza; annual banquet, evening.
Jan. 6—Remington—Dealers' meeting, 1:30 p. m., Cumberland.
Jan. 6—Jeffery—Dealers' meeting in evening.
Jan. 6—Hupmobile—Dealers' business luncheon, noon, Biltmore.
Jan. 6—Paige—Dealers' evening banquet at Healy's, 66th Street and Columbus Avenue.
Jan. 6—Spiltdorf—Meeting of Branch Managers; Astor.
Jan. 6—Velie—Dealers' meeting, 9 a. m., Claridge Hotel.
Jan. 6—Electric Storage Battery Co.—Distributors' convention, Hotel Imperial, followed by dinner.
Jan. 6—A. J. Picard & Co.—Dealers' conference and banquet, Cafe des Beaux Arts, 80 West 40th Street.
Jan. 7—Emil Grossman Mfg. Co.—Salesmen's convention, Biltmore.
Jan. 7, 8, 10, 11—National Association of Automobile Accessory Jobbers—Astor Hotel; convention; first two days, committee meetings; last two days, general meetings.
Date undecided—Detroiter—Dinner at Biltmore.

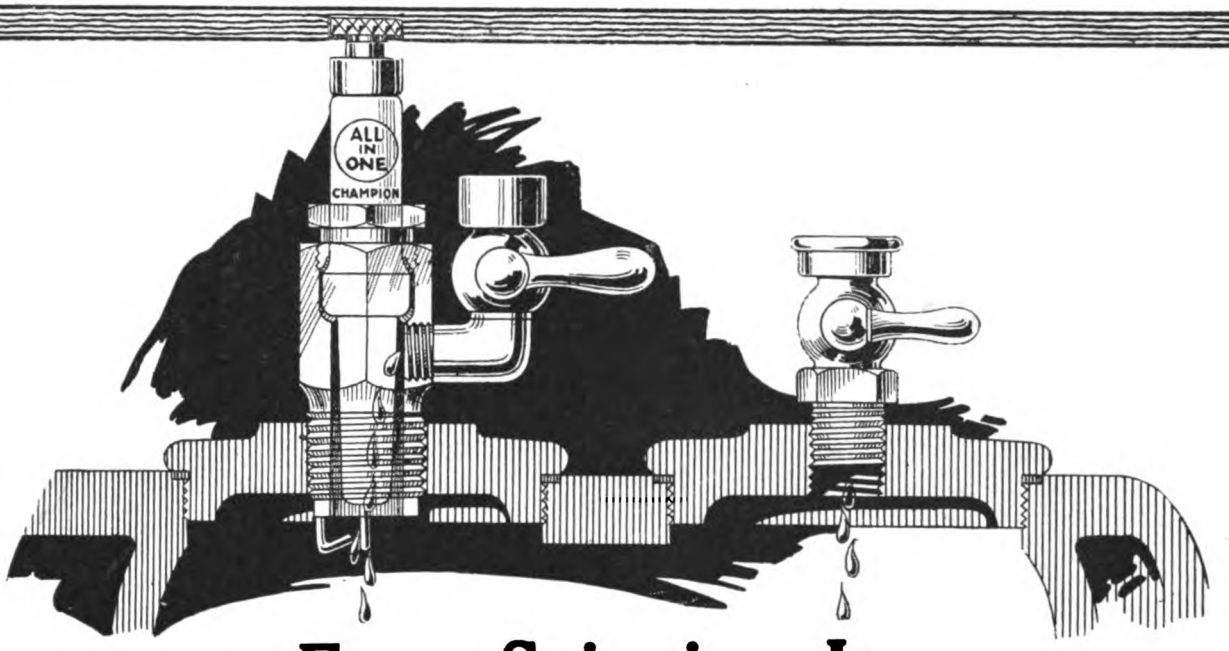
The Automobile Calendar

Dec. 31-Jan. 8	New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; N.A.C.C.
1916	
Jan. 1	Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.
Jan. 3-9	Importers' Salon, Hotel Astor.
Jan. 4	New York City, N. A. C. C. Annual Banquet, Waldorf-Astoria.
Jan. 5	New York City, Motor and Accessory Manufacturers' Banquet in Evening at Waldorf-Astoria.
Jan. 5-6	New York City, S. A. E. Winter Session, Standards Committee Meeting.
Jan. 7, 8, 10, 11	New York City Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13	Milwaukee, Wis., Show, Auditorium.
Jan. 8-15	Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15	Philadelphia, Pa., Show, Philadelphia Auto Trade Assn.
Jan. 13-18	Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Club and Columbus Auto Trades Assn.
Jan. 14-22	Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.
Jan. 10-15	Fort Wayne, Ind., Show, Auto Trade Assn.
Jan. 10-15	New Bedford, Mass., Show, State Armory.
Jan. 15-22	Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22	Rochester, N.Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22	Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22	Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22	Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29	Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29	Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30	Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29	Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5	Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5	Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 1-3	Frederick, Md., Show, Armory.
Feb. 7-12	Kansas City, Mo., Show, J. I. Case T. M. Bldg., Kansas City Motor Dealers' Assn.
Feb. 8-11	Grand Forks, N. D., Show, Auditorium.
Feb. 9-12	Peoria, Ill., Show, Coliseum, Peoria Automobile and Accessory Assn.
Feb. 12-19	Hartford, Conn., Show, First Regiment Armory, Hartford Automobile Dealers' Assn.
Feb. 14-19	Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 14-19	Winnipeg, Man., Show, Ford Plant, Winnipeg Motor Trades Assn.
Feb. 19	Newark, N. J., Show.
Feb. 20-27	Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26	Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26	Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26	Portland, Me., Show, Exposition Bldg.
Feb. 21-26	Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 28-Mar. 3	Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.
Feb. 29-Mar. 4	Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11	Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 8-11	Mason City, Ia., Show, Armory.
Mar. 21-25	Deadwood, S. D., Show, Auditorium, Deadwood Business Club.
Mar. 28-Apr. 3	Manchester, N. H., Show, Under Auspices Couture Bros, Academy.
May 13	New York City, Vanderbilt Cup, Sheepshead Bay Speedway Race.
May 20	Chicago, Ill., Amateur Drivers' Race, Chicago Motor Speedway.
May 30	Indianapolis Track Race.
June 17	Chicago Track Race.
June 28	Des Moines, Ia., Track Race.
July 4	Minneapolis Track Race.
July 4	Sioux City Track Race.
July 15	Omaha, Neb., Track Race.
Aug. 5	Tacoma Track Race.
Aug. 18-19	Elgin Road Race.
Sept. 4	Des Moines Track Meet.
Sept. 15	Indianapolis Track Race.
Sept. 16	Providence Track Race.
Sept. 30	New York City Sheepshead Bay Race.
Oct. 7	Omaha Track Race.
Oct. 14	Chicago Track Race.

UTOMOBILE
CLASS JOURNAL COMPANY
241 W. 39th STREET NEW YORK CITY

ABLE of CONTENTS

NEW YORK, DECEMBER 30, 1915. No. 27



Even Spinning It Will Not Start That Cold Motor

—not if it's a really cold day.

Not even if you prime through the priming cup or by removing the plugs.

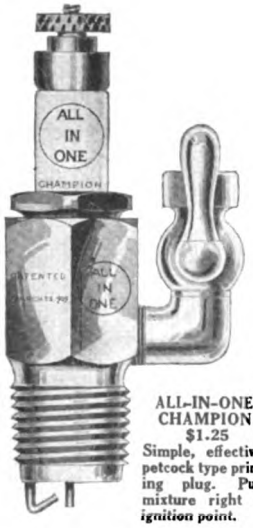
But there is a sure way.

Tho' gasoline will not vaporize fast enough in a cold cylinder to spread across the combustion chamber—to reach the ignition point—

You can put it right at the spark gap of an

"All-In-One" Champion Priming Plug

"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"



ALL-IN-ONE CHAMPION
$1.25
Simple, effective, petcock type priming plug. Puts mixture right at ignition point.

That's the sure way.

No need to prime and prime again in the old way—no need to freeze your fingers—no need to lose time.

The All-In-One Champion is a combination spark plug and priming cup. The gasoline runs down through the center of the plug and actually collects on the electrodes—right where the spark flashes.

It spreads around the rim and entirely surrounds the spark gap with a cloud of rich vapor, so when the first spark jumps there's an explosion—and your motor starts, every time.

And that is why motorists everywhere are demanding Champion Priming Plugs.

Far sighted dealers already have ordered their entire winter's stock. They are getting full benefit of the extensive advertising campaign now running in the biggest national farm and trade periodicals.

Now is the time for **you** to order. See your jobber, or write to us at once.

Champion Spark Plug Company

1003 UPTON AVENUE **TOLEDO, O.**

The New SERIES 17 Cars

Studebaker for the FIFTH time leads the industry

The SERIES 17 line is the most complete that any manufacturer has ever offered. There are 9 pleasure cars in all—3 on the 4-cylinder chassis and 6 on the 6-cylinder chassis—comprising open cars and a variety of closed cars that gives the Studebaker Dealer a car for every prospective buyer's taste.

There is in addition a series of Commercial Cars that offer GREAT sales possibilities — three of the half ton size that have already won such national popularity and three new TON capacity trucks.

But the sensational thing of the entire series of cars is the amazing VALUES that they represent. Never in the history of the entire industry have such values as these been placed upon the market at such LOW prices.

And coming in a season like this, when prices of raw materials are rising daily, the new SERIES 17 SIX, with added new features and priced at $1050, and the new SERIES 17 FOUR, with the same new features, *reduced in price* to $845, are most astonishing achievements even for a manufacturer with Studebaker's resources and unexcelled manufacturing facilities.

With the new SERIES 17 cars, every Studebaker Dealer now has before him a wonderful opportunity for BUILDING up a lasting business—and for greatly increasing his winter sales with the absolute assurance of getting cars thro' the Spring when he wants them most—and assurance, also, of a steady sale and PROFIT the year 'round.

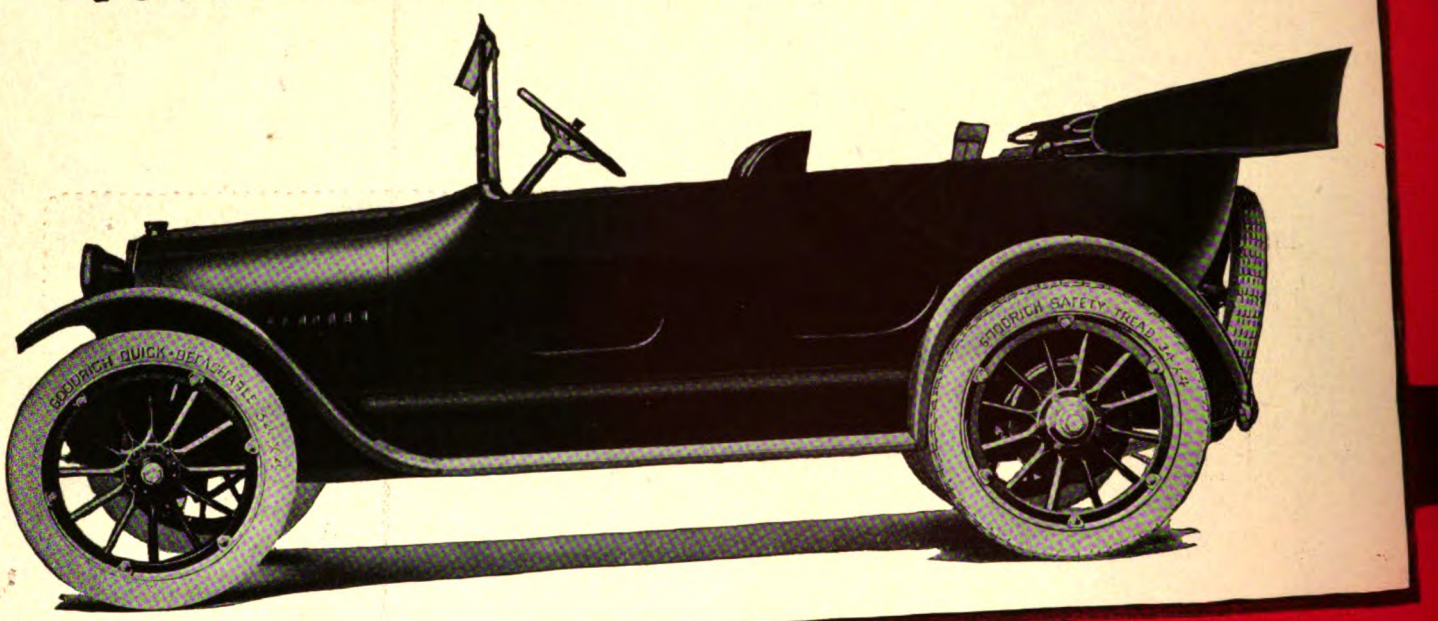
Over 4500 dealers now making money selling Studebaker cars. Merchants all over the country are dropping other lines to become Studebaker dealers, and the same opportunity is offered to other dealers and merchants. Write for further information.

STUDEBAKER

South Bend, Ind. **Detroit, Mich.** **Walkerville, Ont.**

Address all correspondence to Detroit

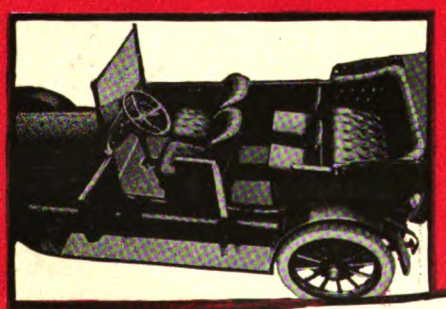
FOUR—40 horse-power—7 passenger—$845

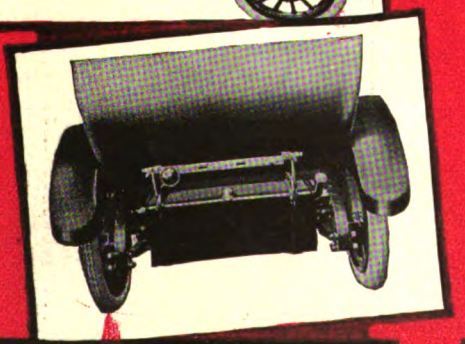


Imagine the selling opportunities a Dealer has with a car like this!

Last year, this Studebaker 4-cylinder car at $885 was the sensational VALUE of the season. This year, the price has been REDUCED to $845—the same car with several added features.

Think what it means to be associated with a manufacturer whose financial resources and unexcelled manufacturing organization makes it possible to produce a car of such quality to sell at $845.



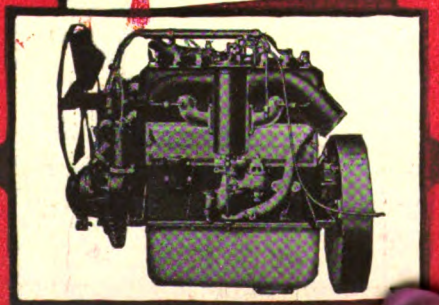


This SERIES 17 FOUR has the same FORTY horse power motor that made it the POWER Car of last season. It has the same SEVEN-passenger capacity. It has the same grace of line and luxury of finish—the same full equipment and the same high quality throughout.

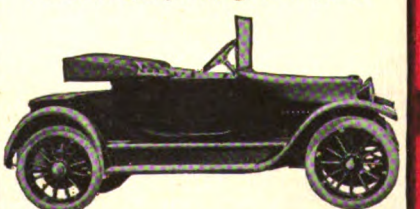
The gas tank has been moved to the rear of the car, thus gaining much more room for the driver. We have adopted the design of one of Europe's most expensive cars for the front seats—DIVIDED them—made them adjustable so that they can be moved to fit the passenger's desires.

We have gained more room in the tonneau. We have used longer springs of extra resiliency for the upholstery, and of course, the SAME high-grade, hand-buffed, semi-glazed leather. We have rearranged the instruments on the dash, making them even more convenient and lighted them by a new, indirect system of illumination.

We have redesigned the windshield, overlapping the plates to give complete protection at all times. The fenders are deeper and richer.

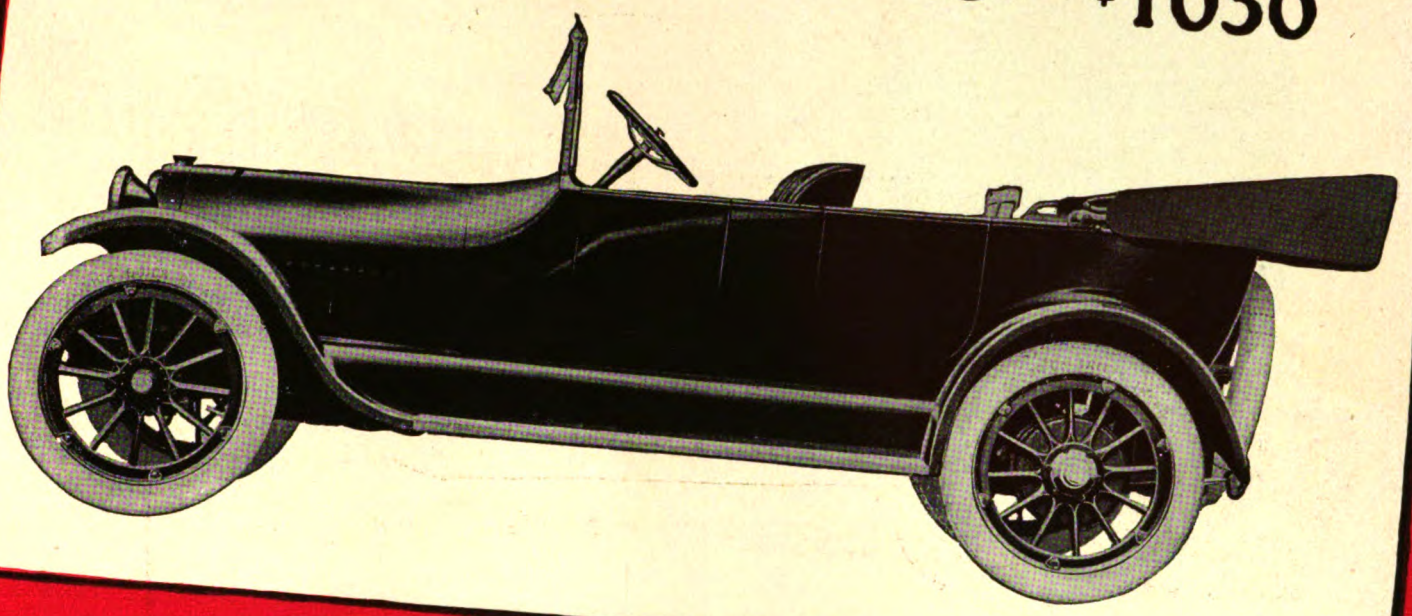


Roadster, 3 passenger - $825



Landau, 3 passenger - $1145

SIX — 50 horse-power — 7 passenger — $1050



—and this SIX at $1050: Think of its possibilities in your territory!

Last year it was the sensation of the season—the ONLY SEVEN-passenger, 6-cylinder car with a 3⅞-inch bore x 5-inch stroke, FIFTY horse power motor ever offered in America or Europe for less than $1450.

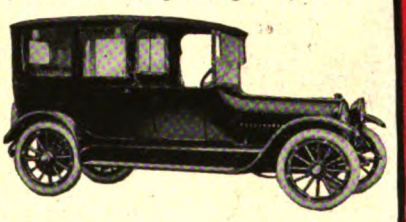
It was $400 ahead of any other SIX that began to rival it in POWER, size or quality. And it swept the country. It was THE value of the year.

This year it has the SAME powerful motor, the SAME seven-passenger capacity and it costs the SAME price—$1050 —in spite of the greatly increased cost of raw materials.

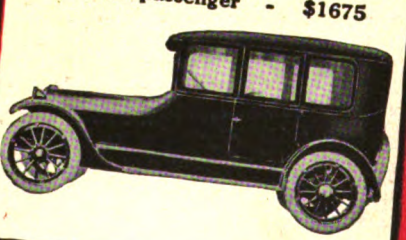
This car also has added features such as—gasoline tank removed to the rear—adjustable, DIVIDED front seats—new overlapping windshield—new arrangement of instruments on dash with indirect lighting system—deeper fenders, etc.

Think of the opportunities such a car offers!

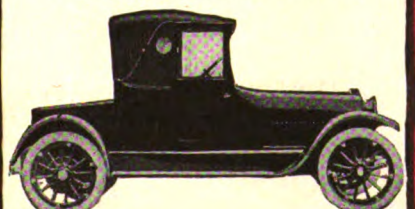
Limousine, 7 passenger $2500



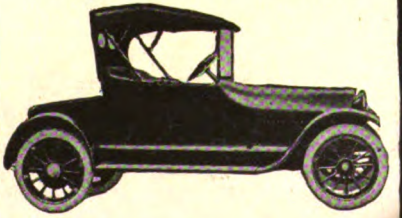
Sedan, 7 passenger - $1675



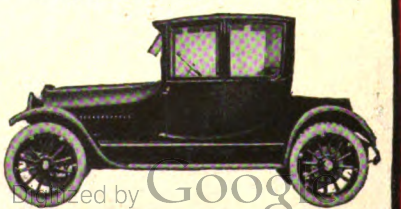
Landau, 3 passenger - $1350



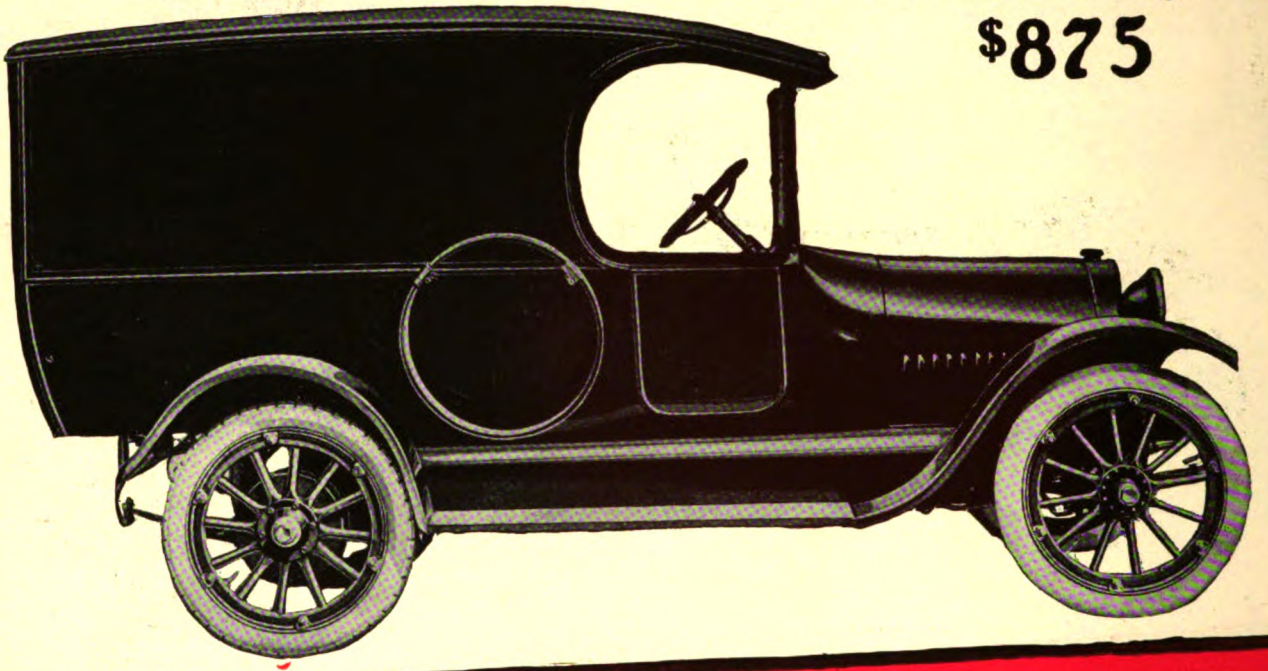
Roadster, 3 passenger $1025



Coupe, 4 passenger - $1600



Panel Delivery Car
$875



And now a COMPLETE Line of Commercial Cars that offers one of the most amazing opportunities of the industry to the progressive dealer

It is impossible to overestimate the opportunities that the Studebaker SERIES 17 line of Commercial Cars offers to the progressive dealer. With national increase in the use of motor vehicles for retail delivery, and the innumerable other commercial purposes, the field is widening daily. And the surface has just been scratched. All the commercial cars now in use do not represent 1% of the possibilities that lie before the men who get into this side of the industry early.

Studebaker offers a remarkable opportunity. With its 64 years' experience in manufacturing delivery vehicles of every nature, in studying commercial vehicle problems—and with its GREAT experience of manufacturing more than 207,000 motor pleasure vehicles, Studebaker offers a series of cars that are RIGHT both from the user's needs and from the mechanical side.

This line comprises 6 models—3 of the half-ton size and 3 new models of ton capacity. Already the half-ton vehicles have won a national popularity. There are more than 20,000 of them in daily use the country over. And not only have they proved up in use, but they offer the biggest dollar-for-dollar VALUES in the market.

The Panel Delivery Car at $875, for instance, is the only car of its price that has a FORTY h.p. motor, fore doors, electric lights, electric starter. It is the only car at its price combining dome light, gas and oil indicators, leather upholstery, heavily braced crown fenders and pleasure car finish.

It is the handsomest car of its kind on the streets—gives absolute COMFORT to the driver—FULL loading capacity—and is built as Studebaker knows a delivery car must be built to give SERVICE. It is not a pleasure car adapted for commercial use.

This is typical of the VALUE that the other cars in the Commercial series offer. No progressive Dealer who is seeking to widen and fortify his business can overlook the opportunity this line offers.

And we urge every dealer to write at once for complete information.

Bus, 16 passenger, - $1400

One-Ton Stake Body - $1250

Photograph not ready at time of going to press. Write for complete information.

STUDEBAKER

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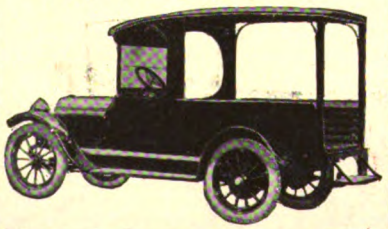
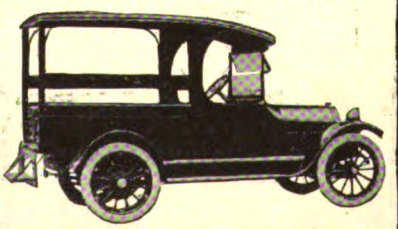
Address all correspondence to Detroit

Open Express - - - - $850



Station Wagon - - - $875



One-Ton Express - - $1200

Photograph not ready for publication when this journal went to press. Full details on request.

Index to Advertisers

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

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of the Automobile Industry

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ROYAL TOURIST TOURING, $350.00. HOTCHKISS LANDAULET, $495.00.
These cars have been thoroughly overhauled and are in the pink of condition. A bargain to one who mails check first.
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GOOD MECHANICAL CONDITION.
A bargain if taken at once.
CONDON, 2635 Wabash Ave., Chicago

Matheson
Cars and Repair Parts
Frank F. Matheson Wilkes-Barre, Pa.

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ALL SEASON'S RECORDS
made with
SCHEBLER EQUIPMENT
Why not get a Schebler Model R carburetor for your car? Our exchange proposition makes it easy.
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1673 Broadway New York

SHIP THAT TROUBLESOME CARBURETOR by Parcel Post. We rebuild and install new parts. Factory testing methods used. Service Station for Rayfield, Schebler, Stromberg and Holley. All work guaranteed.
Wills, Carburetor Specialist
358-360 Belleville Ave. Newark, N. J.

SLIGHTLY USED CARBURETORS
Stromberg, Rayfield and Model L. Schebler in nearly all sizes, $8 each. Condition guaranteed. Terms C. O. D. or cash with order. When cash accompanies order goods are shipped prepaid. **Henry A. Currier,** 5 Harmony St., Salem, Mass.

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AUTOMOBILE CARPETS
Best grade hand made Wilton and Saxony Auto Carpets
Ford $3.00 Chevrolet $3.50 Overland, Model 83 $4.00
All shades and colors to match your car. Carpets for other cars. Prices mailed on request.
GEORGE
High Grade Carpet and Rug Specialist
1037 3rd Ave. New York City

Factories, Garages, Shops

FOR SALE OR RENT
New Brick Garage, 50 x 100, well equipped. Located in a thriving city in Northern Oklahoma. If interested address
Box N 115, care Automobile

MACHINE SHOP FOR SALE
300 medium sized tools (75 lathes 10 to 20" swing) in full operation; 55,000 sq. ft. of floor space; large lot, fully equipped to finish 2000-3" shrapnel per day; price $400,000. Plants, sites, space, garages, in all sections, all sizes, with and without water and rail facilities. Send specifications of your requirements and desired location of the same. We handle above exclusively from an engineering and manufacturing standpoint.
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609-11 Widener Bldg. Philadelphia

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EXCEPTIONAL OPPORTUNITY
for mechanics thoroughly familiar with Overland construction; also foreman. Write
Motor Car Co.
Baltimore Md.

HELP WANTED
Mechanical draftsman, experienced in designing, preferably of automobile parts, small motors, familiar with metric system, knowledge of German preferred.
Answer in own handwriting, stating experience, age, nationality and salary desired, under Box O 511, care The Automobile.

We Place and Supply
Draftsmen, Engineers, Foremen, Superintendents, etc.
The Toledo Engineering Agency, Toledo, Ohio.

Machinery

WE WILL PAY CASH FOR
Modern lathes, milling machines, automatic and hand screw machines; new or used if in excellent condition.
John Macnab Machinery Co.
90 West Street New York

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MAGNETOS AND COILS
All Makes
BOUGHT, SOLD AND REPAIRED
BARGAINS IN BOSCH, EISEMANN, REMY SPLITDORF AND BRIGGS
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M-A-G-N-E-T-O-S
Expert repairing on all makes of magnetos. All types of magnetos.
BOUGHT AND SOLD
MAGNETO SALES COMPANY
1777 Broadway New York City

OFFICIAL SERVICE STATION
for Gray and Davis and Northeast self starters. Willard batteries, K. W. Magnetos. All makes of self starters, batteries, and magnetos repaired. Work guaranteed.
The E. S. Cowie Electric Co., Inc.
1517 Grand Ave., Kansas City, Mo.

Miscellaneous

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Send 25c. for a Nickel Silver Key Check, with name and address; it will serve as Identification Card in case of accident, besides restore your keys in case they are lost in traveling. Address all orders to
DEPT. A.
F. Jos. Mulhaupt, LaFayette, Ind.

Mailing Lists

MAILING LISTS AND STATISTICS
Owners or dealers, any state, county, city; weekly and monthly supplements at lowest prices. Special lists of electrics, trucks, Fords, Studebaker, Overland, etc. **Motor List Co. of America,** 1105 Locust St., Des Moines, Ia.

Manufacturers' Opportunities

ACTIVE AUTOMOBILE MAN
who has handled for years a serious business in France selling pleasure cars and motor trucks, would like to find reliable firm or party willing to do business in France and Switzerland. Write Box O, 620, care The Automobile, 239 W. 39th St.

$50,000
Already Subscribed for New Zealand Agency

Mr. H. L. Rogers has arrived in New York for the purpose of obtaining Automobile and Tire Agencies for New Zealand. The house which Mr. Rogers represents has been established in the Motor Business for *20 years.* Success so far obtained has prompted the stockholders to subscribe a further $50,000 for pushing the sales of automobiles. Manufacturers who are looking for export business are invited to communicate with Mr. Rogers, care of Manhattan Hotel, 42nd Street, New York City.

Seriously

Here is a real business opportunity, requiring an investment of less than 10% of the business transacted during the last fiscal year. Our business (car distributors) is located in one of the most important cities in New Jersey. Average business per year for the last two years over $185,000.00. Present tangible assets $15,000.00 to $20,000.00. All current bills paid and no outstanding indebtedness. Our business affairs will stand the very closest investigation, either personally or through Dun and Bradstreet's. The investment is required for the purpose of taking advantage of present local business opportunities, and the partnership can be active or silent. This announcement covers, as stated, a genuine opportunity. For further particulars address Box O321, care of the Automobile.

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JUST OUT
1916 Delco Book No. 3, Price 25c.
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These books contain wiring diagrams of all Delco systems used on motor cars. Easy to understand. For owners, garage men, and mechanics.
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A.A.A. REPAIR PARTS A.A.A.
STODDARD-DAYTON
You will always be able to get them from the
DAYTON AUTO REPAIR CO.
351-55 West 52d St. New York City

Auto Exhibit & Salvage Co.
WE Save you money on parts buy old cars and parts.
1965 Ogden Ave., Chicago, Ill.

Automobile Tops
Built, Recovered and Repaired
C. G. Meyer & Son, Dept. 3 Tiffin, O.

DON'T DELAY!
High class goods are scarce. BUY NOW. The demand is big.
Steering gears, Warner, Gemmer, Foster and Ross truck $9 to $16. Rear axles full floating $35 front I beam with hubs $10. Complete set fenders Blk. enam. fit Krit and etc., $16.50. Interstate radiators $20. Gasoline tanks all kinds $1 to $4. Headlights 10" elec. $4, gas 8½" per pair $4, lighting generators $7 to $18. Klaxton L motor horns $10. Prest-O-Lite tanks, size B, $7.75; E, $6.50. K.W. high tension model J magnetos $12. Bosch, Eisemann, Simms Mea MAGNETOS. We have a big stock for any and all size motors, high tension, single and dual with coils, and many low tension outfits $8 to $45. Springs for Ford cars, front $2.90, rear $7.90. Top for Ford touring $8. Special deals enables us to sell at greatly reduced prices.
PROGRESS AUTO PARTS CO.
1005 Huron Rd. Cleveland, Ohio.

HENDERSON OWNERS.
Immediate service on all repair parts for every model. Parts made from original patterns and records which are in our sole possession.
HENDERSON MOTOR CAR COMPANY, Detroit, Michigan.

REPAIR MEN AND DEALERS

50 assorted spring clips	$2.50
New 35 H.P. motor, e-point suspension	110.00
Transmission and levers, B & L	45.00
New Axles W. M. 3½:1 Ratio	50.00
34 x 4 wheels Q. D. rims, set 4	12.00

Repairs for any car. Write us.
K. C. AUTO PARTS CO.
1827 McGee St. Kansas City, Mo.

All Parts Carried in Stock
TO FIT

Abbott	Hudson	Michigan
Atlas	Ewing	Herreshoff
Bergdoll	Pullman	Regal
Chalmers	R. C. H.	Warren
Sultan	Packard	Henry
Mora	Mitchell	Havers

Grabowsky Truck Tourine
Brown-Lipe Trans. Gears
Standard Roller Br. Co. Axles
Warner Trans. Gears
Spicer Universal Joints
Weston Mott Axle Parts
Blood Universal Joints
McCord Mfg. Co. Fans

EASTERN DISTRIBUTOR FOR
DETROIT WYANDOTTE CO. GRABOWSKY PARTS
R. C. H. CORPORATION R. C. H. PARTS
SPICER MANUFACTURING CO. UNIVERSAL JOINTS
JOS. C. GOREY & CO.
354 West 50th St. New York

All Service Parts for All Cars

This is a rather broad assertion, but we can back it up by facts. We have acquired through outright purchase the stock of some automobile companies. We are acquiring others constantly. This huge organization enables us to quote prices on automobile repair parts far below those of manufacturer.

Look This List Over

Krit, Speedwell, Abbett, Michigan, Warren, Marquette, Ranier, Deluxe, F. A. L. Car, Reliable Dayton, Anhut, Elmore, Welch Pontiac, Welch Detroit, Demot, Barnes, Cutting, Grabowsky, Wayne, Northern, Ohio, Crescent, Cartercar, Havers, Owen, Scripps-Booth Cycle Cars and many others. If your car is not listed, write us, stating model, and we'll quote you price at once.

AUTO NECESSITIES BELOW COST

Large stock of radiators, Oakland 42, Oakland 35-36, Parry 1911, E. M. F. 1910-30, Buick 26-27, Studebaker 25-35. Write for special low prices. *Radiators* for *Fords,* straight front, V-shaped brass, V-shaped nickel, $17.00 up; mufflers all sizes $1.50, springs all sizes $2.00 up. Locking rings—any size, 50 cents. Baker wheels $3.00. Baker rims, straight side or clincher, $2.30. Coupe tops for Ford roadster cars, $35.00. Page trailers $40.00, motors 16 to 50 H.P. $75.00 up. Wire wheels, per set $5.00 up. Large stock of rear and front axles, transmissions, tops, bodies, in fact everything for the motorist. Write for illustrated bargain bulletin.

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Detroit, U. S. A.
ALL PARTS FOR ALL CARS

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The New Departure Service Station
THE GWILLIAM COMPANY
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Specialists in Bearings
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Charles E. Riess & Co., Inc.,
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AMERICAN UNDERSLUNG
Parts and repairs for all models
PARTS CATALOG FREE.
Write for prices and discounts.
V. A. LONGAKER COMPANY
Indianapolis, Ind.

AMERICAN UNDERSLUNG
We are the sole owners, manufacturers and distributors of repair parts for ALL MODELS — AMERICAN UNDERSLUNG CARS.
AMERICAN MOTORS PARTS CO.
831-33-35-37 E. Washington St.
INDIANAPOLIS INDIANA

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We have purchased the jigs, tools, drawings of the Atlas Motor Car Co., and are the only concern supplying these parts. Write us giving model and number. Parts shipped immediately.
Auto Parts & Repair Co., Springfield, Mass.

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Owners of
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and
FIRESTONE-COLUMBUS AUTOMOBILES
We are in position to furnish PARTS for all cars of our manufacture.
Prompt service assured.
The New Columbus Buggy Co.
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AUTO PARTS
FULL STOCK OF PARTS FOR
MICHIGAN LOZIER
MORA DRAGON
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Philadelphia Machine Works
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We tear 'em up and sell the pieces, buy old cars or parts, can save you money on Repair Parts or Supplies for your Auto.
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13th & Oak Sts., Kansas City, Mo.

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For all makes of cars.
Complete Front Axle.....$7.50
Complete Rear Axle.....15.00
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1429 So. State St. Chicago

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FENDERS
TANKS
LAMPS

Remodeled and Repaired at lowest prices in the U. S.

All Work Guaranteed

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157 West 54th St. New York City

REPAIR PARTS FOR OLD MODELS
All kinds of parts in stock, for 100 cars. Coils, Magnetos, everything for your car. Write us your wants. Satisfaction or money back. **The National Auto Parts Supply Co.**
2025 7th St., N. W., Washington, D. C.

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BUILT and REPAIRED
at lowest prices in the United States

BEST SERVICE
Plain or "V" shape for ANY car.

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THE RESULT { **Loss of Power** / **Excessive Smoke**

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AKRON TIRES ARE FAMOUS

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30 x 3½	6.50	7.50	2.15
31 x 3½	7.25	....	2.20
32 x 3½	7.50	8.50	2.25
34 x 3½	8.00	....	2.35
30 x 4	8.50	....	2.85
31 x 4	8.75	10.25	2.95
32 x 4	8.50	10.00	3.05
33 x 4	9.00	10.50	3.10
34 x 4	$9.00	$10.50	$3.20
35 x 4	10.00	11.50	3.30
36 x 4	10.00	11.50	3.35
34 x 4½	12.00	13.50	4.00
35 x 4½	12.50	14.00	4.10
36 x 4½	13.50	15.00	4.15
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30-3	$4.00	$4.90	32-3½	$5.60	$7.20
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Terms 10% deposit. Balance C. O. D.

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We can save you money at the following prices:

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30x3½	5.00	6.00	36x4½	9.00	10.00
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34x4	8.00	9.00	37x5	11.00	12.00

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Guaranteed 3500 Miles

Size	Plain	Non-skid	Size	Plain	Non-skid
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30x3½	4.75	5.25	36x4	7.25	8.00
32x3½	5.50	6.00	34x4½	8.00	9.00
33x4	7.00	7.25	36x4½	8.00	9.00

Other sizes in proportion.
Compare these prices with others.
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DUPLEX DOUBLE TREAD TIRES
More miles per dollar than any other Tire.

30x3	$6.00	32x3½	$7.50	33x4	$9.00
34x4	9.50	36x4½	11.50	37x5	13.00

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30x3½	5.00	5.75	34x4½	9.00	10.00
32x3½	6.00	7.00	36x4½	9.50	10.75
33x4	7.50	7.75	37x4½	10.00	11.00
34x4	7.50	8.50	37x5	10.00	12.00

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DOUBLE TREAD TIRES

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36 x 4½	10.00		

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The quality and service feature in these tires and tubes are the same as featured in the tires you are now paying high prices for. The following price list buys quality goods:

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30x3½	7.50	2.10
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32x3½	8.50	2.25
34x3½	9.00	2.30
36x3½	10.25	2.50
31x4	11.50	2.80
32x4	12.00	3.00
33x4	12.25	3.05
34x4	12.75	3.15
35x4	13.00	3.25
36x4	13.50	3.30
34x4½	15.75	3.80
35x4½	16.50	4.00
36x4½	17.00	4.10
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37x5	19.50	5.00

FOR NON-SKIDS ADD 10% TO ABOVE PRICES

We also have 500 slightly used and demonstrating tires and tubes, all sizes that are positively guaranteed which we are closing out in this sale.

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31x3½	4.25	1.40
32x3½	4.50	1.40
34x3½	5.00	1.50
31x4	4.25	1.40
32x4	6.00	1.50
33x4	6.25	1.50
34x4	6.75	1.60
35x4	7.00	1.75
36x4	7.00	1.75
34x4½	7.25	1.75
35x4½	7.50	1.80
36x4½	7.50	1.85
37x4½	8.00	1.90
36x5	8.25	1.90
37x5	8.50	2.00

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All shipments made promptly. To avoid delay, kindly mention style of your rim when ordering tires, as we have them in straight side, clincher and Q. D. clincher.

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WITH

Hampton's Inner Liner

when you Double Tread your tires. This liner, made of two pieces of highest grade tire fabric with a layer of chrome leather vulcanized between, keeps the heavy stitching, used to Double Tread your tires, from cutting or puncturing your inner tube.

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Used and demonstrating tires at a sacrifice price—

30 x 3	$2.75	32 x 4	$6.20
30 x 3½	3.50	33 x 4	6.30
32 x 3½	4.50	34 x 4	6.50
34 x 3½	5.00	34 x 4½	6.75

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SO-LUMINUM MFG. & ENG. CO., Inc., 1790 Broadway, New York. Sole Manufacturers and Distributors.

A REAL WELDING JOB

Send us your crankcases, axles, transmissions, any thing to be welded, and we will prove that 10 years' experience places us in a position to give you the right kind of a job. Prices moderate.
Let us estimate.
N. J. Welding Wks., 25 W. 64th St., N. Y.

ATLAS WELDING CO., 42 Eliz. Ave., Rahway, N. J., guarantee to repair parts pronounced impossible or spoiled by others. Broken Crankcases, Axles, Pistons, Flywheels, scored or cracked cylinders. Stripped Gears rebuilt equal to new. Lost pieces supplied. Crankshafts welded, trued to original diameter of bearings.

CYLINDERS REBORED

including new pistons and rings, $7 to $11 per cylinder. General overhauling and repairing.

WELDING

Cylinders, crankcases and crankshafts welded.

STERLING ENGINE COMPANY
331 S. Clinton Street **Chicago, Ill.**

OXY-ACETYLENE WELDING—SCORED CYLINDERS reclaimed with our new silver process, without over-size pistons or rings. All castings welded. Work guaranteed or money refunded. **McCrea & Jones,** 30 Catharine St., Utica, N. Y.

WE WELD Cylinders, Crank Cases, Gear Cases, also weld and straighten Auto Frames. Blacksmithing, Leaf Springs, etc. All our work guaranteed.
Crown Welding Works, Inc.
157 West 54th St. New York

We do a class of

Finished Welding

on Crank Cases, Cylinders and other parts not equalled by concerns west of Chicago. It is seldom a job shows where we make an **Oxy-Acetylene Weld.** Parts are machined to their original shape and painted.

HOBBIE WELDING PLANT

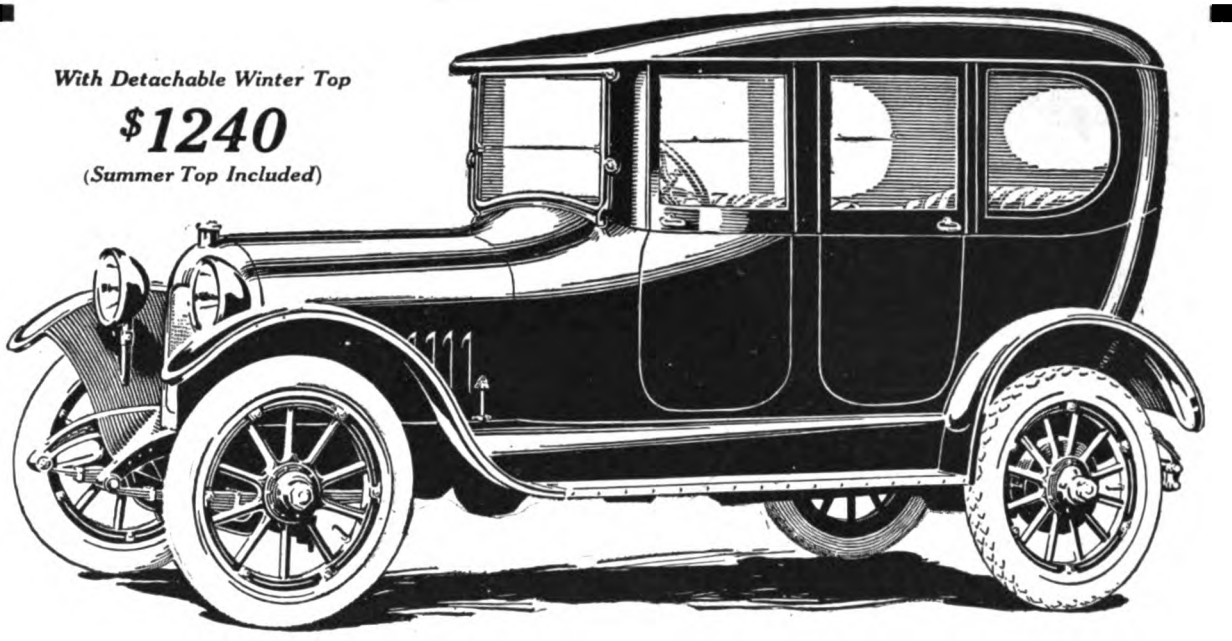
Hampton, Iowa

Why Experiment with Aluminum?

All low temperature methods are solders. Send your broken Aluminum, Cast Iron and Steel parts to us. We fuse them together with the same metals so as to be stronger than before and cheaper than any solder proposition.

BOURNONVILLE WELDING CO.
241 W. 64th St. New York City

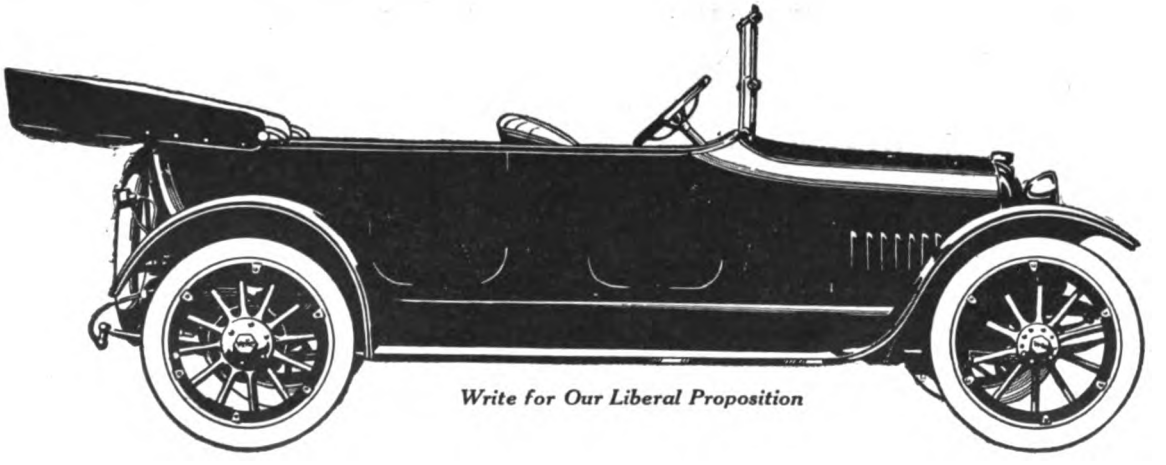
Enclosed Types the Latest
Announcement of 1916 Velie Line



Electric Lighted—Drop Windows—Whipcord Trimmed
Perfect Workmanship—Wire Wheels on Any Model $70 Extra

VELIE SIX Touring Car with Detachable winter top gives all the luxury of the closed car at the price of the ordinary open car. Velie Coupe Type on the same chassis at $1750, combines the town car style and distinction with abundant power for the long tour.

These two Velie enclosed types give the Velie dealer dominating values for the immediate winter market while the Velie Six touring car at $1065 and Velie Roadster at $1045 complete the line at prices not matched by such construction, features and style.

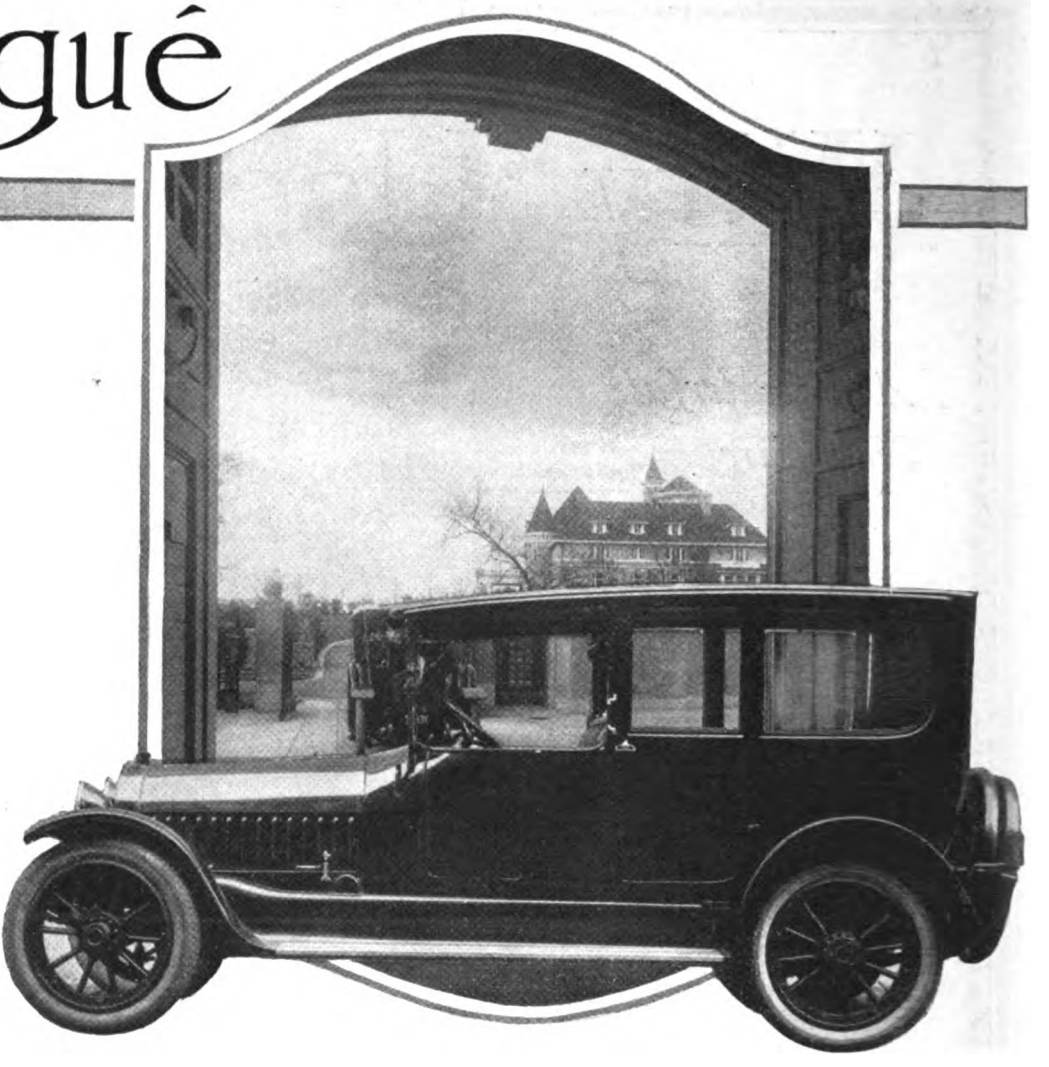


Write for Our Liberal Proposition

Velie Motor Vehicle Co., 114 Velie Place, Moline, Ill.

Velie Six $1065

Distingué



A man's satisfaction with his motoring equipment depends as much upon the architecture and workmanship of its body as upon the mechanical excellence of its chassis.

Recognizing this, many of the more successful distributors of American built cars have working agreements with us to design and build special bodies for their customers whose ideas call for something better than manufacturers' stock body examples.

Certain of the more progressive car manufacturers, taking heed of their distributors' success in handling the equipment of their chassis with custom-built bodies, now contract with us to design and build a certain percentage of their bodies.

NEW HAVEN CARRIAGE COMPANY

NEW HAVEN, CONN.

No center bolt

Tuthill Titanic Springs

Guaranteed forever against center breakage

"There's a Tuthill Titanic for any car"

DEALERS — write to your nearest Tuthill distributor

Albany	Albany Hardware & Iron Co.
Atlanta	Elyea-Austell Co.
Baltimore	Baltimore Hub Wheel & Mfg. Co.
Billings	Barry Motor Co.
Boston	Post & Lester Co.
Buffalo	H. D. Taylor Co.
Chicago	All Jobbers
Cincinnati	The Ohio Rubber Co.
Columbus	Griswold-Sohl Co.
Dallas	The Fisk Co. of Texas
Davenport	Sieg Iron Company
Dayton	S. T. & G. A. Gebhart
Denver	Auto Equipment Co.
Duluth	Kelley-How-Thomson Co.
El Paso	Western Motor Supply Co.
Fargo	J. D. Grant Co.
Florence, S. C.	D. W. Alderman, Jr.
Indianapolis	W. J. Holiday Co.
Kansas City	Faeth Iron Store Co.
"	Motor & Machinists Supply Co.
Lincoln	Nebraska-Buick Auto Co.
Los Angeles	Chanslor & Lyon Co.
Milwaukee	Babcock Auto Spring Co.
Minneapolis	Western Motor Supply Co.
Nashville	Auto Supply Co.
New Orleans	Interstate Electric Co.
New York	W. E. Pruden Hardware Co.
Oakland	Chanslor & Lyon Co.
Peoria	The National Electric & Auto Supply Co.
Philadelphia	Manufacturers Supplies Co.
Pittsburg	Pittsburg Auto Spring Co.
Portland	Chanslor & Lyon Co.
Rochester	Sidney B. Roby Co.
St. Louis	Auto Devices Co.
San Antonio	The Fisk Co. of Texas
San Francisco	Chanslor & Lyon Co.
Seattle	Chanslor & Lyon Co.
Sioux Falls	The H. F. Brownell Co.
Spokane	Chanslor & Lyon Co.
Tampa	The American Supply Co.
Toledo	Union Supply Co.

Foreign Distributors:

Automobile Sundries Co., 18 Broadway, N. Y.

Read what this Taxi Company says

Ever been in Saginaw, Mich.?

If so, you know it's a pretty tough place on automobile springs—especially in a public taxicab service.

Here's what the Letts Auto & Taxi Co., of Saginaw say regarding Tuthill Titanic Springs:

"Up to date we have not had one broken spring or leaf and the first Tuthill Springs we purchased about two years ago are still in use and apparently are as good as ever.

"On the other hand, many new springs furnished as stock equipment have broken at the hole in the center and we have had to replace them with Tuthill Springs within two or three months."

This is only one of many letters we receive from satisfied users.

Insist on Tuthill Titanics on your new car and for replacements on your old car.

No weakening center hole or center nib, which weakens practically as much as center hole.

See the Tuthill Exhibit at the Chicago Auto Show

COLISEUM ANNEX, 2nd Floor, Booths 156 and 157

TUTHILL SPRING COMPANY

754 Polk St., Chicago, U. S. A.

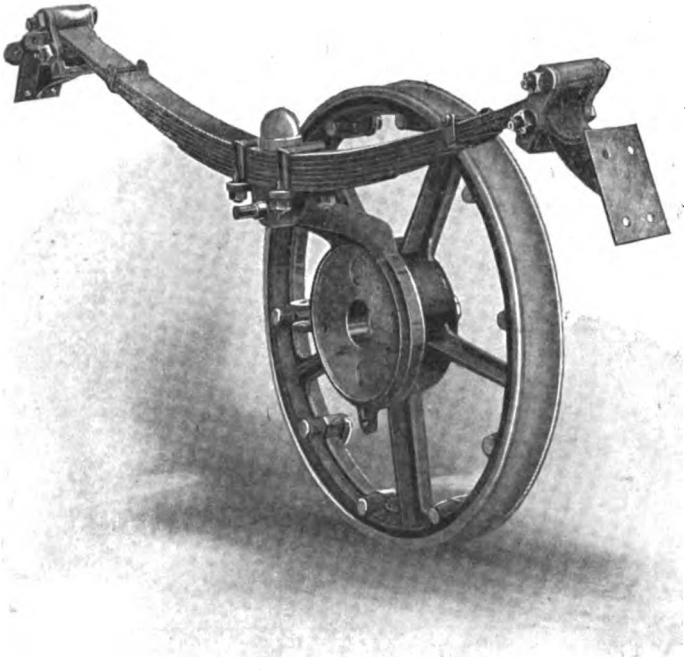
Tuthill Titanics are guaranteed forever against center breakage

Tuthill "Titanics" can be adapted easily to any axle construction and quickly mounted without any extra expense.

At the New York Automobile Show

Space D-169

there will be an exhibit that is going to have a far-reaching effect on Trucking and Delivery Car Service as at present constituted. A simple principle, applied for the first time, will so increase the carrying capacity of the unusually strong and flexible Ford Chassis that it will handle loads up to



Patented August 24th, 1915

ONE TON

with the same ease and at practically the same expense as it does its normal, limited load. This result is obtained by equipping any Ford Chassis with the

"OLSON" CONVERTING UNIT

the cost of which is only **$65.00** F.O.B. Detroit, Mich.

The "OLSON" CONVERTING UNIT makes the Ford rear axle FULL FLOATING. The load weight is carried by the "OLSON" Steel Truck Wheel entirely, being centered on a set of auxiliary Body Springs that pivot on a Spring-Pin set into the Bracket of a Steel Hub Housing, carrying high efficiency Roller Bearings and fitting over and onto Hub of Wheel. A set of auxiliary Radius Rods neutralize load strain and side sway, and a special Truss Rod keeps Hub Housings in perfect alignment. Wheels are made for either pressed-on solid Tires or with demountable Rim for pneumatic Tires.

In all around efficiency, in first cost and in service expense, the "OLSON" equipped Ford stands without a rival, and business men in all lines will be in position to greatly reduce an item of expense that often is a serious drain on their revenue.

Exclusive sales rights will be given to some progressive business man in each locality and this proposition should appeal especially to Ford dealers, everywhere.

THE SWEDISH CRUCIBLE STEEL COMPANY

DETROIT, MICHIGAN, and WINDSOR, O

Factory Branch and Service Station: 237-239 W. 55th S

BESSEMER TRUCKS

The appointment of the

BESSEMER MOTOR TRUCK CORPORATION

FRED. T. NESBIT, President

Long Beach Building, Lexington Ave. and E. 42nd St.

(Two Blocks from the Grand Central Palace)

affords a most convenient opportunity for the inspection of BESSEMER Trucks during Automobile Show week, December 31st to January 8th.

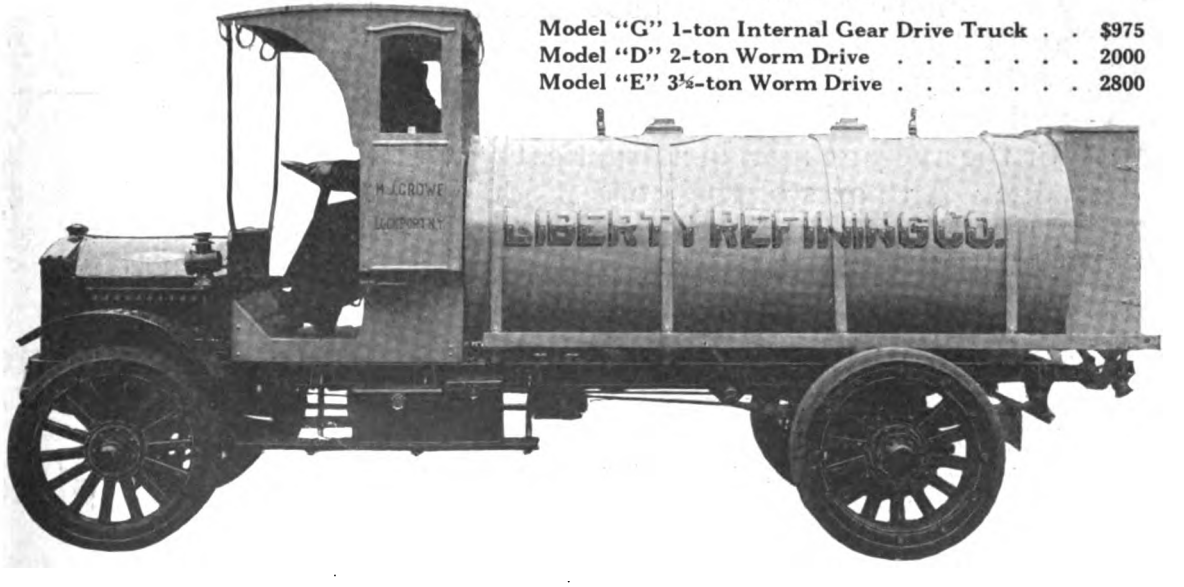
We extend a cordial invitation to all who are interested in the use or sale of motor trucks to call and investigate the line.

DEALERS

All negotiations with regard to the sale of BESSEMER Trucks in New England, Eastern New York, Eastern Pennsylvania, New Jersey, Delaware, Maryland, Virginia and the District of Columbia should be taken up with the BESSEMER MOTOR TRUCK CORPORATION.

THE LINE

Model "G" 1-ton Internal Gear Drive Truck . .	$975
Model "D" 2-ton Worm Drive	2000
Model "E" 3½-ton Worm Drive	2800



BESSEMER MOTOR TRUCK COMPANY

GROVE CITY, PA.

MASTER GARAGE PUMP

for inflating automobile tires

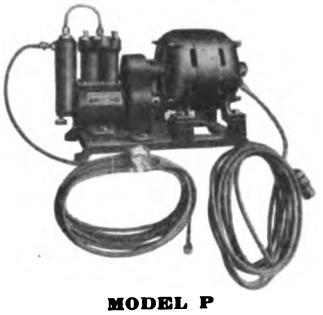
THE Master Garage Pump is just as necessary for an automobile owner or garage proprietor as is the self-starter, electric lights, magneto, Klaxon horn and other 1915 necessities and improvements.

Tires should be *inflated gradually—under steady pressure*—up to the required specified pressure—*gradually* filled with an *even flow of air, not in jerks,* throwing a series of undue strains on the fabric of the casing.

The Master Tire Pump will positively and properly inflate tires up to the specified pressure in the shortest possible time.

No storage tank is required. We have perfected a pump from which every vestige of pulsation has been eliminated in the delivery of air. The steady, even flow of air that is absolutely necessary for the proper inflation of automobile tires is an accomplished fact with the Master.

No other garage pump can muster so many points of excellence. Every piece of material entering into its construction is the finest obtainable. It is mechanically head and shoulders above any other pump on the market, with an unequaled record for efficiency.



MODEL P

For the private garage owner we recommend **Model P.** This is a wonderfully efficient pump. Can be furnished with or without truck. It may be mounted on a shelf, or in an out of the way place in the garage as a **stationary pump. Mounted on a truck** it is easily moved from place to place in the garage, and owners of three or four cars find it more convenient to use in this way. An extra $5.00 charge is made for mounting this equipment on a neat metal truck. Model P Pump, both stationary and mounted on a truck, has proved itself a great favorite with proprietors of small public garages catering to from twelve to twenty cars. It is furnished as shown—a two cylinder pump, mounted on a frame and driven by a General Electric motor. Twenty feet of the best reinforced rubber air hose, with pressure gauge attached and twenty feet of lamp cord with plug. The Master Model P is the most powerful equipment of its size on the market today and will inflate a 37x5 tire to 90 lbs. pressure in less than 3 minutes.

Model P—for private garages or small public garages; stationary, electric-driven, 2-cylinder, ¼ H.P., G.E. Motor. Complete with equipment, ready for use.
Regular A. C. Motor—$60 F.O.B.
Regular D. C. Motor—$55 Hartford

Model P—on truck; same specifications and power as Model P stationary.
Regular A. C. Motor—$65 F.O.B.
Regular D. C. Motor—$60 Hartford

The Pistons are extra long and are of special steel, carefully hardened and ground to exact size and lapped into the cylinders. Rubber disintegrates rapidly under the influence of oil. *It is absolutely impossible for any oil to get into the delicate inner tubes of the tires from the Master Garage Pump.*

No rubber or leather packing rings or piston rings of any kind are used. The pistons fit so tightly into the cylinders that there is no need of them and no danger of oil working through, but as an added precaution, part of the equipment of every Master Pump is a small expansion chamber which collects any possible trace of impurities—*only pure air is delivered to the tires.*

There is a Master model designed for every garage requirement. Hundreds of Master Garage Pumps are in service today, rendering efficient service out of all proportion to their small cost.

The Master Garage Pump can be connected in a moment's time to any electric light circuit. It requires only the switching of an electric button to start a steady stream of pure, clean air for inflating tires.

Free 10-Day Trial—Liberal Guarantee

We ask you to "Use the Master Garage Pump for ten days. If you do not want to keep it at the end of that time your money will be promptly refunded," and if you do keep it, as you surely will after you have once tried it—"we guarantee Master Garage Pumps for one year against defects of material or workmanship. With ordinary care and usage they should last ten years." This is the offer and guarantee of one of the largest and best known companies in the manufacturing field—with 50 years' successful manufacturing experience and prestige.

You can try out a Master Pump with the understanding that, if you are not entirely satisfied, you may return it and have your money refunded. Once you have tried it you will realise how much you need it. Take advantage of our offer today.

N. B.—All pumps are priced F. O. B. Hartford. We do not prepay shipping charges.

Our stock motors are for 110 volt direct current and 110 volt single phase, 60 cycle, alternating current, but where necessary, we can furnish motors for 220 volt direct current, 110 volt 25 to 40 cycle alternating current, or 220 volt, 25, 40 or 60 cycle alternating current. *State current conditions when ordering.*

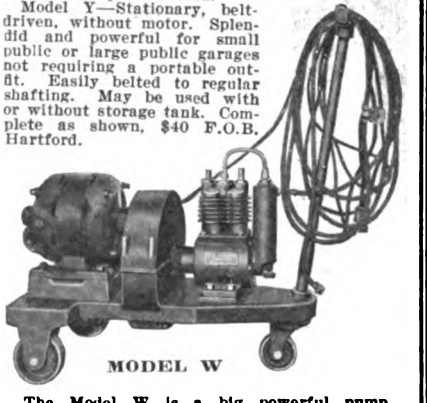
Liberal Discount to Agents

Hartford Machine Screw Co.
482 Capitol Ave., Hartford, Conn.

MODEL Y

Model Y consists of the same pump as is used in Model W but instead of a motor it has a flywheel pulley attached so that it may be used in garages and machine shops with air requirements which already have a line of shafting installed and an individual power unit. This machine was brought out to meet the demand from certain garages and shops not desiring to incur the expense of an extra motor. No more efficient or serviceable machine has ever been put on the market at the remarkably low price at which this Model Y Master Pump is offered.

Model Y—Stationary, belt-driven, without motor. Splendid and powerful for small public or large public garages not requiring a portable outfit. Easily belted to regular shafting. May be used with or without storage tank. Complete as shown, $40 F.O.B. Hartford.



MODEL W

The Model W is a big powerful pump especially designed for large public garages catering to a large number of cars. This can be furnished either with or without truck but is most popular mounted on the truck. The ease of transporting it from place to place in the garage enables the garage proprietor to facilitate his free air service. We have testimonials from garage owners all over the country lauding the merits of this wonderful outfit. It is so sturdy and so heavily constructed that it will stand any amount of abusive treatment to which it will be subjected in the average public garage without fear of injury. Efficient always, it has a record of inflating a 37x5 tire, from flat to 90 lbs. pressure in less than a minute and a half. Public garage owners installing an outfit of this kind will be in a position to render a service to their customers out of all proportion to the cost of the installation. As with other Master Models no storage tank is required, although it has been found practicable in many instances to use this pump in connection with a compressed air tank under which condition it has proven itself amply efficient. A particularly noticeable feature of the pumps is the fact that they are practically noiseless. Rawhide gears are used to connect the motors to the pump.

Model W—2 cylinder, electric-driven, ½ H.P., G.E. Motor. With complete equipment ready for use.
Regular A. C. Motor—$105 F.O.B.
Regular D. C. Motor—$100 Hartford

One of the new **Rutenber** *additions at Marion, Indiana, being rushed to completion. The constantly growing need for larger quarters has made it necessary to occupy the two lower floors before the upper story was finished.*

RUTENBER

Increasing with Such Giant Strides that

Continuously for over two years building operations have been going ahead at top speed that **Rutenber** Output might catch up with **Rutenber** Demand. During this time a 100 per cent. increase in factory space has been made.

An ever increasing number of America's leading car manufacturers throughout this period have been equipping their product with **Rutenber** Motors. A decidedly marked and steady growth in favor for the popular **Rutenber** among discriminating car owners has also made its effect felt.

OVER SOLD

No deliveries from this date until after February 1st on

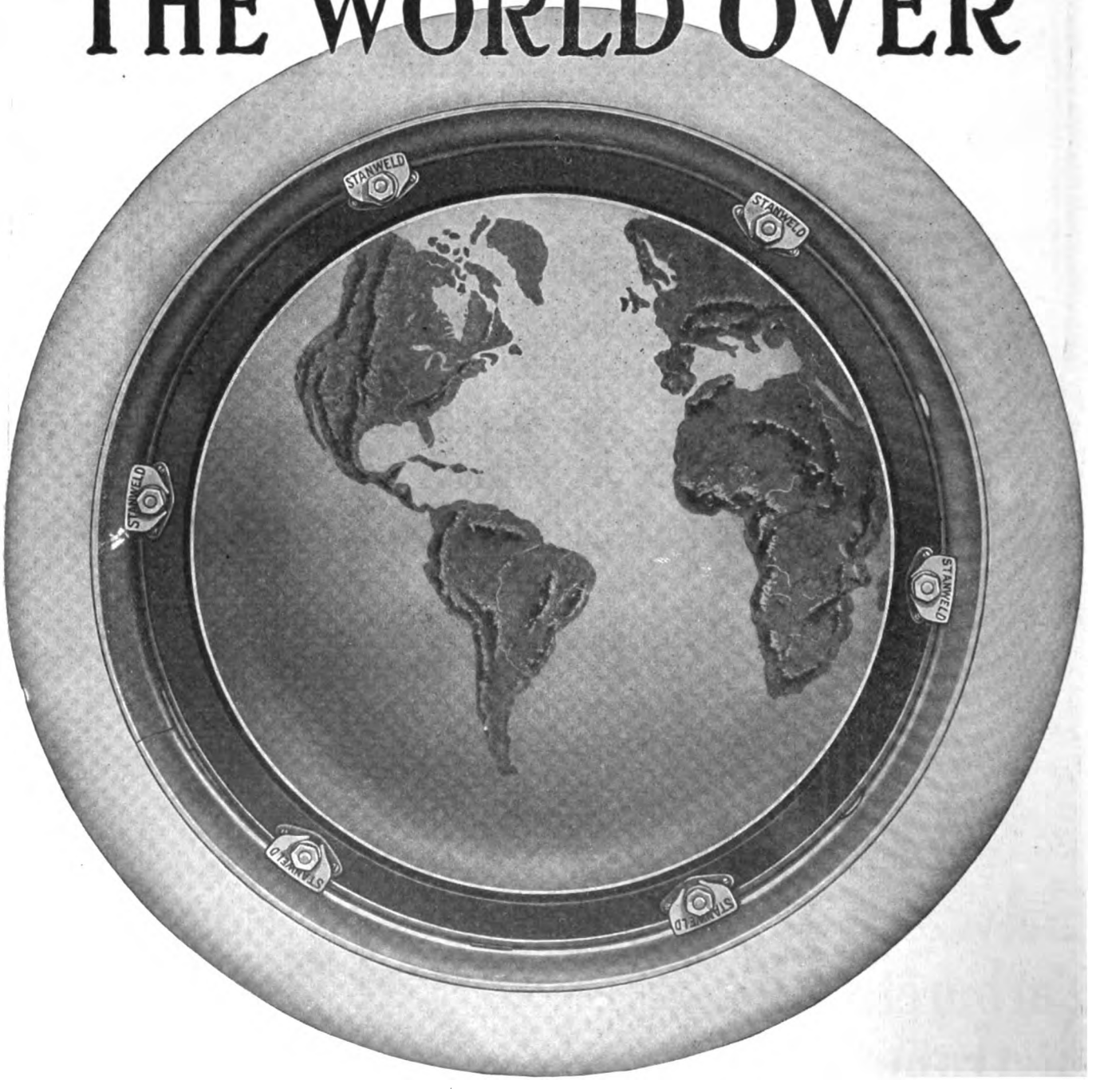
EDWARDS Carburetor

Orders that are received previous to February 1st will be taken care of in the order in which they are received at this office.

National Carburetor Company
154 Whiting Street, Chicago
Room 20

STANWELD RIMS

THE WORLD OVER



THE STANDARD WELDING COMPANY, CLEVELAND.

At the Shows

Dealers and the general public will see the Perfected 2-Wheeled Automobile.

The only vehicle that combines the qualities of a runabout with the economy and convenience of a Motorcycle.

Equipped with a 4-cylinder motor shaft drive, 3 forward and one reverse speeds. starter, force feed lubrication, Bosch high tension ignition, artillery wheels and other standard automobile specifications.

1916

MILITAIRE AUTOCYCLE

are silent and vibrationless, the noise and dirt of chain driven motorcycles is eliminated. Idler wheels take the place of a stand, no lifting is necessary.

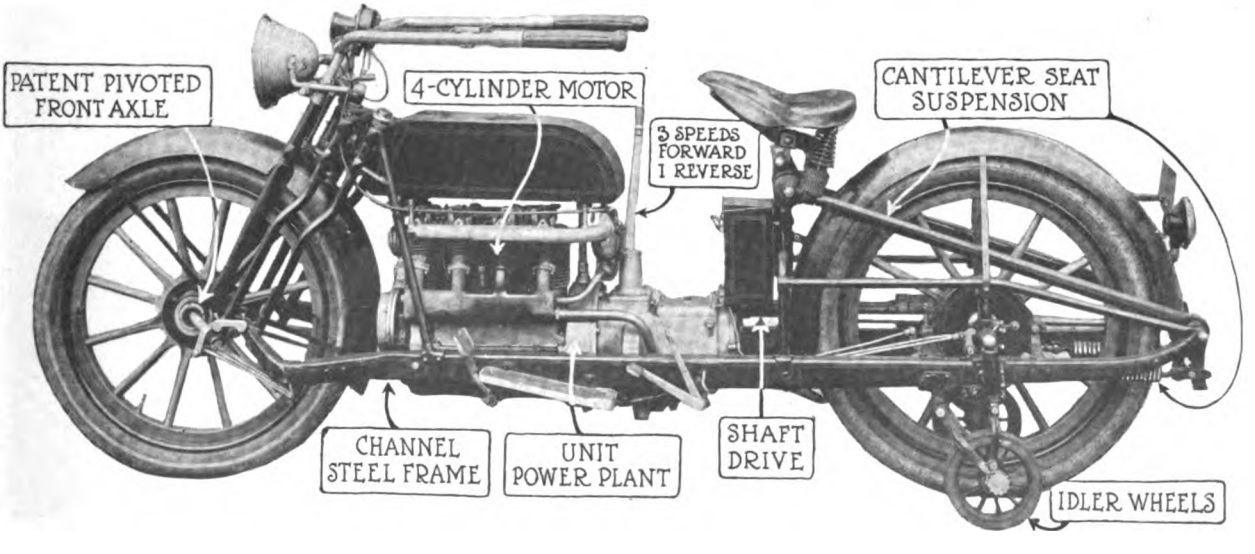
Note the underslung frame which is possible because of the pivoted front axle (patented).

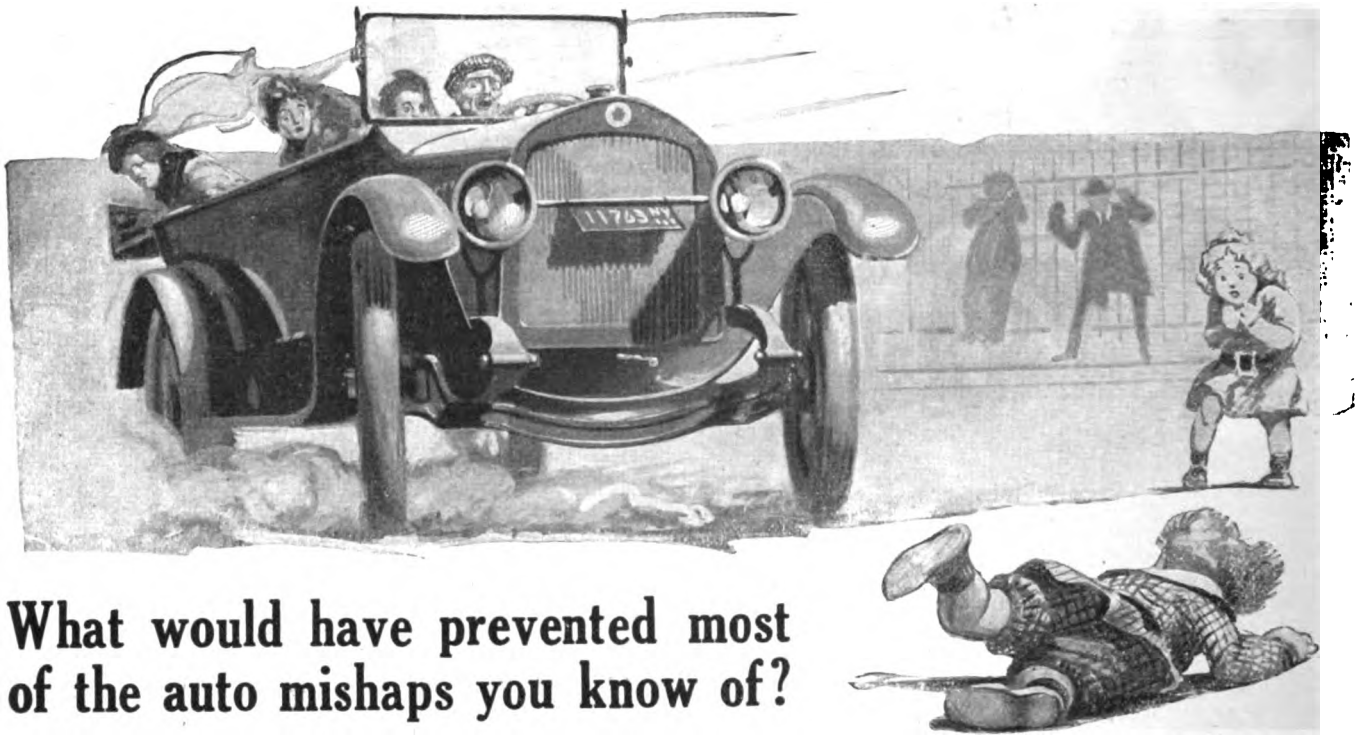
See these machines at the New York and Chicago Shows.

A splendid opportunity for dealers.

In New York—Booth D-191, Fourth Floor.

Militaire Autocycle Company
(of America) Inc.
BUFFALO, N. Y.





What would have prevented most of the auto mishaps you know of?

Wouldn't good brake lining have done it?

Careful drivers know, or they are fast learning, the false economy of friction-shy brake lining.

They are learning the advantage of Thermoid 100% brake lining—an advantage that may any time mean the difference between a close shave and a crumpled car—a narrow miss or a crushed body.

Thermoid HYDRAULIC COMPRESSED Brake Lining-100%

Brake lining that is not 100% is like a heart failure. A sudden shock—a Big Emergency—may mean death.

Thermoid Brake Lining has 100% gripping and holding power even when it is worn paper thin.

That means that lined with Thermoid the brakes will hold, not only when the car is just being stopped but when it must stop quick or hit something.

Thermoid wears because it is cured under hydraulic compression into a solid substance of uniform density. It contains 50% more material foot for foot than do other kinds. Watch the brakes—remember that without a lining they are not brakes at all. Consider, too, how much better it is to see they are lined with Thermoid Brake Lining than to have a finely equipped motor crumpled into junk in an instant, or to have to race to a hospital with a child or adult that would not have been hit if the brakes had held.

Cannot be burned out nor affected by oil, water, gasoline or dirt.

Our Guarantee: Thermoid will make good or we will

Thermoid Rubber Company

TRENTON, N. J.

Makers of Nassau Tires and Thermoid Garden Hose

Please mention The Automobile when writing to Advertisers

JOHNSON'S PREPARED WAX

Keeps Cars Like New

More JOHNSON'S Prepared Wax was used in 1915 than all other makes of automobile polish **combined.**

JOHNSON'S Prepared Wax is the STANDARD automobile polish—the only polish recommended by the makers of the world's finest cars.

Imparts a hard, dry, lasting polish — does not gather dust—sheds water like a duck's back — makes a wash last twice as long—preserves as well as protects the varnish—saves costly refinishing bills

JOHNSON'S CLEANER

Instantly Removes Spots, Stains Surface Scratches, Accumulations of Grime, Grit and Grease that Water Won't Touch

JOHNSON'S Cleaner reduces to an absolute minimum the irksome task of **making** the car clean—JOHNSON'S Prepared Wax **keeps** the car clean. These two JOHNSON products in combination constitute equipment necessary to the fullest motoring enjoyment of every car owner.

end This Coupon with 10c

samples — sufficient one application on a ge car.

S. C. JOHNSON & SON, TA
Racine, Wis.

I enclose 10c for sample can each of Johnson's Prepared Wax and Johnson's Cleaner.

Name ea.....
son's Cleaner

.....

.....

THE STERLING MARK ON MOTOR ACCESSORIES
Gibson Quality

GIBSON

Accessories Shop Equipment Service Treatment

MORE Than a Name

—it means doing things EXACTLY RIGHT.
—it means peace of mind for the dealer.
—it means a guarantee that goes beyond the manufacturer.
—it means QUALITY in every sense.
—it means service that is beyond criticism.
—it means that an accessory offered by this house has been tried, proven and is the best that can be found in any market.

EXCELLENT ENDURING EFFICIENT ECONOMICAL
SOLAR

SIXTEEN YEARS

serving the Dealers in this line from Maine to California, from the Lakes to the Gulf, their loyalty to this house is reflected in our remarkable growth—all the result of a system of FAIR TREATMENT, QUALITY GOODS and INSTANT SERVICE. 7,500 Dealers regular customers.

The Most Complete Stock of Motor Car Accessories and Shop Equipment in America—Insures you IMMEDIATE shipment on every requirement.

We are General Sales Agents for FALCON TIRES AND FALCON INNER TUBES, the HIGHEST QUALITY Tire Products obtainable. A proposition every Dealer should have—it is a money maker and a trade builder. SEND FOR DETAILS AND CONTRACT. Distributors of the guaranteed line of "Solar" Accessories.

In preparation—the Gibson 1916 Catalog. The authority on Automobile Accessories. A complete Dictionary of Supplies and Shop Equipment. It is for the Dealer ONLY. Ready for distribution early in 1916. Edition is limited—get your request in early.

Place your accessory orders with GIBSON and be assured of

Service, Prices, Quality and Fair Treatment

The Gibson Co.

320 North Capitol Boulevard
Indianapolis

Falcon

to Car Owners Reduced

Today, after scarcely more than a year, the Stewart Vacuum Gasoline System is regular standard equipment by over 50 per cent of all car manufacturers and has been installed by thousands of motorists everywhere to bring their old and new cars up-to-date.

On Motor-Driven Tire Pumps we were again the pioneers in reducing the price necessary to pay for a high-grade Motor-Driven Tire Pump

Motor-Driven Tire Pump prices ranged from $20 up.

We made the price on the high-grade Stewart Motor-Driven Tire Pump $15 at the start.

To be fair to the car owner we again took the first losses.

Now we have reduced the price of the Stewart Motor-Driven Tire Pump to $12

It is the fundamental purpose and policy of the Stewart Institution first to make the best product in every line. No prices are ever aimed at in advance. Every department is instructed to build the best. No limitation is placed upon cost in design or construction to accomplish the purpose that each Stewart Product is built for.

The price is finally arrived at on a basis fair to the car owner from the start when the product is marketed.

Of course this policy would not be possible to institutions of less buying power, smaller facilities for manufacturing or narrow marketing facilities.

It has been upon these basic principles that the Stewart Institution has grown so tremendously within the last few years, so that it is today the largest manufacturer of high-grade automobile accessories in the world.

There has never been a time like right now in the face of high "war prices," when there has been so much inducement and temptation with manufacturers to skimp on quality.

Right now, steel is nearly impossible to get even at advance prices. Brass prices have gone up. Aluminum prices have taken a big jump. Die castings have sky rocketed to about triple normal figures.

Yet Stewart prices have been reduced. We are not asking our patrons *higher* prices as many concerns have been forced to do.

We are able to maintain and continue to maintain these low prices on all Stewart Products, because of the loyalty of 1,700,000 motorists of America and 95 per cent of all car manufacturers who regularly equip their cars with Stewart Products.

Such a policy always has been and always will be maintained by the Stewart Institution and supported by car owners and car manufacturers of America.

Speedometer Corporation
U. S. A.

Don't let any dealer sell you anything different than Stewart Products or what he may call "just as good" as Stewart Products.

It is not possible to make higher grade better products than Stewart Products at any price and Stewart Products are always lowest in price, quality considered.

Stewart Motor-driven Warning Signal

Now $6

Stewart Hand-operated Warning Signal

Now $3.50

When You Visit the New York Show Don't Fail to Examine

The Perfection Heater

PATENTED

You'll find our exhibit the Third Floor, Booth C-78. Let our representative show you how simply — how inexpensively —it will warm any car in the coldest weather. Ask him to explain why there is no odor, no noise, no loss of engine power and

—no operating expense

The Heater uses merely a small fraction of the exhaust heat to warm a car. A slight movement of the foot opens and closes the register and regulates the heat perfectly.

The Perfection Heater is being operated with great success by hundreds of car owners. Many more are demanding it.

Every motorist in your territory is a possible prospect. For we build Perfection Heaters in three styles, one of which will fit any car.

The Perfection Heater is a *big winter* seller for dealers and garage men.

To them it means real business during the winter months.

And not only that—they make money on installation work as well as on sales of the Heater itself.

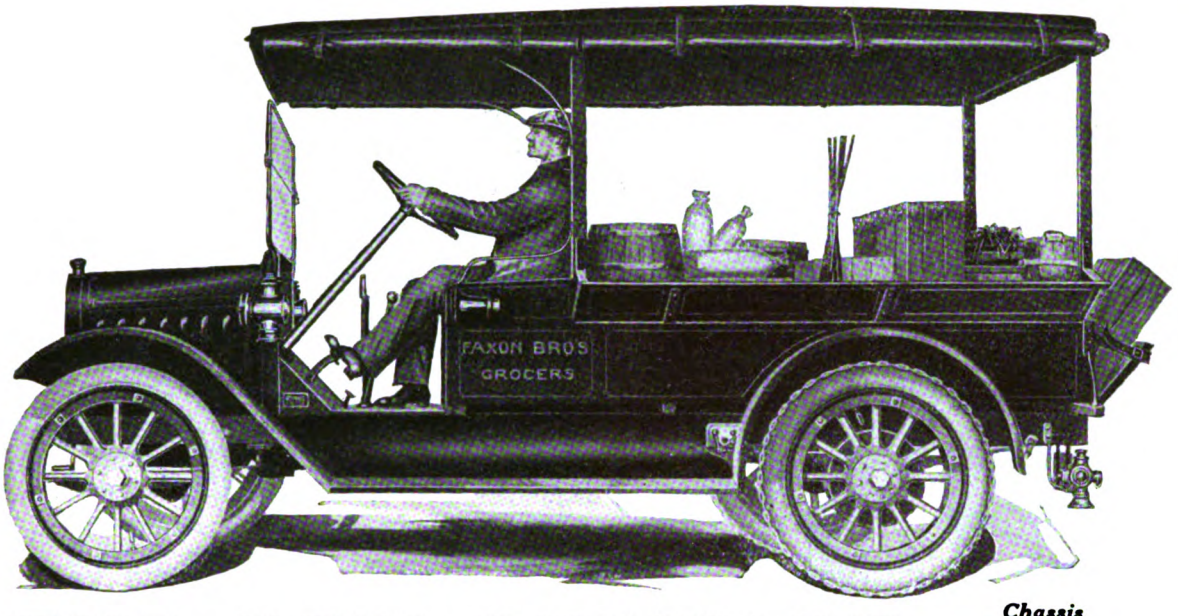
Don't fail to see our exhibit.

It will surely interest you.

The Perfection-Spring Service Company

2014 East 65th Street **Cleveland, Ohio**

New York Service Branch 610-16 West 56th Street



THE NEW STEWART THOUSAND POUND TRUCK

Chassis
$695
Complete With Body
$750

Here is the first real 1000 pound delivery truck produced at a sensational price. Another addition to the Stewart line of quality trucks—giving to the dealer the fastest selling line of trucks ever offered by a responsible organization.

Demands for delivery service prove this—that the light delivery truck is the truck of today—and the truck of the future. More light delivery trucks were sold last year than all other types combined.

And this new 1000 pound truck has all the Stewart quality that has made the Stewart famous throughout the country in over 90 different lines of business. Read over the specifications and you will quickly see that this truck has the stamina and power to meet the gruelling demands of motor delivery service.

"Made by Stewart" is your guarantee that this 1000 pound truck is built right. This new truck is the result of experience in motor truck building—knowing the delivery requirements of motor truck buyers. The price is made possible by quantity production.

BIGGER DEALER OPPORTUNITY

With this new 1000 pound Stewart truck at $695 and the three-quarter ton at $1290, and 1¼ ton at $1390, the Stewart line offers a rare opportunity to dealers. Never before so great dollar for dollar value in truckdom—three popular styles that sell fast.

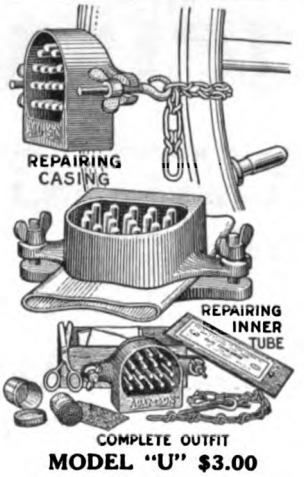
We have some open territory. To attract live dealers we are offering a special inducement in the form of more liberal commissions. Write today for this Special Dealers' Proposition. It will open the way to a profitable motor truck business for you.

SPECIFICATIONS
1000 POUND TRUCK

4 cylinder engine, 25 H.P.; honeycomb type radiator, most efficient made; 3 speed selective type transmission; dry plate clutch; Bosch magneto; pressed steel frame; internal gear drive TRUCK AXLE; demountable rims; 32"x 4" tires, non-skid rear; glass front; mechanical horn; tool kit; jack; tire pump; extra rim.

STEWART MOTOR CORPORATION, Buffalo, N. Y.

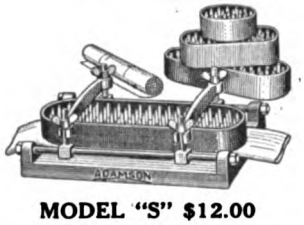
It's Easy to Sell What They All Need—



COMPLETE OUTFIT
MODEL "U" $3.00

MODEL "T" $2.00

MODEL "M" $1.50



MODEL "S" $12.00

"ADAMSON" REPAIR GUM

ADAMSON

VULCANIZERS

—Most Economical of All Tire Insurance

Every Motorist

is a prospective customer. He must face tire repairing sooner or later; and the cheapest and surest kind of quick and lasting repairs is made by ***vulcanizing*** with the "Adamson." No steam or electricity, no watching or regulating; the "Adamson" uses common gasoline and is automatic.

Repairs Instantly

right on the spot, wherever you are. No running on a flat tire and ruining it; no delay, no waiting for a new tube or tire. Do your own work, at a few cents' cost, saving time and money. Repair minor injuries before they grow larger and ruin the tire.

The Simplicity of

"Adamson" vulcanizers keeps their cost down low. No "knack" required; no book of instructions to study; they are safe, sure and easy for ***anyone*** to use.

Over a Million

are now in use—more than all others combined—giving universal satisfaction and creating a demand for ***More "Adamson" Vulcanizers.***

Dealers: Grasp the Big Opportunity

offered by the "Adamson" line for MORE sales and MORE profits. **Write for catalog and Dealers' Proposition.**

Free Booklet—"Repair and Care of Tires"

ADAMSON MANUFACTURING CO.

EAST PALESTINE, OHIO

What's the Answer?

Why have

EISEMANN
MAGNETOS

been adopted as standard equipment by 108 manufacturers, including:

TRUCKS

Adams .....Adams Truck, Fdy. & Mch. Co.
Aetna .....Acme Motor Truck Co.
Avery .....Avery Company
Barker .....C. L. Barker
Bingham ....The Bingham Mfg. Co.
Burford .....H. G. Burford Co.
Acme .....Cadillac Motor Truck Co.
Little Giant .Chgo. Pneumatic Tool Co.
Clinton .....Clinton Motor Car Co.
Commerce ...Commerce Motor Car Co.
Continental . Continental Truck Co.
Corbitt .....Corbitt Automobile Co.
Dart .....Dart Mfg. Co.
DeKalb .... DeKalb Wagon Co.
Delahunty ...Delahunty Dyeing Mch. Co.
Denby .....Denby Motor Truck Co.
Drednot .....Drednot Motor Trucks, Ltd.
Duplex .....Duplex Power Car Co.
Federal .....Federal Motor Truck Co.
4 Wheel Drive. 4 Wheel Drive Auto Co.
Gary .....Gary Motor Truck Co.
Gay .....S. G. Gay Co.
G. M. C.....Gen. Motors Truck Co.
Hahn .....Hahn Motor Truck Co.
——— .....C. F. Hanger Co.
Harvey .....Harvey Motor Truck Co.
Indiana .....Harwood-Barley Co.
Howard .....Robert C. Howard
Hurlburt ....Hurlburt Mot. Truck Co.
Independent Independent Motors Co.
Kelly .....Kelly-Springfield M. T. Co.
Kissel .....Kissel Motor Car Co.
Kosmath ....Kosmath Co.
Lange .....Lange Motor Truck Co.
Lewis-Hall ...Lewis-Hall Iron Wks.
Lippard-Stewart.. Lippard-Stewart M. C. Co.
Locomobile ..Locomobile Co. of Am.
Maccar.....Maccar Truck Co.
Mais.....Mais Motor Truck Co.
Mogul .....Mogul Motor Truck Co.
Mohawk .....Mohawk Motor Truck Co.
Netco .....New England Truck Co.
Pierce-Arrow Pierce-Arrow Motor Car Co.
Curtis .....Pgh. Mch. & Tool Co.
Pull-More ...Pull-More Motor Tr. Co.
Robinson ....Robinson Fire App. Co.
Robinson ....Robinson Motor Truck Co.
Schacht .....G. A. Schacht Mot. Tr. Co.
Selden .....Selden Motor Vehicle Co.
Service .....Service Motor Car Co.
Signal .....Signal Motor Car Co.
Standard ....Standard Mot. Tr. Co.
——— .....Standard Oil Co.
Stegemann ...Stegemann Mot. Car Co.
Sterling .....Sterling Motor Truck Co.
Stewart .....Stewart Motor Corp.
United .....United Motor Truck Co.
Universal ....Universal Mot. Service Co.
Walter .....Walter Motor Truck Co.
White .....White Company
Wichita .....Wichita Falls Motor Co.
Superior .....E. G. Willingham's Sons
Wilson .....J. C. Wilson Co.
Witt-Will ....Witt Will Co.
——— .....Niles Motor & Mfg. Co.

TRACTORS

Bates Machine Co.
Bear Tractor Co.
C. L. Best Gas Traction Co.
Buckeye Manufacturing Co.
Hoke Tractor Co.
Hume Mfg. Co.
Geo. S. Jacobs
Lawtor Tractor Co.
Morton Truck & Tractor Co.
Peoria Tractor Co.
Perrett Tractor Co.
Sweeney Tractor Co.
Three-Way Prism Co.
Wolf Tractor Co.
Yuba Construction Co.
Cleveland Horseless Farm Machinery Co.
Kansas City Hay Press Co.

PLEASURE CARS

Abbott
Apperson
Dodge
Franklin
Kissel
Locomobile
Lozier
National
Simplex

ALSO

17 Miscellaneous, including Gasoline Locomotives, Stationary Engines, Mining Machinery, etc.

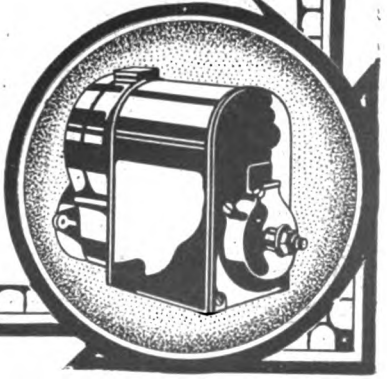
There Must Be a Reason?

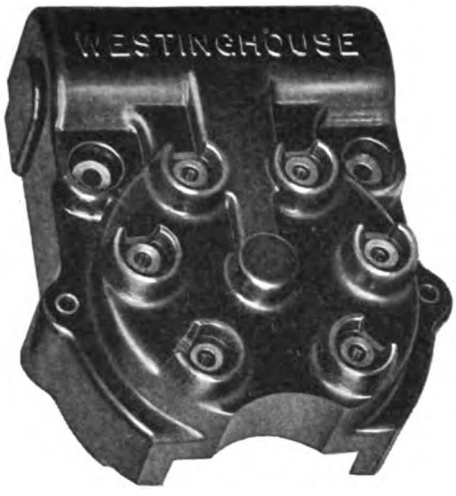
The Eisemann Magneto Company

Sales and General Offices:

32-33rd Street, Brooklyn, N. Y.

New York, 245 West 55th Street
Indianapolis, Ind., 415-417 N. Capitol Ave.
Detroit, Mich. 802 Woodward Ave.





BAKELITE

The Premier Insulation
for

Automobile Ignition

The illustrations tell the story of its success

See these and many more interesting applications of
BAKELITE
at the
AUTOMOBILE SHOWS
NEW YORK—Fourth Floor No. D-147
CHICAGO—Coliseum Annex, 2nd Floor No. 198

GENERAL BAKELITE COMPANY
100 WILLIAM STREET, NEW YORK

55—126

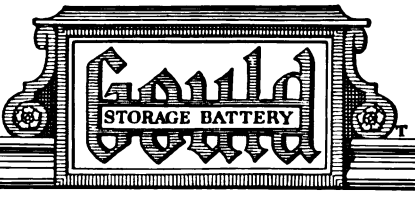
THE same superlative merit of the Gould Storage Battery, in use by the greatest armies and navies of the world, has earned for

The GOULD AUTOMOBILE BATTERY

this sobriquet: "The Strong Right Arm of a Starting-Lighting System."

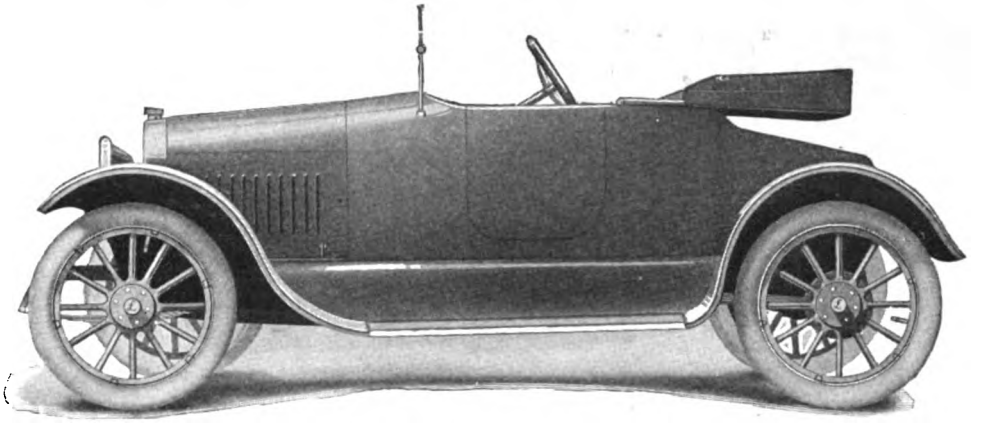
"The Armored Car," a war story by Edward S. Moffat, illustrated by W. H. Foster and C. B. Falls, will be sent upon request.

GOULD STORAGE BATTERY CO.
30 East 42d Street, New York
Boston, Philadelphia, Cleveland, Detroit, Chicago,
Los Angeles, San Francisco



The Sterling—New York

assures unusual profits to the agent who understands the commercial value of a moderate priced car of elegant design, appealing to discriminating buyers, with grace of line and powerful motor of low gas consumption.



The Sterling—New York Roadster 1916

SPECIFICATIONS

MOTOR—Sterling 4-cylinder, water cooled, 3 x 4½, overhead valves, unit power plant, selective sliding gear transmission, 3 speeds forward and reverse, thermo-syphon cooling, cylinders cast en bloc, detachable heads.
LUBRICATION — Self-contained, constant level, plunger pump and splash, individual oil pocket for each connecting rod dipper. Sight feed on dash.
CARBURETOR —Zenith, supplied by gravity from tank in cowl, filler cap on instrument board.
IGNITION—Unisparker system with spark advance.
CLUTCH —Large leather-faced cone, with springs under leather for smooth engagement.
DRIVE —Shaft through pinion and ring gear to rear axle.
REAR AXLE —Semi-floating, high grade materials and bearings throughout.
FRONT AXLE —Drop forged. I-beam with integral yokes; tie rod in rear of axle.
BRAKES —Two on rear wheel hubs, Raybestos lined.
WHEELS —Wood, artillery type, with large cup and ball bearing, demountable rims.
TIRES —Clincher, 30 x 3½ in.
STEERING GEAR —Irreversible split nut type, adjustable, 16-in. steering wheel, LEFT DRIVE.
CONTROL —Gear change lever conveniently located in center of body. Foot accelerator. Hand throttle on steering wheel. Left pedal for clutch, right pedal for service brake. Foot-operated emergency brake. CENTER CONTROL.
BODY Streamline, with elevated cowl, wide doors, ample leg room, tufted upholstery.
CROWN FENDERS
FRAME —Pressed steel channel section, extra strong.
SPRINGS —High grade spring steel, double heat treated. Front, semi-elliptic; rear, full cantilever; no side sway.
WHEEL BASE—102 inches.
TREAD—56 inches (standard).
FINISH—Blue-black or grey.
STANDARD EQUIPMENT — Real one-man-style mohair top, side curtains and dust cover; rain-vision ventilating windshield; electric lights, tail light and combination cowl and trouble light; electric or hand-operated horn; tire repair kit; set of tools and jack; speedometer. Also—

Two unit Auto lite electric starting and lighting system, equipped with Eclipse-Bendix drive, battery included.

Dealers of Standing and Responsibility

are invited to write for territory. Get acquainted at the New York Show, Booth C.-10. Hundreds of cars already ordered—early shipments guaranteed. Catalogs and specifications sent gladly on request. Write immediately.

Address Sales Department

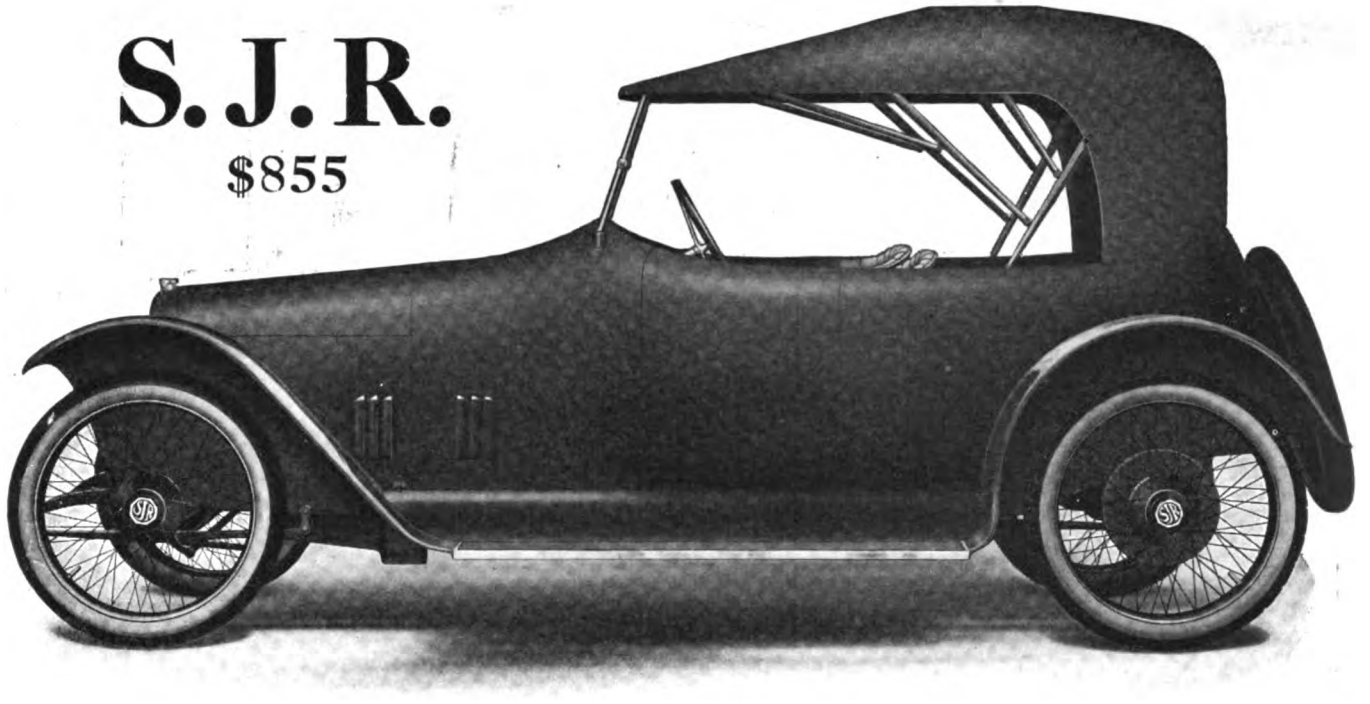
STERLING AUTOMOBILE MFG. CO., Inc. of New York
1790 Broadway, N. Y.

Entirely $595 Equipped

F. O. B. FACTORY, Paterson, New Jersey

S. J. R.

$855



Dealers, Look Into This Car!

Here is a car that will draw from every class of buyers in your territory. The owners of big cars will need it as an auxiliary. The family of moderate means will find it a social help. The salesman, the doctor, all who must cover territory in their business will find it not only an economical means of transportation but an effective maintainer of prestige.

Its sleek, snappy body lines, with the dull-gray finish, suggest a high-priced European design.

The ratio of horsepower to car weight is very high, insuring a responsiveness and quick pickup seldom found in any car regardless of size or price.

SPECIFICATIONS

Motor.—25-30 hp., 3¼ in. bore by 5 in. stroke, 4-cylinder cast en bloc with removable water cooled head. Two bearing crankshaft of liberal proportions made of heat-treated chrome-nickel steel.

Transmission.—Selective sliding gear type, three speeds forward and one reverse. Gears, high carbon steel triple heat treated. Transmission case bolts to rear side of clutch bell on motor case, forming a unit power plant which is supported at three points.

Clutch.—Disc type of special design.

Lubrication.—By plunger pump driven by the cam shaft and accessible located on the side of the motor. All moving parts are constantly covered with a spray of oil.

Ignition.—By high tension, waterproof, oil-proof and dust-proof magneto.

Starting and Lighting.—Six volt, 80 ampere, single unit system with storage battery.

Carburetor.—Is a special design developed especially for this motor, designed to secure great pulling power at low speeds, quick pick-up and extreme fuel efficiency at high speeds.

Cooling.—Is by the tested and proven thermo-siphon system, with unusually large radiator capacity.

Gasoline Supply.—Is by gravity feed from 13 gal. tank carried in cowl.

Control.—The car is driven from the left side, with control levers in the center mounted directly on transmission case. Gear shift lever has positive locks for each of the four gear positions. Spark and throttle levers are mounted directly on the steering wheel.

Instrument Board.—Of highly finished natural wood, all instruments being mounted flush. Directly under the driver's eye are the Standard 60-mile speedometer with total and trip mileage dials driven from transmission. Oil gage magneto and light switches, two ammeters, gasoline filler cap and gasoline indicator.

Wheelbase.—108 in. Tread 56 in.

Rear Axle is of the full floating type with low carbon case and hardened steel differential gears, pinion and bevel ring. Ball bearings are used throughout.

Springs.—Rear: 48 in. cantilever type so slung as to minimize all road shocks.
Front: 42 in. long, of chrome vanadium steel.

Steering gear is irreversible, of the worm and sector type, and operated by a 17-in. wheel so positioned as to afford maximum comfort for the driver.

Frame.—An original design in high carbon steel of a type found only in high-priced cars.

Wheels.—Houk wire wheels with standard QD rims. Extra wheel and tire supplied with car.

Tires.—30 by 3½ in. all around. Plain tread front, and non-skid rear.

Body.—3-passenger roadster type of pressed steel, finished with a special dull surface, and luxuriously upholstered in process leather. Seats stuffed with natural curled hair.

Fenders.—An attractive design in pressed steel. They are joined by linoleum covered, aluminum bound running boards.

Windshield.—Clear vision, rain vision, ventilating type—a single piece of French bevel plate glass.

Top.—One man type with dust envelope.

Lamps.—Electric. Two headlights with dimmers; tail light and dash light.

Equipment.—Vibrating horn, tool kit and tire repair outfit. Wheel carrier with extra wheel and tire.

Price.—$855 f.o.b. factory.

Our Exhibit is Spaces 12 and 13

Grand Central Palace

Come and see this new wonder car. File your reservations of territory, and engage your allotment for spring sales.

S. J. R. MOTOR CO.

126 Massachusetts Avenue, Boston, Mass.

75-2

You'll See Them Everywhere in Chicago

Flecking the boulevards and downtown thoroughfares with brilliant patches of color—dominating Chicago's 50,000 other motor cars as a king's coach would dominate a procession of one-horse shays.

And when you see them—Chicago's famous Yellow Cabs, 260 strong—and when you ride in them—as everyone who comes to Chicago does—note the master workmanship, inside and out, of the RACINE Bodies which adorn their sturdy chassis.

Due to the terrific grief a cab body must stand in comparison to a similar body in private service, extraordinary attention must be given every detail entering into the construction and manner of supporting and bracing the various items subject to strain.

Duplication of every part must be worked out so that in the event of accident new parts can be replaced with a minimum amount of labor and time.

The working out of these items is not a matter of a hurried set of drawings and building of these bodies but the result of a great number of repeated attempts being made until the height of perfection is reached in every detail, realizing that bodies put to this service are only as good as their weakest part. The elimination of the weakest part has been our object.

We Are Specialists with Over 10 Years' Experience in the Manufacture of—

COUPES	LIMOUSINES	VICTORIAS
COUPELETS	SEDANS	PALANQUINS
LANDAUS	BERLINES	CABRIOLETS
LANDAULETS	BROUGHAMS	TAXICAB BODIES

—and if you are interested in the increasingly popular Demountable Top

it will interest you to know that RACINE Demountable Tops set the standard by which all other similar tops are gauged.

Demountable Tops must be made by a concern with a world of closed body experience, since every refinement and all the close work requisite to perfection in closed body manufacture is doubly imperative to satisfactory demountable top work. The RACINE Manufacturing Company has had this experience—**perhaps more of it than any other body builder in this country.**

Separate from its touring body shop it operates a closed body shop under the watchful supervision of closed body and demountable top experts, among which are numbered some of the most famous designers of Europe.

In conjunction with both shops is conducted a large painting and trimming department with facilities for turning out in completed form any type of high-grade top work.

Regardless of what your preconceived ideas of closed body or demountable top perfection may be, we have a price and quality proposition which will surely interest you.

While at the Chicago Show visit our factory at Racine if you can, or let us know where you are stopping and one of our representatives will get in touch with you.

The Racine Manufacturing Company

Racine Wis.

No Better Tires or Tubes are built than these

National "REDWALL" Tires

A TIRE of superior design, construction, material, workmanship and supervision. Immediate Delivery of all types and sizes. Guaranteed for 5000 Miles.

Size	Price Smooth Tread	Price Non-Skid
28 x 3	$13.85	$15.40
30 x 3	14.60	16.20
30 x 3½	19.45	21.60
32 x 3½	20.55	22.85
31 x 4	24.80	28.55
32 x 4	25.60	29.85
33 x 4	26.45	30.40
34 x 4	27.15	31.15
36 x 4	28.75	33.65
33 x 4½	32.45	37.85
34 x 4½	33.25	39.15
35 x 4½	33.95	40.05
36 x 4½	34.65	41.05
37 x 4½	35.70	42.10
35 x 5	40.55	47.35
36 x 5	41.95	48.50
37 x 5	42.95	49.60
38 x 5½	51.40	59.00

National "SPECIAL" Tubes

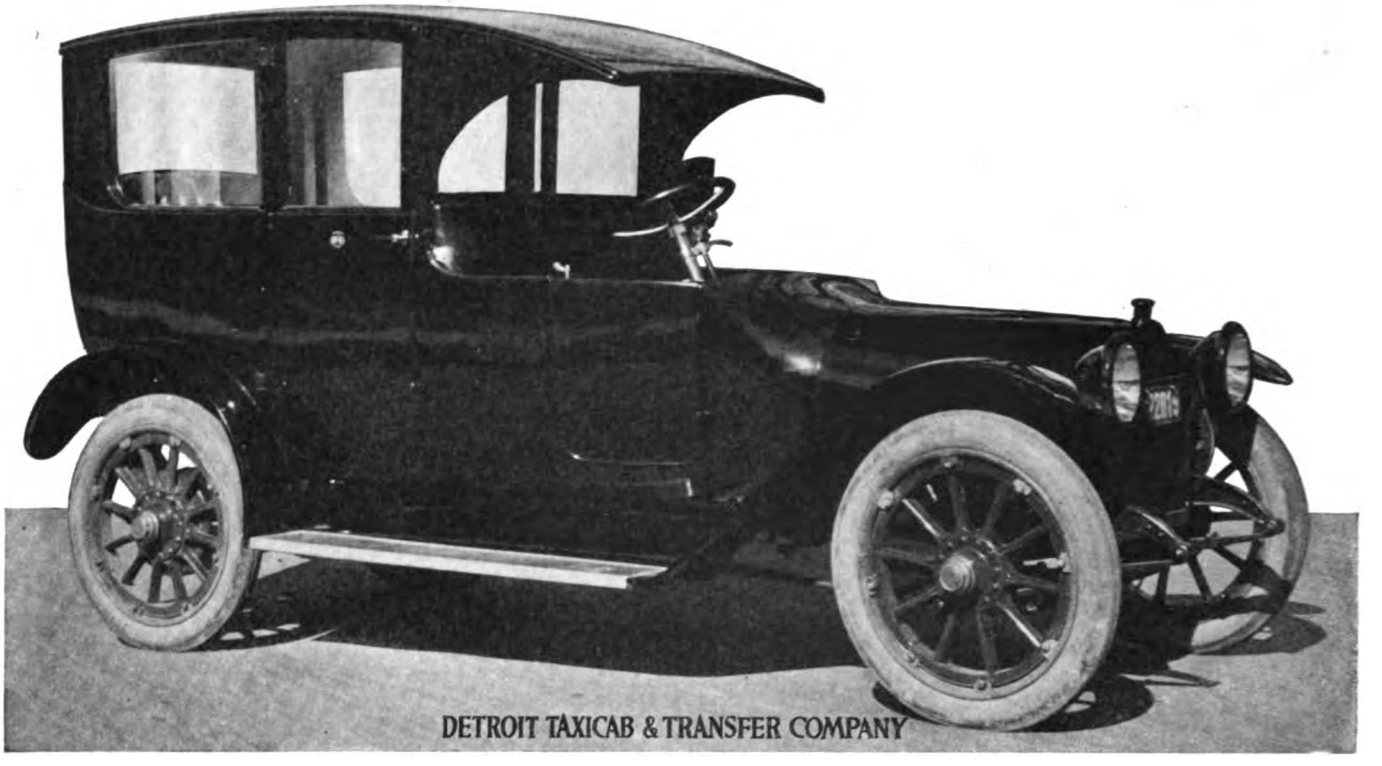
—Pure Gum!—Antimony Cured!—Built by Hand!—Almighty Thick!—Everlastingly Tough!—Laminated!—Specially Guaranteed!—"Some Tube" is Right!

Size	Price Pure Gum Gray	Price Heavy Red Special
28 x 3	$2.30	$3.10
30 x 3	2.40	3.20
30 x 3½	2.75	4.10
32 x 3½	3.00	4.40
31 x 4	3.95	5.20
32 x 4	4.05	5.30
33 x 4	4.20	5.50
34 x 4	4.30	5.65
36 x 4	4.50	5.90
33 x 4½	5.10	7.00
34 x 4½	5.15	7.10
35 x 4½	5.30	7.25
36 x 4½	5.40	7.50
37 x 4½	5.50	7.75
35 x 5	6.30	6.50
36 x 5	6.45	7.70
37 x 5	6.55	9.00
38 x 5½	7.45	10.50

NATIONAL RUBBER CO. **Pottstown, Penna.**

MR. DEALER: Here is your chance to get in on the ground floor of a good tire proposition. You can get better discounts and more territory NOW than you can later on. Real built-in merit plus good aggressive advertising will soon make the exclusive agency for National "REDWALL" Tires and National "SPECIAL" Tubes a most valuable asset—

BUT THE TIME TO ACT IS *NOW*



Where shall your customers buy Shaler Tourist Vulcanizers?

Your customers know the advantages and reputation of Shaler Vulcanizers because the Shaler is advertised in their favorite general magazines and motor papers.

These customers are ready to buy their Shalers. Every day new prospects are created. If you do not supply your own customers some dealer is going to make a profit on goods that you ought to sell.

We help you sell Shalers. In fact our entire effort is directed to selling Vulcanizers for dealers instead of to dealers.

SHALER

Vulcanizers

Opposite are pictures and descriptions of three of the most popular Shaler Tourist Vulcanizers.

Remember that every motorist ought to carry one of them in his toolbox to use instead of patches. He ought to use them to mend small casing cuts and prevent blowouts. Your reputation for selling good tires will be increased with every customer who cares for his tires with a Shaler because the Shaler will double his mileage.

If you haven't been getting the vulcanizer sales that have been made in your own territory, stop and think whether you have ever let a single customer know that you could supply the Shaler.

Get these sales helps FREE

Nearly all of our advertising appropriation is used to tell motorists of the advantages of Shaler Vulcanizers and to urge them to buy from their dealers. The Shaler is advertised in such magazines as Saturday Evening Post, Collier's, etc. Other vulcanizers are advertised only to dealers. Motorists don't know them.

We furnish circulars, signs and window displays to help you. We finish and pack our product attractively.

Accessory Dealers

You make a good profit on Shaler Vulcanizers—you make a profit on every repair that is made because you sell the repair material to use with it. Send the coupon today and get our proposition to the trade. It means money to you.

COMPLETE CATALOG FREE

Send coupon for a new complete catalog describing each Shaler model in detail. We will also send you our book "Common Sense About Tire Repairs."

C. A. SHALER CO., 100 Fourth St., Waupun, Wis.

Largest Manufacturers of Vulcanizers in the World

Canadian Distributors, John Millen & Son, Ltd., Toronto, Winnipeg, Montreal and Vancouver

SHALER

Vul-Kit $3.50

Fits Any Size Tire

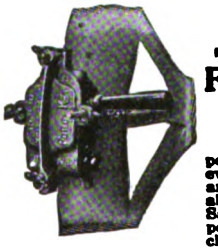
Can be carried in the tool box for emergency repairs to tubes and casings. Does away with patches and cement. Has no exposed blaze. Absolutely safe. Burns gasoline or alcohol—an exclusive Shaler feature. No watching, no regulating; simply fill the cut or puncture with new rubber, clamp on the vulcanizer—fill and light the generator. You can't overcure or undercure a repair. Handle always cool. Anyone can use it. Complete, $3.50.

Model for home garage $12.50

SHALER

Tube-Kit $2.00

Does away with temporary patches for repairing tubes. It takes no more time to repair a tube permanently with a Shaler Tube-Kit than it does to use a make-shift patch. Can be carried in the tool box for roadside repairs or can be used indoors. Has no exposed blaze—is free from soot and smoke and the fuel cannot spill and flare up. Handle is detachable.



SHALER

Ford-Kit $2.75

For Ford Tubes and Casings

This model, designed especially to fit Ford tires, makes every practicable tube repair, and what is much more valuable, mends casing cuts too. Safe, simple, clean. No exposed blaze so can be used close under a fender.

Mail This Coupon

C. A Shaler Company,
100 Fourth St., Waupun, Wis.

Send me 1916 catalog, dealers' terms and free book, "Common Sense About Tire Repairs" (for dealers and garages only).

Name .....

Street .....

City ..... State.....

Do you sell accessories?.....

Have you a repair department?.....

Jobber's name.....

The Advertising "Hit" of the New York Show

Every automobile driver and dealer will be interested in this series of advertisements which "talk sense" from a new viewpoint.

The ad reproduced is one of a series of twelve.

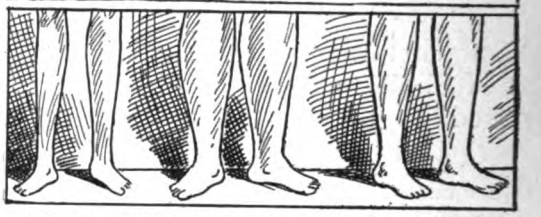
A complete set will be sent to any one interested.

Address:

Publicity Department,
MITCHELL-LEWIS MOTOR CO.
Racine, Wis.

Supposing You Started Out to Buy a Pair of Legs Instead of An Automobile

Have This Thought in Mind When You Go to the Show—Which, of Course, You Will.



In buying your first pair or a new pair of legs, what would be the essentials that you would DEMAND before you buy?

You would want a pair that would take you "there and back" without having to stop for some "tinkering." You would want a pair that would not jar your collarbone loose every time you took a step.

You would want a pair so constructed that you would not have to THINK ABOUT THEM ALL THE TIME. You would want a pair with feet that would do their part without your thoughts going down in your shoes. Your trips—business or pleasure—would not be very enjoyable or EFFICIENT with them down there.

Then—according to individual requirements—you would want a pair of legs that would best meet YOUR needs. They may be shapely, powerful, small, large, silk-stockinged, high-heeled, broad toed, or like a contortionist's. BUT YOU WOULD BUY YOUR LEGS FOR THE SERVICE THAT THEY WOULD RENDER YOU.

Buy an automobile from the same SERVICE viewpoint.

At the automobile show you'll see many styles, kinds, colors, designs. Some will have real points that will appeal to you: many will have just "talking points" that perhaps will not.

At the Mitchell—"THE SIX of '16"—exhibit you'll see what we believe to be a truly wonderful car for ALL AROUND EFFICIENCY. You will not be told that it's hundred per cent perfect. But the fact that its "average" will place it at the head of the list will be demonstrated and PROVEN.

THE SERVICE THAT THE CAR WILL RENDER YOU will be the basis of our demonstration. You'll not just be told what this car has or is—but what it "has" or "is," DOES.

You are not interested very much in the fact that it has a distinctively unique spring suspension—but you are interested in the fact that the Mitchell spring suspension makes it the easiest riding car.

Many other exclusive points of merit and superiority will be shown for *what they do* rather than for what they are.

After you have walked around a bit and seen the other cars—see the Mitchell—see WHAT SERVICE IT WILL GIVE YOU—and you'll buy it.

The truth of this is proven by the thousands of others who were sold on a "show me" basis, now driving this marvelous car value.

The Greatest Car Value the World Has Ever Known

Mitchell

$1250

"*THE* SIX OF '16"

Mitchell-Lewis Motor Co., Racine, Wisconsin

Carl H. Page Motors Co., Broadway at 59th Street

VALUE

When all claims for tire supremacy are made and checked up against tire performance, the big fact remains that motorists will repeat only on those tires that have shown real value. Such are

MATTSON TIRES

We shall tell you about them in more detail in later ads. But chiefly important **now** is the fact that they are far beyond the usual quality for standard tires, and we sell them on a basis which puts real profits into tire selling for those dealers who know how to push their goods.

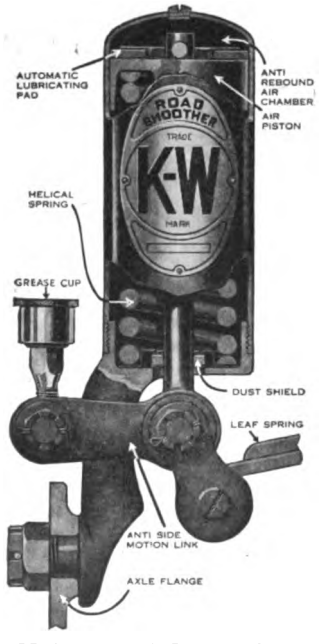
A fine selling proposition and a liberal exclusive territory arrangement await dealers who are wise enough to grasp this opportunity.

Work Fast – Write or Wire

MATTSON RUBBER COMPANY
LODI, NEW JERSEY

$15 With Regular Kick Switch
$16 With K-W Autolock Switch

K-W Autolock Switch
$3.50 Complete



K-W Road Smoother
$15 Set of Four One for Each Wheel

TRADE K-W MARK PROTECTION

The name K-W is really a symbol of protection for both the motorist and the dealer.

To the Ford Owner

The K-W Autolock Switch protects your Ford car absolutely against theft or tampering when left in garages or in the street.

The K-W Master Vibrator protects you from the annoyances of poor ignition. It gives you surer and better ignition than high tension magneto—easier starting in cold weather—one adjustment instead of four—more power—a hotter spark—cleaner spark plugs, and all on less gasoline.

K-W Road Smoothers protect you and the parts of your car from the jolts and bumps common to riding over rough, rutty, frozen roads. They smooth out the kicks and worries of the road. Where you ride there are no jolts—no jars. They are so constructed that they absolutely do not interfere with the steering. They prevent side motion and rocking.

Right in your neighborhood you will find a Ford car equipped with a K-W Master Vibrator and Autolock Switch or Road Smoothers. Ask the owner what they are doing for him every day. He can tell you better than we of the efficiency, economy, and reliability of K-W products.

K-W products are the Standard of Excellence all over the World. They are sold by dealers who know the difference everywhere. If yours is out sent prepaid on receipt of price.

To the Dealer

The integrity of the name K-W prohibits exaggerated claims and promises. It is a symbol of fair dealing, as important to you as this mark on K-W apparatus is a guarantee to the user of quality, reliability and service. This broad, square-deal K-W Policy protects you, Mr. Dealer.

The K-W line is a profitable one for live dealers. Write for our liberal sales plan today.

Visit our booths at the New York Automobile Show, D 92-93.

Chicago—No. 22, Armory Balcony.

TRADE THE K-W IGNITION Co MARK
2833 CHESTER AVENUE CLEVELAND, OHIO. U.S.A.

PAIGE

The Standard of Value and Quality

The Paige Message to You

ON THESE four pages you will read a message the importance of which every progressive and successful motor car dealer in the country will be quick to recognize.

It is the announcement of the Paige Line—exclusively six-cylinder cars—for 1916.

You will find there a detailed description of the new Paige Fleetwood "Six-38," $1050—a five-passenger reproduction of the incomparable Paige Fairfield "Six-46."

Your experience and trained judgment will detect the extraordinary roominess, the beauty, luxury, power and unique value of this new Paige.

You will find in this Paige Message a statement of Paige Plans for the big seven-passenger Fairfield "Six-46," the Supreme "Six" of the year, the car that established new standards of value and quality in six-cylinder cars.

Read these pages carefully. Consider well the cardinal requisites of motoring luxury and motoring service. Note the roominess, beauty, comfort, power, elegance of equipment and excellence of construction of these two Paige "Sixes." Compare them, in these vital essentials, with any other "Sixes" on the market.

Satisfy yourself that the Value and Quality are there. Whatever car you sell, satisfy yourself that price reduction has not been accompanied by quality reduction.

Compare it with the Paige "Sixes"—the five-passenger "Six-38" at $1050, and the seven-passenger "Six-46" at $1295.

Then, we are confident, you will be quick to realize the supreme advantage, the invincible position and unique range in values and prospect-selling the Paige offers you.

You know of your own knowledge that the Paige Fairfield "Six-46," among seven-passenger six-cylinder cars, has been accepted as standard and supreme.

You will instantly grasp the fact that the new Paige Fleetwood "Six-38" at $1050—in practically every important feature a reproduction of the "Big Six"—must inevitably win country-wide endorsement and popularity in the field of five-passenger cars in precisely the same way.

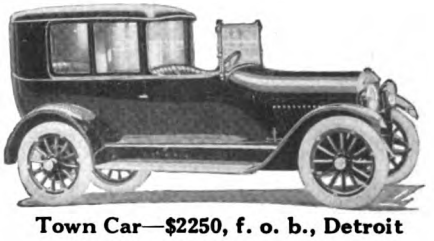
With these two Paige "Sixes" in 1916 you will occupy an impregnable position. You need fear no competition. You can sell any prospect. You are entrenched in Paige Prestige and Paige Supremacy.

You have behind you the momentum and support of a tremendously successful company, a line of extraordinary latitude for all selling conditions and the supreme popularity of Paige cars.

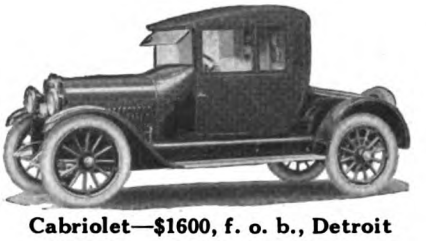
Therefore, we ask you and urge you to read this Paige Message with closest attention and discriminating judgment.

We are confident of your conviction.

Paige-Detroit Motor Car Company, Detroit, Michigan



Town Car—$2250, f. o. b., Detroit

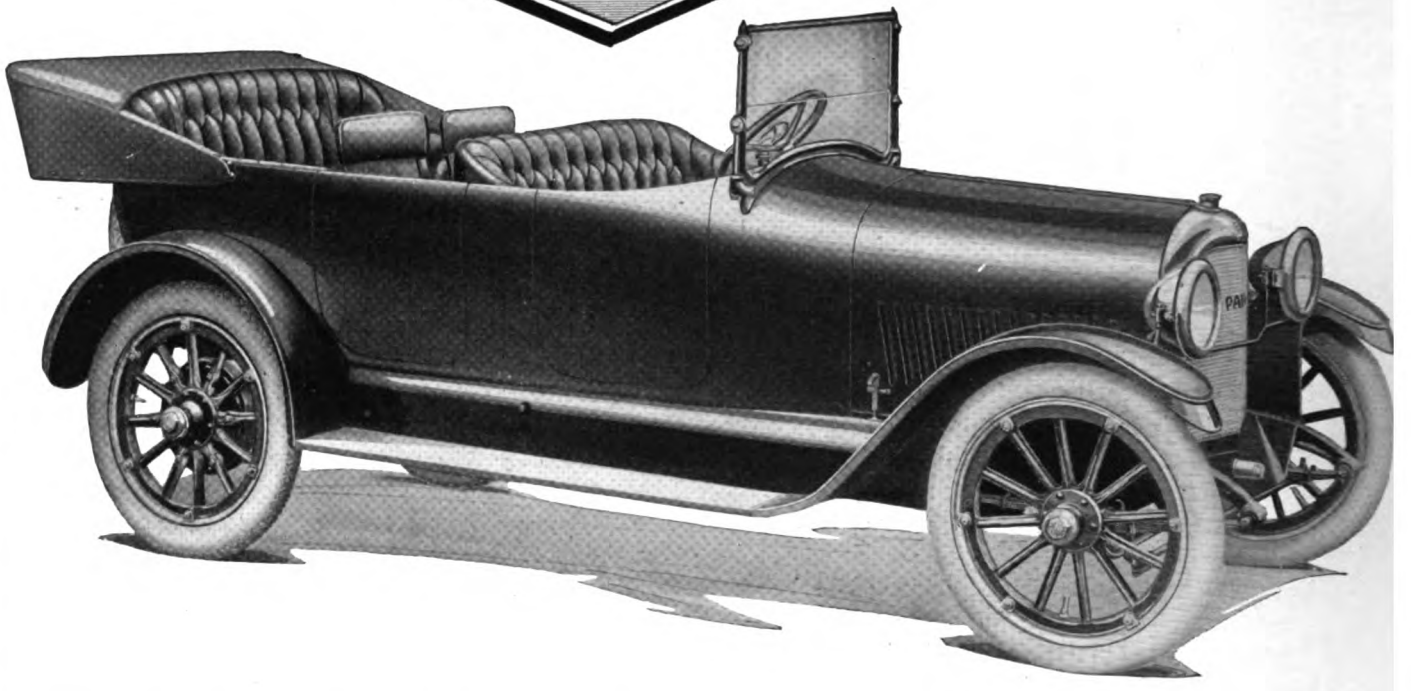


Cabriolet—$1600, f. o. b., Detroit

Sedan—$1900, f. o. b., Detroit

PAIGE

The Standard of Value and Quality



The Bulwark of Paige Supremacy
The Fairfield "Six-46"

YOU know this car. The whole country knows this car. This car instantaneously created a demand which never permitted the Paige factory to catch up with orders until the huge annex was opened, although the plant worked night and day.

This Fairfield "Six-46" is the car which in the popular judgment of what power, flexibility, beauty, service and motoring luxury and elegance should be, established new standards.

Its refinements and improvements have been brought down to the current hour of the industry. The Fairfield "Six-46" holds and will continue indefinitely to hold the Leadership of all real Quality cars among the medium priced "Sixes."

It is so firmly entrenched in the appreciation, confidence, even affection of the discriminating motoring public that it is guaranteed a continuous demand. The Fairfield "Six-46" is an American institution.

With the Fairfield "Six-46" the Paige first won the Supremacy of the "Sixes." With it, re-enforced now by the new five-passenger Fleetwood "Six-38," Paige will continue to hold the Supremacy of the "Sixes."

This, then, is the Paige Line:

The seven-passenger Fairfield "Six-46" at $1295.

The five-passenger Fleetwood "Six-38" at $1050.

Does the entire motor car field offer you a better, surer business opportunity than this?

Paige-Detroit Motor Car Company, Detroit, Michigan

Specifications—"Six-46"

Motor—46-50 H.P.; six cylinder; cast en bloc from special gray iron; bore 3½", stroke 5¼". Bottom of crank case sheet steel.

Transmission—Three speeds forward and reverse in an aluminum case at rear of motor. Transmission gears and shafts are Chrome nickel steel, heat treated and ground. Shafts carried on annular ball bearings and Hyatt roller bearings. Oil capacity 2 quarts.

Clutch—Multiple disc, cork inserts enclosed in flywheel and running in oil; 14 discs; 36 corks in each of seven driving discs.

Frame—High carbon steel, channel section 4" deep and 3" wide, ⅛" thick. Narrowed in front with drop in front of rear axle.

Springs—Special spring steel stock, heat treated. Front semi-elliptic 36" long, 2" wide. Rear: Cantilever type 48" long, 2½" wide.

Tires—Goodyear or Firestone 34"x4"; safety tread on rear.

Wheel Base—124".

Steering Gear—Jacox irreversible screw and split sleeve type.

Carburetion—Rayfield, filled with hot air intake tube. Dash adjustment.

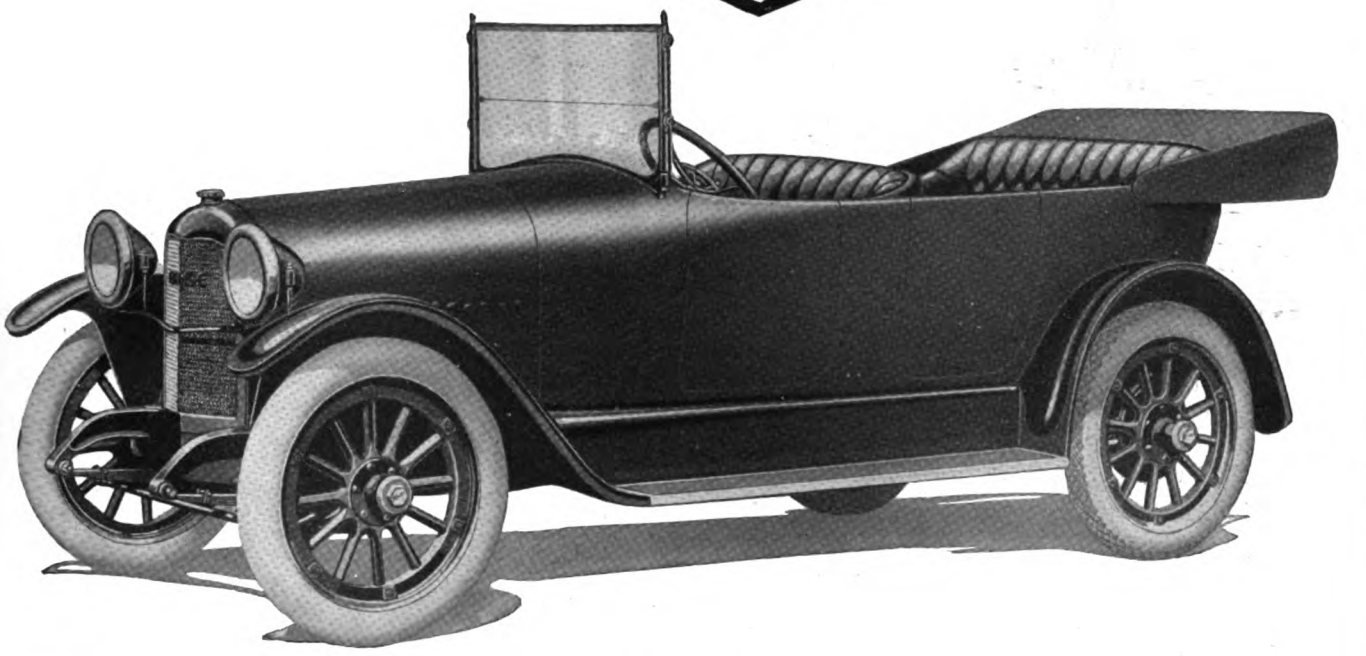
Electrical System—Gray & Davis improved electric starting motor; Gray & Davis separate electric generator with automatic electric governor.

Ignition—Remy high tension distributor and Willard 6-volt battery.

Standard Colors—Paige Richelieu Blue; red wheels. Nickel trimmings all models.

PAIGE

The Standard of Value and Quality



Specifications—"Six-38"

Motor—38 H. P.; six cylinder; cast en bloc from special gray iron; bore 3⅛", stroke 5". Cylinder head cast separate. Bottom of crank case sheet steel.

Transmission—Three speeds forward and reverse in an aluminum case at rear of motor. Transmission gears and shafts are Chrome nickel steel, heat treated and ground. Shafts carried on annular ball bearings and Hyatt roller bearings. Oil capacity 2 quarts.

Clutch—Multiple disc, cork inserts enclosed in flywheel and running in oil; 14 discs; 36 corks in each of seven driving discs.

Frame—High carbon steel, channel section, 4" deep and 3½" flange; ⅛" thick. Frame tapers to 29" in front, giving short turning radius.

Springs—Special spring steel stock, heat treated. Front semi-elliptic 36" long, 2" wide. Rear: Cantilever type 44" long, 2¼" wide.

Tires—Goodyear or Firestone 32"x4"; safety tread on rear.

Wheel Base—117".

Steering Gear—Jacox irreversible screw and split sleeve type.

Carburetion—Rayfield, fitted with hot air intake tube. Dash adjustment.

Electrical System—Gray & Davis improved electric starting motor; Gray & Davis separate electric generator with automatic electric governor.

Ignition—Remy high tension distributor and Willard 6-volt battery.

Standard Colors—Paige Richelieu Blue; straw wheels. Nickel trimmings all models.

Here Is The Proof That Paige Quality Is Again Supreme

FIRST, we want to introduce to you—and to every man whose business it is to study and judge motor car values—the newest Paige—the five-passenger Fleetwood "Six-38."

We ask you to examine as exhaustively, impartially and critically as you can every detail, every specification of this car—which you will see at the New York Show, and all the other Automobile Shows this winter.

We ask you to bear firmly in mind these Three Vital Facts: First, that the price of materials and labor has increased substantially; second, that this new Paige Light "Six-38" is in actual Sterling Quality and Value an even more remarkable offering than the Paige "Six-36" which sold at $1095 (and was sold out by November first); and, third, that in spite of this substantial increase in actual manufacturing cost, this new Paige Fleetwood "Six-38"—in every important feature a reproduction of the great seven-passenger Fairfield "Six-46"—is offered for $1050. That is actually a reduction of $45 for more actual quality.

There are reasons why the Paige—and probably the Paige alone—can do that. We have brought our manufacturing equipment and methods to the highest degree of efficiency. For efficiency and economy we believe that the Paige is unsurpassed. We have put into operation the huge factory annex, which means a capacity of 150 Paiges a day and a scheduled production of 20,000 Paiges this coming year. We have the lowest over-head expense per car, we believe, in the motor car industry.

That is why Paige CAN honestly lower price and actually give More Quality.

That the Paige actually HAS added quality at a lower price is for you to judge.

Paige-Detroit Motor Car Company, Detroit, Michigan

PAIGE

The Standard of Value and Quality

What Paige Popularity Means to Paige Production

PRESIDENT Harry M. Jewett, in his message to Paige Dealers, has just said:

"Paige quality, which was supreme last year, which has been supreme all this year, will this coming season be recognized immediately as still more incomparable.

"THERE WILL BE NO COMPROMISE OF PAIGE REPUTATION, PAIGE CHARACTER OR PAIGE QUALITY."

With Paige Quality assured, the Paige Problem this coming year is to Supply the Overwhelming Popular Demand for Paige Cars.

We have solved that Problem.

Below, on this page, you see a photograph of the Detroit plant of the Paige—with the huge new annex just completed and now in full operation.

This plant gives the Paige a capacity of 150 cars a day.

Do you realize what a stupendous production of motor cars—of Paige Quality and at Paige Prices—that is?

Still more important, however, is the fact that we actually have the materials, the equipment, the men, the resources to meet any Popular Demand for Paige Cars—however tremendous it may be.

Paige is prepared.

You will grasp the significance of this—because you see that Paige is making and will continue to make Immediate Deliveries.

It will no longer be necessary to keep Paige Purchasers waiting a month, even three months, for the one car of their choice.

You know that this huge fact alone—Immediate Deliveries—means the safeguard of your own investment and the guarantee of a year's successful retail business.

Of the impregnable financial strength, of the integrity and stability and unique prestige of the Paige-Detroit Motor Car Company we need tell you nothing. You know these facts yourself.

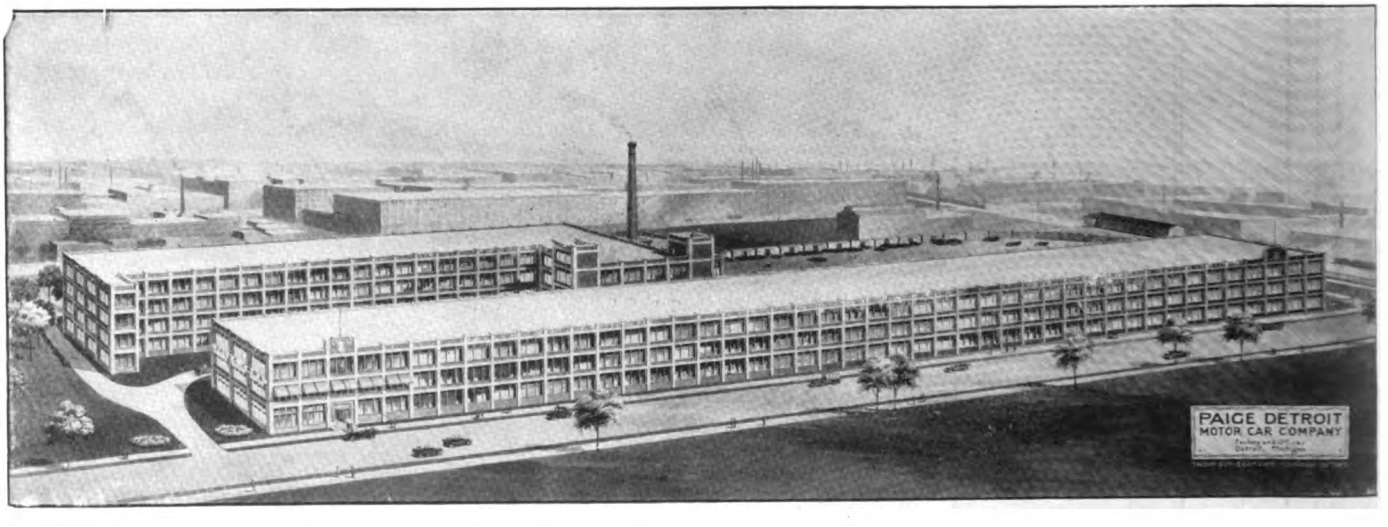
Of the Supreme Quality of Paige Cars—which means low repair bills to Paige Owners and minimum service cost to Paige Dealers—we need tell you nothing. You know these facts yourself.

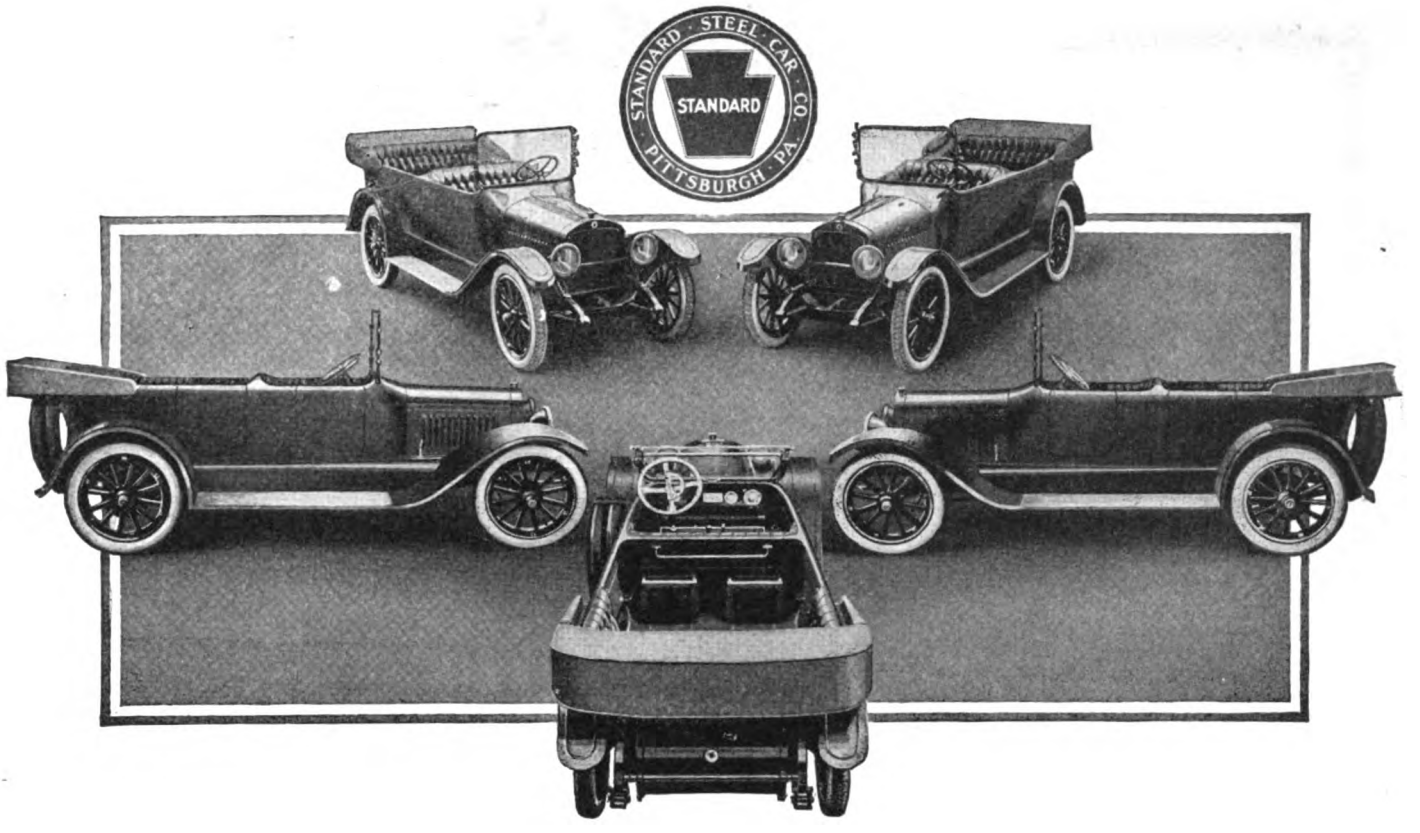
This year, of all years, with the tremendously increased Paige Production: with a popularity and public confidence unique in the motor car industry back of us, there is a tremendous reward awaiting every alert and loyal Paige Dealer.

For three years now Paige has led the way. We believe that every successful, money-making, well-established Dealer wants the support of a company as sound as the Paige and wants to sell a product of the Quality and Value and Character that distinguish Paige cars. Also, the Paige-Detroit Motor Car Company wants Dealers who know and appreciate the Quality and Value and Character of Paige Cars.

Are you the man?

Paige-Detroit Motor Car Company, Detroit, Michigan





"8" STANDARD

THE production of Automobiles by the Standard Steel Car Company is a logical development.

Regularly engaged in designing and building the steel transportation equipment, of all kinds, which has done so much for the safety and comfort of the traveling public—controlling all necessary facilities, in both men and material—and with an organization trained along the lines, primarily, of determining the best thing to do, and then the way of doing that best thing repeatedly and uniformly—the production of Automobiles came nearly as a natural sequence.

About four years ago the Standard Steel Car Company commenced to use its resources and facilities specifically in the designing and manufacturing of Automobiles—its progressive steps being directed by careful study and analysis under laboratory conditions, supplemented and verified by service tests.

One year ago, having foreseen and experimented with the eight-cylinder type of motor, the Standard Steel Car Company brought forward its "Standard Eight"—one of the few of its kind which had been offered to the public.

In now announcing the 1916 "Standard Eight," we can state that it has been born of thorough and extensive experience, under all-varying conditions of sufficient severity to detect any defects or oversights in the 1915 product—and with the happy conclusion that no changes have been indicated as necessary in the mechanical features, and only such changes in body construction as are required to meet the latest demands.

It is of the greatest importance that the automobile purchaser should know that he can depend upon the representations and workmanship of the manufacturer, as well as upon the sort of treatment and service he will receive.

The reputation of the Standard Steel Car Company is in itself assurance that the purchaser of its products will not regret his confidence in the people he deals with, nor be deceived or disappointed in what they furnish him.

A 1916 seven-passenger "Standard Eight," at $1,735, is not an experiment with an unknown quantity—but is, rather, the investment of money in an article of proven merit and reliability, produced by people who know what they are doing and have the resources to do what they know should be done.

Among the features of appealing interest and importance of the "Standard Eight" are its light weight, wedge-shaped frame, staggered cylinders, double universal (anti-skid) drive of the Hotchkiss type, the force-feed oiling system, etc.

From All Viewpoints the "Standard Eight" Excels.

WE ARE EXHIBITING AT THE NEW YORK AND CHICAGO AUTOMOBILE SHOWS

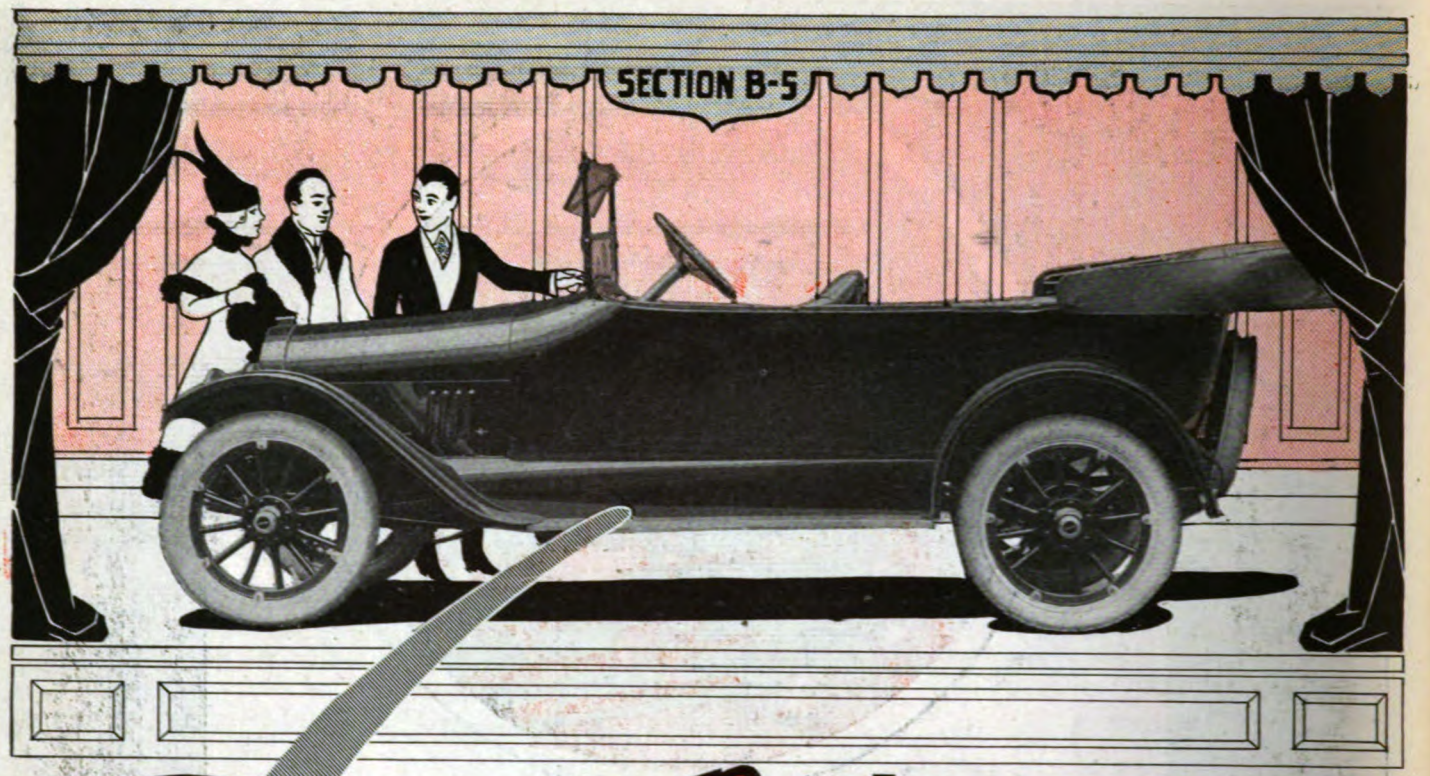
Cabinet sized photographs, full specifications, and details of our new sales plan will be furnished upon request

STANDARD STEEL CAR CO., Pittsburgh, Pa.

DISTRIBUTORS

Duffy Motors Corporation, 1895 Broadway, New York City.
Crane Auto and Garage Company, 442-450 Potter Ave., Providence, R. I.
T. C. Woodin, 307 Reliance Building, Kansas City, Mo.
Eastern Motors Corporation, 1634 Chestnut Street, Philadelphia, Pa.
F. C. Van Derhoof, 3765 Grant Boulevard, Pittsburgh, Pa.
C. E. Trace, Apartment Garage, Baltimore, Md.

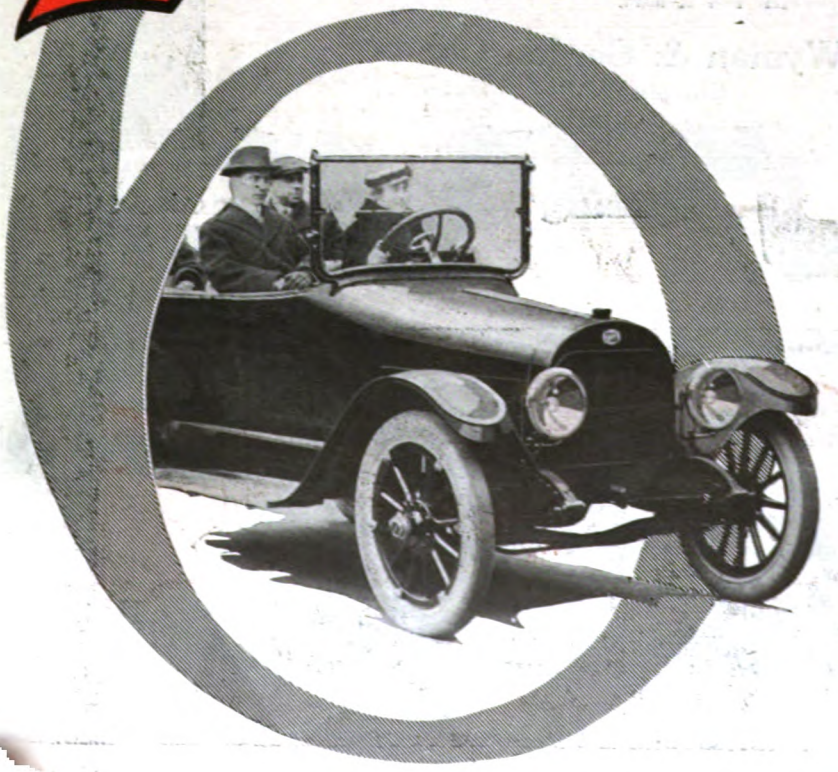
STANDARD



Paterson $985

SEVEN-PASSENGER BODY WITH DISAPPEARING AUXILIARY SEATS - - - - - $1060

6-42



Paterson Dealers Talk Facts

Dealers who sell Paterson cars are never up against the necessity of having to talk mere generalities.

Apologies are never necessary.

The Paterson embodies all those essentials of equipment so universally demanded by the car owners of to-day. And the dealer can talk facts — always.

There is no reluctance in pointing out the features of the new high-speed, six-cylinder Continental Motor, 3¼" x 4½"; of going into complete details of the Delco system of starting, lighting and ignition, the Willard storage batteries, Stewart-Warner Speedometer, Stewart Vacuum Gasoline System, the new Stromberg Carburetor, Goodrich 32" by 4" tires (Safety Tread, rear).

Then there is the one-man top, neat dust hood, quick adjustable side curtains, full ventilating rain-vision windshield, electric horn, demountable rims, and full tool equipment, that go to make up the complete car.

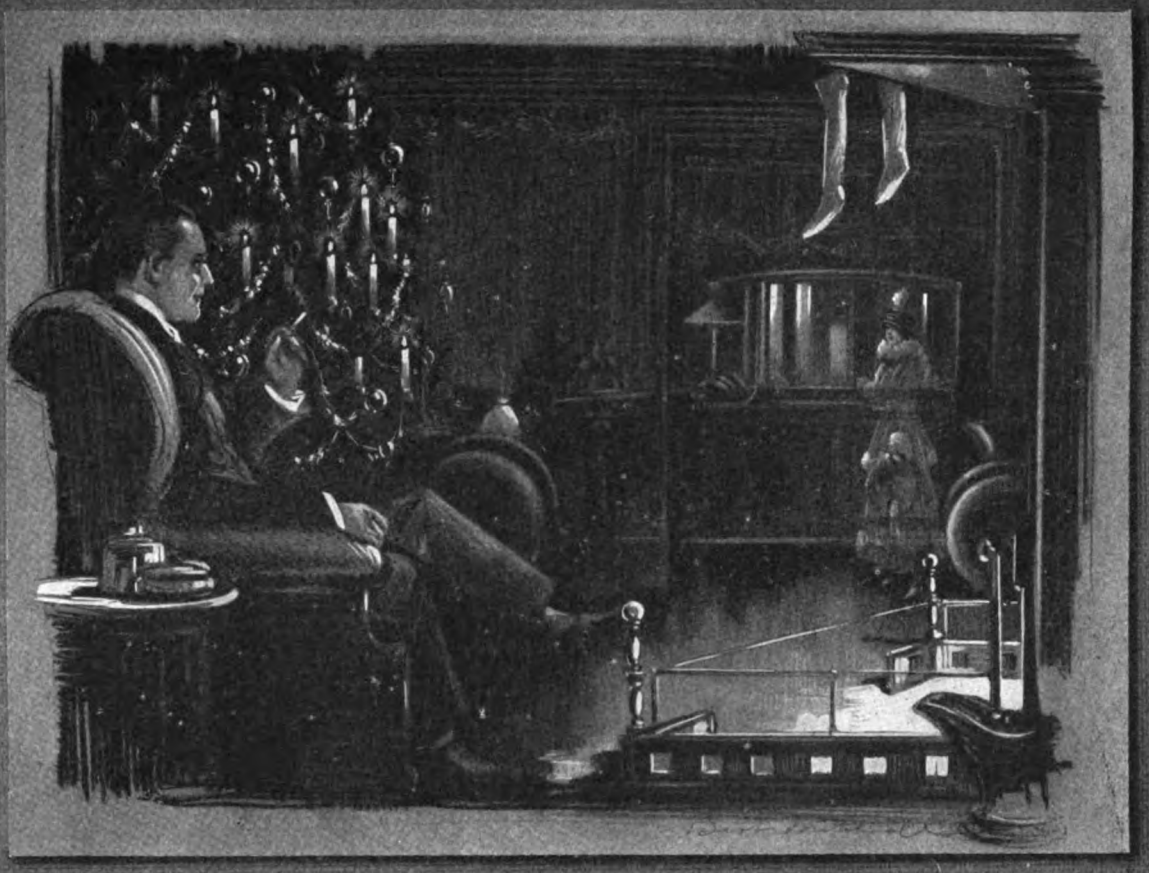
And the car is big and roomy—117" wheelbase.

It is those details of vital importance about which the experienced automobile buyer asks that the Paterson dealer is always proud to demonstrate.

Dealers have already specified for 90% of the 1916 output.
Complete specifications and information on request.

W. A. Paterson Co., Flint, Mich.
Members of National Automobile Chamber of Commerce.

Showing at
New York—Section B-5 Grand Central Palace.
Chicago—Section C-6—First Regiment Armory.



Vision

THE Scripps-Booth car was created of a vision of quality—of the luxury of the distinctive home, of the preferences of the woman of taste, of the judgment of the man of business, of the spirit of home happenings and gifts; all combining into a vision of a car of light weight but of maximum luxury which fits naturally into the highest home atmosphere.

No car ever before created can claim this spirit, nor take so intimate a relation to the home as the Scripps-Booth luxurious light car. It is this intimate spirit of design which has placed the Scripps-Booth car before the doors of the most luxurious homes in America, while the spirit of the car without has entered into the home itself and has moulded the home atmosphere.

SCRIPPS-BOOTH DETROIT SB

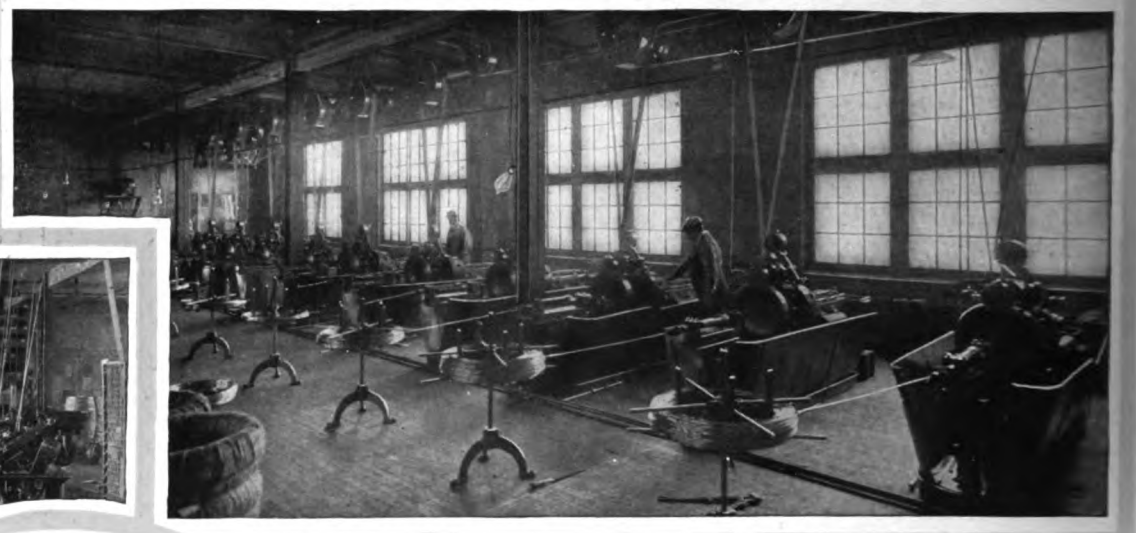
Scripps-Booth Company
Detroit, Mich.

A YEAR OF MARVELOUS GROWTH

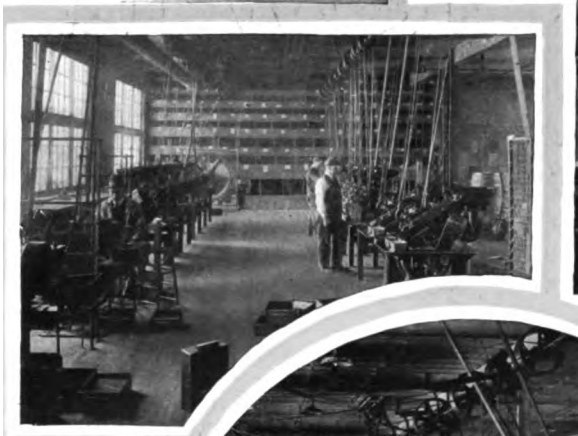
If all the Houk wheels now in use were made into one huge wheel, its size would dwarf man's biggest creations.

HOUK
QUICK-CHANGE
WIRE WHEELS

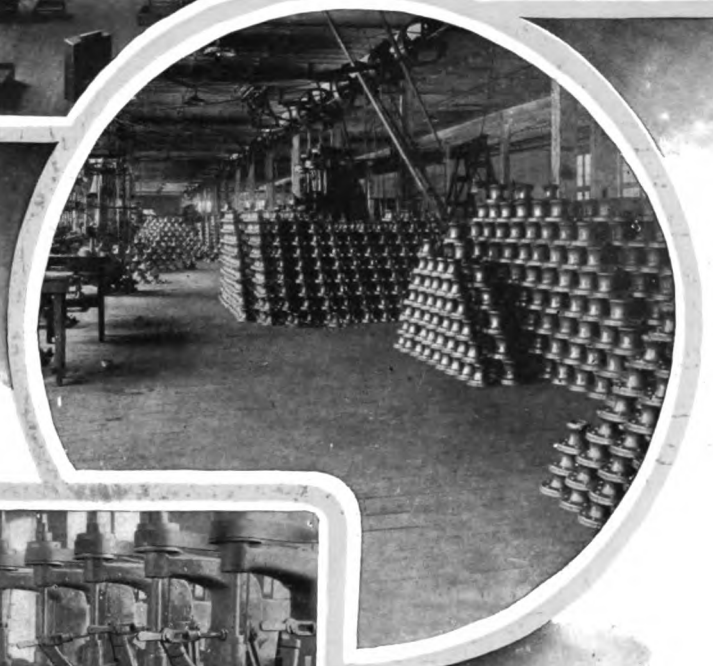
For light weight and supreme strength, nothing represents greater skill or ingenuity than the Suspension Bridge. The Houk Wire Wheel is built on the same principle.



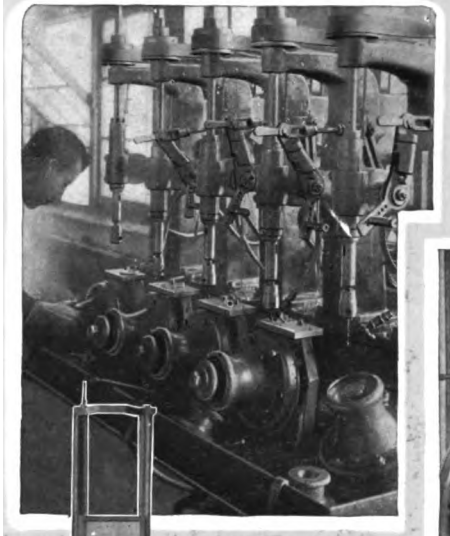
Nipple Making Machines

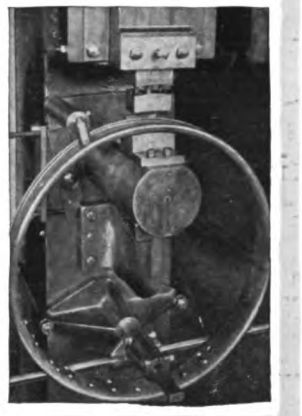


Spoke Making Machines



Hub Shell Department





Testing the Tensile Strength of a Spoke at 3200 lbs.

19

THE BIG

THE MOST important single advance in automobile construction in the year 1915 is the establishment of the unquestionable supremacy of the wire wheel. No other engineering movement has made such conclusive strides as the wire wheel. Nothing has been more positively clinched as a principle of ultimate automobile construction than the Houk Wire Wheel.

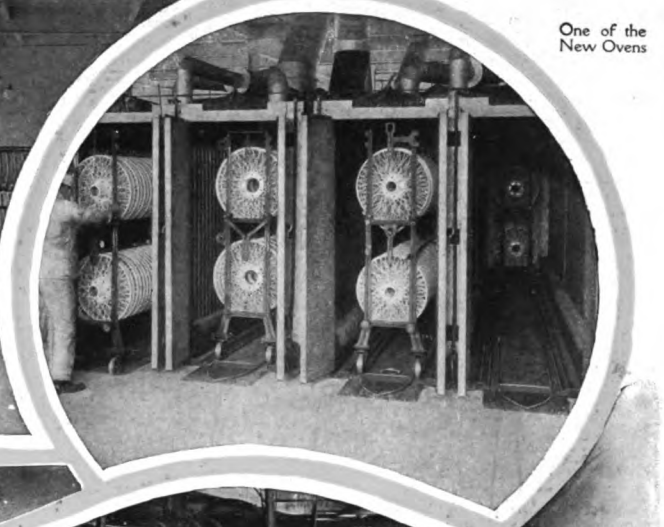
For several years the wire wheel has been "a'brewing." To be sure it has been used by sportsmen, motor car fanciers, and race drivers.

But 1915 experienced a wave of enthusiasm and realization of the advantages of the wire wheel, which spread from coast to coast.

With the advent of 1915 the Houk Plant at Buffalo was working along with the serene conviction that America like Europe ***must adopt*** the "best engineered" wheels ever devised for motor cars. The production was all that could be conveniently accomplished without crowding, and the demand was exactly co-ordinate with that production.

The beginning of 1916 sees the Houk Plant at Buffalo nearly double in size. The machines never stop. Special machines of all sorts have been developed or obtained. New special machines have been completed for assembling in remarkably short time absolutely ***true*** wire wheels. A very large and modernly equipped enameling department has just been opened, and one entire floor of one of the newer buildings has been turned into a really

Atomizers in New Enameling Department

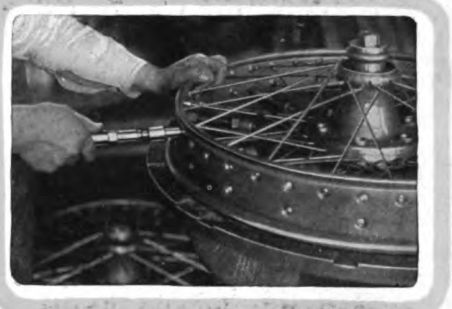


One of the New Ovens

5

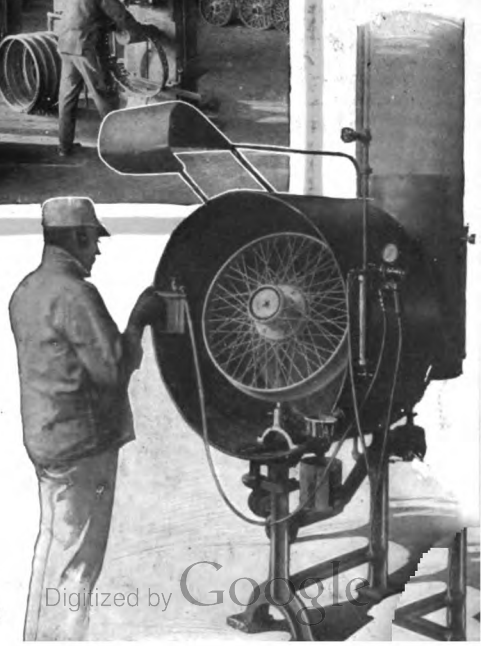
HOUK YEAR

Hub Dept.



Punching Rims

Tightening Up Wheels



Spraying Enamel

wonderful department where spokes and nipples are completely produced by automatic machines.

No more activity has been experienced anywhere in the automobile industry than has been found at the Houk Plant where every effort has been made to keep pace with constantly growing demands, the size of which could scarcely have been realized a year ago.

"Wire Wheels" has come to be the slogan of car-maker, car-dealer and car-purchaser. "Wire Wheels" has come to be the mark of distinction on America's best cars and the demand for these wheels coming from the car manufacturer who in turn received his orders from his dealers, has been growing in volume so rapidly that it has strenuously overtaxed our facilities.

Unfortunately, the day this story is written we are behind on our *immediate* deliveries over fourteen thousand wheels. Nevertheless, since that is but a small proportion of our production, this shortage will quickly be wiped out. And our facilities are being expanded so rapidly that we anticipate keeping well apace with this constant increase of orders.

Those who have visited the Houk Plant recently can scarcely understand this phenomenal growth and in fact, it would be unintelligible if it were not for the fact that the American Automobile Industry is on the most prosperous basis, producing more cars than ever, and the American public has awakened to the realization that *wire wheels* are basically essential on a *modern* car.

We certainly cannot supply all the cars made with this carefully built wheel but we *can* supply a large proportion of all the first class cars.

Stock or Optional Equipment on America's Finest Cars

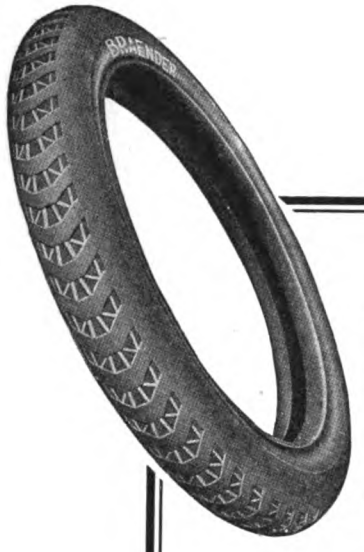
TWO years ago the car manufacturer said "The wire wheel! Oh, that's a European idea, our American wooden wheels are every bit as good."

A year ago, he said, "Wire wheels, oh yes, they are indeed a fine article but they cost more money to build and we think our wooden wheels are good enough."

To-day he says, "We aim to build the best motor cars, and knowing the supreme character of wire wheels, we feel that we *must* use them," or, he may say, "Since it cost much more to make wire wheels, we simply can't afford to put them on at the list price, but for a small additional charge we will be delighted to equip the car for you."

To-day, *every* car of any particular engineering value offers Houk Wire Wheels as a *necessity.*

Guaranteed for Three Years



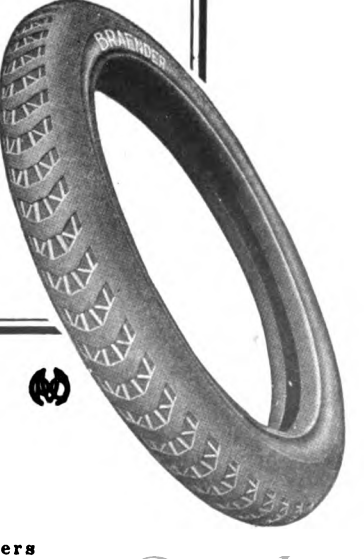
Trade Mark

BRAENDER
TIRES & TUBES

will ***not*** be exhibited at the
N. Y. SHOW

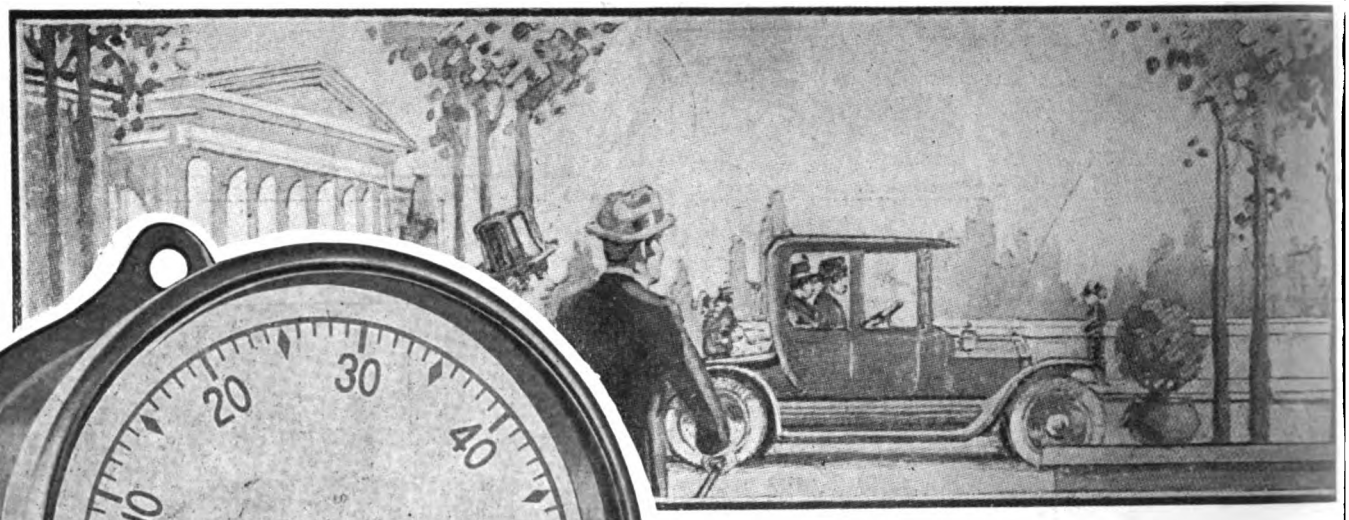
We cordially invite you to call
at our N. Y. City Salesrooms
250 W. 54th Street

where our complete line of Braender "Bull Dog" Tires (Non-Skid and Plain) Tubes, etc., will be shown.



BRAENDER RUBBER & TIRE COMPANY

Factory: RUTHERFORD, N. J.



THIS IS THE SPECIAL FORD MODEL STAN SPEEDO

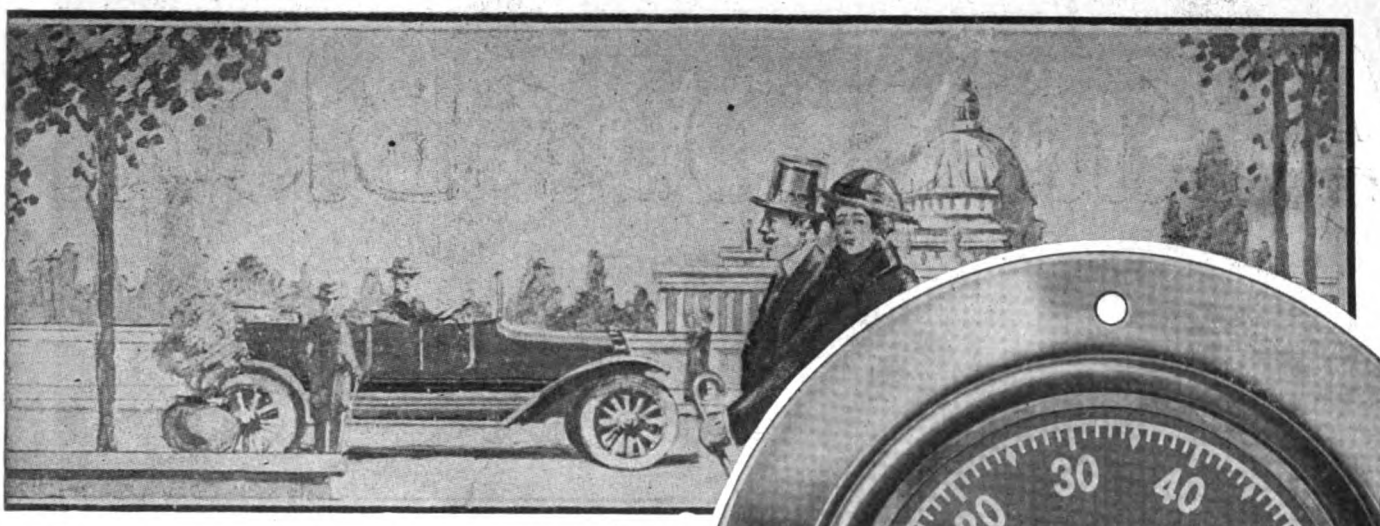
LIST PRICE $12

See Them at Our Exhibit In Grand

Fifty factory branches in the United States and ten in Canada are equipped with outfits of calibrating instruments and complete facilities for the attachment and repair of Standard Speedometers in the hands of men who are not merely repair men but Standard Speedometer experts.

You can pay more money for a speedometer—but you can't possibly get more speedometer for your money, no matter what you pay, than we offer you in the Standard.

Standard Thermometer Co.,



THIS IS THE SPECIAL CHEVROLET MODEL DARD METER

LIST PRICE $15

Central Palace Space, C-100

In the Special Ford and Chevrolet "Four-Ninety" models of the Standard Speedometer, we offer you dealers an instrument that is as trustworthy as the cars you sell.

The first contract for speedometer equipment ever signed by an automobile manufacturer called for Standard Speedometers.

And ever since the Standard has led in accuracy and in engineering development.

Dealers!

Learn About Our Sales Proposition, It Means Better Sales and More Profits For You

616 Shirley Street, Boston, Mass.

73-16

At the Shows

Warner Gear Co. Transmissions

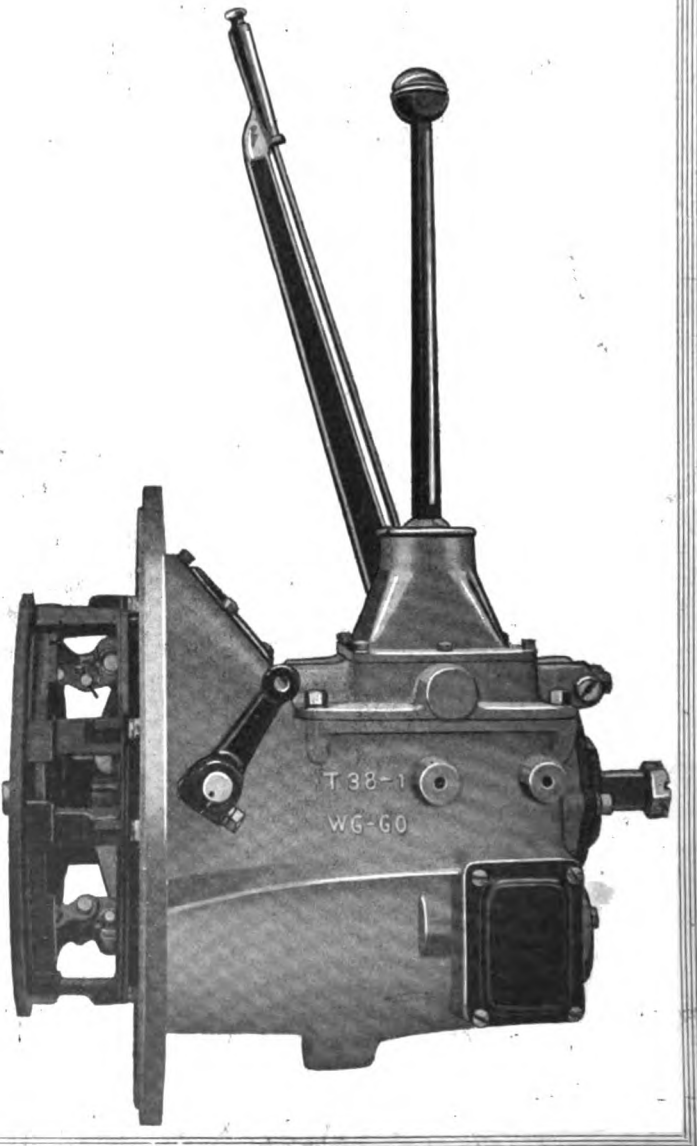
Take the opportunity offered by the automobile shows and notice the car manufacturers who are building Warner Gear Company Transmissions into their product. Get their angle on the policy of dependable service to the car buyer. These concerns are building successful, dependable cars that enjoy a big reputation, and their policy is built strictly on a business basis.

WARNER
"THE RECOGNIZED STANDARD"

Warner Gear Company Transmissions are built for just such manufacturers—the ones who will place quality above price and put out only product that will give maximum value to the buyer.

Warner Gear Company
Muncie Indiana
Detroit Office, 967 Woodward Avenue

Exhibit Space 46
Coliseum, Gallery
Chicago



Moon Cars Sell—and "Repeat"

Fifty per cent of the entire Moon sales represent increased output to new buyers. The other fifty per cent are sales to people who have owned one to three Moon cars previously.

There is just one reason for this: ***Satisfaction.*** More than mere satisfaction with the price. Satisfaction with the car's performance, based on power, economy of maintenance, beauty, comfort, smoothness in running, and length of life.

This satisfaction is shared by buyer and dealer alike. You will see the reason for it in the new models of the

MOON

at the

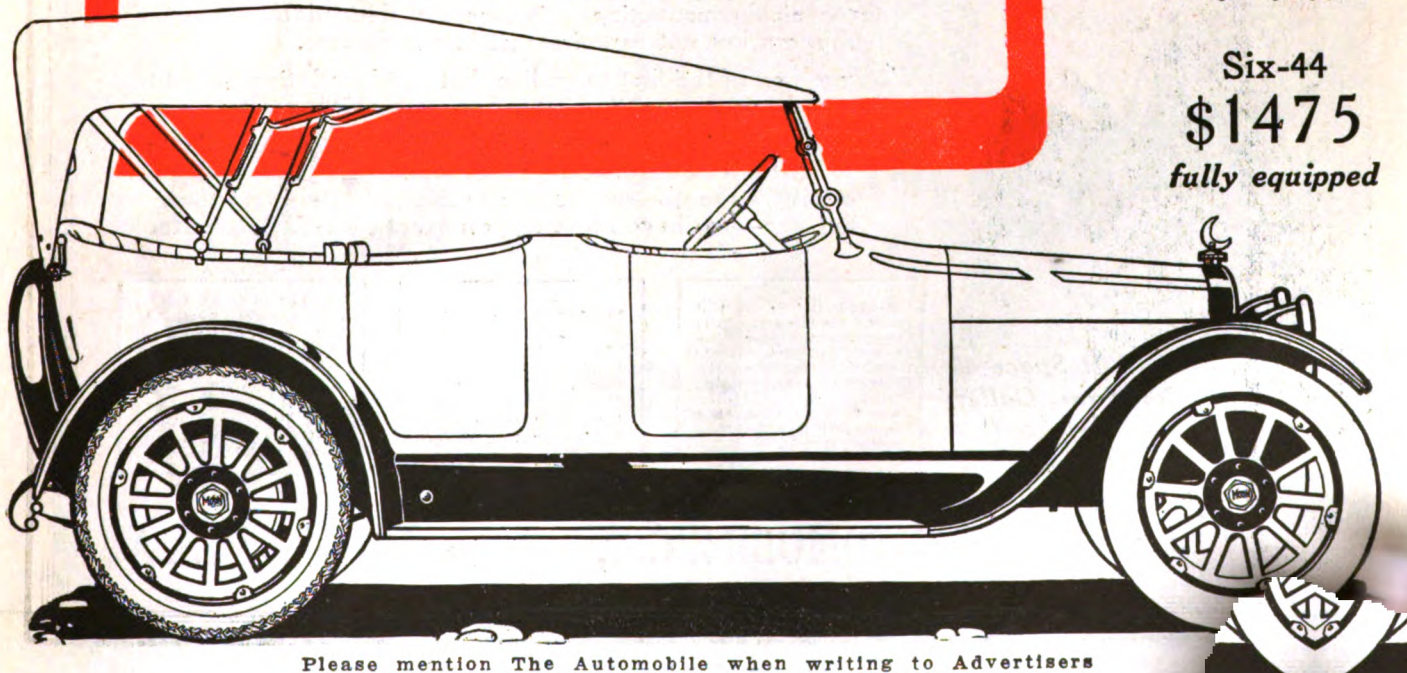
New York Auto Show

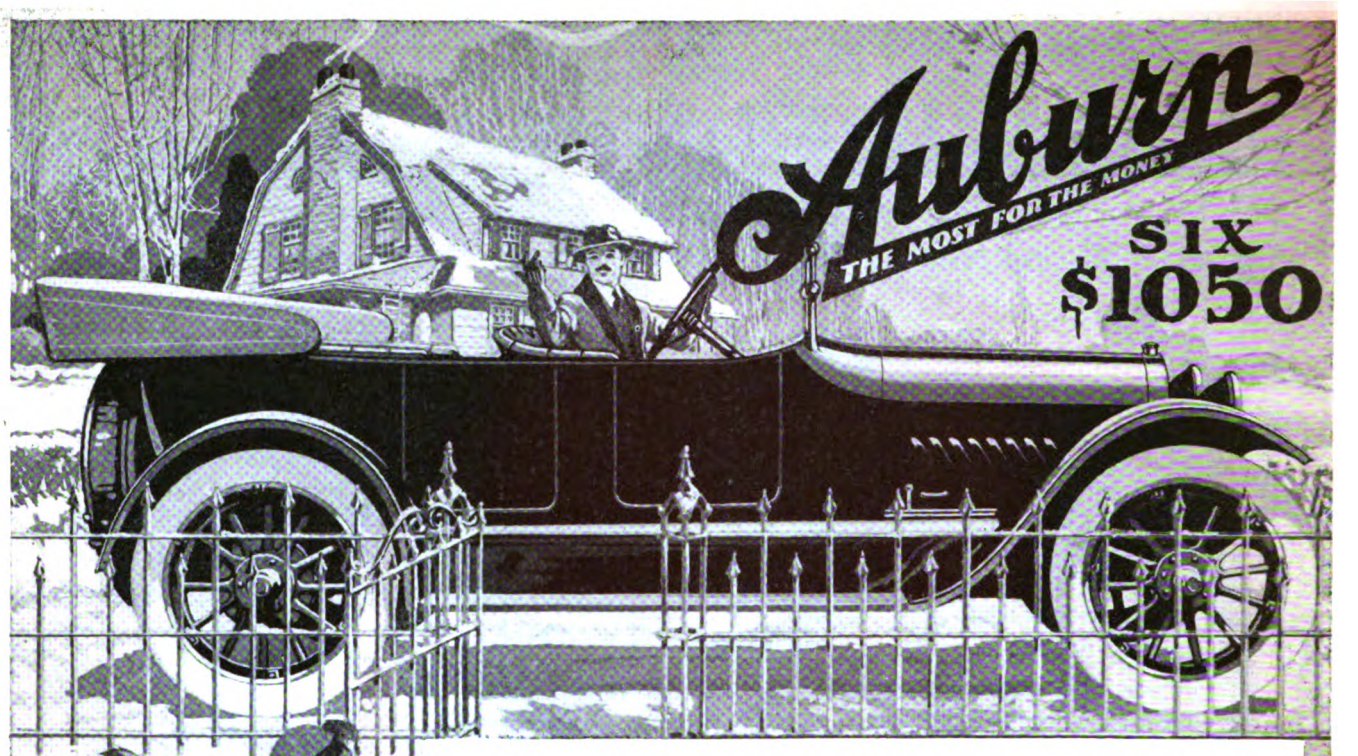
Note that there is nothing more to buy to make them absolutely complete—each car is fully equipped.

MOON MOTOR CAR CO.
ST. LOUIS, U. S. A.

Six-30
$1195
fully equipped

Six-44
$1475
fully equipped





"No Car Is Easier To Sell"

The vast majority of cars will be bought this season by people who have owned cars before.

It is human nature to change.

This means thousands of car buyers will **come down** from higher priced cars to the common sense Auburn prices. Also, thousands will **come up** from the cheap cars to the economical but good-looking and roomy Auburn type.

Don't judge until you let us submit the **proof** that the Auburn gives "The Most for the Money." And where can you find a car backed by a more reliable and successful institution built upon sixteen years' experience?

In looks, the Auburn ranks alongside the most costly imported cars.

In mechanical construction, it is sane and dependable—perfectly modern but not experimental in any feature.

We were one of the first to realize that the foundation of permanent business must rest upon **Money-making dealers.**

It costs you nothing to learn the Auburn proposition for dealers, so write us at once. No matter where you live, small town or city, write us—we have something of vital importance to tell you—**we have an offer you cannot afford to overlook.**

Model 6-38; $1050—Six cylinder, 3x5; Cantilever springs; Electric lighted and started; Spacious tonneau and driving compartment; 34x4 tires; 120-inch wheel base; Completely equipped; 3 and 5 passenger models.

Model 4-38; $985—Four cylinder, 3⅞ x5; Cantilever springs; Electric lighted and started; 34 x 4 tires; 114-inch wheel base; Completely equipped; 2 and 5 passenger models.

Model 6-40A; $1375—Six cylinder, 3½ x5; Cantilever springs; Electric lighted and started; Luxuriously roomy tonneau and driving compartment; Folding auxiliary seats; 35x 4½ tires; Completely equipped; 2 and 7 passenger models.

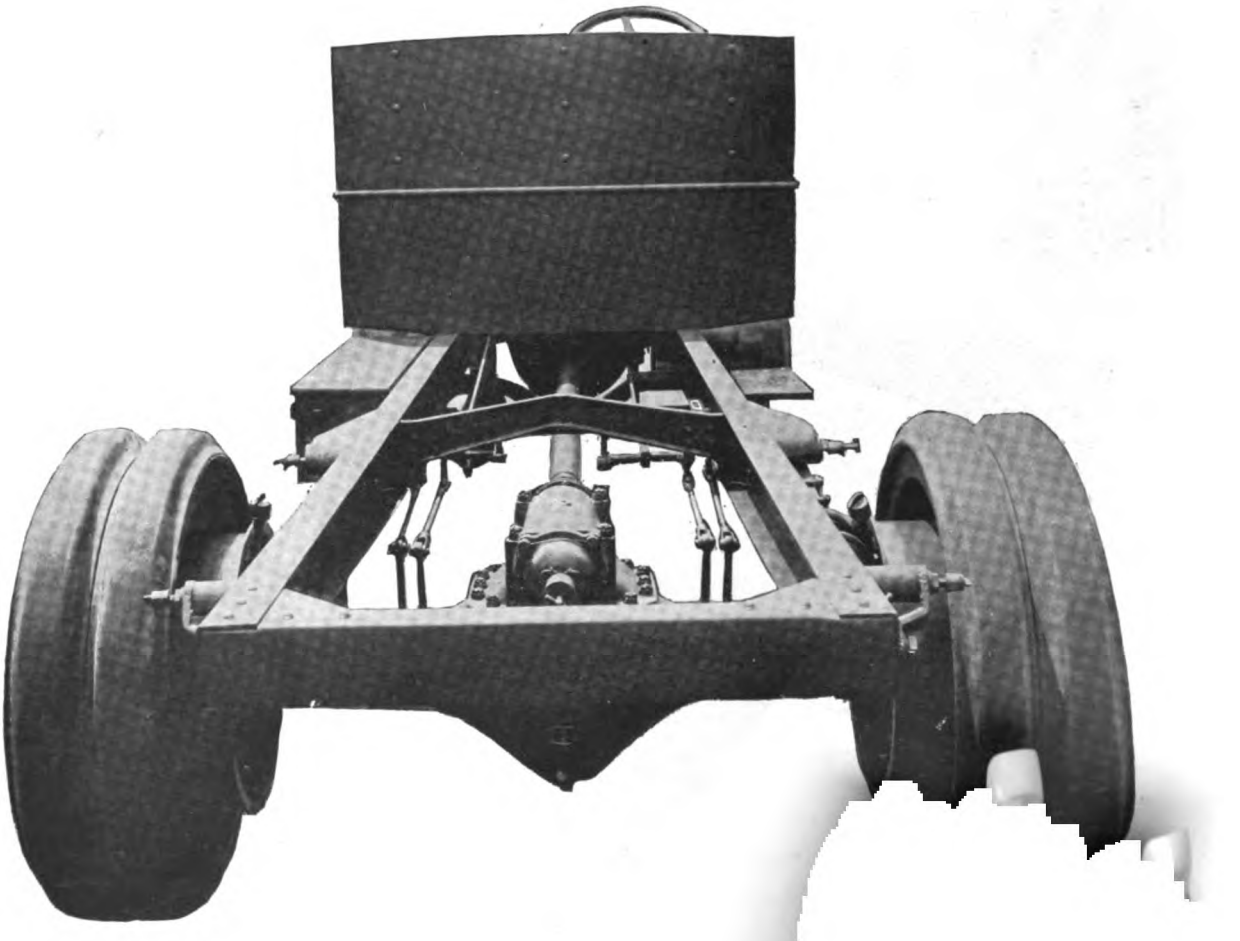
AUBURN AUTOMOBILE CO., Auburn, Indiana, U. S. A.

Power and Simplicity

YOUR particular attention in this Sheldon advertisement is directed to the clean cut, simplified appearance of the

SHELDON

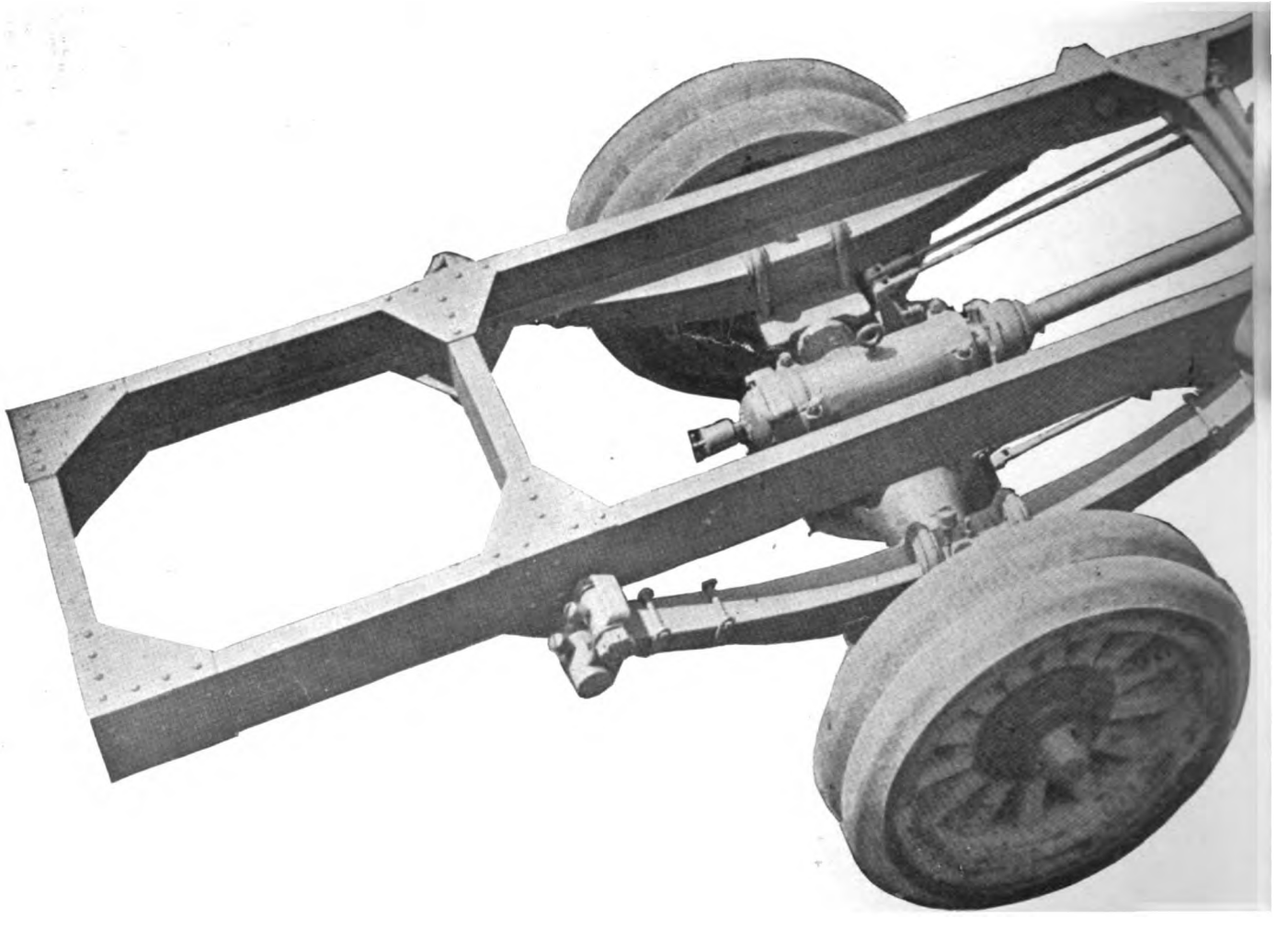
Worm Gear Chassis shown in various positions. Note them carefully and then remember that such construction is possible today only in connection with Sheldon design and Sheldon products.



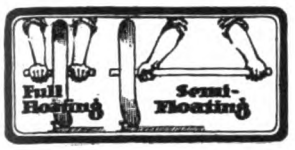
Clean as a H

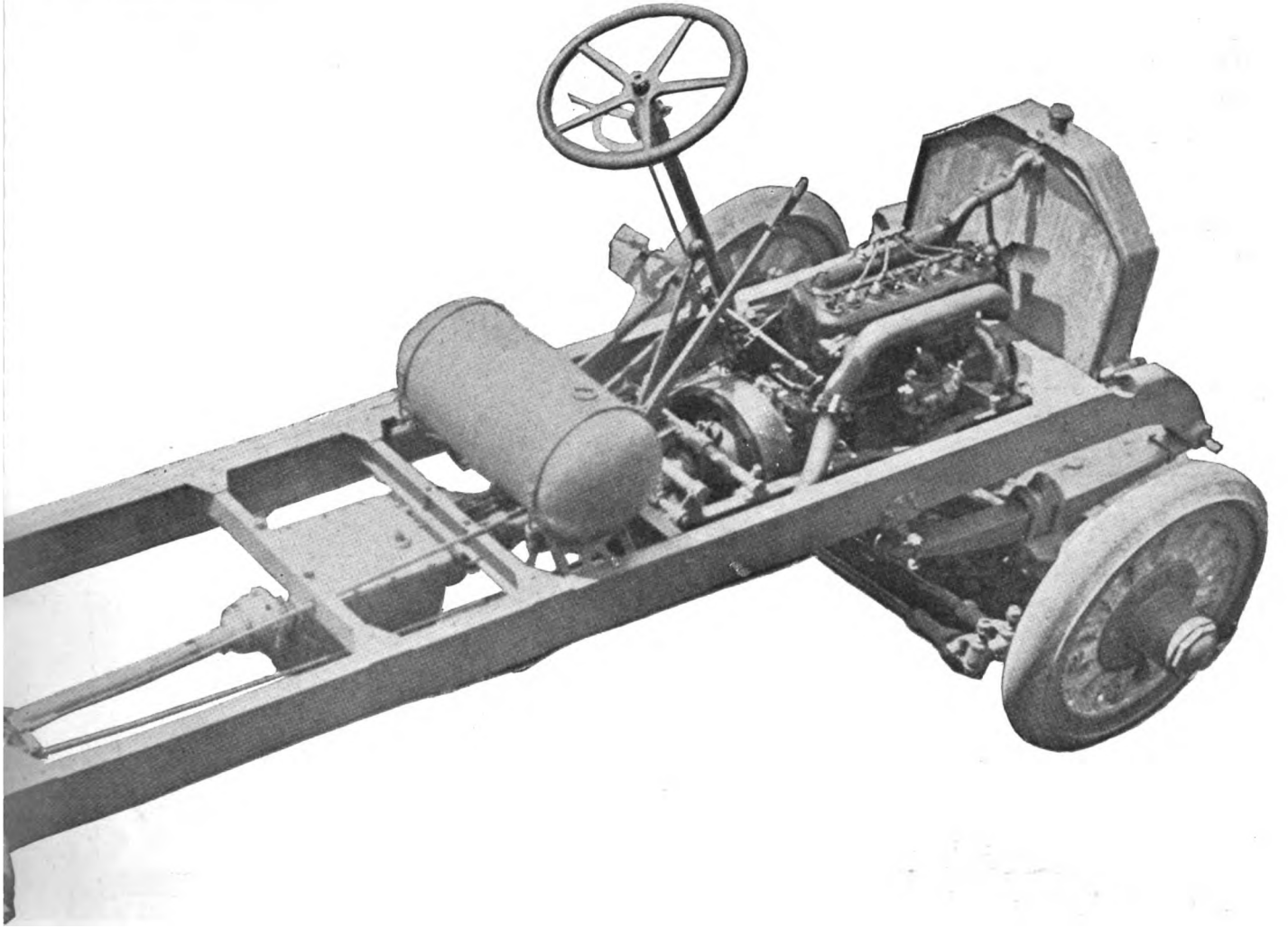
Semi-floating type of construction is primarily responsible for most of the inherent superior qualities of Sheldon worm gear axles. For today the vast majority of truck and axle builders concede what Sheldon, as pioneers, have always contended—that **for simplicity, lightness, capacity and durability there is no equal to semi-floating construction.**

Ball Bearings for carrying the worm and gear loads is another Sheldon characteristic. Both here and abroad practical results from long usage have established clearly the fact that any substitute for ball thrust bearings to take care of the worm thrust load is absolutely impractical.



ound's Tooth

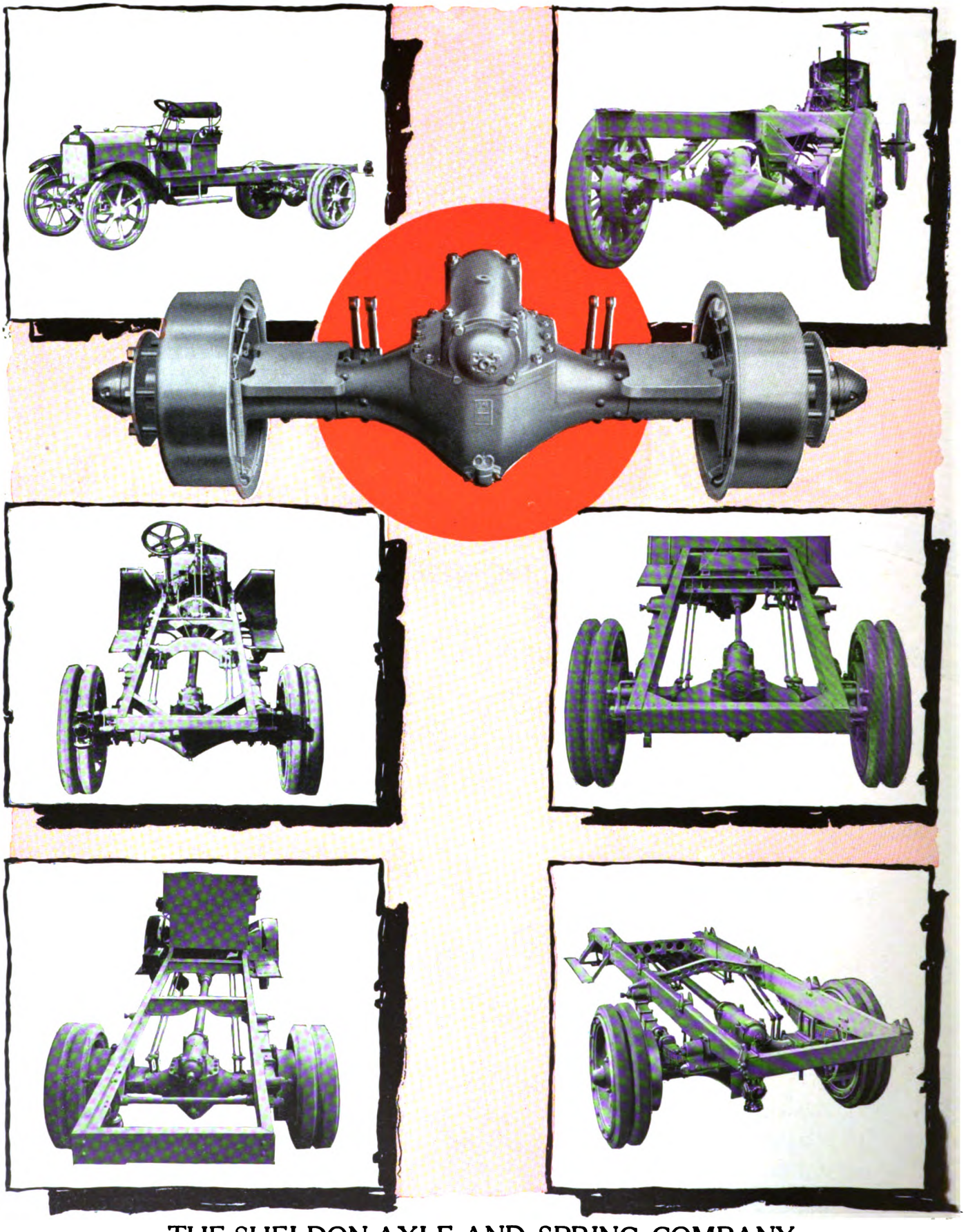




Taking the driving strains through the rear springs (as is done with Sheldon construction) is the greatest single factor in the simplifying and cleaning up of the chassis. For this method of construction does away with all radius rods, torque tubes, and other needless weight-producing complications.

Braking on the rear wheels adds greatly to the life of the entire rear assembly. This is frankly admitted. The trick has been to obtain positive braking efficiency at this point. Sheldon has accomplished this, thereby relieving all the universals and gears of the terrific strains imposed by the propeller shaft brake.

SHELDON



THE SHELDON AXLE AND SPRING COMPANY

Manufacturers of Springs and Axles for More Than 50 Years

WILKES-BARRE, PENNSYLVANIA

BRISCOE

Now a $6,000,000 Company Manufacturing every part of its cars

A line of three leaders:

THE BRISCOE DE LUXE "FOUR" 38, - - $750
THE BRISCOE DE LUXE "EIGHT" 38, - - 950
AND
THE BRISCOE "TWENTY-FOUR" - - 585
"THE LATEST BRISCOE BEAUTY"

A wonderful demonstration of the dollar-value made possible by the enlarged organization

HERE are eight pages of which you cannot afford to skip a word. The Briscoe Twenty-four, which will be exhibited for the first time at the National Shows, is close to the ultimate in automobile desirability at a very low price. The other models, refined to the utmost, maintain their supremacy. And the Briscoe Motor Company is today without a superior in facilities for economical production on a large scale, and for adequately taking care of both dealer and owner.

A Company Whose Dominant Future is Assured

For some time past the Briscoe Motor Company has felt the need of much larger facilities to meet the steadily increasing demand for its product. Benjamin Briscoe, with his accustomed foresight, early recognized that the big factor in the automobile production of the future would be found among the manufacturers fully equipped to turn out every detail of their product in their own shops, and independent of outside sources of supply for anything but raw materials. For years, too, it has been his ambition to build up an organization of strong manufacturing and selling executives whom he could ask to share with him the full responsibilities and rewards which came from the development of the company.

For some months past, Mr. Briscoe and L. E. Willson, as the representative of prominent Chicago business interests, have been working together to bring about a condition which would not only assure the future of the company as a large producer of motor cars but would enable it to utilize to the fullest advantage the wonderful creative genius of Benjamin Briscoe, unhampered by the many sided activities of directing an entire organization.

These plans culminated in the enlargement of the capital stock of the Briscoe Motor Company to $6,000,000. At the same time a number of parts plants were purchased. These included the plant of the Mason Motor Car Company of Waterloo, Iowa—the machinery of which was moved to Jackson—the Jackson Motor Parts Company and the Jackson Metal Products Company. As a final step in assuring adequate parts supplies, the $1,000,000 Jackson plants of the Lewis Spring and Axle Company were purchased. This in itself gives the company a large and fully equipped motor, axle and drop-forging plant.

From the engineering standpoint, the company has in Benjamin Briscoe a man who is universally recognized as a wizard of design. And in the enlarged organization he will be able to give to his creative effort a wider range that will inevitably accentuate his leadership of the past.

The Briscoe "Twenty-four" is the first development of the new organization's wonderful facilities of production and design. Several pages are devoted to it elsewhere in this announcement. You will agree that it offers a value unmatched in the popular-priced field today.

You, as a dealer, know that today perhaps more than at any previous time, it is wise to look far ahead in forming a connection. It is wise to ask yourself, "Is the company so strongly financed that it will be able to meet competition not only now but two years or ten years from now? If I build up a clientele on this car, am I building on a firm foundation or on the shifting sand of weak finance and changing policies which may destroy all my effort in a season?"

Write us, wire us, or come in to the factory. If you're the right kind of dealer we think you'll see both a present and a future opportunity unmatched today in the business.

BRISCOE MOTOR COMPANY, 105 WILDWOOD AVENUE JACKSON, MICHIGAN

The Policy Back of Briscoe Cars

A STRONG, loyal organization of dealers is essential to success. There is no sense in establishing a large number of dealers unless it is possible to give them cars in sufficient quantity to meet the demand. We have every facility for large production; but we will not sign more dealers than we feel sure we can adequately care for.

We want you to feel that the effort you put into making contracts and sales will not be rendered useless by any lack of thorough co-operation in our production department.

We recognize an obligation on the part of any concern which aspires to manufacturing leadership to produce at all times cars which will enable its dealers to meet competition upon a successful basis. That means not only price competition, but the production of cars which will be so satisfactory in the hands of the user that they will enhance the reputation of the company and its product, and create a sales asset of value for the dealer.

It is our policy to supply Briscoe dealers with a line of cars as complete as possible—a line that will enable them to sell the greatest possible percentage of motor-car buyers in their territories and to give to each class of buyer exactly what it prefers.

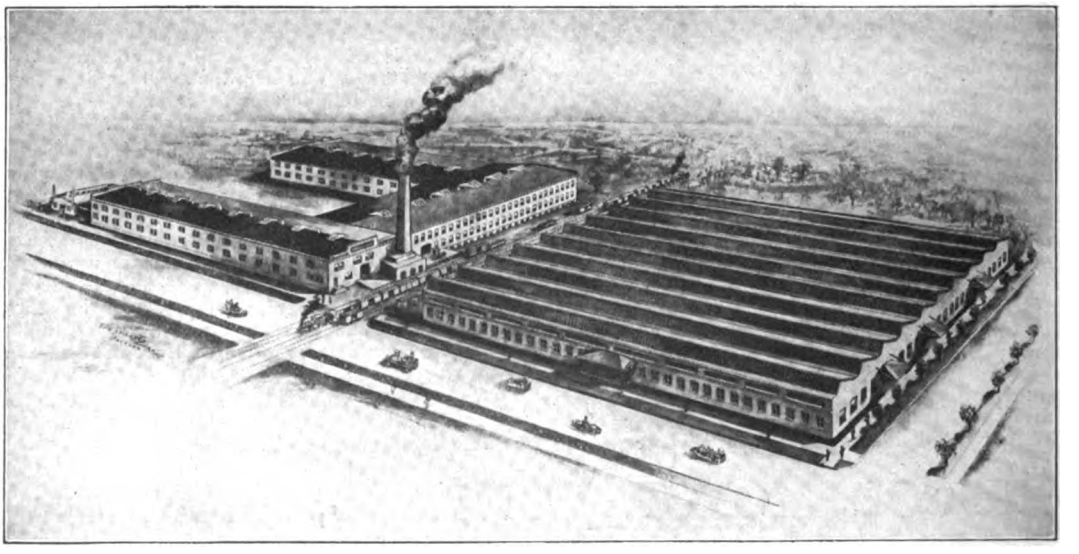
The Briscoe De Luxe "Eight" 38 at $950 and the Briscoe De Luxe "Four" 38 at $750 have already demonstrated their immediate appeal to thousands of motorists. And in the Briscoe "Twenty-four" we believe we have produced a car which is the best possible evidence of our intention to make the automobile value of a dollar greater under the Briscoe name than it has ever been before in automobile manufacture.

Advertising and Sales Co-operation

Adequate advertising in strong mediums is of course a first essential in the success of motor-car selling in large volume. We are employing the best experts obtainable to prepare distinctive, aggressive Briscoe advertising during 1916—advertising with a "punch" in it—advertising that will make Briscoe cars and their supremacy familiar to every automobile buyer in the country.

We shall use good space consistently in an extensive list of mediums. The big national weeklies, standard publications, farm papers, trade papers, newspapers—all will receive adequate representation. We believe that Briscoe advertising during the coming year will compare very favorably in volume per car with any in the country.

We shall get out direct literature of a distinctive type for the general public and every department of our organization will be operated in a spirit of thorough co-operation to increase the sales possibilities of our dealers.



BRISCOE

NOW "A LINE OF THREE LEADERS"

YOU know that the big money for you is in the popular-priced field, provided you can get the **right** line, at the **right** price and with the **right** company back of it.

The Briscoe line, already dominant in two sections of the popular-priced field, now becomes "a line of three leaders."

The Briscoe Twenty-four is literally "the car the public built." For Benjamin Briscoe set himself to build not merely a car which the average motorist would **take,** but one which would make him feel that even at an exceptionally low figure, he had a car without the apologies, excuses or omissions. It will be a wonderful seller, beyond doubt. Here, for instance, is

How You Can Make Sales on the Briscoe Twenty-four

BENJAMIN BRISCOE has always said that beauty is not a question of dollars and cents—that it should cost no more to build a well-shaped body than any other. And the Briscoe Twenty-four is the best possible proof that he's right. For it's a car you'll be proud to ride in—a beauty of the boulevards that will hold its own for looks with any car—and a little more. Modified streamline body, tapering hood, crown-type fenders, raking windshield—the man who sees it says, "Some car!" The woman, "Isn't it a beauty!"

COMFORT

Look at the four full elliptic springs, with an extra leaf in the rear set. Try out the seats and note the deep upholstery bedded on sofa-type springs. It will have to be a pretty rough road before you begin to feel it in **this** car. And you'll notice that with five people in the car there's plenty of leg-room, and body-room, too, for everybody. With a wheelbase of 104 inches, the special body-design affords more room than in many cars considerably heavier.

POWER

The car has exceptional power per unit of weight—and that's the way you want to figure it. Excessive power in a motor-power that you never can use merely represents a lot of your good money going for oil and gasoline that never does you any good. The weight of the Briscoe Twenty-four, ready for the road and including gas, oil and water, is less than 1750 pounds. The motor is of the long-stroke type, with 3⅛-inch bore and 5⅛-inch stroke—the largest motor, and at the same time the most economical in any car of its type today. A floating type axle is used, with the Gearless Differential. This differential has all the advantages of a positive drive in straight going; skidding and sidesway are practically eliminated. And in uneven going, power is delivered only to the wheel on solid ground. It adds greatly to both safety and service.

CONVENIENCE

The starting crank and the clincher tire are fast finding their rightful place in the museum of motor antiquities—exhibits "A" and "B"—useful only to show what owners were once willing to tolerate under the stress of necessity. Every Briscoe Twenty-four is electrically started and lighted—at the service of the woman who has use for a car of moderate size, but who has not the physical strength to cope with a hand-cranked motor. Tires, too, offer no obstacle with the regular Briscoe equipment of demountable rims. The top is the very latest "one-man" type, light enough to be handled easily by one person. The car is equipped with adjustable clear-vision, rain-vision windshield. The car is driven from the left with center control levers. There are three speeds forward and one reverse.

Spark and throttle control are on the steering wheel, and there is a foot accelerator. Two sets of powerful brakes are used, one operated by left foot pedal, and one by a hand-lever at the driver's right.

ECONOMY

You know that within reasonable limits the cost of operating a motor-car may be figured by the pound. The principal items of expense—tires and gasoline—are directly proportionate to the weight. The Briscoe Twenty-four has reduced operating expense to the minimum. The spring and chassis construction keep down the tire-wear; and you'll be astonished at the number of miles a gallon of gasoline will drive the car, fully loaded.

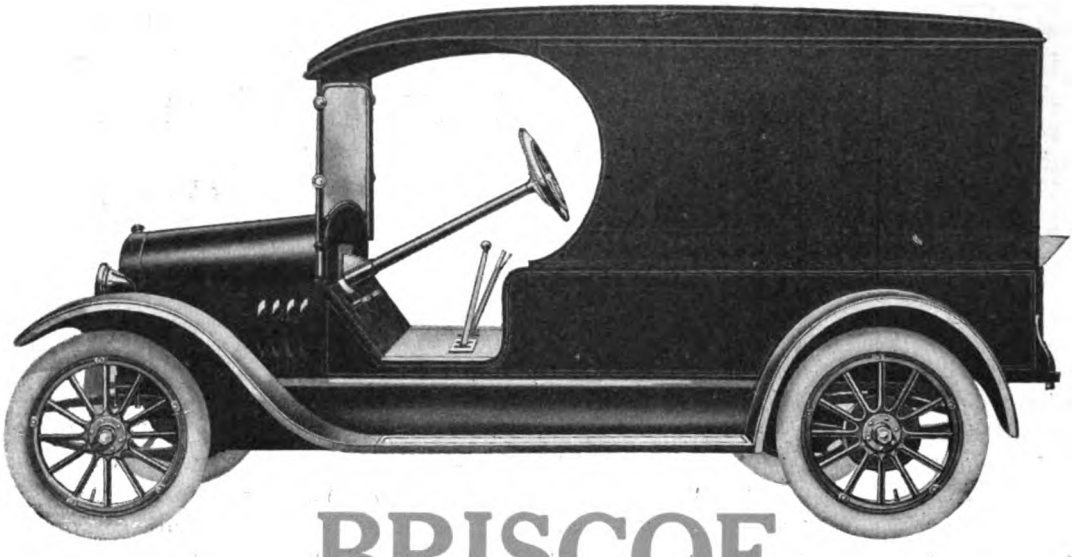
DURABILITY

Every part of the car is there because it has defied all the efforts of our testing crews to break it. These men have given test cars usage that no owner would achieve in a lifetime. Their instructions have been to do all the damage they could. Today, the metals, the bearings, the transmission, the motor, every part down to the smallest screw has passed these tests with flying colors.

Don't wait! Here's the time, and the car. Are you the man? Get action today on your territory—tomorrow may be too late. Good profits, a permanent connection that will become increasingly valuable as the years go by—a live proposition all through.

Come in if you can. But write or wire if that's impossible.

Another Feature of Dominance for Briscoe Dealers



BRISCOE

CONVERTIBLE LIGHT-DELIVERY WAGON

HERE is the solution of the light-delivery problem for thousands of merchants and business men. The Briscoe Light-delivery wagon is mounted on the regular Briscoe Twenty-four chassis, modified to suit commercial requirements. In addition to being stylish and efficient, it is therefore exceptionally economical in upkeep.

There is absolutely no question that the country is turning to motor haulage as never before in its history. Experts estimate that 100,000 light-delivery wagons could be sold during 1916, provided it were possible to produce that many.

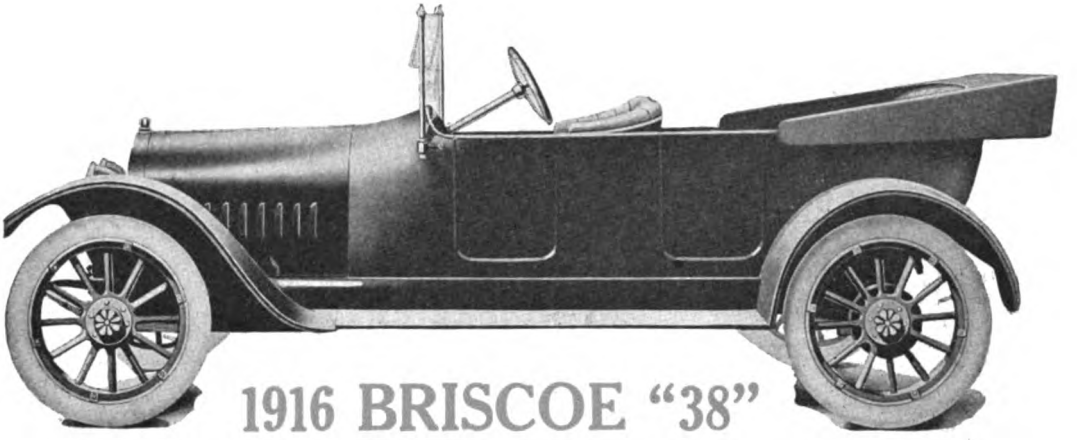
The Briscoe Convertible Light-Delivery Wagon greatly increases your selling field—and most of these sales come during the off-seasons on pleasure-car business.

Open body is standard. But detachable flare-boards, canopy top and full panel sides and back are optional at moderate additional cost. The owner may therefore have in one wagon a combination of all types, instantly adjustable.

$585 ***f.o.b. factory***

We shall popularize the Briscoe Convertible Light-Delivery Wagon by special advertising in a list of mediums appealing especially to merchants with light-delivery problems.

Here's opportunity with a capital O! Tomorrow some quicker man may have your territory.



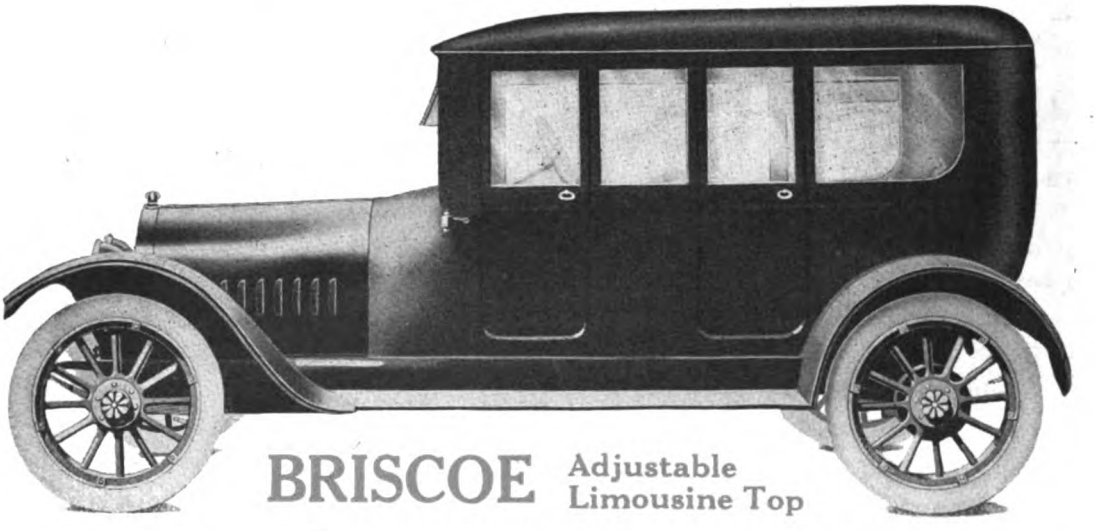
1916 BRISCOE "38"

Four-cylinder and eight-cylinder types

"THE car de luxe." Every refinement that good taste and comfort demand. Especially designed and built throughout to satisfy the most exacting —to please the hard-to-please. Distinctive Briscoe-line body; 38 h.p. motor; full cantilever spring suspension; 114 wheel-base; electric starting and lighting; one-man top and full equipment; 32 x 3½ Ajax tires—with written guaranty for 5000 miles.

An aristocrat of motordom in everything but price.

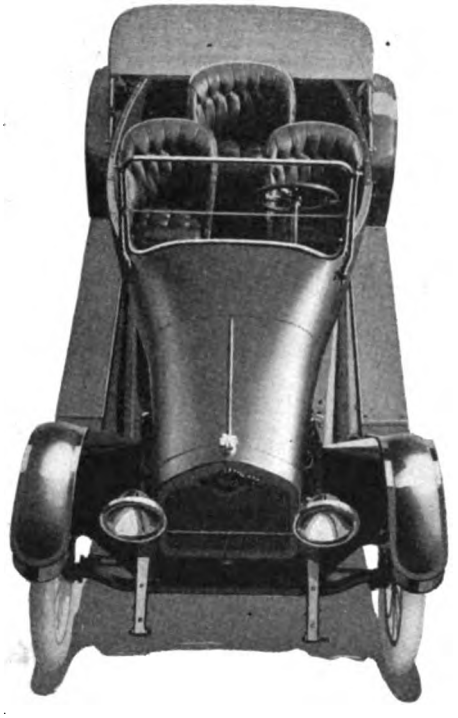
5-passenger Touring Car—4 cylinder	$750
5-passenger Touring Car—8 cylinder	950
3-passenger Clover leaf Roadster—4 cylinder	750
3-passenger Clover leaf Roadster—8 cylinder	950
2-passenger Coupe, 4-cylinder	1000
2-passenger Coupe, 8-cylinder	1200



BRISCOE Adjustable Limousine Top

The Briscoe "38" Touring Car is readily transformed into a stylish weather-defying closed car by means of the perfect-fitting Briscoe Limousine Top. Made throughout of quality materials, and designed especially for the Briscoe, it differs from the ordinary limousine top in looking what it really is—an integral part of the car. Can be supplied on either Four or Eight for $200 additional.

BRISCOE "38"



Clover-Leaf Roadster

COMFORTABLE individual seats for three people—plenty of room for each passenger.

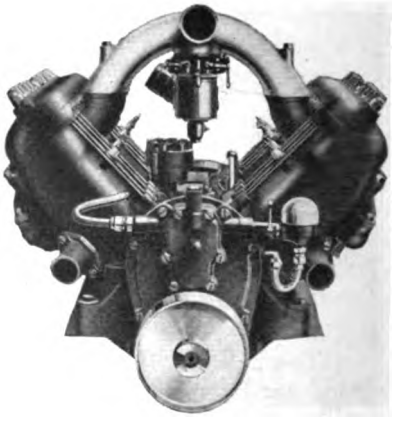
A type that has restored the popularity of the roadster as a small family car.

The construction affords opportunity for exceptionally beautiful body-lines, of which Benjamin Briscoe has taken full advantage. Perhaps no more distinctive car than this runs the road today. Large luggage space at the back.

THE BRISCOE

"Eight-38" Power Plant

IN this connection the wide foreign engineering experience of Benjamin Briscoe perhaps shows to best advantage. The motor has a 3-inch bore, with 3⅛-inch stroke. It is one of the most accessible 8-cylinder motors in the world. Both rows of cylinders, and the upper half of the crank-case integral. Head is detachable, with valves operated by Briscoe-type rocker arms, eliminating noise and wear. Valve-tappets are adjustable from top. A self-contained constant-level splash system, with pump circulation keeps every part thoroughly lubricated.

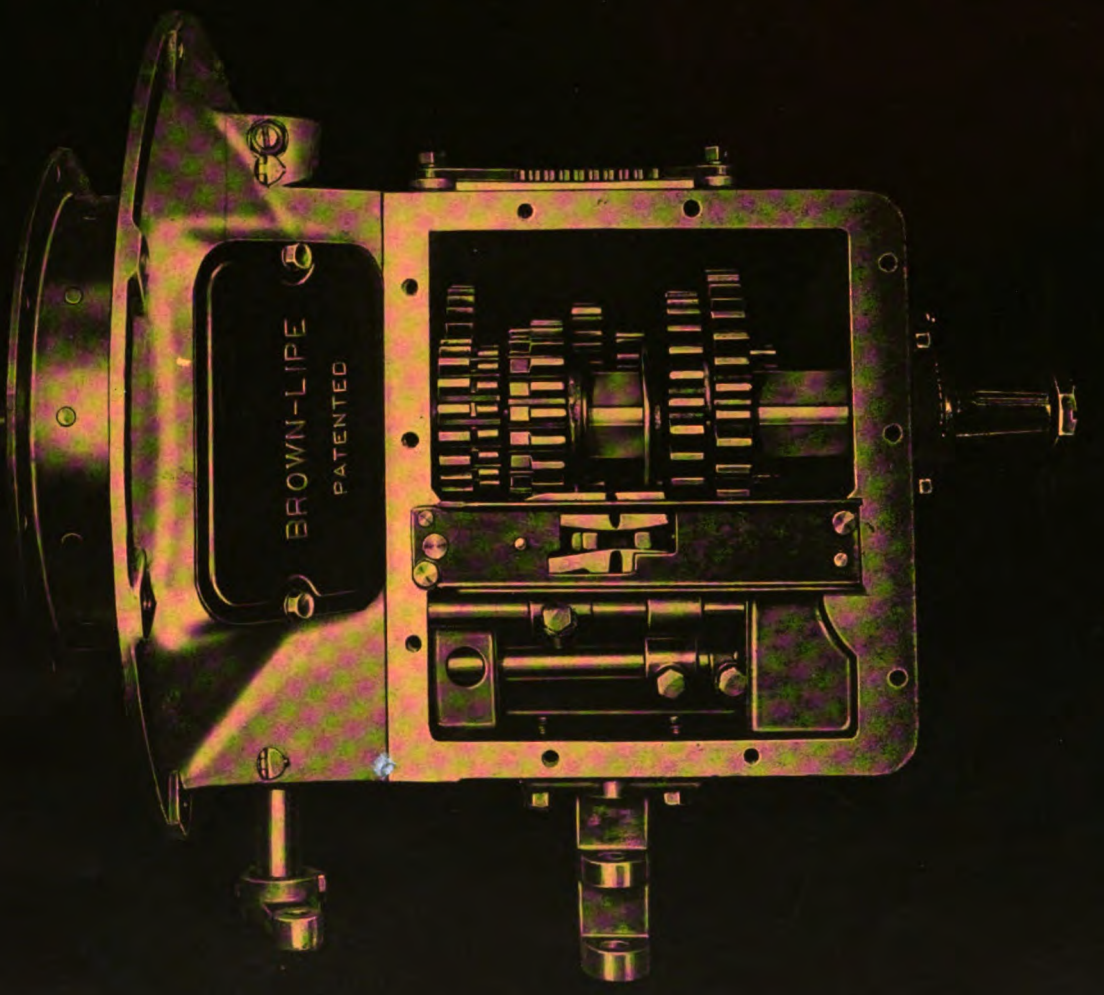


Again we want to urge quick action upon you. The Briscoe "line of three leaders" means the best proposition, present and future, that is offered you today.

Write, wire or call. Don't let some one else get your territory.

BRISCOE MOTOR COMPANY, 105 WILDWOOD AVENUE JACKSON, MICHIGAN

BROWN-



LIPE

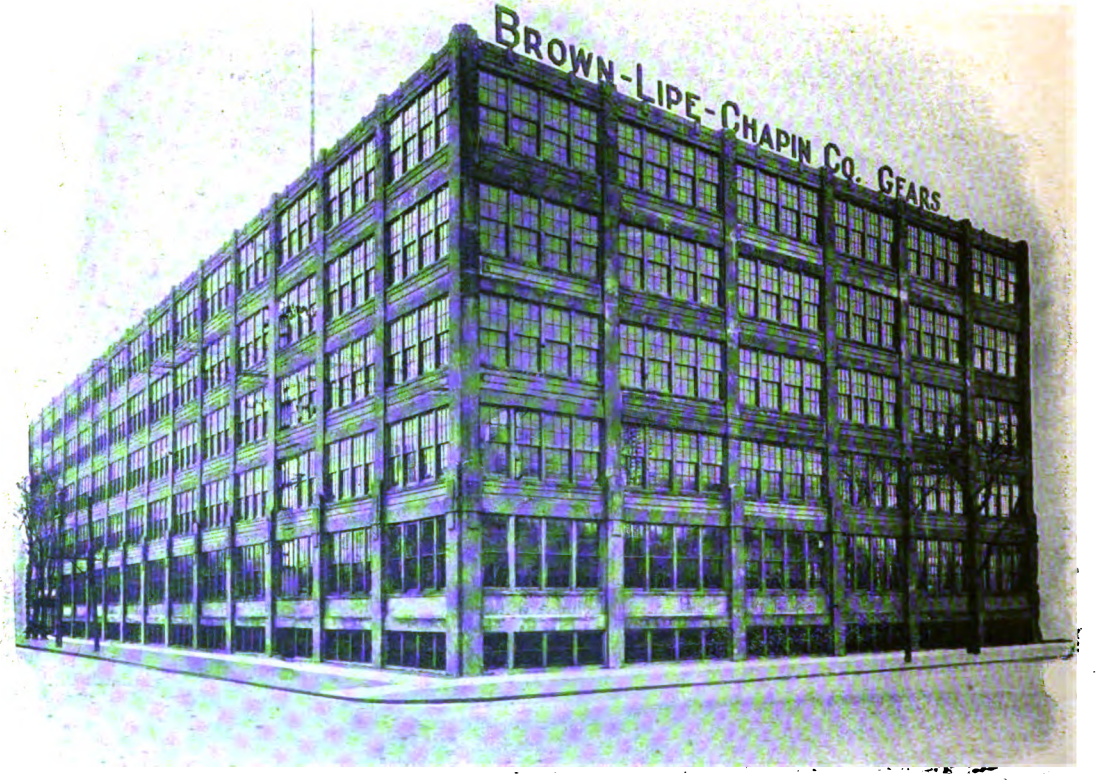
Just a reminder of the fact that more than 80% of the cars in use (excluding one low-priced car) carry Brown-Lipe Differentials in their axles.

And a further reminder—that notwithstanding the exceptional demand that has taxed our capacity during the past few months, in no manner have Brown-Lipe products been hurried or slighted in their production.

BROWN-LIPE-CHAPIN CO.

SYRACUSE DIFFERENTIALS **N. Y.**

NEW YORK
Thos. J. Wetzel, 29 West 42d St.
CHICAGO
K. Franklin Peterson, 122 So. Michigan Ave.
DETROIT
L. D. Bolton, 2215 Dime Savings Bank Bldg.
SAN FRANCISCO
A. H. Coates, 444 Market St.
Foreign Agent, Benjamin Whittaker, 2, Norfolk Street, Strand, London, W. C.



Considerably more than a hundred manufacturers are now using Brown-Lipe Transmissions—and inability to further increase our production is the only limitation that prevents us from greatly increasing that number of patrons.

Rapid progress, however, is being made on our new factory, with which we hope to be able soon to care for the vastly increased demand for Brown-Lipe quality products.

BROWN-LIPE GEAR CO.

SYRACUSE TRANSMISSIONS **N. Y.**

NEW YORK
Thos. J. Wetzel, 29 West 42d St.

CHICAGO
K. Franklin Peterson, 122 So. Michigan Ave.

DETROIT
L. D. Bolton, 2215 Dime Savings Bank Bldg.

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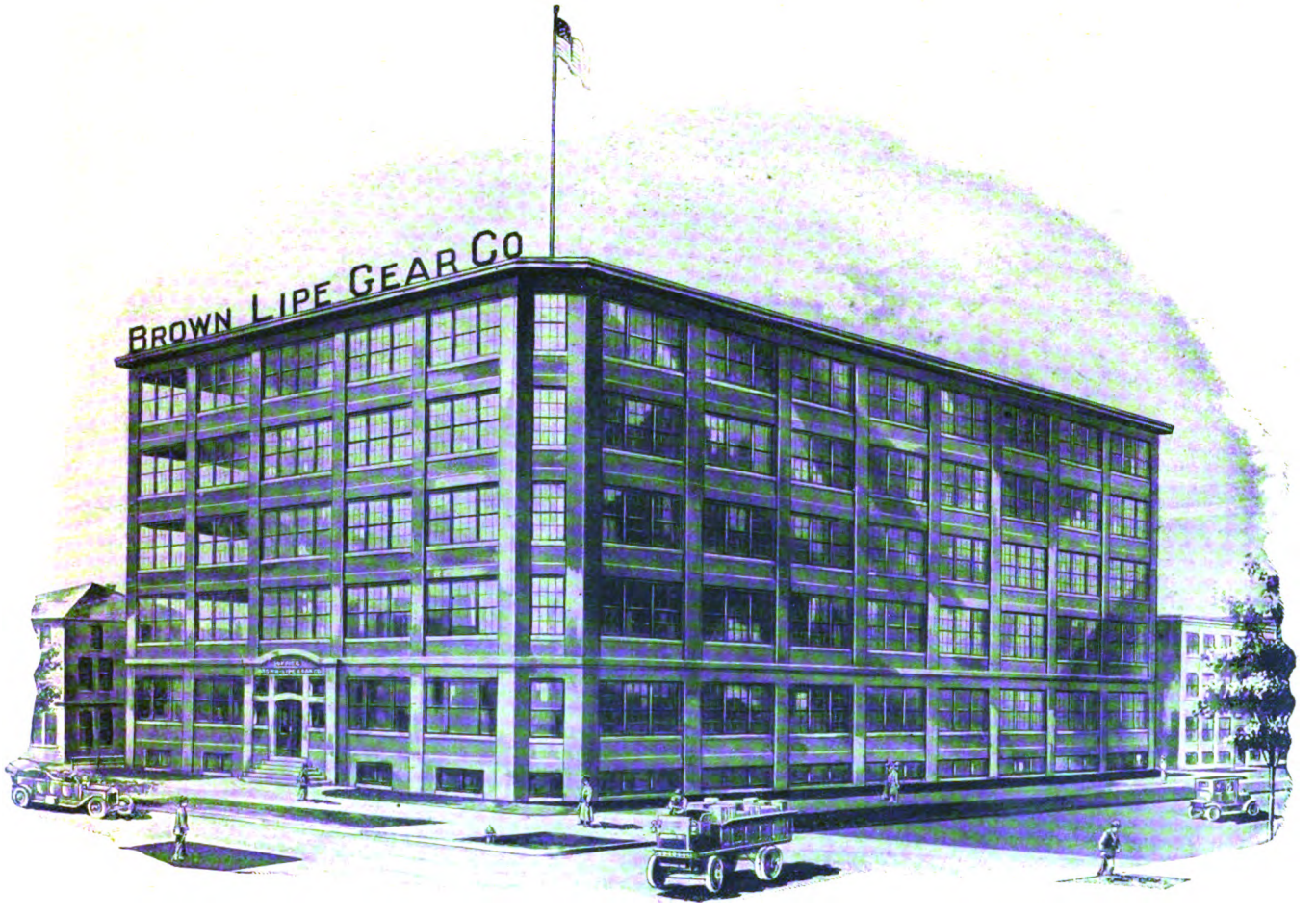
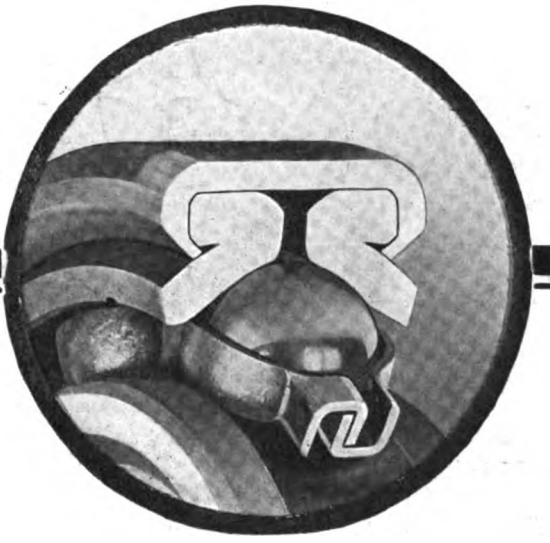


BROWN-

LIPE

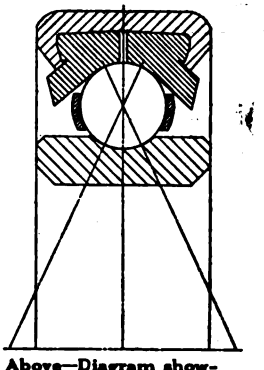


Schatz Quality

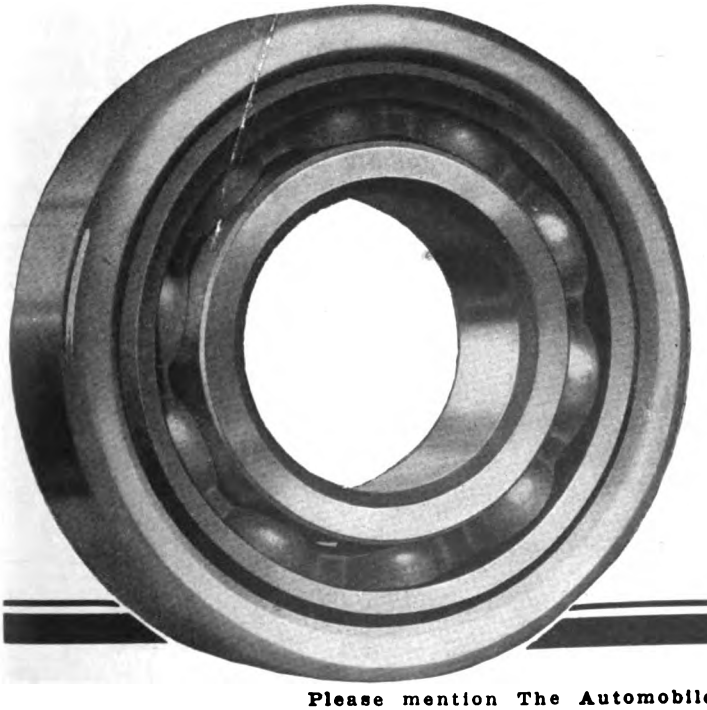
Supplementing the quality of materials and precision with which they are handled throughout every process involved in the manufacture of SCHATZ BEARINGS is a design which not only enables these bearings to take a thrust equal to 50 per cent of their carrying capacity, but also works a marked degree of economy in their application.

This design provides two points of contact on the outer race rings and a third on the inner race ring. Conventional bearing design provides but two. The curvatures of the raceways on the outer race rings as well as in the cone are 4 per cent greater than that of the ball. Theoretically, these contacts are points, although under load the area of contact becomes large enough to support a high thrust load.

Second only to the uniformity and unquestioned quality of SCHATZ BEARINGS is the fact that their three point contact increases insurance against broken balls, for by this arrangement the shock is dissipated and not transmitted through the center line of the ball.



Above—Diagram showing ball support in Schatz annular bearing

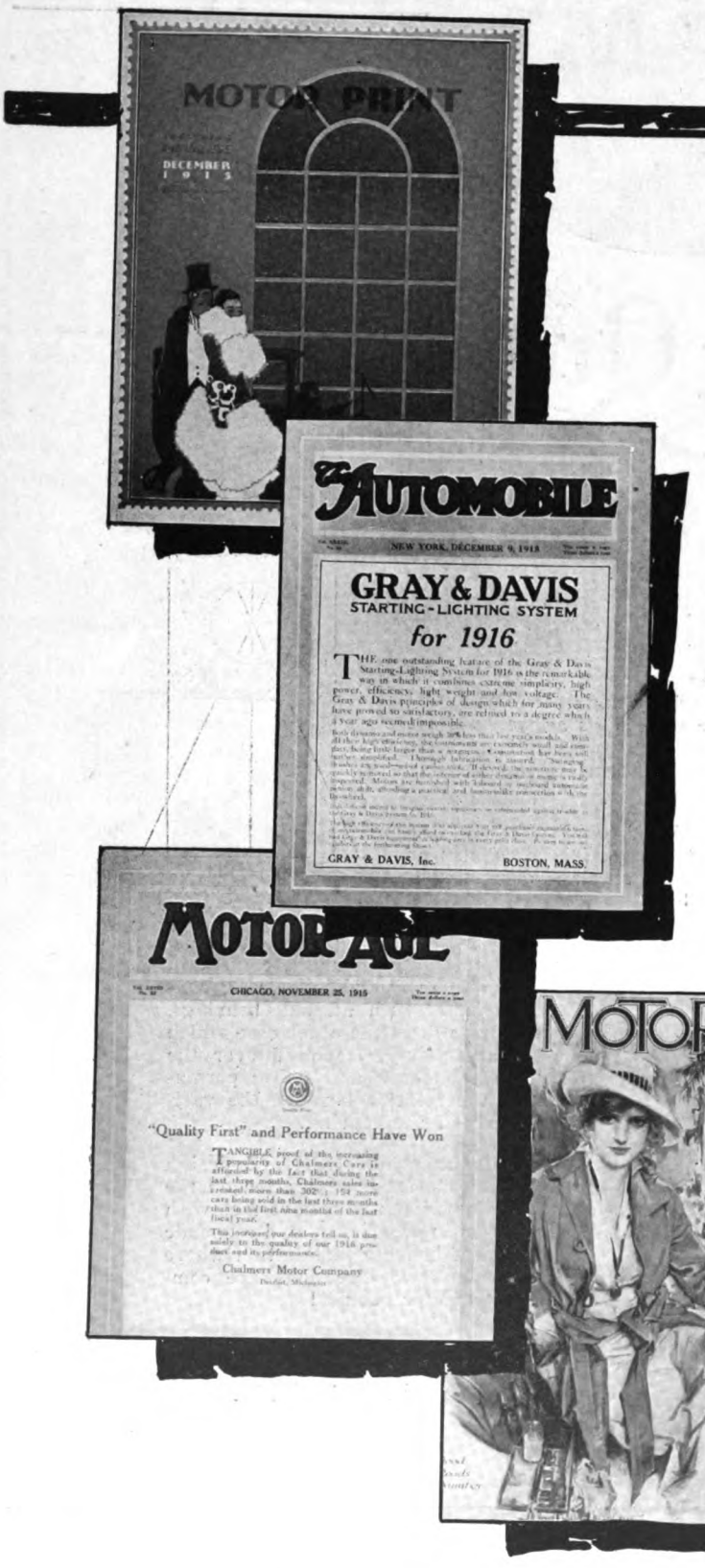


The cup rings which provide a double contact instead of a single contact in addition to the third inner ring contact common with all ball bearings, are a press fit in the outer case which after assembling, is closed over the cups, establishing and fixing permanently the relation between the various parts of the bearing.

The advantages of SCHATZ design merit the closest investigation on the part of engineers who have met with a problem in an efficient and economic solution of bearing installation where loads from two directions are common. Send for booklet!

The Schatz Mfg. Company
Poughkeepsie, N. Y.

125000 MOTORISTS



Here is the push that sets the ball rolling—
An advertising campaign that reaches the families and friends of 125,000 motorists—

An advertising campaign that tells what WONDERMIST is, what it does, its superiority over the best cleaners and body polishes on the market and the conveniences and economy that go with its use—

An advertising campaign that is sufficiently aggressive to increase the existing demand where WONDERMIST is known; to create a demand where it has as yet not been introduced—

An advertising campaign that comes at exactly the right time when it will link up with our dealers' window display proposition to the best advantage.

Are you selling WONDERMIST?

If not, you are overlooking one of the most profitable opportunities the automobile supply business has ever offered—the triple advantage of a live-selling supply with a generous dealer proposition backed by the advertising campaign outlined above.

Ask your jobber.

The Super Carburetor for all types of Modern Motors

EMBODYING the precision principle which is rapidly becoming a standard.

It functions completely through one single moving part—**the Automatic Metering Valve**—which proportions with absolute precision the gasoline and air mixture required by the motor.

The consistent efficiency of the Stewart Carburetor is resultant from this original and highly developed principle.

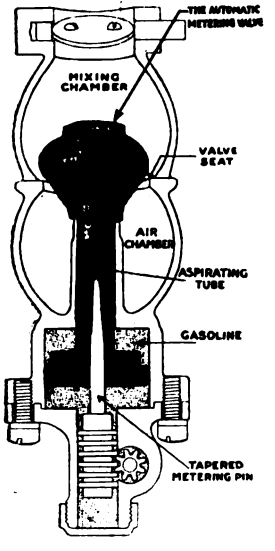
Over 100,000 are now in use in all parts of the world—and under all climatic conditions.

100,000 more will be built in 1916, **alone**—nearly 600 every working day.

Thousands are being and will be supplied direct—to owners who are experiencing inefficient carburetion and poor economy.

For ten years the basic principle of

STEWART PRECISION CARBURETORS



has been consistently adhered to in each successive model. Only improvement of detail has been possible.

A careful inspection of the accompanying sectional view will do much to explain its simplicity, and will illustrate the principle of

THE AUTOMATIC METERING VALVE

The Automatic Metering Valve (shown in the cut at the middle of its stroke) is perfectly free to slide up and down and would normally rest on its seat, entirely closing the air passage thru the carburetor.

Any air passing thru the carburetor *must* raise the valve.

The greater the amount of air the engine draws thru the carburetor the higher the valve must lift.

The valve is lifted against the force of gravity, which, of course, never varies, so that a given amount of air will always lift the valve a corresponding definite height.

This factor of an exact unchanging relation between the position of the Metering Valve and the volume of air passing is utilized to measure exactly and correspondingly the gasoline supply.

It is evident that the suction effected above the valve to lift it will also draw up the gasoline within the valve stem.

It is also evident that the *amount of gasoline* lifted will be measured by the widening of the gasoline passage around the tapered Metering Pin, as the valve is lifted away from it.

Send for the Stewart book A-3. It is the most interesting carburetor book ever issued. Tell us the name, model and year of your car and we will show you how easily the Stewart can be adapted to it.

DETROIT LUBRICATOR COMPANY

DETROIT, U. S. A.

CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO, CANADA.

AT NEW YORK SHOW C-106 **AT CHICAGO SHOW 14-15**

Where Quality Is Paramount

Along Fifth Avenue, with its solidly packed, double stream of motors, you can see more fine cars in an hour than on any other of the world's famous thoroughfares.

It is significant that among those dealers and jobbers who supply this high grade clientele, a large and constantly increasing number are advising the use of

Jumbo Jiant Spark Plugs

With the Molite Insulation

For the dealer, worthwhile profits—for the owner, guaranteed freedom from the spark plug troubles—for the motor, a new life and snap, quicker pickup and better economy—these are the reasons why you should see us at

Space D-89, Fourth Floor, Grand Central Palace

GIBSON-HOLLISTER MFG. CO., 3380 Washington Street Jamaica Plain, Mass.

Photo by Underwood & Underwood

69—21

Jeffery Pleasure Cars

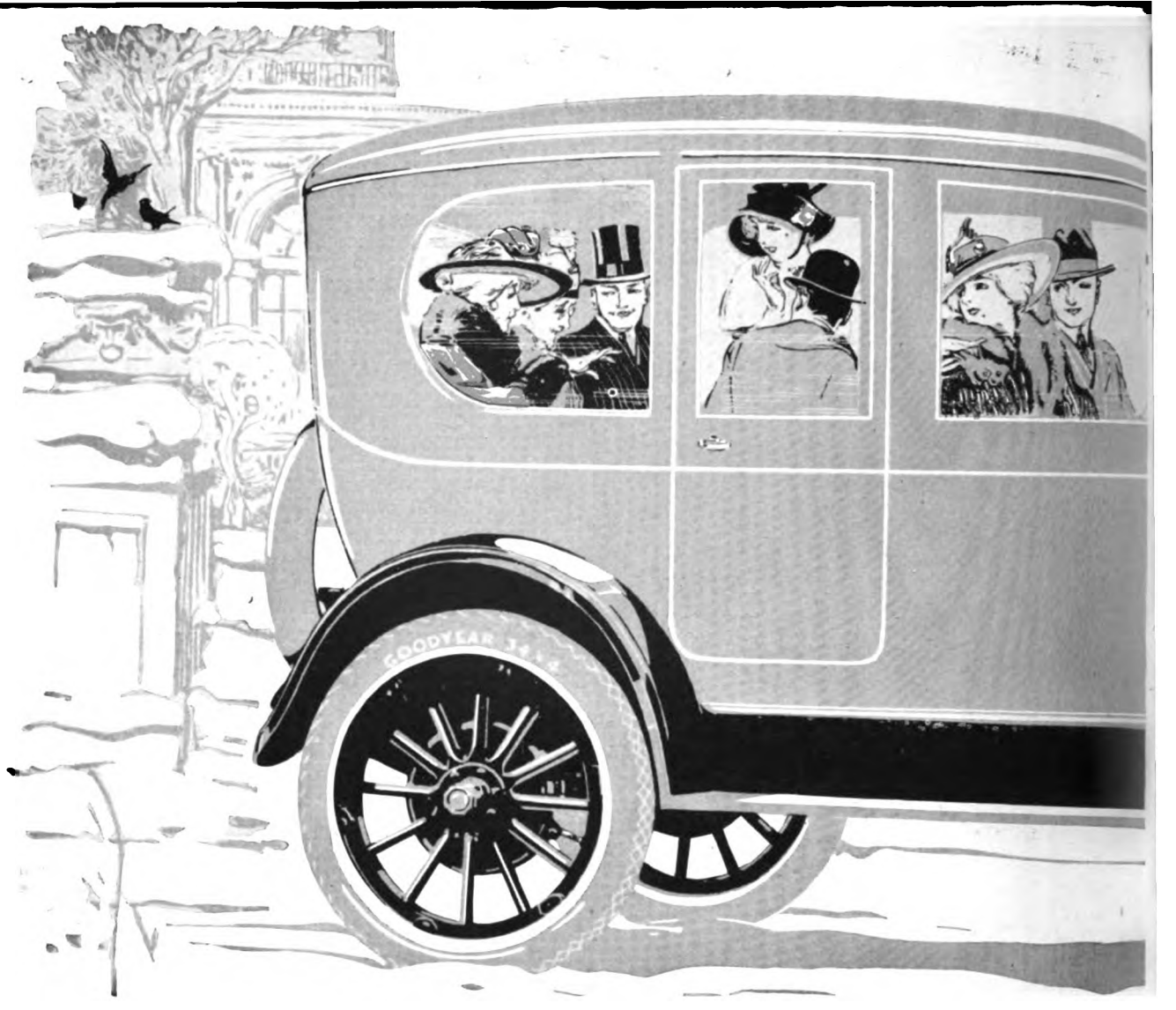
Ushering in a New Motoring Era

For 14 years the THOMAS B. JEFFERY COMPANY has been making motor car history.

It fostered the first American car with the now famous light-weight high-speed motor—built the first automobile of its quality, size and efficiency to sell below $2000, the original Jeffery Four—designed and constructed the amazing JEFFERY "Quad," the truck whose fame has spread 'round the world.

As to more recent achievements, two of the outstanding sensations of 1916 were JEFFERY sensations—the establishment of a new standard of motor car value at a thousand-dollar price and the announcement of the first enclosed coach of real quality to sell at a moderate price—the Jeffery Sedan, complete with both winter and summer tops at $1165.

Jeffery is making motor car history. Post yourself. Read the following three pages.



Don't Envy Closed Car

Heretofore only the wealthy few could afford a closed car.

Now with the coming of the JEFFERY Sedan at $1165 the prohibitive cost associated with closed cars has been forever removed. The JEFFERY Sedan for the first time puts closed car luxury, style and comfort within reach of large numbers of motorists. It is making real the dreams of those who have always envied closed car convenience without feeling entirely able to afford it—until now.

Think of it! At last a custom-built enclosed coach at $1165—only $165 over the price of the JEFFERY Four touring car, yet offering the same features formerly associated only with closed cars costing from $2000 to $5000.

The Jeffery Sedan

$1165

Enclosed Top Removable—Summer Top Included

The roof of the **JEFFERY Sedan is** of laminated **wood construction** covered with a **very fine quality of** top material. The **rear section of the** body of the top **is of metal. The sup**ports and sills **are built substantially,** giving a rigidity **of construction** which meets **every test.**

The windows **are of** ¼**-inch crystal** plate, ground **and polished. In the** two broad forward **windows and in** the doors the **glass is arranged to** drop half way, **affording ample ventil**ation.

The illumination **of the interior is** provided by an **electric dome placed** in accordance **with the latest enclosed** car practice.

Divided front **seats afford easy access** from the rear **to the front compart**ment, doing **away with fore doors,** thereby providing **wider windows, a** broader vision **and longer unbroken** body lines.

The upholstery **is grey whipcord—** leather seats **optional. The window** curtains—portiere **type.**

Comforts-Enjoy Them!

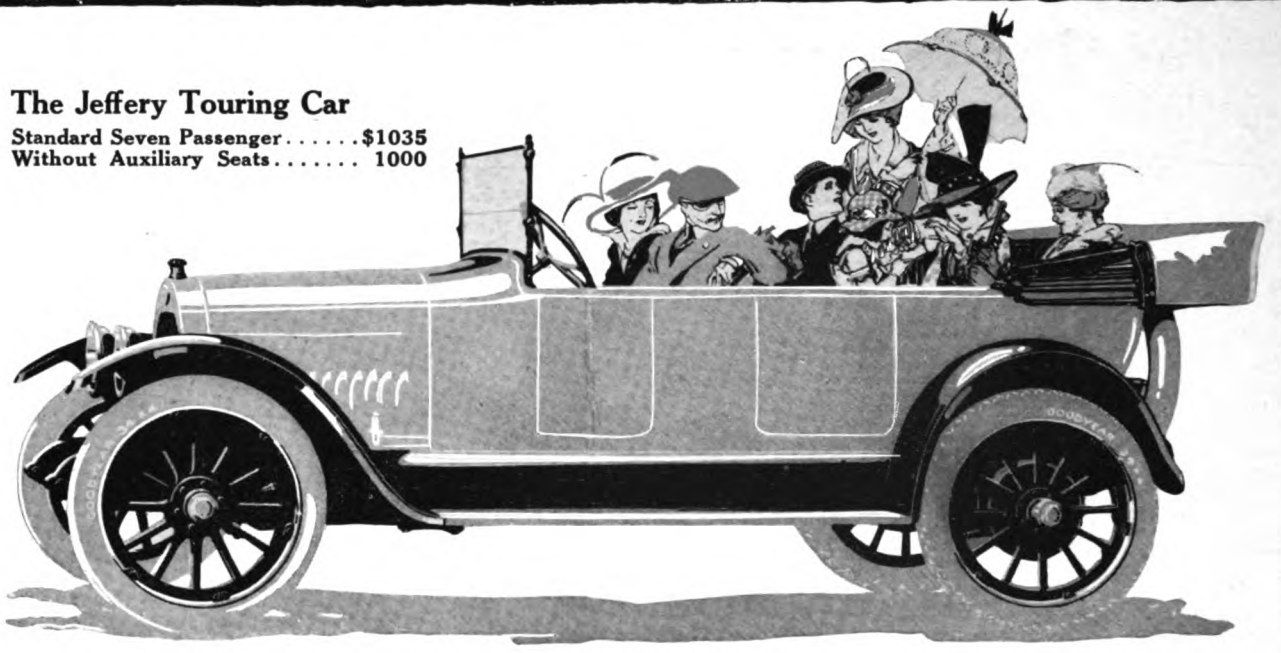
And when summer comes it is a simple matter to remove the Sedan top—giving you a touring car with summer top—at NO EXTRA COST. Here you have virtually two cars in one at the price of one car alone!

Judge the Jeffery Sedan first by appearance. You will find **no flaps, exterior curtains, buttons or unsightly bolts.** Body and top blend perfectly. Body and top are flush with each other. Each top is tailored especially to the particular body which carries it—thereby eliminating every possibility of looseness, rattling, squeaking or rumbling.

And the upkeep of the JEFFERY Sedan is in the touring car class. For with all its strength and firmness the weight of the Sedan top is but approximately 200 pounds, only a trifle over 100 pounds additional to the weight of the JEFFERY summer top—ample insurance of economical operation.

The Jeffery Touring Car

Standard Seven Passenger.....$1035
Without Auxiliary Seats..... 1000



Jeffery Cars 93% Jeffery Built

JEFFERY cars are built almost entirely beneath the JEFFERY roof—including even bodies, tops, axles and other parts usually purchased from special makers. We are dependent neither upon the deliveries nor quality standards of parts manufacturers. The JEFFERY plant is one of the largest and most scientifically equipped of its kind in the world. JEFFERY workmen are highly paid. The result—JEFFERY Quality has become a proverb among JEFFERY owners.

This winter, during what is generally known as the dull season, 3,000 men have been steadily employed in the JEFFERY factory as against 1,300 last year. Shipments during the first six days of this month exceeded those of the entire month of December last year.

JEFFERY dealers everywhere are doing a record-smashing business—winter as well as summer. An opportunity for a limited number of new dealers will be open the first of the year. Investigate.

Orders must be placed immediately to insure early deliveries. Write or wire us.

The Jeffery Four Touring Car
Standard Seven Passenger.....**$1035**
Without Auxiliary Seats.....**$1000**
The Jeffery Four, Three-pass. Roadster..$1000

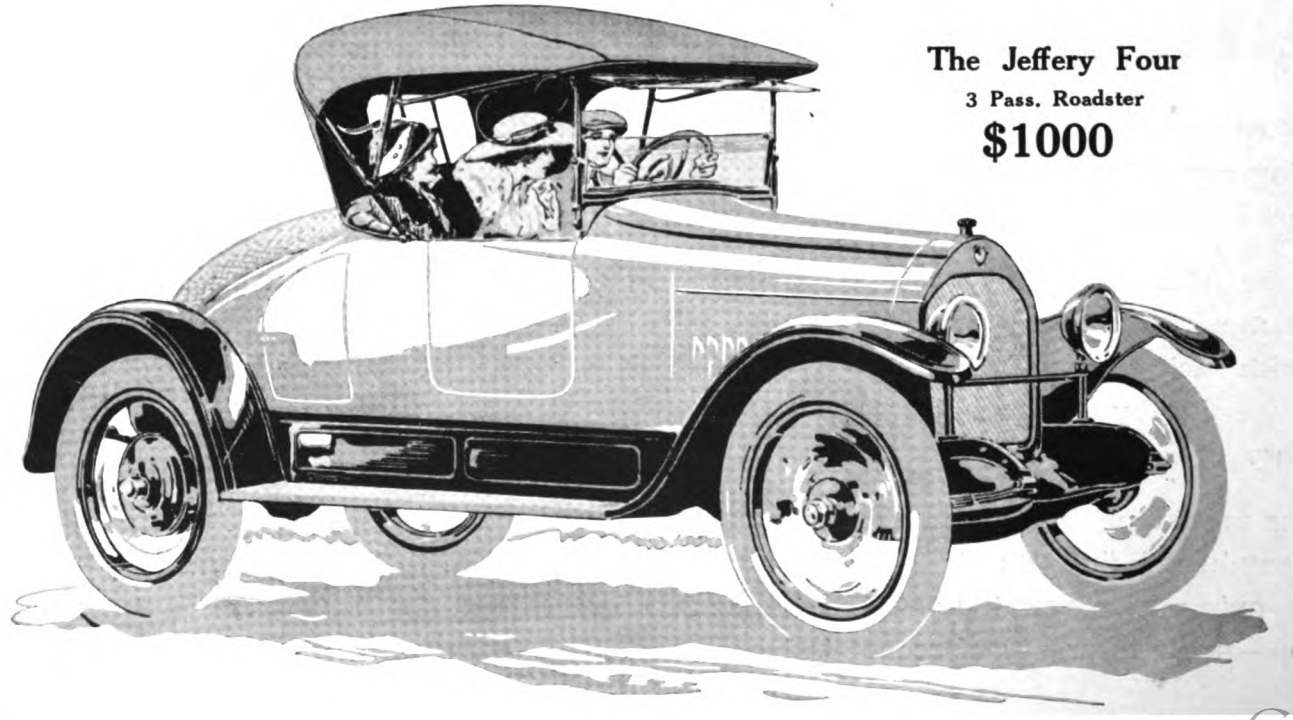
The Jeffery Sedan
Five Passenger.....**$1165**
Seven Passenger.....**$1200**

The Jeffery Quad—the truck that drives, brakes and steers on all four wheels....$2750

The Thomas B. Jeffery Company

Main Office and Works. Kenosha. Wisconsin

Builders of Motor Cars Since 1902



The Jeffery Four

3 Pass. Roadster

$1000

A luxurious "electric" is a sort of drawing room on wheels and the appointments ought to harmonize in quality. The Waltham automobile clock does not suffer by comparison with any environment.

The Waltham Automobile Clock

is cased in various forms and with different dials. There is a model suited to every purpose and taste.

In every case, the instrument itself is of true Waltham quality.

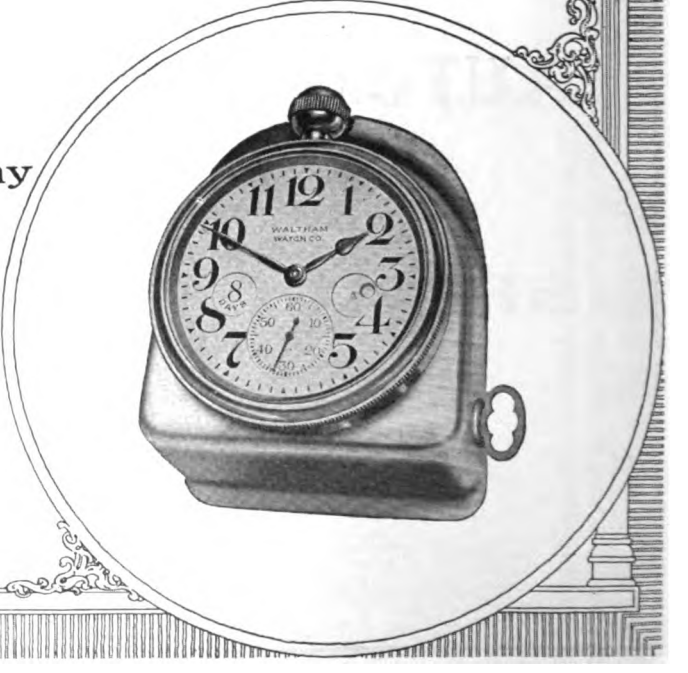
The following cars use our clocks as regular equipment:

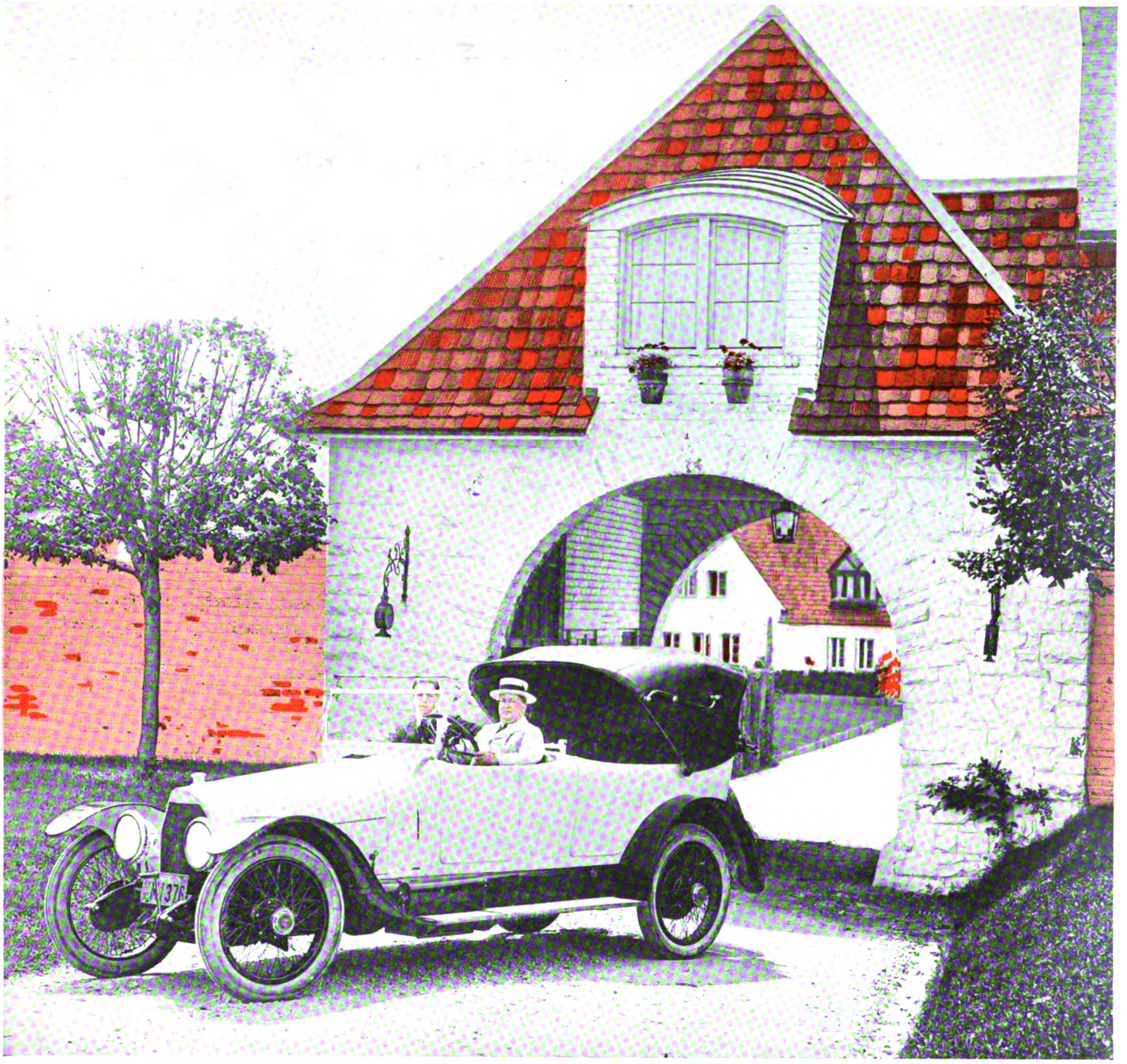
Brewster	Marmon
Cadillac	Owen Magnetic
Cole	Packard
Crane	Pierce-Arrow
Detroit	Rauch & Lang
Franklin	Rolls-Royce
Haynes	Russell-Knight
Jeffery	Simplex
Locomobile	Stearns
Lozier	Winton

The following companies equip *all* their enclosed bodies with our timepieces:

Brewster	Locomobile
Cadillac	Packard
Franklin	Pierce-Arrow
Stearns	

Waltham
Watch Company
Waltham
Mass.





The Story of a Marvelous Car

TWELVE months ago the first announcement of the Owen Magnetic car was published.

Since that time giant strides have been made, both in the development of the car and in the organization of facilities for its production on a scale large enough to more nearly meet the demand.

During the past year Owen Magnetic cars have been placed—not merely sold—in the service of some of the most critical motorists in the country—men whose demands put the extreme burden of proof upon a car's stamina—as well as upon its ability and ease of handling, and every car, without exception, has won not only the unqualified but enthusiastic approval of its owner.

The Development of Our Organization Has Paralleled the Success of the Car

First—The co-operation and interest of the General Electric Company, under whose direction and guarantee the electric transmissions will be built, not only insures our supply of these important units but places the unqualified stamp of approval of the world's foremost electric manufacturers upon it.

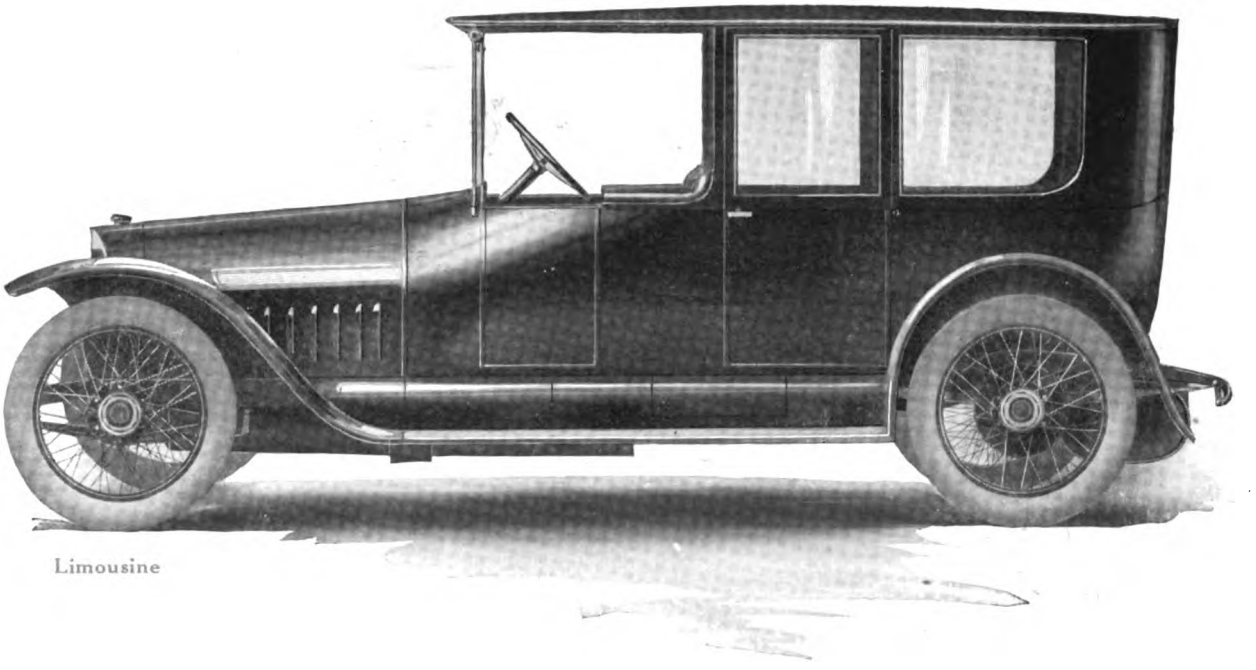
Then, the acquisition and consolidation of the manufacturing and coach building facilities of the Baker R & L Company of Cleveland assures us of unsurpassed manufacturing conditions and quality of workmanship in both chassis and body building that is world famous.

Last year the exhibit of Owen Magnetic cars at the Automobile Shows focused the attention of thousands.

Many came with a more or less accurate understanding of the principle of magnetic transmissions—others to see it and learn about it for the first time—what it was, how it differed from the conventional, and what advantages accrued from it.

They found a car with a six-cylinder engine and a chassis, with but one exception, the same general design as other high-grade cars.

They found that the engine—the opera-



Limousine

tion of which is identical with any other—created the power, but instead of fly-wheel, clutch, transmission gears, and individual units for starting and lighting, they saw the Entz system of transmission, a complete electric plant, yet far less complicated than the conventional units it displaces—a simple and effective means of transforming the inelastic power of the gasoline engine into flexible energy for driving the car—and used also for starting and lighting it.

Thus it is that practically every function required in the operation of the car—except the production of power—is centered in a simple electrical machine which makes possible a multiplicity of speeds where heretofore but three or four have been practicable.

Every operation from starting the car on up to a speed of sixty miles an hour is regulated by a simple lever attached to the steering wheel. When the power is applied, the car moves away as if impelled by unseen force—with absolute silence—with an acceleration a thousand times more flexible than can result from any gasoline engine, regardless of the number of its cylinders, working with the conventional gear transmission.

The consensus of opinion of all who have seen and had the operation of the Owen Magnetic car explained to them is that it is the fulfillment of the ultimate in motor car construction reduced to the greatest degree of simplicity.

The impression of those who have gone farther and taken a demonstration of the Owen Magnetic is that we have harnessed under easy control the power and efficiency of the gasoline motor, giving it the flexibility of the steam engine and the simplicity of control of the electric.

This year you can allow your interest in the Owen Magnetic car to take definite shape.

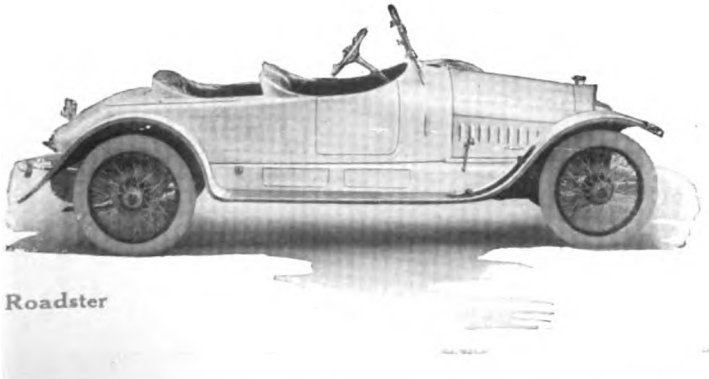
The car itself in the hands of its owners has proven a huge success.

We ask that you honor us with a visit at the shows, or let us send you the Owen Magnetic literature.

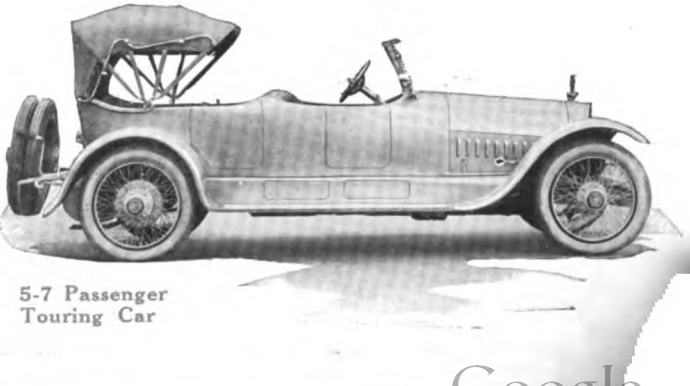
BAKER R & L COMPANY, Cleveland, Ohio

New York Branch: Broadway and 57th Street

BOSTON PHILADELPHIA CHICAGO



Roadster



5-7 Passenger
Touring Car

THE PLAZA

NEW YORK

THE JENKINS-KIRBY PACKING CO.

FOOD SPECIALTIES.

THE JONES SPEEDOMETER

FACTORY CORRESPONDENCE

San Francisco, Feb 2, 1912.

Messrs. R. H. Owen & Co.,
5th Ave., 142nd St.,
New York City.

Dear Mr. Owen:-

Your car is running excellently. I
five others - foreign and domestic, but have
ed any of them since receiving yours. In
whatever and there does not seem any

Yours,

Geo Whittell

Oakdale, July 29, 1912.

R.H. Partridge, Sales Manager.
R.H. Owen & Co.,
57th Street & B'way,
New York City.

Dear Sir:-

The Owen Magnetic for you sold me
far surpasses my expectations. You undoubtedly
have many enthusiastic owners, but none can be more
so than I am. The wonderful flexibility, ease of
control, quietness at all speeds, easy riding and
general performance of the car leaves little to be
desired.

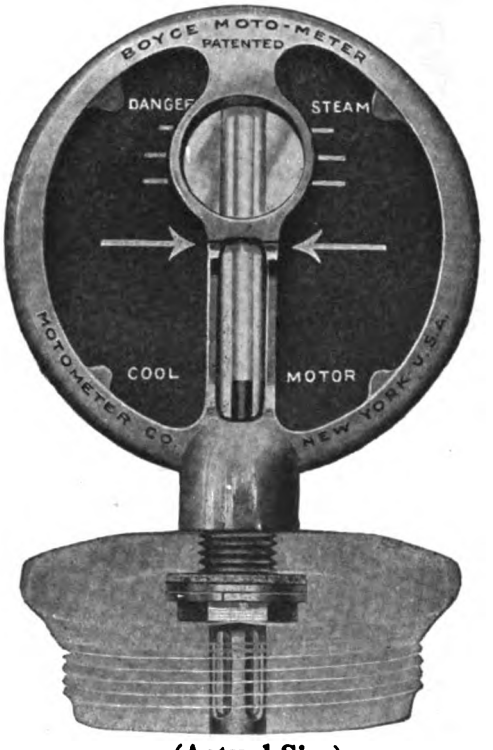
My car is greatly admired wherever it is
seen; the carriage work is very good. I predict a
great success for this form of transmission.

Yours very truly,

A. L. Bowers, Jr.

New Boyce MOTO-METER

Midget Model



(Actual Size)

A motor heat indicator for small cars combining perfect accuracy with sturdiness of construction.

It can be attached to any radiator cap in 10 minutes.

$2.50

Motorists now agree that the Boyce Motometer is a NECESSITY

Primarily a gasoline engine is a heat engine and is only efficient when operated at proper temperature—the BOYCE Motometer tells the driver this temperature at all times and warns him of possible motor trouble before damage can take place.

The leading engineers anticipating the requirements of the car owner for motor protection and efficiency — have adopted the BOYCE Motometer as standard equipment on more than 50,000 cars for 1916.

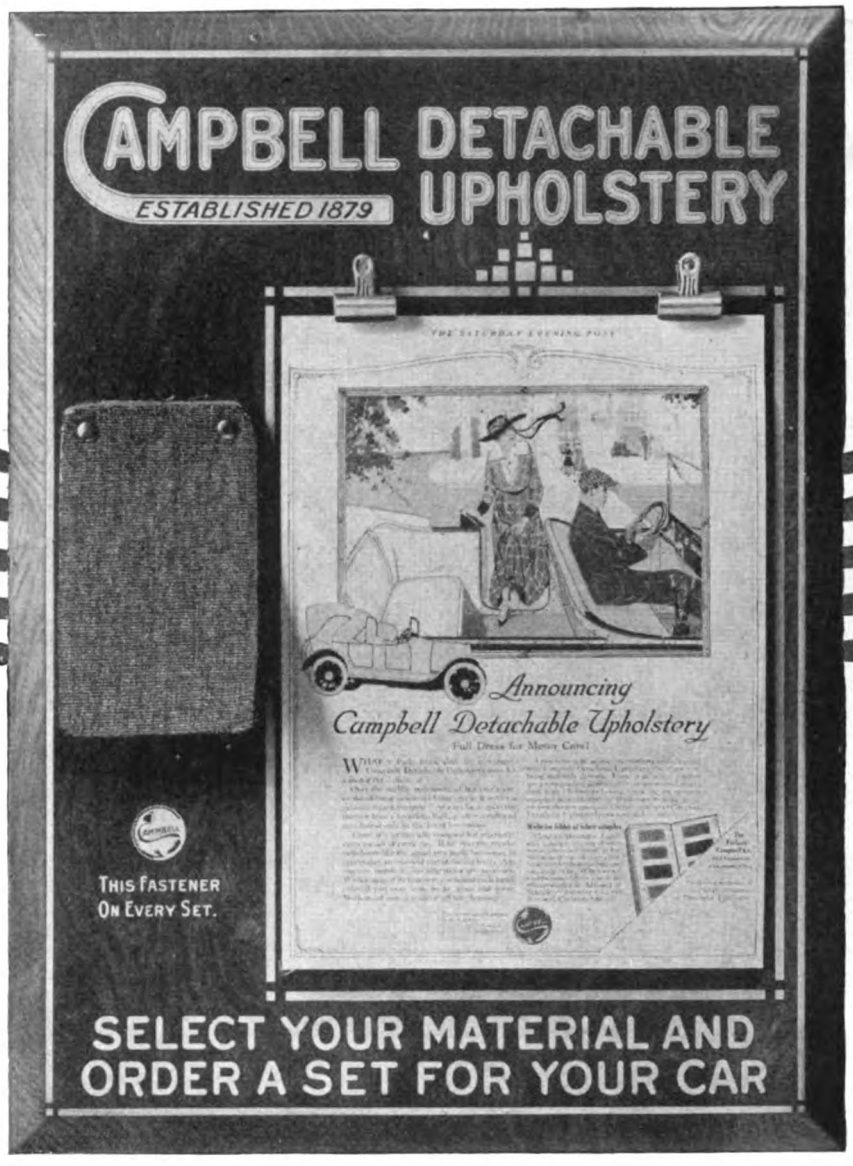
In addition to our larger models we have designed and are now placing on the market the Midget Model BOYCE Motometer to meet the great demand of the light or *small car owner*.

On sale by leading supply stores. Get one from your dealer or order direct
Descriptive catalogue on request

"See our exhibit New York Show, Booth No. C-88—third floor
Chicago Show, Booth No. 104."

MOTOMETER CO., Inc.

1790 BROADWAY NEW YORK CITY



Reserve Artillery!

How we help the dealer "cash in" on The Big Push

Last month we announced our big campaign in the Saturday Evening Post and seventeen other national mediums.

It is The Big Push!—the strongest support ever given the automobile dealer in the sale of an article like Campbell Detachable Upholstery.

Now we announce the Reserve Artillery—the selling force we furnish our dealers so that they may convert the magazine-created demand for Campbell Detachable Upholstery into dollars in the cash drawer.

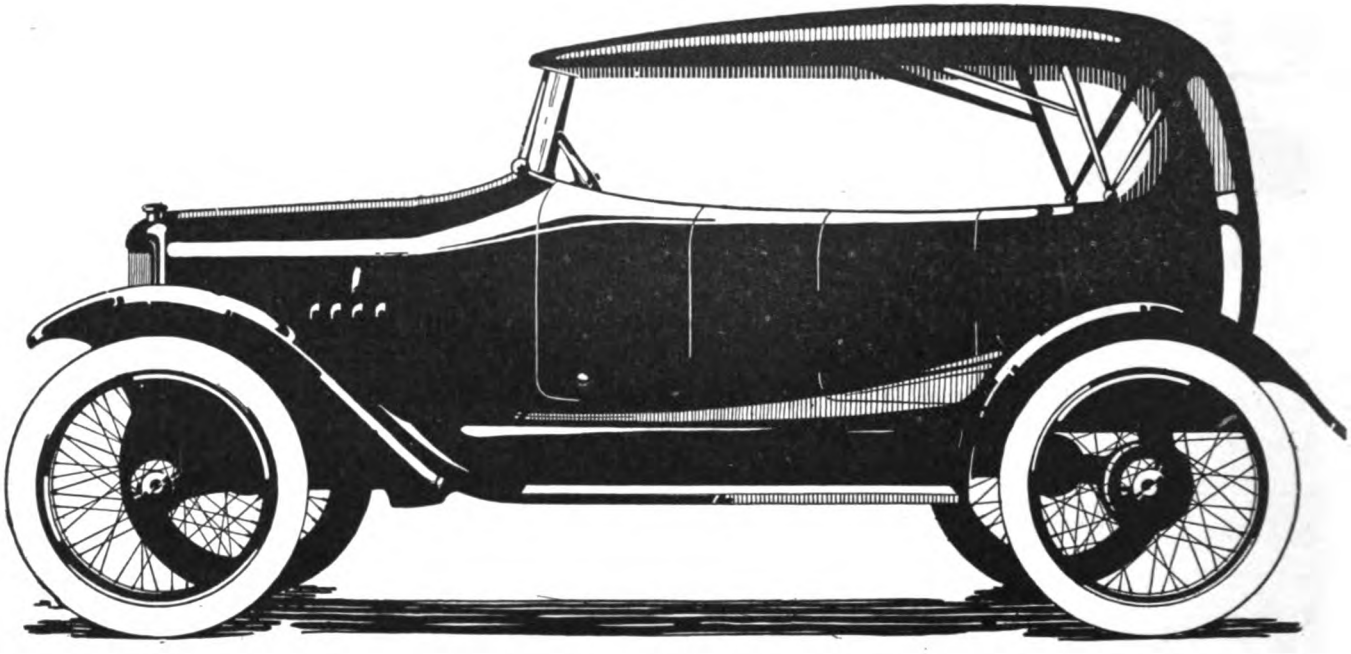
The beautiful display stand illustrated above is but one of the Big Guns. We give you in addition handsome posters in seven colors, booklets, etc., to follow up your trade and make sales.

Without any concentrated selling effort Campbell Detachable Upholstery outsells all other articles of interior trim for motor cars. But backed by the tremendous advertising campaign we are putting behind it, Campbell Detachable Upholstery is the livest accessory you can stock.

If you want to sell prestige, luxury that has no competition, and an article that is in a class by itself, that insures you against mail-order competition, write or wire for samples, prices and trade discounts on Campbell Detachable Upholstery and details of our co-operative selling plan. The Perkins-Campbell Co., 633 Broadway, Cincinnati, Ohio; New York Office, 89 Chambers Street.

DEALERS—QUICK ACTION

How Many Ford Owners in Your Territory? You Can Sell Nine in Every Ten



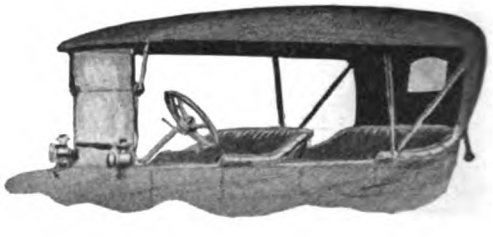
TOURING CAR BODY
$150

TO appreciate the sales possibilities with the Universal line, imagine yourself a FORD owner. Would you spend $150 to make your car look like this photograph? Of course you would and so will all the FORD owners in your vicinity. Our dealer proposition tells the story, it's ready, and deliveries will start in quantity January 1st.

Springer Demountable Rim Wire Wheels. Complete Set and 5 Rims, $30

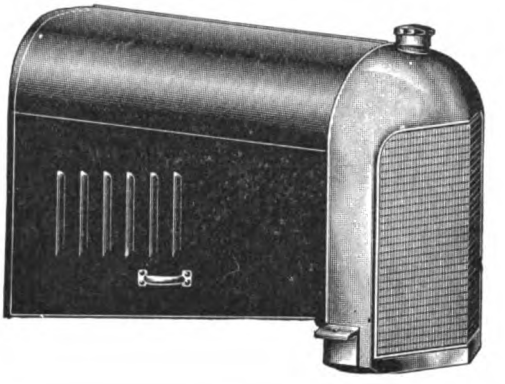
We Want the Best Representation In Every Territory —Start Something

Universal One Man Top, A Sure Winner



The Money to Be Made with Universal Specialties is Only Limited to the Ford Cars in Your Territory

OUR line is not a FORD specialty—it's a necessity. A direct appeal to every FORD owner and more Dealer profit than with all FORD-sellers combined. National advertising calculated to reach every FORD owner will blaze the trail.



Act Quick—
We Want One Thousand

distributing stations in thirty days - don't wonder—don't hesitate—don't be skeptical. It had to happen and it remained for us to solve the problem.

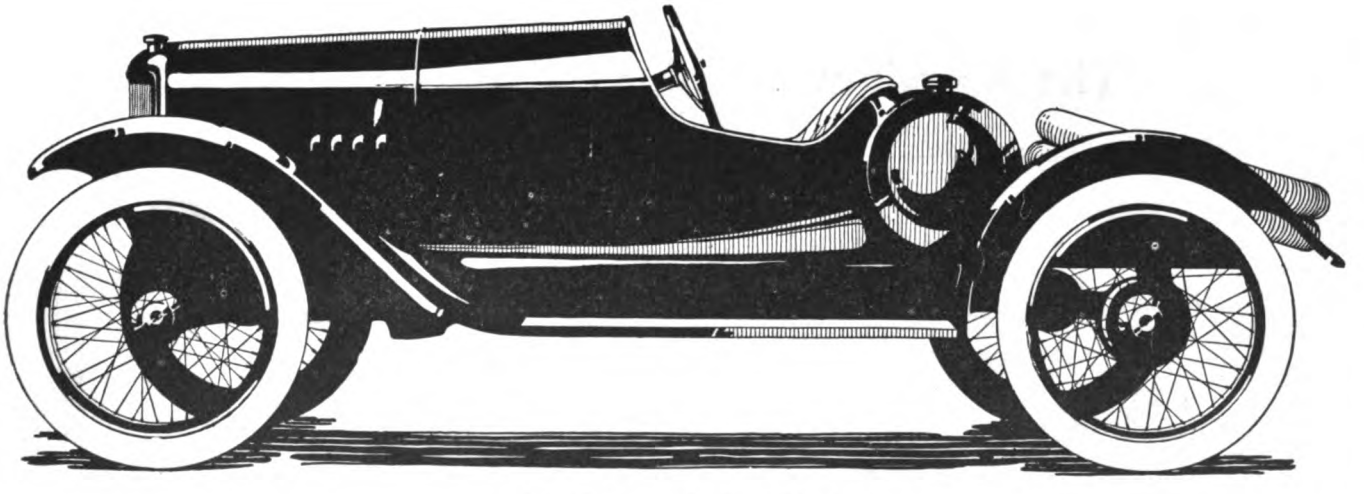
¶ Dunn's, Bradstreet's or your own bank will tell you who we are.

¶ Deliveries in any quantity as soon as you are ready. We suggest a telegram.

UNIVERSAL CAR EQUIPMENT CO.
251 East Jefferson Ave. Detroit, Mich.

Universal Streamline Radiator

ABSOLUTELY the last word in Ford-motor cooling. This radiator was designed by experts after making an exhaustive study of the conditions to be overcome. Efficiency, plus—to universal owners. Profit in abundance to our distributors. The line to tie to.



RACE-A-BOUT BODY
$100

MARMON 34

A Scientifically Constructed Light Weight Car

MARMON

Announcing a New Automobile

LET us say in the beginning that only the *facts* about this new car will be published for it is against our policy to allow any announcement to smack of sensationalism.

We have stated, and so have the publishers of this paper, after careful investigation

— *that this new car fully equipped will ride with comfort and safety and handle with extraordinary ease over ordinary highways at from fifty to fifty-five miles an hour.*

— *that it will easily do sixty-five miles an hour.*

— *that it will accelerate from ten to fifty miles an hour in less than eighteen seconds on any hard, level road.*

— *that it weighs only three thousand five hundred and forty pounds although of seven-passenger capacity, and one hundred and thirty-six inch wheel base, completely equipped with spare wheel and tire, with gasoline, oil, and water compartments filled, and full complement of tools.*

These are *demonstrable* facts. Unprejudiced men have seen them demonstrated.

Then is the Marmon the *new motor car* that will sooner or later take the better-class motor car buyers by storm?

We firmly believe the answer is in the affirmative, and that you will be willing to so answer that question just as soon as you have tried this unusual car. For here is a motor car that is as *beautiful* as it is efficient.

We will state without hesitancy, and we are conservative, that no car in the world is built better.

This model has been two years in development with fourteen years of successful motor car building experience back of it, plus a manufacturing experience that dates from 1851.

We know materials thoroughly, we use only the best, and we build every important part of this car ourselves.

The Marmon 34 is a car of remarkable power, perfect balance, light weight, extremely easy to handle, refined in every detail, of beautiful design and striking individuality—in short, the *finished car*.

We invite the motor-car industry to keep our every statement in mind and examine the Marmon car.

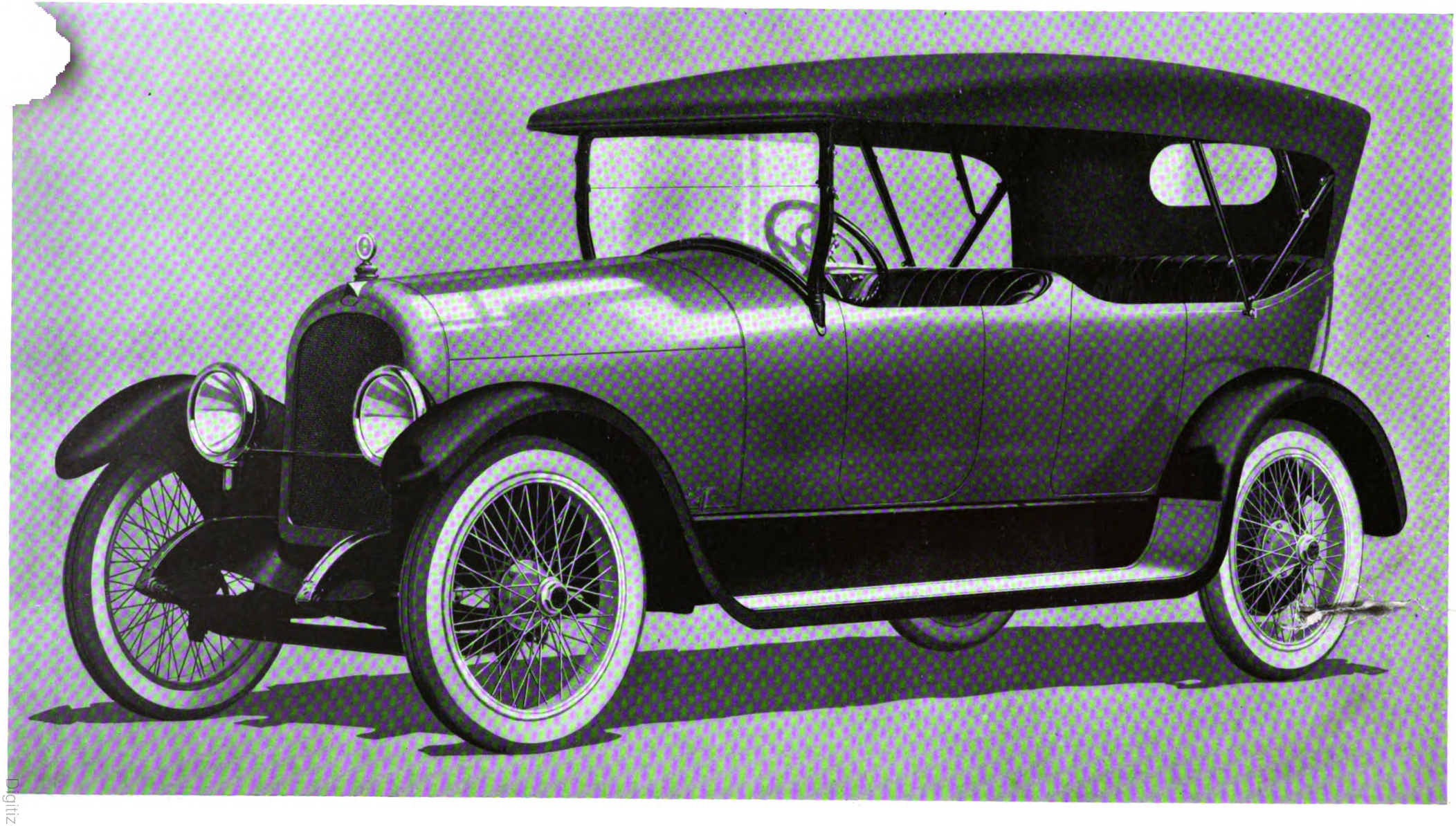
NORDYKE & MARMON COMPANY

ESTABLISHED 1851

INDIANAPOLIS INDIANA

NEW YORK SHOW
Space A18, First Floor

CHICAGO
Space H



MARMON 34

A Scientifically Constructed Light Weight Car

SPECIFICATIONS OF THE MARMON 34

Body Types — THE *Marmon 34* is furnished with the following body types: Seven-passenger touring, five-passenger touring, four-passenger "Club" roadster, three-passenger "Club" roadster.

Wheelbase — The *wheelbase* is 136 inches. Short turning radius.

Weight — The *weight* of the seven-passenger touring car, ready for shipment, is 3295 pounds. The actual weight of this car, in full touring trim — extra wheel and tire and all gasoline, oil, and water compartments filled — is 3450 pounds for five-passenger car, 3540 pounds for seven-passenger car.

Aluminum — *Aluminum* is used more extensively than in any other car. The main structural member of the motor, the body, fenders, hood, radiator shell, and many small castings — usually of iron or bronze — are of aluminum.

Motor — The *motor* is six-cylinders, bore 3¾ inches, stroke 5⅛ inches, with quiet, efficient overhead valve construction. The en-bloc cylinder casting, water jackets, bearing supports, and crank case are combined in a single aluminum casting. Hard-iron cylinder barrels fit in the aluminum casting with a cast-iron firing head.

Lubrication — Motor lubrication is by the famous Marmon hollow crank shaft force-feed system, supplemented by a hollow rocker arm pivot so that all valve parts are lubricated by pressure feed. Cams are integral with cam shaft, cut from a single steel forging.

Frame — The *frame* is of extraordinary depth — ten inches. The steel running boards, hot riveted to the side members, form a part of the frame.

Body — The *body* bolts direct to the frame without sills or subframe. It is made in three sections: First — cowl, containing gasoline tank, wind shield supports, and instrument board; second — front seats with compartment for folding chairs; third — tonneau seats. The floor boards are 24½ inches from the ground.

Upholstery — The *upholstery* is removable, the extra seats fold into a compartment when not in use, and passengers sit deep in the car at comfortable height, with plenty of leg room.

Springs — The *rear springs* are of the compound cantilever type, mounted across to the rear of the frame and axle, eliminating side sway and giving perfect spring action and balance. All springs are self-lubricating.

Front Axle — The *front axle* is an I-section drop forging with marine-type thrust-bearing steering spindle, operating in self-contained oil bath.

The *famous Marmon cone clutch*, transmission suspended on front end of torque tube, tubular propeller shaft, and perfectly aligned helical gear — give a silent drive and a saving of power.

Oiling — *Only four grease cups are used*, and these are on the steering connections. The front axle spindles, clutch release collar, transmission and rear axle run in medium weight oil sufficient for 15,000 miles.

Wheels — Five *wire wheels* are standard equipment. Tires, Silvertown cord 34 x 4½ inches, front and rear.

Equipment — Bosch magneto, generator, and starting motor. Every *convenience* that may be desired for general use is furnished.

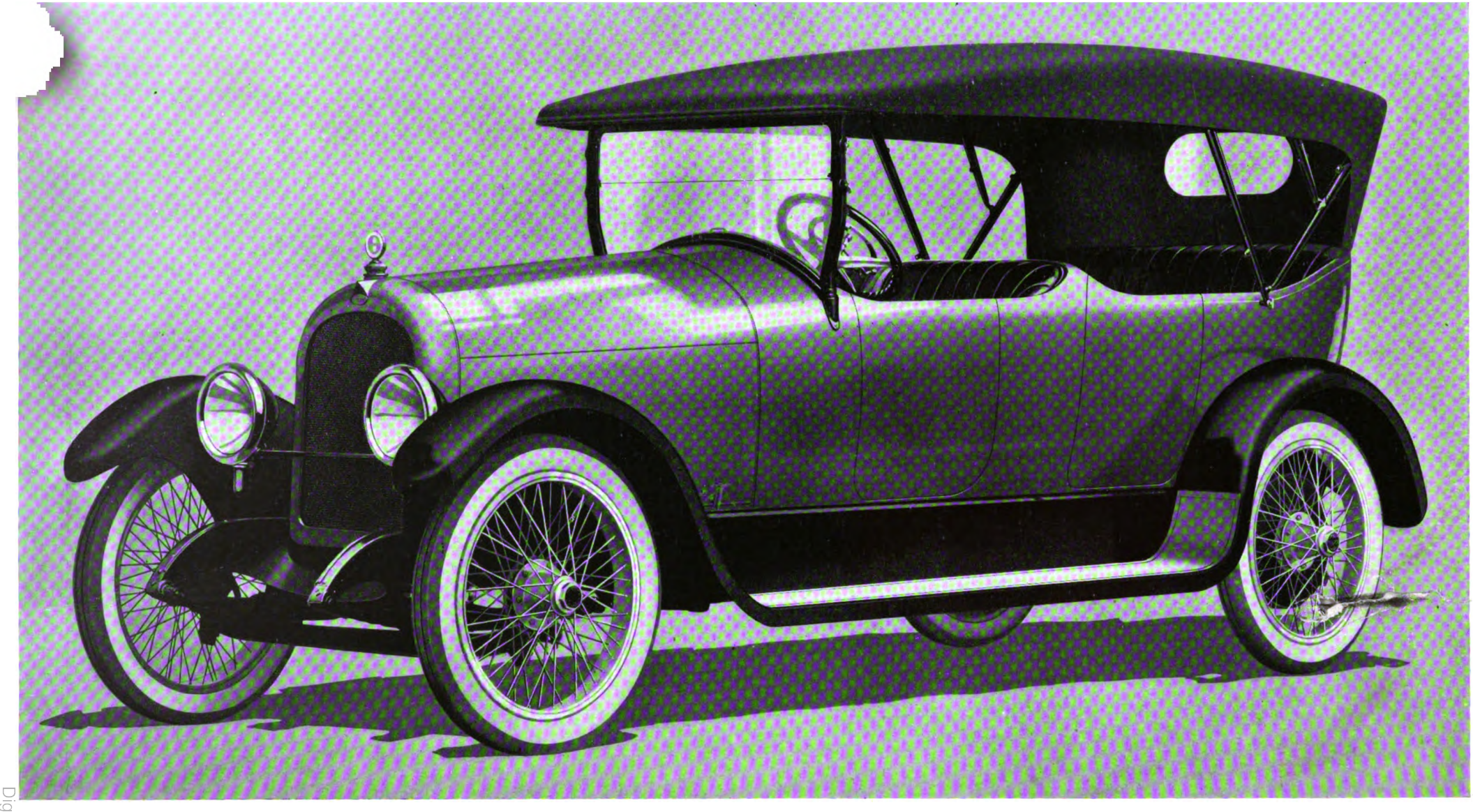
Prices — $2700 for three, four, and five-passenger models; $2750 for seven-passenger model. All prices f. o. b. Indianapolis.

Deliveries — *Deliveries* are now being made.

NORDYKE & MARMON COMPANY

ESTABLISHED 1851

INDIANAPOLIS INDIANA



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Weight The *weight* of the seven-passenger touring car, ready for shipment, is 3295 pounds. The actual weight of this car, in full touring trim — extra wheel and tire and all gasoline, oil, and water compartments filled — is 3450 pounds for five-passenger car, 3540 pounds for seven-passenger car.

Aluminum *Aluminum* is used more extensively than in any other car. The main structural member of the motor, the body, fenders, hood, radiator shell, and many small castings — usually of iron or bronze — are of aluminum.

Motor The *motor* is six-cylinders, bore $3\frac{3}{4}$ inches, stroke $5\frac{1}{8}$ inches, with quiet, efficient overhead valve construction. The en-bloc cylinder casting, water jackets, bearing supports, and crank case are combined in a single aluminum casting. Hard-iron cylinder barrels fit in the aluminum casting with a cast-iron firing head.

Lubrication Motor lubrication is by the famous Marmon hollow crank shaft force-feed system, supplemented by a hollow rocker arm pivot so that all valve parts are lubricated by pressure feed. Cams are integral with cam shaft, cut from a single steel forging.

Frame The frame is of extraordinary depth — ten inches. The steel running boards, hot riveted to the side members, form a part of the frame.

Body The body bolts direct to the frame without sills or subframe. It is made in three [illegible] First — cowl, containing windshield, [illegible] supports, and instrument board; second — front seats with compartment for folding chairs; third — tonneau seats. The floor boards are $24\frac{1}{2}$ inches from the ground.

Upholstery The *upholstery* is removable, the extra seats fold into a compartment when not in use, and passengers sit deep in the car at comfortable height, with plenty of leg room.

Springs The *rear springs* are of the compound cantilever type, mounted across to the rear of the frame and axle, eliminating side sway and giving perfect spring action and balance. All springs are self-lubricating.

Front Axle The *front axle* is an I-section drop forging with marine-type thrust-bearing steering spindle, operating in self-contained oil bath.

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Oiling *Only four grease cups are used*, and these are on the steering connections. The front axle spindles, clutch release collar, transmission and rear axle run in medium weight oil sufficient for 15,000 miles.

Wheels Five *wire wheels* are standard equipment. Tires, Silvertown cord $34 \times 4\frac{1}{2}$ inches, front and rear.

Equipment Bosch magneto, generator, and starting motor. Every *convenience* that may be desired for general use is furnished.

Prices $2700 for three, four, and five-passenger models; $2750 for seven-passenger model. All prices f. o. b. Indianapolis.

Deliveries Deliveries are now being made.

MARMON 34

A Scientifically Constructed Light Weight Car

MARMON

THE Marmon method of building motor cars has been developed through fourteen years of continuous success.

And the Nordyke & Marmon Company had been successful manufacturers of machinery for fifty-one years before the first Marmon motor car was produced. We have never experimented at the expense of Marmon dealers or owners.

We have never introduced a *novelty* in any Marmon car though we *have pioneered* in placing new *features* on the motor car market through the medium of our cars. We have *developed* novelties, and used the resulting practical features, but we have done the experimenting and developing in the Marmon *factory* at Marmon *expense*.

Our first car built in 1902 marked the beginning of the general use of side-entrance tonneau. It had straight-line drive, selective-type sliding gear transmission, double brakes on rear wheels, controls on the steering column, and the famous hollow crank shaft and force-feed oiling system — features now universally used.

We have never jumped forward just "to be first." So we are usually first when it comes to *practical* advance.

We emphasize this point because in our new 34 there are features that may seem novel.

For instance — the Marmon 10-inch frame, of which the running boards form a part, the compound cantilever cross-suspension rear spring, the fact that there are only four grease cups on this car, and the extensive use of aluminum.

But these features and others have a definite place in Marmon *performance*. They are not included either to *meet competition* or to "take it unawares." We never have introduced a feature merely for its value as a "talking point."

The Marmon's greatest feature is that intangible, undescribable thing called performance, for educated buyers finally *purchase* on the strength of a car's performance and Marmon performance is so *unusual* that every Marmon car not only *stays* sold but its owner unconsciously becomes a Marmon salesman working for you who sell these cars.

Single features, no matter how good, in any automobile are forgotten in the general results shown by the car on the road.

The Marmon has the features to impress those who place importance on single features, but its great *permanent* selling power is in *Marmon performance* and it is the conviction of the officials of this company that in this the Marmon leads all cars.

AN OPPORTUNITY FOR THE DEALER

We are increasing our output this year. There are sections where the Marmon is not represented — communities where there are real opportunities to market this type of car. Experienced dealers who are interested in real worth-while advancement are invited to communicate with

NORDYKE & MARMON COMPANY

ESTABLISHED 1851

INDIANAPOLIS INDIANA

NEW YORK SHOW
Space A18, First Floor

CHICAGO SHOW
Space H2, Coliseum

Announcing the Highest Quality Tire Possible of Manufacture

HARDMAN "SURE-GRIP" —TIRES—

¶ During years of practically localized activity our facilities have grown to such an extent that we are ready for national distribution.

¶ The opportunity therefore, is presented to high grade dealers, to acquire the exclusive Agency for Hardman Sure Grip Tires in their particular territories.

¶ HARDMAN SURE GRIP TIRES are high quality; high priced tires. They are the best tires that can be produced insofar as general manufacturing principles are concerned, and from a standpoint of wear and all around efficiency, in addition they possess several features of design that make them stand head and shoulders above the crowd.

¶ The HARDMAN Agency offers a splendid opportunity for a substantial money-making business with an assured future.

Are you located in the territory we want to open up?

Better write and see—Or wire collect.

HARDMAN TIRE & RUBBER COMPANY
BELLEVILLE, N. J.

LOZIER

THE connoisseur of art readily sees the beauty of the original, though there are prints which seemingly are alike. The work of a Rubens or an Angelo cannot be mechanically duplicated. Antakolski may be copied, but the copy will not be an Antakolski. Ellman alone can elicit from the violin the sweetness of an Ellman. There is only one Paderewski.

Men who know separate the copy from the original.

The gracefulness, the elegance, the tasteful and pleasing lines, the exclusiveness, the richness and the mechanical perfection of the Lozier, though imitated, have never been equalled.

Men who know have chosen the Lozier. They have chosen the Lozier because they know.

The Lozier Motor Co.
Detroit, Mich., U.S.A.

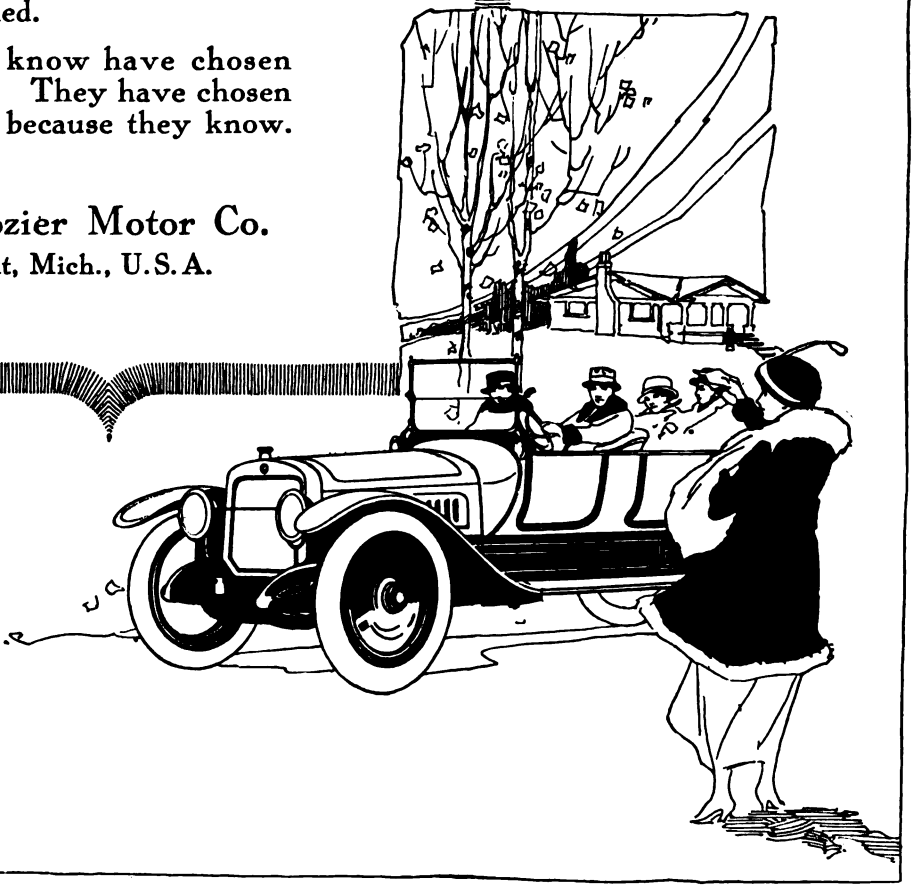
A Word With Dealers

Though you may or may not know it, it is true, nevertheless. Dealers who are now connected with the new Lozier proposition are doing well.

A number of our representatives are devoting their entire attention to the Lozier and cashing in.

We have some good territory open. If you can qualify, we'll take the matter up further with you.

Write or wire.



We shall exhibit at all the shows. There you can compare the Lozier with other cars at or about its price. That you'll admit the Lozier still retains its supremacy, we feel confident—for the Lozier is a better car to-day than it has ever been.

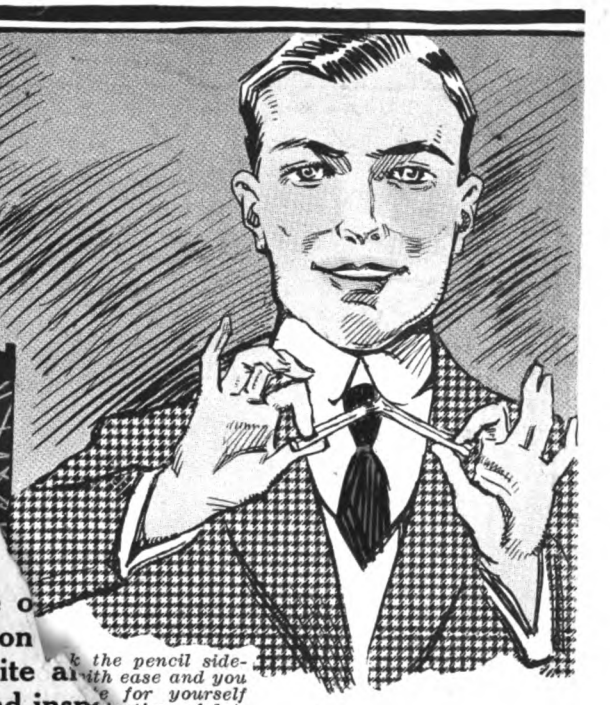
INCREASED
EXAMPLE OF

SHOWN herewith is the new home of Fedders radiators. This plant which has just been occupied provides for a little more than double the capacity of the old plant. The new portion is the four story structure shown in the illustration above.

¶ Notwithstanding the fact that even with this vastly increased manufacturing facility we are unable to accept all of the orders offered us at this time, we feel that with this new factory we have the finest equipment for the production of quality radiators in existence. At least under normal conditions it should enable us to maintain our reputation for both quality and service—a reputation attested to by scores of America's leading manufacturers, many of whom have used Fedders radiators since first they were produced.

FACILITIES
FEDDERS SI

FEDDERS RADIATORS



THE illustrations below show graphically one o
Primarily of course quality is dependent upon
those in the production of radiators and quite a
equal importance—that of most extreme testing and inspe

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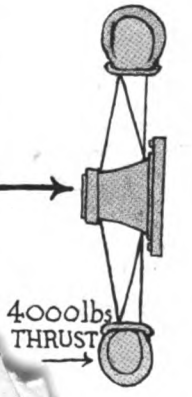
cation of lat-
in to the
ke.

¶ The photograph at the left shows one of the testing
of testing tanks. In this room the cores are tested, during
under pressure, to make sure that every joint is solidly solde
capacity of the Fedders plant may be gained by noting the s

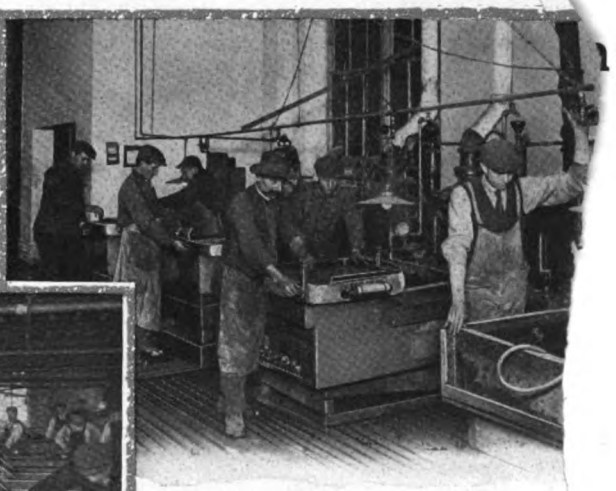
M

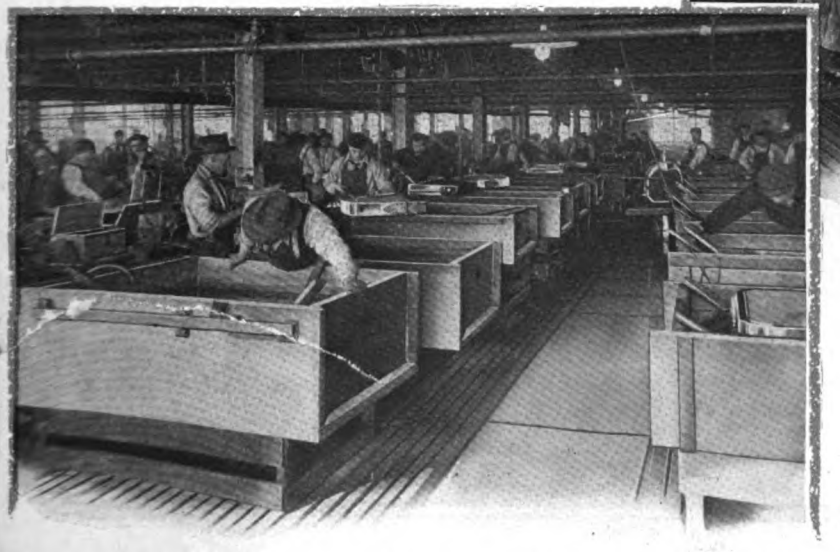
¶ The photograph at the right shows the final check aga
radiators. It is one corner of the final testing room into whi
radiator comes just before being packed for shipment. After the
through every other test and has been finally assembled and made rea
upon its chassis, then as a positive check upon all other departme
this final testing department where it receives its release to the purc



gth

One of the testing rooms with its long rows of testing tanks. In this room the cores are tested, during the process of assembly, under pressure, to make sure that every joint is solidly soldered.





One corner of the final testi
into which every completed
comes just before being pack
shipment.

N. Y.

ews Bldg.

FEDDERS MFG. CO. F

ALL-YEAR
be the Big Feature

great idea of Kissel's that stirred up
shows—will again be the dominating
go.

ous and enthusiastic approval of thousands
as: "Can this convertible car possibly be

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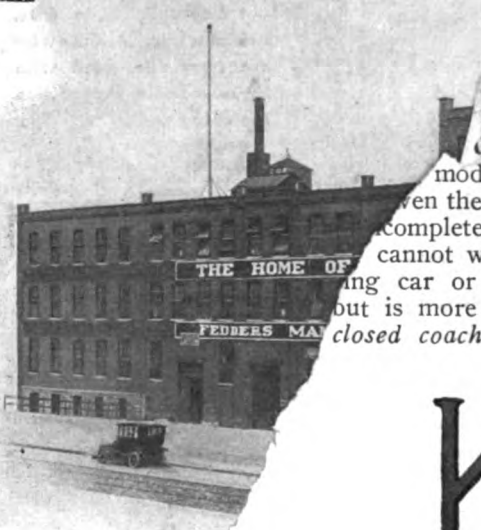
nything of the kind to offer.



model of the
ven the remotest
completeness.
cannot with strict
ng car or roadster
ut is more properly
closed coach built in

Here is a Sedan—or Coupe if you prefer—that matches in beauty, comfort and refinement the creations of a master coach-maker.

It is absolutely free from rattles—not a chatter in it. It is weather proof—there isn't a chance for water to seep through even in a driving downpour. It has inverted top irons—leaving the surface free and smooth.

KISSELKAR
Every Inch a Car

The ALL-YEAR Car is mounted on both the 32-Four and 42-Six chasses—*challenge values in mechanical worth.* The 32-Four is the sturdiest small car in America. The 42-Six is as good as a Six can be.

The five passenger ALL-YEAR Sedan on the 32-Four is $1450, on the 42-Six $2000. The ALL-YEAR Coupe on the 32-Four is $1450, on the 42-Six $1950.

Kissel Motor Car Co.
Hartford, Wisconsin, U. S. A.

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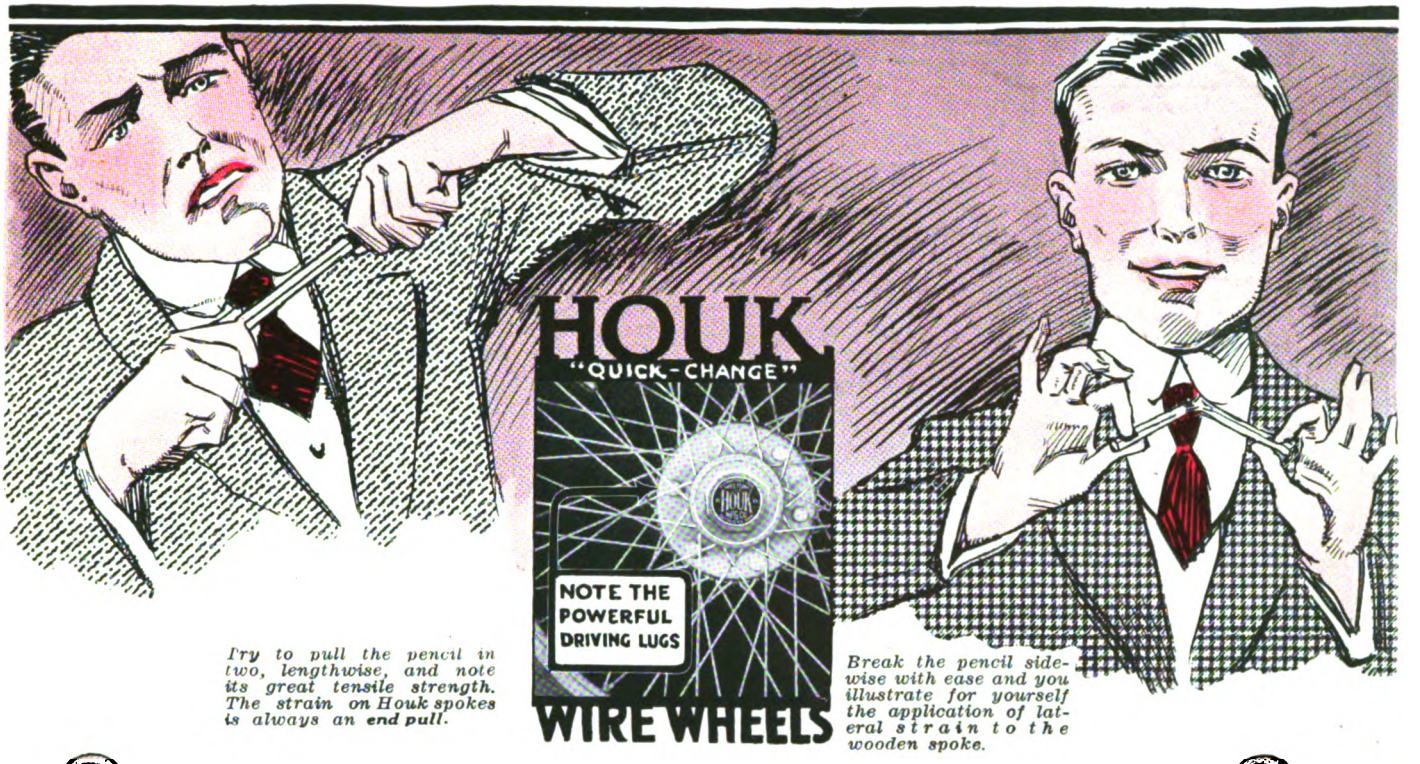
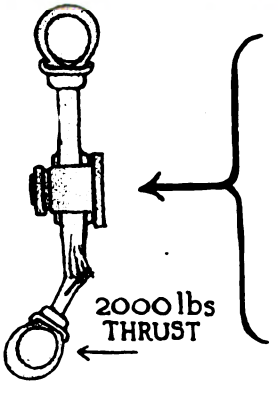
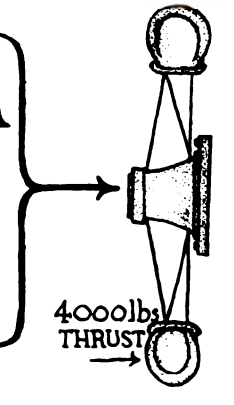


Try to pull the pencil in two, lengthwise, and note its great tensile strength. The strain on Houk spokes is always an ***end pull.***

Break the pencil sidewise with ease and you illustrate for yourself the application of lateral strain to the wooden spoke.



COMPARE THEM YOURSELF —



Tensile Strength *versus* Fracture Strength

You have traveled along a country road where rut after rut would strike your wooden wheels a dangerous lateral strain. Curves, rocks, and bumps are encountered now and then by every country-used car. Wooden wheel drivers, through instinct, have learned to drive these places with great caution.

Add joy to motoring by the absolute assurance that the strongest part of the car is the wheels and the easiest, quickest tire change in the world may be made with your own Houk Quick-Change Wire Wheels.

HOUK MANUFACTURING COMPANY, Buffalo, N. Y.

New York, 1792 Broadway **Chicago, 2337 Michigan Ave.** **San Francisco, Hews Bldg.**

Your Money Buys More

More power and greater smoothness—improved 45 horsepower motor which is the last word in six-cylinder smoothness and flexibility.

More room—125-inch wheelbase which means—

More comfort—for a full quota of seven adult passengers.

More convenient electrical control—all switches located on the steering column.

More certain starting—a two-unit starting and lighting system.

More tire mileage—4½ x 35 tires.

More stable organization—to give you service—there are more Overlands in use and going into use every day than any other car of more than 100-inch wheelbase.

Because we are the world's largest producers of sixes and fours, we can and do give in this improved six a car which is *dominant value* among sixes.

"Made in U. S. A."

The Willys-Overland Company, Toledo, Ohio